



SARATOGA  
SPRINGS

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1. 2020-8-4 Cc Agenda

Documents:

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2. 2020-8-4 Cc Packet

Documents:

[2020-8-4 CC PACKET.PDF](#)



## AGENDA – City Council Meeting

Mayor Jim Miller  
Mayor Pro Tem Ryan Poduska  
Council Member Christopher Carn  
Council Member Michael McOmber  
Council Member Chris Porter  
Council Member Stephen Willden

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### CITY OF SARATOGA SPRINGS

Tuesday, August 4, 2020, 6:00 pm

Pursuant to State and Federal Guidelines concerning  
COVID19, this Meeting will be conducted electronically.

Meetings are streamed live at

<https://www.youtube.com/c/CityofSaratogaSprings>

Questions and comments to staff and/or Council may be  
submitted to [comments@saratogaspringscity.com](mailto:comments@saratogaspringscity.com)

I, Jim Miller, the Mayor of the City of Saratoga Springs, hereby determines that conducting the City Council meeting at an anchor location presents a substantial risk to the health and safety of those who may be present at the anchor location. The World Health Organization, the President of the United States, the Governor of Utah, and the County Health Department have all recognized a global pandemic exists related to the new strain of the coronavirus, SARS-CoV-2 (COVID-19). Due to the State of emergency caused by the global pandemic, I find that conducting a meeting at an anchor location under the current state of public health emergency constitutes a substantial risk to the health and safety of those who may be present at the location. This written declaration expires 30 days from the date signed.

*Jim Miller, Saratoga Springs Mayor*

*Expiration: August 15, 2020*

### POLICY MEETING

1. Call to Order.
2. Roll Call.
3. Invocation / Reverence.
4. Pledge of Allegiance.

### REPORTS:

1. Mayor.
2. City Council.
3. Administration: Ongoing Item Review.

### BUSINESS ITEMS:

1. Planning Commission Appointment, Bryce McConkie; Resolution R20-36 (8-4-20).
2. The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan and Village Plan, Johnny Watson – JRW & Associates Applicant, Redwood Road and Medical Drive; Ordinance 20-27 (8-4-20).
3. Agreement with Avative for Use of Conduit for Fiber; Resolution R20-37 (8-4-20).

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In compliance with the Americans with Disabilities Act, individuals needing special accommodations (including auxiliary communicative aids and services) during this meeting should notify the City Recorder at 801.766.9793 at least one day prior to the meeting.

4. Reimbursement Agreement for Saratoga Springs Commercial Plat E with Westlake Partners, LLC; Resolution R20-38 (8-4-20).
5. Annual Interlocal Cooperation Agreement for Substance Misuse Prevention and Communities That Care Prevention Model with Utah County and Eagle Mountain; Resolution R20-39 (8-4-20).
6. Interlocal Cooperation Agreement for School Resource Officer with the Board of Education of Jordan School District; Resolution R20-40 (8-4-20).

**MINUTES:**

1. July 21, 2020; July 27, 2020.

**CLOSED SESSION:**

Motion to enter into closed session for any of the following: purchase, exchange, or lease of real property; discussion regarding deployment of security personnel, devices, or systems; pending or reasonably imminent litigation; the character, professional competence, or the physical or mental health of an individual.

**ADJOURNMENT**

Councilmembers may participate in this meeting electronically via video or telephonic conferencing. The order of the agenda items are subject to change by the Mayor. Citizens may address the Council during Public Input which has been set aside to express ideas, concerns, and comments on issues not listed on the agenda as a Public Hearing. All comments must be recognized by the Mayor and addressed through the microphone. Final action may be taken concerning any topic listed on the agenda.

**Decorum** - The Council requests that citizens help maintain the decorum of the meeting by turning off electronic devices, being respectful to the Council and others.



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**RESOLUTION NO. R20-36 (8-4-20)**

**A RESOLUTION APPOINTING BRYCE MCCONKIE TO THE CITY OF SARATOGA SPRINGS PLANNING COMMISSION AND ESTABLISHING AN EFFECTIVE DATE.**

WHEREAS, the City of Saratoga Springs has established a municipal Planning Commission as required by Section 10-9a-301, Utah Municipal Code; and

WHEREAS, one Planning Commission vacancy has been created through the voluntary departure of a member; and

WHEREAS, the Mayor is authorized to fill vacancies in the Planning Commission with the advice and consent of the City Council; and

WHEREAS, the purpose of this Resolution is to make recommendation to fill the Planning Commission vacancy; and

WHEREAS, the Mayor desires and believes it to be in the best interest of the health, safety, and welfare of the residents of the City of Saratoga Springs to appoint Bryce McConkie to the Planning Commission.

NOW THEREFORE, BE IT RESOLVED BY THE GOVERNING BODY OF THE CITY OF SARATOGA SPRINGS, UTAH, AS FOLLOWS:

1. Bryce McConkie is hereby appointed to the Planning Commission to complete the remainder of Bryan Chapman's four-year starting August 13, 2020, and ending December 31, 2020.
2. This Resolution shall take effect immediately upon passage.

Current Regular Members

Expiration of Term

Bryce McConkie	December 31, 2020
Ken Kilgore	December 31, 2020
Audrey Barton	December 31, 2021
Joshua Wagstaff	December 31, 2021
Bryce Anderson	December 31, 2022
Troy Cunningham	December 31, 2023
Reed Ryan	December 31, 2023

Passed this 4<sup>th</sup> day of August, 2020.

Signed: \_\_\_\_\_  
Jim Miller, Mayor

Attest: \_\_\_\_\_  
Cindy LoPiccolo, City Recorder



**Community Plan and Village Plan**

**The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community/Village Plan**

**August 4, 2020**

**Public Meeting**

Report Date:	July 28, 2020
Applicant:	Johnny Watson – JRW & Associates
Owner:	Suburban Land Reserve
Location:	Redwood Road and Medical Drive
Major Street Access:	Redwood Road
Parcel Number(s) & Size:	58:032:0208, 16.52 acres (11.82 acres)
Parcel Zoning:	Planned Community (PC)
Parcel Land Use:	Planning Community Mixed Use
Adjacent Zoning:	PC, RC, CC
Current Use of Parcel:	Agriculture
Adjacent Uses:	Agriculture, commercial, vacant
Previous Approvals:	City Center District Area Plan (2010) Planning Commission recommendation (July 2020)
Land Use Authority:	City Council
Future Routing:	City Council
Type of Action:	Legislative
Author:	David Stroud, AICP, Planning Director

**A. EXECUTIVE SUMMARY**

The applicant requests approval of The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan (CP) and Village Plan (VP) pursuant to Section 19.26 of the Land Development Code (Code) and the City Center District Area Plan (DAP). The proposal allocates 32 residential equivalent residential units (ERU) with one ERU equal to 2,165 square feet of non-residential use. Lot 1 ERUs are yet TBD. The proposed structures comprise approximately 69,788 square feet.

**The Planning Commission recommends the City Council conduct a public meeting, discuss the proposed CP and VP and approve the request subject to the finding and conditions in the staff report along with the following additional conditions: 1) look at enhancing the walls visually with pilasters or some-such detail to bring it closer to compliance to City Code, and 2) look at suggesting to UDOT to mitigate Access 1 and its LOS F with a possible right/right median installed.**

**B. BACKGROUND**

The City Center District Area Plan (DAP) was approved in 2010 following annexation of just under 3,000 acres into the City. As part of the annexation agreement and DAP, the 2,883 acres are vested for 16,000 residential units and 10,000,000 square feet of non-residential area:

**Land Use Table**

Type of Land Use	Quantity
Residential Housing	16,000 Units
Non-residential Area	10 million sq. ft.
Equivalent Residential Units	20,620 Units

The DAP also approves Place Types ranging in density from 5-75 dwelling units per acre:

Place Types	Dwelling Unit Density Range	Range of FAR *
Urban Center	14-75	0.39-2.34
Transit Oriented Development	8-75	1.25-2.4
Town Neighborhood	6-34	0.36-1.82
Business Park	0	0.39-0.93
Office Warehouse	0	0.39-0.93
Neighborhood Commercial	5-14	0.39-1.5
Regional Retail	0	0.36-0.47
Traditional Neighborhood	5 -32	0.47-1.04
Master Planned Subdivision	4-14	0.35-0.50
Resort/Hospitality	6-8	.36-.93

\* FAR = Floor Area Ratio

(Note: the complete DAP can be found by visiting <http://www.saratogaspringscity.com/182/Planning-Zoning> and clicking on “General and Master Plans” then “City Center District Area Plan.”)

While the DAP includes several conceptual scenarios for the distribution of various place types, both the DAP and Code allow the place type for individual developments to be identified and finalized at the time of CP approval. Of the six concept maps in the DAP identifying potential place types, the applicant has chosen Regional Retail as the specific place type. Regional Retail does not permit residential uses.

**C. SPECIFIC REQUESTS**

**Community Plan**

The CP cover approximately 11.82 acres. The proposed plan contains a one village plan and one lot with a tenant to be approved at a later date. The CP contains development standards and other information necessary to develop the VP parcel. The vacant parcel will be developed in the future and will follow Title 19 standards pertaining to development in the Regional Commercial zone.

**Village Plan 1**

The village plan contained in this request outlines the development standards of the Welfare Complex. The subsequent village plan provides the on-site details necessary to construct the two buildings, landscaping, and parking of the complex.

## D. PROCESS / HOW IT WORKS

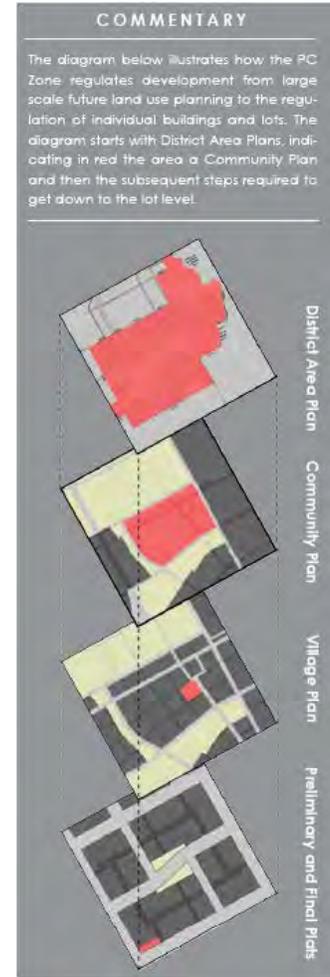
Section 19.26 of the Code describes development in the PC zone, and the graphic to the right shows the hierarchy of the different plans:

1. For a large-scale planned community district, an overall governing document is first approved, known as the District Area Plan (Section 19.26.13).
  - *The City Center DAP was approved in 2010.*
2. A Community Plan is then proposed and approved (Sections 19.26.03-19.26.08). The Community Plan lays out the more specific guidelines for a sub-district within the DAP.
  - *The Welfare Complex Community Plan will govern the 11.82 acre sub-district of the DAP.*

The approval process for the CP/VP includes:

1. A public hearing and recommendation by the Planning Commission.
2. A public meeting and final decision by the City Council (19.26 states the process is per Section 19.17, which then refers to Utah State Code 10-9a-502, which requires a public hearing with the Planning Commission and a public meeting with the legislative body).

Next steps will include preliminary and final subdivision plats to create the development lots, and a site plan of the buildings. Because the site plan and lotting plan is contained in the CP/VP, these subsequent approvals will be done at a Staff level. Development on Lot 1 will follow the standard procedure outlined in Title 19 with Planning Commission as the land use authority.



## E. COMMUNITY REVIEW

The Planning Commission will hold a public hearing on July 23, 2020. A notice has been sent to the *Daily Herald* and a mailed notice was sent to all property owners within 300 feet. As of the date of this report, no public comment has been received.

## F. REVIEW

### Place Type

The applicant has designated Regional Retail as the place type and Parkway Open Space of the District Area Plan.

### REGIONAL RETAIL

Range of Average Dwelling Units/Acre	0 du/ac
Range of Average FAR	0.36-0.47
Range of Open Space	11 -14 %

Open Space Types:

- Plaza
- Entrance park
- Pocket park
- Special Use
- Greenway
- Parkway (Boulevard)
- Park lawns
- Connector trail

*The “ingredients” that make up Regional Retail:*

Regional retail includes an agglomeration of large and small scale retail buildings. Some office buildings can also be found in regional retail areas. The retail serves a community that extends beyond the neighborhoods to the entire region. Regional retail provides adequate parking for the businesses in close proximity to the stores and the customers arriving via automobile. Regional retail is located at major intersections of highways and arterials and along key transit corridors in the region. Housing is not included in this place type, however neighborhoods may be located adjacent to regional retail. Nearby residential can be connected to regional retail centers by a grid street network that is walkable.

# Parkway (Boulevard)



## Description

Urban streets that provide comfortable and safe pedestrian and cyclist connections. May include landscaped center median, large shade trees, on or off street bikeways, and seating.

## Size

Varies

## Service

Varies

## Examples

600 East, 300 South (Broadway)

## Uses

The uses identified in the development are to be those uses permitted in the Title 19 designation of the Regional Commercial zone.

## Traffic and Infrastructure

A traffic study prior to or concurrent with site plan and plat approval will be required. Water, sewer, and storm drain lines are in the immediate vicinity to service the site. General infrastructure plans have been provided, and more detail will also be provided and reviewed with later applications.

## Development Standards

### *Community Plan and Village Plan*

The CP and VP contain the general standards as proposed by applicant for the entire 11.82-acre project and address such issues as

- Signage
- Sidewalks
- Landscaping
- Architecture
- Pedestrian network
- Transportation
- Infrastructure and utilities
- Environmental issues

## Staff Review

Staff has reviewed the CP and VP and provided redlines to the applicant. A resubmittal was provided to staff and this latest document is provided as an exhibit in the staff report. The Planning Commission held a public hearing on July 23, 2020, with the direction to provide a recommendation to the City Council. There was no public comment. The City Council meeting is scheduled for August 4, 2020.

## G. GENERAL PLAN

The General Plan Land Use map identifies this area as Planned Community Mixed Use, which states:

*The Planned Community designation includes large-scale properties within the City which exceed 500 acres in size. This area is characterized by a mixture of land uses and housing types, and has a mixture of commercial uses. It is subject to an overall Community Plan that contains a set of regulations and guidelines that apply to a defined geographic area*

The 2,883 acre DAP was approved in 2010 in compliance with the General Plan and the intent of the Planned Community designation. The proposed Community Plan and Village Plan include trail connections and landscaping in compliance with the related master plans, and specific development standards and design guidelines.

## H. CODE CRITERIA

The property is zoned PC, and is subject to the standards and requirements in Section 19.26 of the Code, and its several sub-sections.

### 19.26.04 – Uses Permitted within a Planned Community District

- The Community Plan addresses what uses will be permitted within the development as the PC zone text does not make this distinction. The uses identified in the development are to be a regional commercial in nature.

## COMMUNITY PLAN CODE REQUIREMENTS

### Section 19.26.06 – Guiding Standards of Community Plans

The standards for a Community Plan/Village Plan are below:

1. Development Type and Intensity. The allowed use and the conceptual intensity of development in a Planned Community District shall be as established by the Community Plan.  
*Staff finding: complies. Development type has been identified as well as the intensity of the uses broken down into a single village plan.*
2. Equivalent Residential Unit Transfers.  
*Staff finding: complies. No residential density is proposed to be transferred. Residential is not considered as part of this CP nor is it permitted in the Regional Retail Neighborhood Place Type.*
3. Development Standards. Guiding development standards shall be established in the CP.  
*Staff finding: complies. The CP will establish a level of standards to be met with future site plans and subdivision plans and more detailed standards in the VP. If a standard is not addressed in the CP or VP, Title 19 of the City Code shall be used to determine compliance.*
4. Open Space Requirements.  
*Staff finding: complies. While the Code currently requires 30 percent open space for development in the Planned Community Zone, it allows DAPs to include a lower range. The City Center DAP is the governing document for the proposed Community Plan, and the proposed open space and landscaping meets the standards and range of 11-14 percent as identified in the DAP for the Regional Retail Neighborhood Place Type.*
5. No structure (excluding signs and entry features) may be closer than twenty feet to the peripheral property line of the Planned Community District boundaries.
  - a. The twenty-foot area is to be used as a buffer strip and may be counted toward open space requirements, but shall not include required back yards or building set back areas.
  - b. The City Council may grant a waiver to the requirement set forth in this subsection upon a finding that the buffer requirement will result in the creation of non-functional or non-useable open space area and will be detrimental to the provision of useful and functional open space within the Project.  
*Staff finding: complies. The proposed buildings will not be located within 20 feet of the PC zone boundary.*

### b) 19.26.07 – Contents of Community Plans

The items summarized below are required to be part of a Community Plan:

1. Legal Description. **Provided**
2. Use Map. **Provided**
3. Buildout Allocation. **Provided**
4. Open Space Plan. **Provided**
5. Guiding Principles. **Provided**

5. Utility Capacities. **Provided**
6. Transportation. **Provided.**
7. Conceptual Plans. Other elements as appropriate - conceptual grading, wildlife mitigation, open space management, hazardous materials remediation, fire protection. **Provided**
8. Additional Elements. **Provided**
9. Application and Fees. **Provided**

**c) 19.26.05 – Adoption and Amendment of Community Plans**

The criteria for adoption of a Community Plan are below:

- a. is consistent with the goals, objectives, and policies of the General Plan, with particular emphasis placed upon those policies related to community identity, distinctive qualities in communities and neighborhoods, diversity of housing, integration of uses, pedestrian and transit design, and environmental protection;  
*Staff finding: consistent. See Section G of this report.*
- b. contains sufficient standards to guide the creation of innovative design that responds to unique conditions;  
*Staff finding: complies with conditions. The Community Plan contains the standards necessary at this level. Great detail is/will be provided when the time comes to review the various village plans. Future development will comply with the standards in the CP and VPs.*
- c. is compatible with surrounding development and properly integrates land uses and infrastructure with adjacent properties;  
*Staff finding: complies. The surrounding uses are vacant, agriculture, and commercial. The proposed CP uses are compatible with the adjacent properties.*
- d. includes adequate provisions for utilities, services, roadway networks, and emergency vehicle access; and public safety service demands will not exceed the capacity of existing and planned systems without adequate mitigation;;  
*Staff finding: complies. Utility plans have been reviewed by the City Engineer and Public Safety.*
- e. is consistent with the guiding standards listed in Section 19.26.06; and  
*Staff finding: complies. See analysis in subsection H.a) above.*
- f. contains the required elements as dictated in Section 19.26.07.  
*Staff finding: complies. The application contains all required elements.*

**VILLAGE PLAN CODE REQUIREMENTS**

**19.26.03(2) – Additional Village Plan Requirements**

Additional requirements for a Village Plan are summarized below:

- a. A detailed traffic study – **General information provided, detailed information required with site/preliminary plat.**
- b. A map and analysis of backbone infrastructure systems - **Provided.**
- c. Detailed architectural requirements and restrictions - **Provided.**
- d. If applicable, details regarding the creation of an owners’ association, master association, design review committee, or other governing body - **N/A.**

**Contents of a Village Plan**

The required contents of a Village Plan are summarized below:

1. Legal Description – **Provided**
2. Detailed Use Map – **Provided**

3. Detailed Buildout Allocation – **Provided**
4. Detailed Development Standards – **Provided**
5. Design Guidelines – **Provided**
6. Owner’s/Governing Associations – **N/A**
7. Phasing Plan – **Provided**
8. Lotting Map – **Provided**
9. Landscaping Plan – **Provided**
10. Utility Plan – **Provided**
11. Vehicular Plan – **Provided**
12. Pedestrian and Bicycle Plan – **Provided**
13. Additional Detailed Plans. Other elements as necessary (grading plans, storm water drainage plans, wildlife mitigation plans, open space management plans, sensitive lands protection plans, hazardous materials remediation plans, and fire protection plans) – **Provided**
14. Site Characteristics – **Provided**
15. Density Transfers – **N/A, no transfer considered**
16. Findings Statement – **Provided**
17. Mitigation Plans (Protection and mitigation of significant environmental issues) – **Provided**
18. Offsite Utilities – **Provided**
19. Development Agreement – **If needed**

**Village Plan Approval**

The criteria for a Village Plan approval are summarized below:

- a. is consistent with the proposed/adopted Community Plan;  
*Staff finding: can comply. The Village Plan appears to be consistent with the allowed densities, FAR, uses, and standards of the proposed Community Plan.*
- b. does not exceed the total number of equivalent residential units dictated in the adopted Community Plan;  
*Staff finding: complies with conditions. The ERUs are consistent with the CP.*
- c. for an individual phase, does not exceed the total number of equivalent residential units dictated in the adopted Community Plan unless transferred per the provisions of the Community Plan;  
*Staff finding: complies. The ERUs have been provided and are consistent with the CP.*
- d. is consistent with the utility, infrastructure, and circulation plans of the Community Plan; includes adequately sized utilities, services, and roadway networks to meet demands; and mitigates the fair- share of off-site impacts;  
*Staff finding: complies with conditions. See Engineering Report*
- e. properly integrates utility, infrastructure, open spaces, pedestrian and bicycle systems, and amenities with adjacent properties; and  
*Staff finding: complies. Utility plans, pedestrian plans, and trail/sidewalk cross sections have been provided. Future connectivity is considered.*
- f. contains the required elements as dictated in Section 19.26.10.  
*Staff finding: complies. See below. All required topics have been included.*

**I. Recommendation:**

The Planning Commission recommends the City Council conduct a public meeting, discuss the proposed CP and VP and approve the request subject to the finding and conditions in the staff report along with the following additional conditions: 1) look at enhancing the walls visually with pilasters or some-such detail to bring it closer

to compliance to City Code, and 2) look at suggesting to UDOT to mitigate Access 1 and its LOS F with a possible right/right median installed.

**Option 1 – Approve**

“I move to **approve** of The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan and Village Plan with the Findings and Conditions below:”

**Findings**

1. The application complies with the City Center District Area Plan (DAP). Specifically, the neighborhood type, open space type, required contents, density, and unit type as permitted in the DAP.
2. The application is consistent with the goals, objectives, and policies of the General Plan, as identified in Section G of this report, which section is incorporated by reference herein;
3. The application complies with Section 19.26 of the Development Code as outlined in Section H of the Staff report, which section is incorporated by reference herein.

**Conditions:**

1. All requirements of the City Engineer shall be met.
2. All requirements of the Fire Department shall be met.
3. The Community Plan shall be edited as directed by the Council.
4. Minor non-substantive changes shall be made prior to Council action.
5. Other: enhance the walls visually with pilasters or some-such detail to bring it closer to compliance to City Code.
6. Other: suggesting to UDOT to mitigate Access 1 and its LOS F with a possible right/right median installed.
7. \_\_\_\_\_

**Option 2 – Continuance**

“I move to **continue** The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan and Village Plan to the [DATE] City Council meeting with direction to the applicant and Staff and the applicant on information and/or changes needed to render a decision, as follows:

1. Changes identified by the City Council shall be incorporated.
2. Other: \_\_\_\_\_
3. Other: \_\_\_\_\_
4. Other: \_\_\_\_\_

**Option 3 – Denial**

“I move to **deny** The Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan and Village Plan with the Findings below:

1. The application is not consistent with the General Plan, as articulated by the City Council: \_\_\_\_\_, and/or
2. The application is not consistent with the DAP, as articulated by the City Council: \_\_\_\_\_, and/or
3. The application does not comply with Section 19.26 of the Code, as articulated by the Commission: \_\_\_\_\_.

**J. Exhibits:**

1. Proposed Community/Village Plan
2. Planning Commission Minutes

COMMUNITY AND  
VILLAGE PLAN

# Saratoga Springs UT Welfare Complex



July, 2020

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## PREFACE

The following Community and Village Plan document addresses the proposed improvements as they pertain to the proposed Deseret Industries and Bishop’s Storehouse located in Saratoga Springs, Utah. The property and the proposed improvements for the development are discussed in detail and follow the requirements set forth within the Community and Village Plan requirements of the City Code of Saratoga Springs. The purpose of the document is to inform the City (Staff, Planning Commission, and City Council) and Public of the proposed general design elements, open space plans, guiding design principles and land uses for the Saratoga Springs Welfare UT Welfare Complex. In addition, utility capacities based on conceptual plans, will outline the methods used to anticipate the demands and service requirements necessary to provide adequate utility service and infrastructure for the proposed improvements.

## EXECUTIVE SUMMARY

The proposed Saratoga Springs UT Welfare Complex is an approximate 11.82-acre parcel located on the northwest corner of State Route 68 (Redwood Road) and Medical Drive in Saratoga Springs. The project is ideally situated to provide connectivity and minimize impact with local and major transportation corridors.

The proposed Community and Village Plan incorporates the following units and approximate acreages:

- *11.82 Total Acres*

## LEGAL DESCRIPTION

The proposed Village Plan contains approximately 11.82-acres of property. Please see Appendix A for a copy of the ALTA survey for the property. The parcel metes and bounds legal description is as follows:

A portion of the Southwest Quarter of Section 14, Township 5 South, Range 1 West, Salt Lake Base and Meridian, located in Saratoga Springs, Utah, more particularly described as follows:

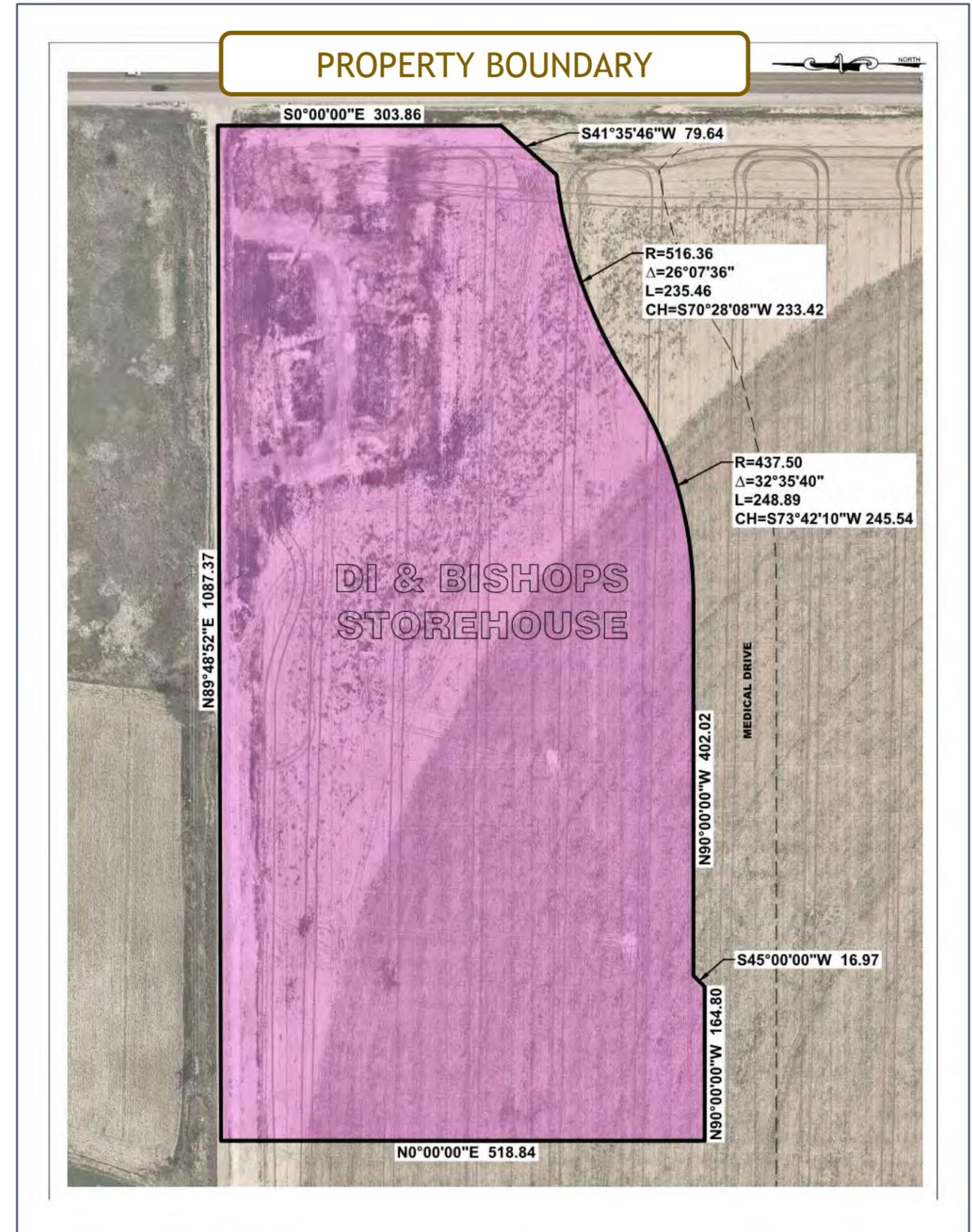
Beginning at a point on the north right-of-way line of Medical Drive, Being located  $N0^{\circ}20'51''E$  along the Section Line 2137.03 feet and east 1512.99 feet from the southwest corner of Section 14, Township 5 South, Range 1 West, Salt Lake Base & Meridian; thence north 518.84 feet to the Quarter Section Line; THENCE  $N89^{\circ}48'52''E$  along the Quarter Section Line 1087.37 feet; thence south 303.86 feet; thence  $S41^{\circ}35'46''W$  79.65 feet; thence southwesterly along the arc of a 516.36 foot radius non-tangent curve to the left (radius bears:  $S6^{\circ}28'05''E$ ) 235.46 feet through a central angle of  $26^{\circ}07'37''$  (chord:  $S70^{\circ}28'09''W$  233.43 feet); thence along the arc of a 437.50 foot radius curve to the right 248.89 feet through a central angle of  $32^{\circ}35'40''$  (chord:  $S73^{\circ}42'10''W$  245.54 feet); thence west 402.02 feet; thence  $S45^{\circ}00'00''W$  16.97 feet to the north right-of-way line of Medical Drive; thence west along said right-of-way line 164.80 feet to the point of beginning

Contains:  $\pm 11.82$  Acres

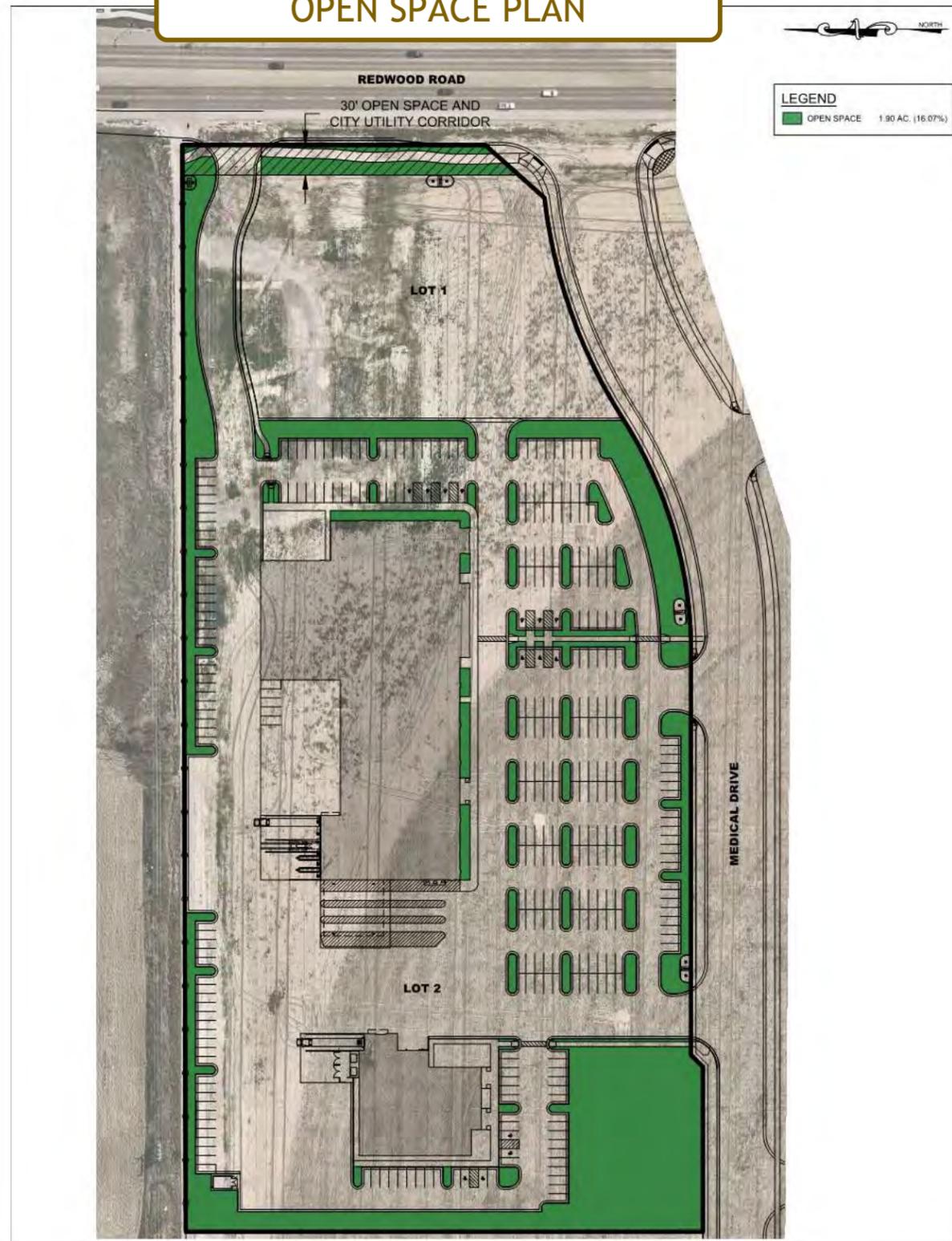
The intersection at Medical Drive and Redwood Road (SR-68) is currently being designed with the proposed development to the south. Depending on the design review and final platting from the Utah Department of Transportation and City staff, the following conditions are proposed related to this Community/Village Plan:

- If the project's acreage increases or decreases from the amount listed above, City Staff can approve the updated acreage by amending the Community/Village Plan as a minor amendment.

The 11.82 acres of land is part of an overall parcel that will require a City approved subdivision exception through a metes and bounds description to be divided from the parent parcel. This will be completed prior or concurrently with the site plan approval.



## OPEN SPACE PLAN



## OPEN SPACE PLAN

Open space for the proposed Saratoga Springs UT Welfare Complex will continue the City's goal for pedestrian wayfinding and safety by incorporating the following key elements that are based on the current City Code requirements:

**Public Sidewalks.** Sidewalks are to be installed along the entire property frontage. Sidewalk connections points will be at Medical Drive and Redwood Road (south. Roadway frontage improvements will adhere to City Roadway Standards. Sidewalk widths and placements will follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.

- **Open Space / Landscaping.** The proposed Saratoga Springs UT Welfare Complex will follow the Regional Retail place type as specified in the DAP. The DAP specifies a landscaping requirement for Regional Retail of approximately 11 to 14-percent which is exceeded for the site at approximately 16-percent. In addition to the sidewalk and pedestrian access throughout the project and along the City ROWs, the project will utilize the Parkway (Boulevard) Open Space Type by placing a pedestrian plaza with benches at the corner of the shared access to the Bishop's Storehouse and Deseret Industries. The backdrop to the pedestrian plaza will feature landscaping that will create a warm and inviting location for those passing by. See the Conceptual Landscaping Plans found in Appendix B for more detail.
- **Public Open Space.** A 30-foot landscape and utility easement/buffer will be provided along Redwood Road that will be owned and maintained by the Church of Jesus Christ of Latter-day Saints. The buffer will include a meandering trail located within a pedestrian access easement and follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.
- **Monumentation and Signage.** Signage will be specific and similar to other uses within the City. Monumentation and signage will meet the regional commercial sign requirements set forth in Title 19.18 of the City Code. See the signage example provided in the following section.



## USE MAP AND BUILDOUT ALLOCATION

The following Use Map depicts the proposed land uses for the Saratoga Springs UT Welfare Project. There will be two lots within the boundary of the Saratoga Springs UT Welfare Project Community/Village Plan. The Village will incorporate the following place type as specified in the District Area Plan:

- Regional Retail.** This area is located just west of State Route 68 and adjacent to Medical Drive in Saratoga Springs. The anticipated land use of Regional Retail coincides with the land uses within the City Center District Area Plan for Saratoga Springs. The DAP place type of Regional Retail will follow the Regional Commercial (RC) zone standards of Title 19 unless expressly identified herein.

Lot 1 will remain vacant until such time a commercial use is determined for the site. Lot 1 will need to follow the appropriate City approval process (Title 19.04 – Regional Commercial [RC]) once a commercial use has been determined. The remaining portion of this document will address the anticipated improvements of Lot 2 which will be completed in a single phase.

Two different methods were requested in determining the land use intensities for Lot 2 within this Village. Both methods illustrate the process used in determining the Equivalent Residential Units (ERUs) for this specific project. They are as follows:

**Method 1 – District Area Plan Guidelines.** The District Area Plan (DAP) states that one ERU is equivalent to 2,165 square feet (sf) of “non-residential area.” The 2,165 sf is generated by dividing 10,000,000 sf commercial area by 4,620 non-residential ERUs as per the DAP. The total proposed building square footage within the boundaries is approximately 69,788 sf. The following yields:

$$(69,788 \text{ sf}) / (2,165 \text{ sf/ERU}) = 32.2 \text{ ERUs}$$

**Method 2 – Water Supply Fixture Unit (wsfu).** A plumbing fixture analysis was completed and based on the anticipated uses for this project. Calculations provided within the utility section of this Community and Village Plan generate approximately **6.5 ERUs** for the two proposed buildings within the project.

The ERU density calculation method (Method 1) identified in the District Area Plan will be used and results in **32.2 ERUs** for the proposed Lot 2 of this Village. Method 2 will be used later within this document for determining the anticipated utility capacities for the project and eventual impacts to the City system.

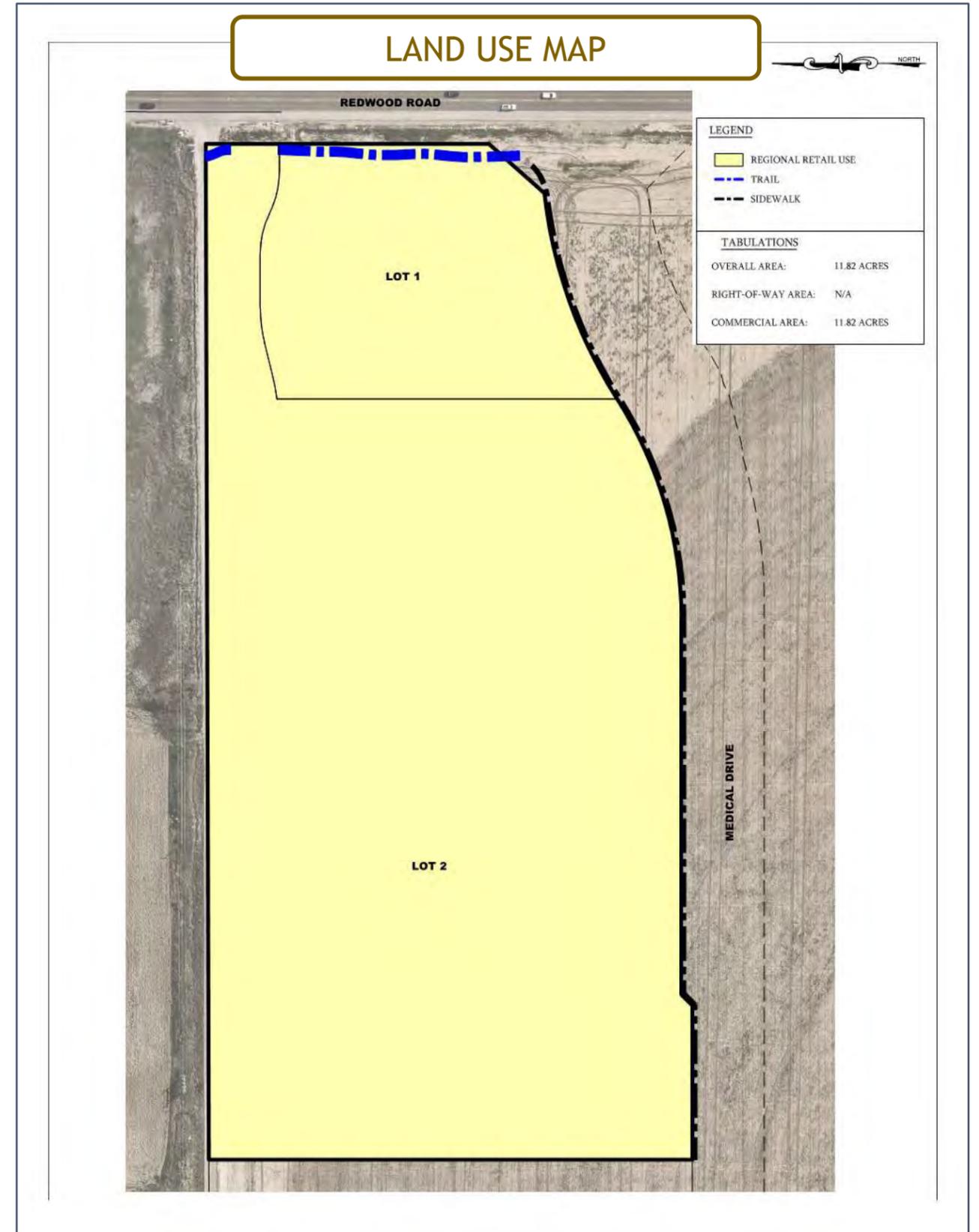
### Village Plan

Lot 2 of this Village will only contain a single use. The Welfare Complex will contain a commodity resource center and a retail thrift store, both of which are a non-profit organization and a division of the Welfare Services of The Church of Jesus Christ of Latter-day Saints.

Overall Village Area (Regional Retail):	11.8 Ac (100%)	32 ERUs based on floor area (100%)
Lot 1 Area:	2.0 Ac (17%)	ERUs to be determined.
Lot 2 Area:	9.8 Ac (83%)	32 ERUs based on floor area (100%)
Projected Population:	0 Persons	
Projected Employment:	255 Equivalent Full Time Jobs	
Deseret Industries:	220 Equivalent Full Time Jobs (includes Employment Center)	
Bishop’s Storehouse:	35 Equivalent Full Time Jobs	

## DEVELOPMENT STANDARDS AND LOTTING MAP

The Saratoga Springs UT Welfare Complex is the only use within this proposed area. Development standards will adhere to the City Code (RC Zone) and the latest approved version of the Standards and Specifications if not specified in the CP/VP.



**Fencing.** There is only one type of fencing anticipated for the site. The fencing type is as follows:

- **6-Foot SimTek Fence.** This fence type will typically follow the rear exterior property lines on the north side of the Village. An authentic stone texture or material pattern is anticipated to contain and restrict access and viewership to the non-public areas and help the anticipated uses for the site to function uninhibited. Pattern and material may vary and to be approved by City Staff during the site plan approval process.
- **Trash Enclosure.** The proposed trash enclosure will follow Title 19 of the City Code.

**Lighting.** Section 19.11 Lighting shall govern with the exception that parking lot light poles may include fixtures of the type and design shown in below. Parking light poles of 36-feet 6-inches in height are permitted provided such lighting poles are bronze in color and designed to blend into existing backgrounds. Additional building accent and security lighting may be provided on the building not to exceed 16-feet in height. Lighting along public roads will be maintained by the City (Redwood Road) and shall be per City standard details and specifications. All exterior lighting shall comply with the City of Saratoga Springs Dark Sky ordinance/requirements.

#### **MAINTENANCE PLAN**

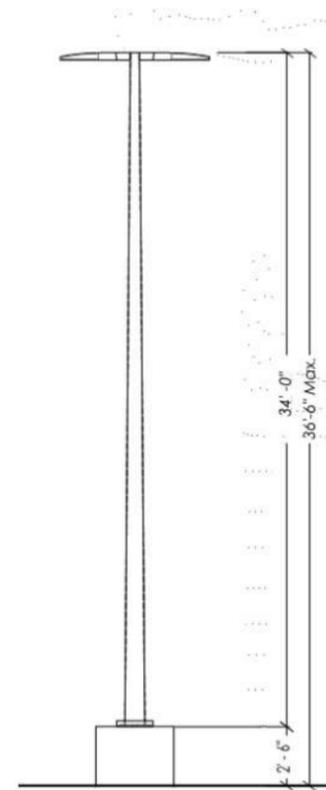
All the proposed open space or landscaping improvements as discussed above will be owned and maintained by The Church of Jesus Christ of Latter-day Saints. The planter strips within a public right-of-way along each property boundary will be owned by the City or UDOT but maintained by The Church of Jesus Christ of Latter-day Saints.

#### **PHASING PLAN**

All improvements for the proposed Village Plan will be completed in a single construction phase.

## **HOMEOWNERS ASSOCIATION**

No homeowners association is anticipated for the project with all open space and amenities in and around the proposed Village Plan to be owned and maintained by The Church of Jesus Christ of Latter-day Saints.



## **GUIDING PRINCIPLES**

The guiding principles for the proposed Saratoga Springs UT Welfare Complex will stay consistent with similar uses provided by the Church of Jesus Christ of Latter-day Saints within Saratoga Springs. It is the Church's goal to integrate with the local surroundings and keep in harmony with the standards set forth by the City of Saratoga Springs. The following provides the guiding principles anticipated for the project:

- **Establishment of Standards.** Architectural design of the building will be similar to what is shown in the rendering shown in Appendix F with final design to be reviewed at site plan approval. No Covenants, Conditions and Restrictions (CC&Rs) are anticipated for the project.
- **United Theme.** It is the desire of the Church of Jesus Christ of Latter-day Saints to keep consistent with similar uses within Saratoga Springs. Any and all street signage and monumentation will keep consistent with similar uses within the City. See the example previously provided. Colors and dimensions may vary with final design.
- **Minimize Impacts.** A variety of techniques have been incorporated within proposed Saratoga Springs UT Welfare Complex to decrease the impacts on the surrounding area and adjacent neighbors to the project. This is accomplished through project orientation and transportation corridors.
  - **Project Orientation.** The front of the Deseret Industries and Bishop's Storehouse are oriented to the south facing Medical Drive. A shared access point will be placed between the two buildings onto Medical Drive.
  - **Transportation Corridors.** Primary access to the Saratoga Springs UT Welfare Complex will be from Medical Drive with a single primary access and two secondary access points. Medical Drive and Redwood Road (State Route 68) is planned to be a controlled access point or traffic light. An additional secondary access point is planned on the northeast end of the project on to Redwood Road (State Route 68).
- **Community Plan Character.** Properly designed and placed landscaping can create a sense of character similar to other uses within the City. The conceptual landscape plan in Appendix B provides an example of the anticipated landscaping for the proposed Saratoga Springs UT Welfare Complex. Landscaping within the planter strips of the City right-of-way will adhere to City Standards and Specifications. Interior landscaping exhibits are conceptual by nature but show the general placement of trees, shrubs and other vegetation.

## UTILITY CAPACITIES

The location of the proposed Village Plan has utilities located within two of the existing rights-of-way: Redwood Road (State Route 68 and Medical Drive. The existing utilities within these two-existing rights-of-way will serve as the backbone infrastructure for the culinary water, secondary water, storm drain and sanitary sewer. Internal line connections from one right-of-ways to the other will provide the necessary looping and sizing required to service the proposed uses within Village Plan. The following addresses each of the different utilities and any specific requirements for each:

### CULINARY WATER

There is an existing 12-inch culinary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. An additional loop will be created by extending an 8-inch culinary water main interior to the project to serve the necessary fire line and fire hydrants required on-site. The interior loop is not anticipated to connect with the existing culinary infrastructure within Redwood Road due to traffic and utility locations in this area.

#### Fire Flow Requirements

A fire flow test has not been conducted in the area but could be completed following the completion of the roadway and utility improvements completed by Costco. The expected fire flow available to the Saratoga Springs UT Welfare Complex is expected to be adequate with the connection and looping to the existing Zone 1 water zone in the area.

There are two proposed buildings within Village Plan which vary in size and use. Building #1 is a single-story, approximately 57,485 square foot, Type II-B structure with a fire flow requirement of 5,000-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 75-percent reduction with the proposed full sprinkler protection. It is anticipated that the 75-percent reduction will be accepted by the State Fire Marshal and local fire authority.

Building #2 is a single story, approximately 12,303 square foot, Type II-B structure with a fire flow requirement of 2,250-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 44-percent reduction with the proposed full sprinkler protection. It is anticipated that the 44-percent reduction will be accepted by the State Fire Marshal and local fire authority.

#### Water Demands

Based on estimations for the proposed uses, the following provides a breakdown of the anticipated plumbing fixtures within the proposed Village Plan. The plumbing fixture requirements were based on the International Building Code (IBC) 2015, Section 2902.1. The following provides a summary of the anticipated uses:

Type	Fixtures Provided	wsfu per Fixture	Total wsfu
Lavatories	15	2.0	30.0
Water Closet	16	10.0	160.0
Urinal	5	5.0	25.0
Drinking Fountains	12	0.25	3.0
Laundry Unit	3	4.0	12.0
Service Sinks	10	3.0	30.0
<b>Total Fixtures</b>	<b>61</b>		<b>260</b>

A total of **260.0 wsfu** is equivalent to **6.5 Equivalent Residential Connections (ERCs)** (260.0/40) as per the Saratoga Springs Drinking Water Impact Fee Plan, Section 2.4, Existing Equivalent Residential Connections.

The anticipated demand for the proposed Village Plan is approximately 61 fixtures. The architectural plans provide more specific detail to the types of fixtures that can be reviewed and compared to the standards set in the International Plumbing Code (IPC).

### SECONDARY WATER

There is an existing 8-inch secondary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. There will be no anticipated water loop planned interior to Village Plan. The landscaping needs for Lot 2 of the project will be served by existing secondary water laterals installed with the Costco roadway and utility improvements.

#### Overall Water Demand

The following design criteria was used in determining the secondary water demand for the project:

- Water Rights (WR) Required: 3.13 ac-ft/Irrigated Acre (IA) per year
- Storage Required: 9,216 gal/IA
- Peak Day Demand: 7.5 gpm/IA

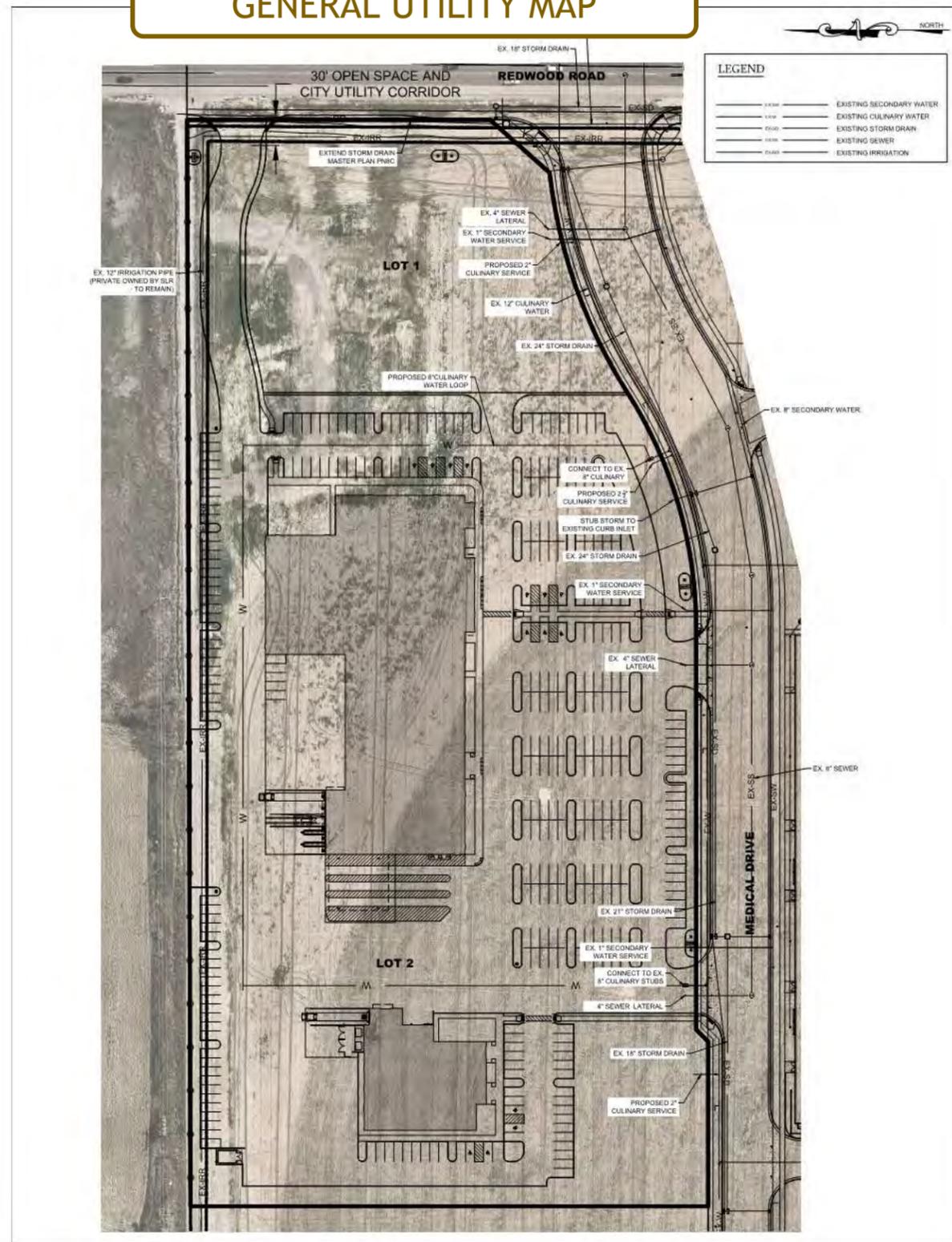
The overall secondary water demand for source and storage is as follows:

Type of Use	Irrigated Area (acres)	Water Right Req'd (ac-ft/IA)	Total Water Right Req'd (ac-ft)	Storage Req'd (gal/IA)	Total Storage (gal)
Regional Retail	1.90	3.13	5.95	9,216	17,510

### SANITARY SEWER

There is an existing 8-inch sanitary sewer main located within Medical Drive that will collect the sanitary sewer waste for Building #1 and Building #2 of the Saratoga Springs UT Welfare Complex. Necessary sanitary sewer infrastructure and service laterals will be installed as per City Standards.

## GENERAL UTILITY MAP



### STORM DRAIN

A preliminary storm drain study in the Appendix C – Storm Drain Analysis was completed for the proposed Saratoga Springs UT Welfare Project and follows the design requirements provided within the Market Street Storm Drain Capacity Analysis dated May 3, 2019. The proposed uses within the site have been evaluated on a preliminary basis to determine the best methodology to discharge from the site with little impact to the downstream system. The following provides a summary of the findings with the full report:

- All storm water runoff from the site will be collected using curb inlets or similar devices at various points within the project. The runoff will then be conveyed using pipes to the southeast corner of the project to a discharge point or pipe installed with Costco roadway and utility improvements.
- A total of 1.30 cfs will be discharged during a 100-year storm event which coincides with the allowed discharge specified in the Market Street Storm Drain Capacity Analysis. All downstream pipes have been sized to accept this stormwater discharge along with runoff from the surrounding area.
- The storm drain design is based on the latest Market Street Storm Drain Capacity Analysis for the overall development area.

### OFFSITE UTILITIES

There are no offsite utilities required with the improvement of the proposed Saratoga Springs UT Welfare Complex. Each of the utilities discussed above are adjacent to the property as depicted in the General Utility Map.

### POWER

All primary power infrastructure improvements within the right-of-way will be installed and buried with the subdivision improvements. All secondary power infrastructure to the site and buildings will be placed underground in conduit or boxes.

## TRANSPORTATION

The following addresses various elements related to the transportation design and service to the proposed Saratoga Springs UT Welfare Complex and is in harmony with the City's Transportation Master Plan. This includes design parameters for proposed roadways and cross sections as it is applicable to the site.

### VEHICULAR AND PEDESTRIAN PLAN

Transportation and pedestrian access in and around Saratoga Springs UT Welfare Complex is a key element for the Church of Jesus Christ of Latter-day Saints and the proposed uses on the site. Transportation access points to the site are planned at three different locations to two different existing right-of-ways adjacent to the site: two on the south and one on the east. These various access points have been strategically placed to spread the flow of traffic rather than concentrating at one or two points of access. The access from Redwood Road (SR-68) will require a Utah Department of Transportation (UDOT) permit and final alignment will be determined during the UDOT approval process. The existing Medical Drive is planned as a 77-foot collector class transportation corridor. Redwood Road will follow the City's standard 180-foot right-of-way with access limited and controlled by the UDOT.

Pedestrian access to the site will be provided with connections to the adjacent City right-of-ways. Each use will connect to the existing five-foot sidewalk installed with Medical Drive and convey foot traffic to the proposed 10-foot trail running parallel to Redwood Road within the City 30-foot pedestrian and utility easement.

### ROADWAY SECTIONS

There are no proposed changes to the existing roadway sections adjacent to the project.

### FIRE DEPARTMENT ACCESS

There are no proposed modifications to the City Standards and Specifications as it relates to the fire department accesses. The internal traffic circulation of the site will be addressed at the time of site plan approval with City Staff.

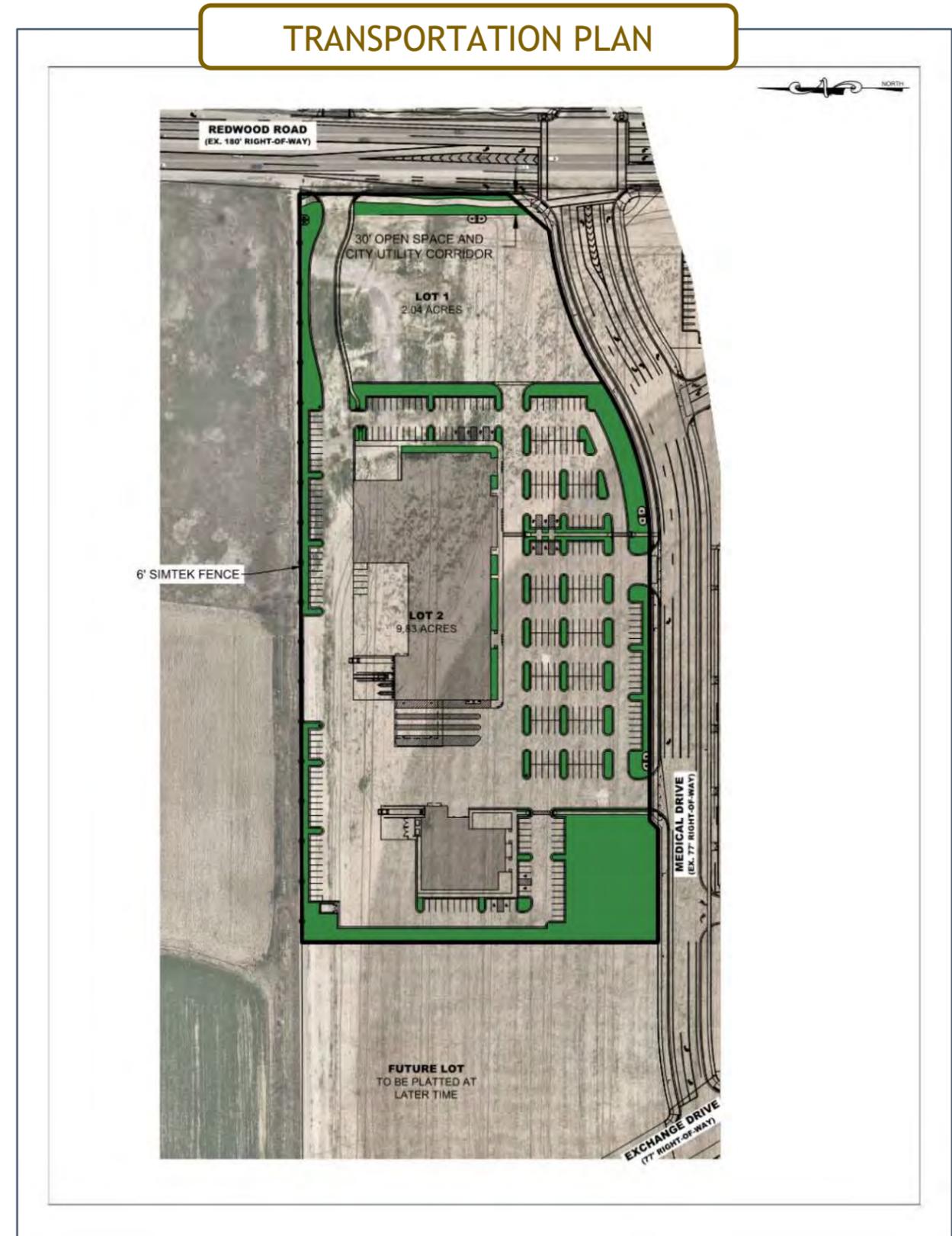
### ROAD NAME AND ADDRESSING

As shown on the exhibit to the right, the main roadways have been named. The existing roadways around Saratoga Springs UT Welfare Complex will remain the same as dedicated with Costco's roadway improvements: Medical Drive (south) and Redwood Road (west). No other additional roadways are planned internally to the property.

### OFF-STREET PARKING

The anticipated parking layout and final quantity will meet the requirements of Title 19 in the City Code. A breakdown of the required parking has been provided below based on the conceptual floor plans provided later in this Village Plan. Although floor plans may vary, approximately 197 parking stalls are required with 334 parking stalls provided. The appropriate number of accessible stalls will be provided as required by the International Building Code (IBC) and the Americans with Disabilities Act (ADA). The final layout, quantity and placement of these stalls will be reviewed at the site plan submittal to the City.

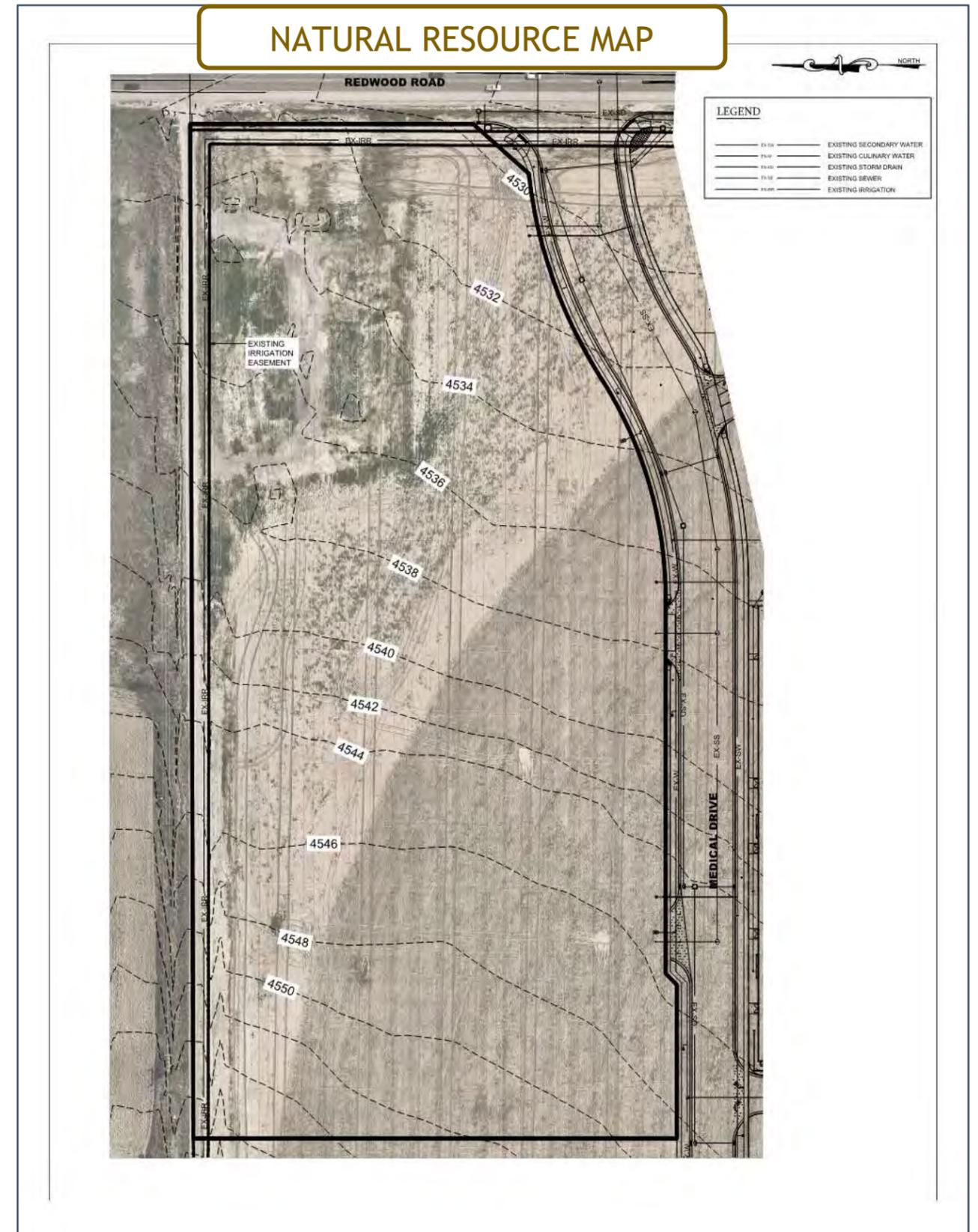
Type	Area (sf)	Parking Requirement	Required Parking
<b>Deseret Industries</b>			
Office	13,200	4 stalls per 1000 sf	53
Retail	24,700	4 stalls per 1000 sf	99
Warehouse	19,900	1 stall per 1000 sf	20
<b>Bishop's Storehouse</b>			
Office	3,800	4 stalls per 1000 sf	16
Warehouse	8,700	1 stall per 1000 sf	9
<b>Total</b>			<b>197</b>



## ADDITIONAL ELEMENTS

The Natural Resource Inventory Map contains information regarding specific site elements such as:

- **Waterways.** There are no existing waterways traversing the site.
- **Geological Information.** Geological information has been obtained from Utah County Hazards Mapping as published by Utah County Public Works Department, in coordination with USGS, MAG and other applicable agencies:
  - This area of the project falls within a low to moderate potential for liquefaction.
  - No flood hazards have been identified. The project area is within flood zone "X" according to FIRM map 4955170115B, dated 17 July, 2002.
  - No landslides hazards have been identified in the project site.
  - No rock fall hazards have been identified in the project site.
  - No wildfire hazards have been identified in the project site.
  - No dam failure risks have been identified in the project site.
  - No avalanche hazards have been identified in the project site.
- **Fault Lines.** According to Utah County Hazards Mapping as published by Utah County Public Works Department, no fault lines or fault ruptures are identified within the project.
- **General Soils Data.** A geotechnical investigation has been conducted on the development. A copy of the investigation results has been included in Appendix D. Excerpts from the investigation include:
  - Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
  - The site is covered by approximately 12 to 24 of inches of topsoil, which will need to be removed before constructing footings.
  - Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
  - Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
  - Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
  - Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
  - Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.



- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least 12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.
- **Slopes.** There are no slopes in the project greater than 30-percent.
- **Statement of Findings.** A statement regarding the findings of this submittal can be found in the Findings section towards the end of the document.
- **Environmental Issues.**
  - **Wetlands.** No wetlands or sources of surface or shallow groundwater have been identified in the project site.
  - **Historical Sites.** No historical sites have been identified in the project site.
  - **Existing Trees.** No existing trees are present on the site.
    - **Traffic Study.** A full traffic study has been included within Appendix E of the Community Plan.
- **Compliance Issues.**
  - **Architectural Standards.** Architectural design of the building will be similar to what is shown in the rendering and typical elevations found in Appendix F.
  - **Common Area Maintenance.** No common area maintenance is anticipated for this project.

## CONCEPTUAL PLANS

- A. **Wildlife Mitigation Plans.** The United States Fish and Wildlife Service has been contacted to determine whether there are any endangered species or wildlife that needs to be mitigated at this time. The Division responded and do not have any concerns due to the current agricultural use of the land.
- B. **Open Space Management Plans.** All the proposed open space as discussed above will be owned and maintained by the Church of Jesus Christ of Latter-day Saints including the 30-foot landscape and utility easement/buffer along Redwood Road. The planter islands within the City right-of-way along each property boundary will be owned by the City but maintained by the Church of Jesus Christ of Latter-day Saints. This includes the frontage along State Route 68 (Redwood Road) outside of the 30-foot landscape and utility easement/buffer.
- C. **Hazardous Material Remediation Plans.** No hazardous materials have been identified within the site. Should any hazardous materials be identified through further geotechnical investigation or site observation, acceptable mitigation must be completed prior to development.

## DESIGN GUIDELINES

The following evaluates various design guideline items as required within the Community and Village Plan requirements:

- **Architectural Standards.** There are a total of two different buildings anticipated within Saratoga Springs UT Welfare Complex. Each of the buildings will be described below with the general architectural standards anticipated with each use. Each building will be constructed of high-quality materials and have high quality architectural design. Final design and materials will be determined at the building permit phase and approved by City Staff. The grounds around these buildings will be beautifully landscaped with trees, shrubs, flowers and grasses.
  - **Building #1.** This building shall be the Bishop's Storehouse for the Church of Jesus Christ of Latter-day Saints and will be comprised of a single floor above grade. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
  - **Building #2.** This building shall be a single-story Deseret Industries for the Church of Jesus Christ of Latter-day Saints. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
- **Floor Area Ratios** – The approximate anticipated building footprints on a 9.83-acre site (Lot 2) produces an FAR of 0.20 maximum.

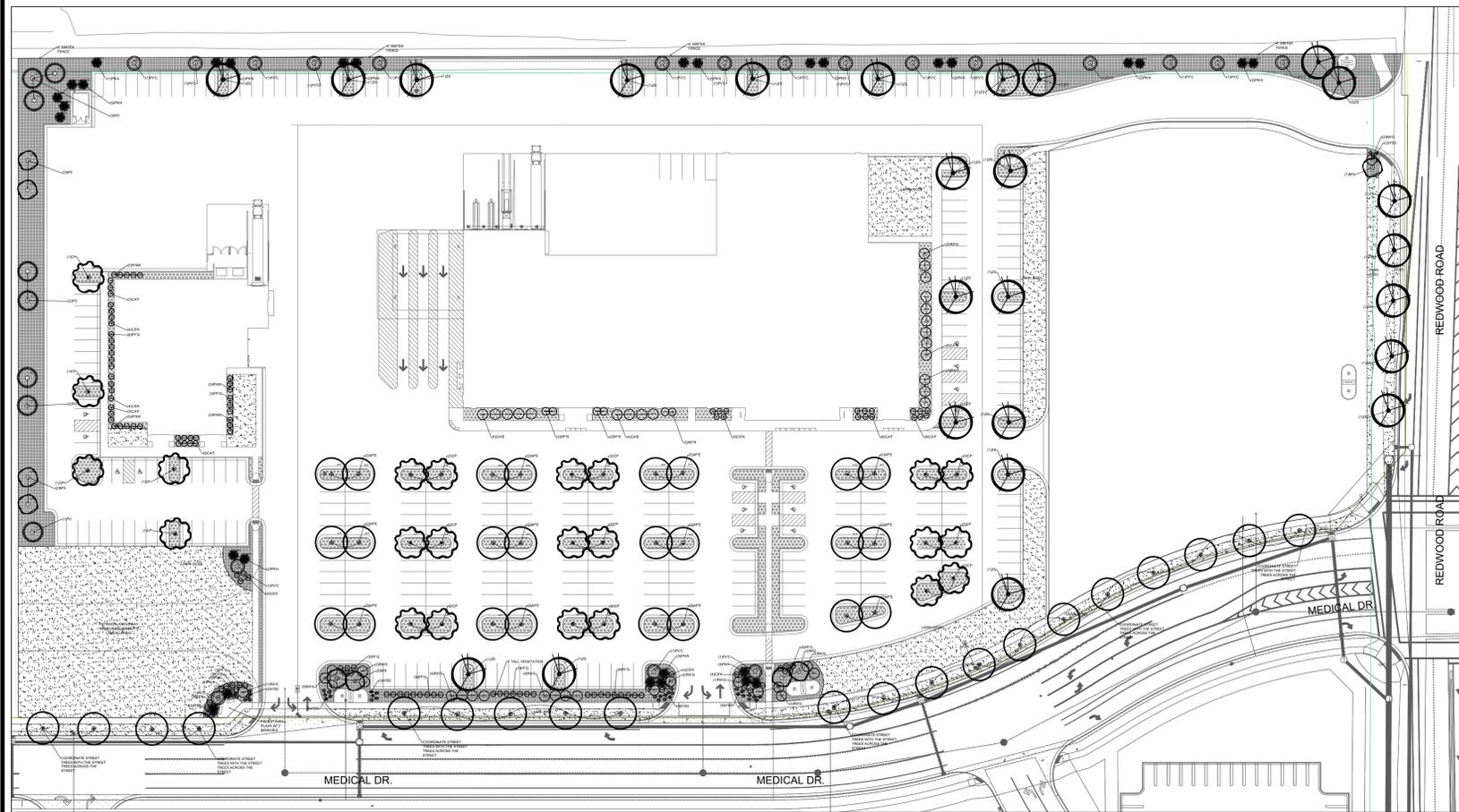
## FINDINGS

The proposed Saratoga Springs UT Welfare Complex is consistent with the goals, objectives and policies outlined within the District Area Plan (DAP) for Saratoga Springs. The project will provide irreplaceable value and honor to the surrounding area with the services provided to the local community. The Church of Jesus Christ of Latter-day Saints will do all they can to provide the civic service to the region and see this proposed Welfare Complex as a worthy extension and symbol for those values within the City of Saratoga Springs.

## APPENDIX A - ALTA SURVEY



## APPENDIX B - LANDSCAPE PLANS



### SITE CALCULATIONS

TOTAL SITE W/ FUTURE RETAIL LOT: 529,303 SQ FT  
 TOTAL SITE WITHOUT FUTURE RETAIL LOT: 446,860 SQ FT  
 TOTAL LANDSCAPE AREA: 98,643 SQ FT (22%)  
 WITHOUT DRIVE AISLE ON THE SOUTHWEST: 90,643 SQ FT. (20%)

SITE TREES:	REQUIRED:	PROVIDED:
DECIDUOUS	39	39
EVERGREEN	37	37
SHRUBS	57	139 - 5 GAL
		PARKING BUFFER 35

STREET TREES:	REQUIRED:	PROVIDED:
MEDICAL DR.	17	17
REDWOOD RD.	6	6
	69	69
		TOTAL 146

3' CIRCLE UNDER TREES  
 50% DROUGHT TOLERANT  
 MINIMUM TWO COLORS OF ROCK

### REFERENCE MAP

LP-1.3	LP-1.2	LP-1.1
LP-1.4	LP-1.5	LP-1.6

### LANDSCAPE PLAN SPECIFICATIONS

**PART I - GENERAL**

**1.1 SUMMARY**

A. This section includes landscape procedures for the Project including all labor, materials, and installation necessary, but not limited to, the following:

- Soil Amendments
- Fine Grading
- Cultivation
- Landscape Edging
- Turf Planting
- Furnish and Installing Plant
- Maintenance
- Mowing
- Weeding

**1.2 SITE CONDITIONS**

A. Examination: Before submitting a Bid, each Contractor shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the Bid the cost of all items required by the Contract Documents are at a variance with the applicable laws, building codes, rules, regulations, or contain obvious erroneous or uncoordinated information, the Contractor shall promptly notify the Project Representative and the necessary changes shall be accomplished by Addendum.

B. Protection: Contractor to conduct the Work in such a manner to protect all existing underground utilities or structures. Contractor to repair or replace any damaged utility or structure using identical materials to match existing at no expense to the Owner.

C. Irrigation System: Do not begin planting until the irrigation system is completely installed, is adjusted for full coverage and is completely operational.

**1.3 PERMITS**

A. Blue Stake/ Dig Line: When digging is required, "Blue Stake" or "Dig Line" the work site and identify the approximate location of all known underground utilities or structures.

**1.4 PLANT DELIVERY, QUALITY, AND AVAILABILITY**

A. Unauthorized substitutions will not be accepted. If proof is submitted that specific plants or plant sizes are unobtainable, written substitution requests will be considered for the nearest equivalent plant or size. All substitution requests must be made in writing and preferably before the bid due date.

**1.5 FINAL INSPECTION**

A. All plants will be inspected at the time of Final Inspection prior to receiving a Landscape Substantial Completion for conformance to specified planting

procedures, and for general appearance and vitality. Any plant not approved by the Project Representative will be rejected and replaced immediately.

**1.6 LANDSCAPE SUBSTANTIAL COMPLETION**

A. A Substantial Completion Certificate will only be issued by the Project Representative for "landscape and irrigation" in their entirety. Substantial Completion will not be proportioned to be designated areas of a project.

**1.7 MAINTENANCE**

A. Plant Material: The Contractor is responsible to maintain all planted materials in a healthy and growing condition for 30 days after receiving a Landscape Substantial Completion at which time the Guarantee period commences. This maintenance is to include mowing, weeding, cultivating, fertilizing, monitoring water schedules, controlling insects and diseases, re-guying and staking, and all other operations of care necessary for the promotion of root growth and plant life so that all plants are in a condition satisfactory at the end of the guarantee period. The Contractor shall be held responsible for failure to monitor watering operations and shall replace any and all plant material that is lost due to improper application of water.

**1.8 GUARANTEE**

A. Guarantee: A guarantee period of one year shall begin from end of maintenance period and final acceptance for trees, shrubs, and ground covers. All plants shall grow and be healthy for the guarantee period and trees shall live and grow in acceptable upright position. Any plant not alive, in poor health, or in poor condition at the end of the guarantee period will be replaced immediately. Any plant will only need to be replaced once during the guarantee period. Contractor to provide documentation showing where each plant to be replaced is located. Any outside factors, such as vandalism or lack of maintenance on the part of the Owner, shall not be part of the guarantee

**PART II - PRODUCTS**

**2.1 LANDSCAPE MATERIALS**

A. Tree Staking: All trees shall be staked for one year warranty period. All trees not plumb shall be replaced. Staked trees shall use vinyl tree ties and tree stakes two (2) inch by two (2) by eight (8) foot common pine stakes used as shown on the details.

B. Tree Wrap: Tree wrap is not to be used.

C. Mulch: See Plans. All planter beds to receive a minimum 4" layer for trees, shrubs, and perennials and 1" for groundcovers.

D. Weed Barrier: DeWitt 5 oz. weed barrier fabric. Manufactured by DeWitt Company, dewittcompany.com or approved equal.

E. Tree, Shrub, and Grass Backfill Mixture: Backfill mixture to be 50% native soil and 50% topsoil, thoroughly mixed together prior to placement.

F. Topsoil: Required for turf areas, planter beds and Backfill Mixture. Acceptable topsoil shall meet the following standards:

- PH: 5.5-7.5
- EC (electrical conductivity): < 2.0 mmhos per centimeter
- SAR (sodium absorption ration): < 3.0
- % OM (percent organic matter): >1%
- Texture (particle size per USDA soil classification): Sand <70%; Clay < 30%; Silt < 70%; Stone fragments (gravel or any soil particle greater than two (2) mm in size) < 5% by volume.

G. Turf Sod: All sod shall be 18 month old as specified on plans (or approved equal) that has been cut fresh the morning of installation. Only sod that has been grown on a commercial sod farm shall be used. Only use sod from a single source.

H. Landscape Edging: Headers and Edging six (6) inches by four (4) inches extruded concrete curb made up of the following materials:

- Washed mortar sand free of organic material.
- Portland Cement (see concrete spec. below for type)
- Reinforced fiber - Specifically produced for compatibility with aggressive alkaline environment of Portland cement-based composites.
- Only potable water for mixing.

**PART III - EXECUTION**

**3.1 GRADING**

A. Topsoil Preparation: Grade planting areas according to the grading plan. Eliminate uneven areas and low spots. Provide for proper grading and drainage.

B. Topsoil Placement: Slope surfaced away from building at two (2) percent slope with no pockets of standing water. Establish finish grades of one (1) inches for planters below grade of adjacent paved surfaced. Provide neat, smooth, and uniform finish grades. Remove surplus sub-soil and topsoil from the site.

C. Compaction: compaction under hard surface areas (asphalt paths and concrete surfaces) shall be ninety-five (95) percent. Compaction under planting areas shall be between eighty-five (85) and ninety (90) percent.

**3.2 TURF GRADING**

A. The surface on which the sod is to be laid shall be firm and free from footprints, depressions, or undulations of any kind. The surface shall be free of all materials larger than 1/2" in diameter.

B. The finish grade of the topsoil adjacent to all sidewalks, mow-strips, etc. prior to the laying of sod, shall be set such that the crown of the grass shall be at the same level as the adjacent concrete or hard surface. No exceptions.

**3.3 PLANTING OPERATIONS**

A. Review the exact locations of all trees and shrubs with the Project Representative for approval prior to the digging of any holes. Prepare all holes according to the details on the drawings.

B. Water plants immediately upon arrival at the site. Maintain in moist condition until planted.

C. Before planting, locate all underground utilities prior to digging. Do not place plants on or near utility lines.

D. The tree planting hole should be the same depth as the root ball, and three times the diameter of the root ball.

E. Trees must be placed on undisturbed soil at the bottom of the planting hole.

F. The tree hole depth shall be determined so that the tree may be set slightly high of finish grade, 1" to 2" above the base of the trunk flare, using the top of the root ball as a guide.

G. Plant immediately after removal of container for container plants.

H. Set tree on soil and remove all burlap, wire baskets, twine, wrappings, etc. before beginning and backfilling operations. Do not use planting stock if the ball is cracked or broken before or during planting operation.

I. Apply vitamin B-1 root stimulator at the rate of one (1) tablespoon per gallon.

J. Upon completion of backfilling operation, thoroughly water tree to completely settle the soil and fill any voids that may have occurred. Use a watering hose, not the area irrigation system. If additional prepared topsoil mixture needs to be added. It should be a coarser mix as required to establish finish grade as indicated on the drawings.

K. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches. All cuts, scars, and bruises shall be properly treated according to the direction of the Project Representative. Proper pruning techniques shall be used. Do not leave stubs and do not cut the leader branch. Improper pruning shall be cause for rejection of the plant material.

L. Prepare a watering circle of 2' diameter around the trunk. For conifers, extend the watering well to the drip line of the tree canopy. Place mulch around the planted trees.

**3.4 TURF - SOD LAYING**

A. Top Soil Amendments: Prior to laying sod, commercial fertilizer shall be applied and incorporated into the upper four (4) inches of the topsoil at a rate of four pounds of nitrogen per one thousand (1,000) square feet. Adjust fertilization mixture and rate of application as needed to meet recommendations given by topsoil analysis. Include other amendments as required.

B. Fertilization: Three weeks after sod placement fertilize the turf at a rate of 1/2 pound of nitrogen per 1000 square feet. Use fertilizer specified above. Adjust fertilization mixture and rates to meet recommendations given by topsoil analysis.

C. Sod Availability and Condition: The Contractor shall satisfy himself as to the existing conditions prior to any construction. The Contractor shall be fully responsible for furnishing and lay all sod required on the plans. He shall furnish new sod as specified above and lay it so as to completely satisfy the intent and meaning of the plans and specification at no extra cost to the owner. In the case of plans and specification at no extra cost to the owner. In the case of any discrepancy in the amount of sod to be removed or amount to be used, it shall be the Contractor's responsibility to report such to the Project Representative prior to commencing the work.

D. Sod Laying: The surface upon which the new sod to be laid will be prepared as specified above. Areas where sod is to be laid shall be cut trimmed, or shaped to receive full width sod (minimum twelve (12) inches). No partial strip or pieces will be accepted.

E. Sod shall be tamped lightly as each piece is set to insure that good contact is made between edges and also the ground. Sod laid on any sloped areas shall be anchored with wooden dowels or other materials which are accepted by the grass sod industry.

F. Apply water directly after laying sod. Rainfall is not acceptable.

G. Watering of the sod shall be the complete responsibility of the Contractor by whatever means necessary to establish the sod in an acceptable manner to the end of the Maintenance period. If an irrigation system is in place on the site, but for whatever reason, water is not available in the system. It is the responsibility of the Contractor to water the sod by whatever means, until the sod is accepted by the Project Representative.

H. Protection of the newly laid sod shall be the complete responsibility of the Contractor. The Contractor shall provide acceptable visual barriers, to include barricades set appropriate distances with strings or tapes between barriers, as an indication of new work. The Contractor is to restore any damaged areas caused by others (including vehicular traffic), erosion, etc. until such time as the lawn is accepted by the Owner.

I. All sod that has not been laid within 24 hours shall be deemed unacceptable and will be removed from the site.

**3.5 WEED BARRIER**

A. Cut a slit or x at each plant location no larger than necessary to install plant.

B. Overlap rows of fabric min. 6"

C. Stable fabric edges and overlaps to ground.

END OF SECTION

### TREE LEGEND (TOTAL PLANT COUNT)

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APE	ACER PLATANOIDES EMERALD QUEEN MAPLE	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6'-8" TALL	LOW	
PWA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6'-8" TALL	LOW	
M'S	MALUS X 'SPRING SNOW' CRABAPPLE	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
		STREET TREES MATCHING TREES ACROSS THE STREET	20	2" CAL.	LOW	

### SHRUB LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PF'G	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA 'GOLDFINGER'	47	5 GAL	LOW	
CS'K	CORNUS SERICEA 'KELSEY'	KELSEY DOGWOOD 'KELSEY'	31	5 GAL	MODERATE	
R'NW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
R'FR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN 'TALL HEDGE'	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC 'AUTUMN AMBER'	29	5 GAL	HIGH	

### GRASSES LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CAF	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL.	HIGH	

### PERENNIAL LEGEND

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

### SITE MATERIALS

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
	LAWN (SOD) AREA	50,591 SQ.FT.	DROUGHT TOLERANT VARIETY SEE NOTE BELOW
	1" 2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ.FT. (172.2 CU.YD.)	LOCATED WHERE SPECIFIED
	1" OQUIRRH GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ.FT. (259 CU.YD.)	LOCATED WHERE SPECIFIED

### LANDSCAPE GENERAL NOTES

INSTALLER RESPONSIBILITIES AND LIABILITIES

1. THESE PLANS ARE FOR BASIC DESIGN LAYOUT AND INFORMATION. THE INSTALLER IS REQUIRED TO REFER TO THEIR INDIVIDUAL TRADE - SCOPE OF WORK. OWNER ASSUMES NO LIABILITIES FOR INADEQUATE ENGINEERING CALCULATIONS, MANUFACTURER PRODUCT DEFECTS, INSTALLATION OF ANY LANDSCAPING AND COMPONENTS, OR TIME EXECUTION.

2. THE INSTALLER OF ALL LANDSCAPING AND IRRIGATION SYSTEMS ARE LIABLE AND RESPONSIBLE FOR ALL JURISDICTIONAL AND CODE REQUIREMENTS, TIME EXECUTIONS, AND INSTALLED PRODUCTS AND MATERIALS.

GRADING AND DRAINAGE REQUIREMENTS

- ALL GRADING IS TO SLOPE AWAY FROM THE STRUCTURE PER CODE.
- FINISHED GRADE IS NOT PERMITTED BY CODE TO DRAIN ON NEIGHBORING PROPERTIES
- 6" MIN. FOUNDATION LEFT EXPOSED AT ALL CONDITIONS
- LANDSCAPER TO MAINTAIN OR IMPROVE EXISTING FINAL GRADE AND PROPER DRAINAGE ESTABLISHED BY THE EXCAVATOR'S FINAL GRADE ACTIVITIES INCLUDING ANY MAINTENANCE, PRESERVATION, OR AGGRAVATION OF SLOPES, BERMS, AND SWALES.
- IF ANY SWALE, BERM, OR GRADE HAS BEEN DAMAGED OR IS INCORRECT TO ENSURE CORRECT WATER FLOW THE TRADE CONTRACTOR IS RESPONSIBLE TO FIX STATED ISSUE.
- ROOF RUN-OFF DEVICES SHOULD BE INSTALLED TO COLLECT AND DISCHARGE ALL ROOF RUNOFF A MINIMUM OF 10 FEET FROM FOUNDATION ELEMENTS OR BEYOND THE LIMITS OF BACKFILL AROUND THE FOUNDATION WALLS; WHICHEVER DISTANCE IS GREATER.
- THE GROUND SURFACE WITHIN 10 FEET OF THE FOUNDATIONS SHOULD BE SLOPED TO DRAIN AWAY FROM THE STRUCTURE WITH A MINIMUM FALL OF 6 INCHES.

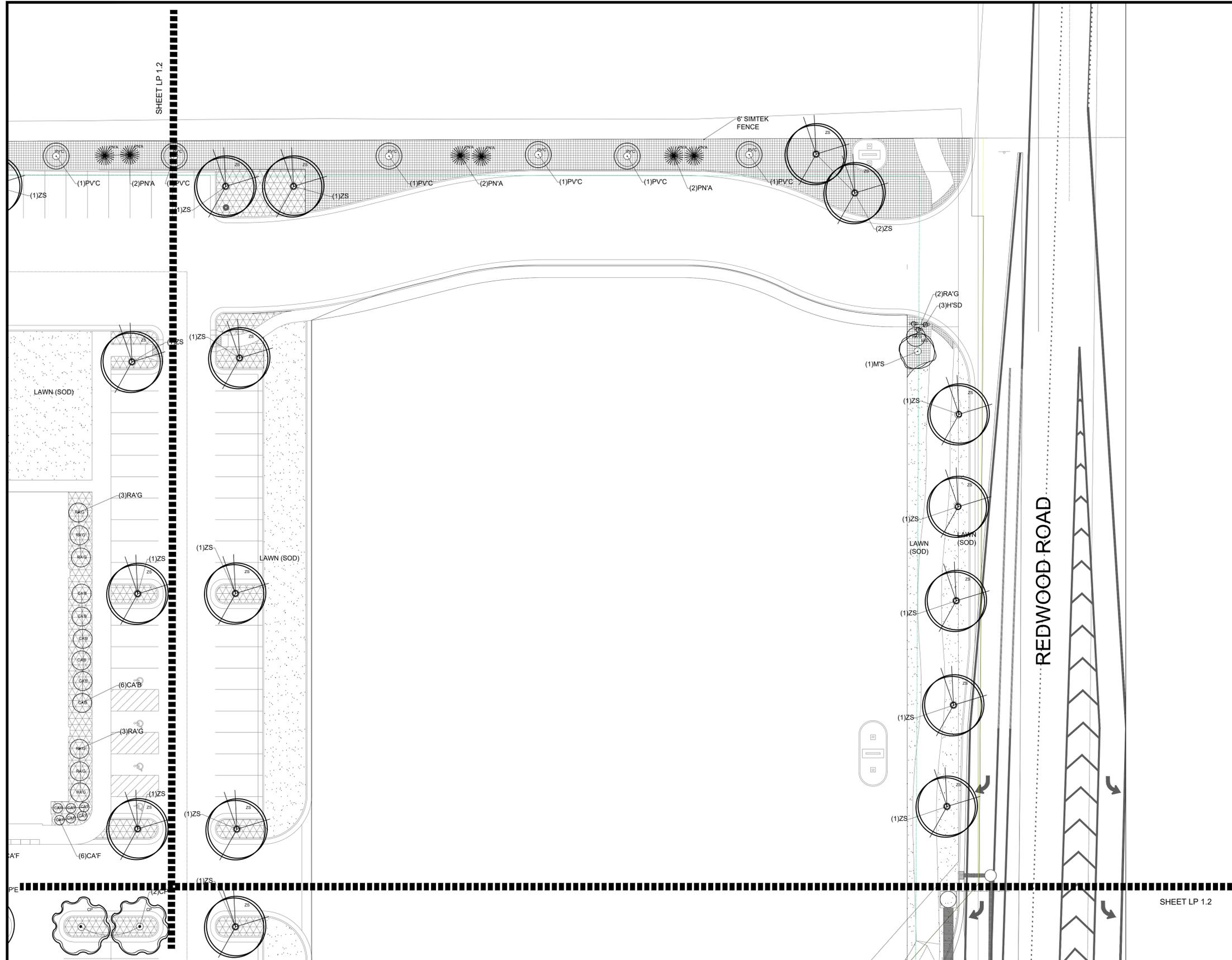
LANDSCAPING REQUIREMENTS

- ALL LANDSCAPING IS TO BE INSTALLED PER ALL GOVERNING JURISDICTIONS I.E. INTERNATIONAL BUILDING CODE, CITY CODES.
- NON-COMPLIANCE TO ALL GOVERNING JURISDICTION REQUIREMENTS AND REGULATION ARE THE RESPONSIBILITY OF THE LANDSCAPING INSTALLER.
- ALL PLANTED LANDSCAPING IS TO BE INSTALLED ACCORDING TO THE NURSERY CARE AND INSTALLATION INSTRUCTIONS WHERE PURCHASED AND BASED ON INDIVIDUAL SOIL CONDITIONS AND SITE CONDITIONS.

### LANDSCAPE NOTES

- LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR VERIFYING QUANTITIES OF ALL MATERIALS FOR BIDDING AND INSTALLATION PURPOSES. IF DISCREPANCIES EXIST, THE PLAN SHALL DICTATE QUANTITIES TO BE USED.
- PLANT MATERIAL TO BE INSTALLED PER PLANT LEGEND. IF SUBSTITUTIONS ARE WANTED, PROPOSED LANDSCAPE CHANGES MUST BE SUBMITTED TO THE LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO PLANTING.
- NEW LAWN AREAS TO BE SODDED WITH DROUGHT TOLERANT VARIETY. FINE LEVEL ALL AREAS PRIOR TO LAYING SOD.
- SANDY LOAM TOPSOIL TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 6" TOPSOIL (WITH 2" HUMUS MIXED INTO TOPSOIL PRIOR TO SPREADING) IN ALL NEW PLANTER AREAS AND 4" IN ALL NEW LAWN AREAS. PLANTER BEDS TO BE EXCAVATED AS NECESSARY IN ORDER TO ACCOMMODATE NEW TOPSOIL AND/OR PLANTER BED MULCH TO REACH FINISHED GRADE.
- 4"X6" EXTRUDED CONCRETE MOW CURB TO BE INSTALLED BETWEEN ALL LAWN AND PLANTER AREAS PER PLAN. ANY TREES LOCATED IN LAWN MUST HAVE A 4" CONCRETE TREE RING.
- DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS EXCEPT UNDER ANNUAL PLANTING AREAS AS SHOWN ON PLAN.
- ROCK MULCH TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 4" IN ALL TREE, SHRUB, AND PERENNIAL PLANTER AREAS; ANNUAL PLANTING AREAS AS SHOWN ON PLAN TO RECEIVE 4" OF SOIL AID MATERIAL. PULL BARK MULCH MIN. 3" AWAY FROM BASE OF ALL PERENNIALS AND SHRUBS AND MIN. 6" AWAY FROM ALL TREES.
- CONTRACTOR TO PROVIDE NEW AUTOMATIC UNDERGROUND IRRIGATION SYSTEM TO BE INSTALLED IN ALL LANDSCAPE AREAS. ALL LAWN AREA TO RECEIVE 100% HEAD TO HEAD COVERAGE WITH SPRAY AND ROTARY SPRINKLER HEADS. ALL PLANTER AREAS NEED TO RECEIVE A FULL DRIP SYSTEM TO EACH TREE AND SHRUB ON PROJECT. SEE IRRIGATION PLAN.

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP																					
06-30-2020	UT19010	BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<h1>DI STOREHOUSE</h1> <h2>SARATOGA SPRINGS, UTAH</h2>	Developer / Property Owner: <b>JRW &amp; ASSOCIATES</b> ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	<b>PKJ DESIGN GROUP L.L.C.</b> 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com	License No. 81281-8001 06/30/2020 STATE OF UTAH																					
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7			 	Developer / Engineer: <b>LEI-ENGINEERING</b> 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com	<b>LANDSCAPE PLAN</b> LP-1.0
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TREE LEGEND (TOTAL PLANT COUNT)						
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APF	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.		MODERATE
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PERENNIAL LEGEND						
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SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
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**BLUE STAKES OF UTAH**  
 UTILITY NOTIFICATION CENTER, INC.  
 1-800-662-4111  
 www.bluestakes.org

GRAPHIC SCALE: 1" = 20'

**DI STOREHOUSE**  
 SARATOGA SPRINGS, UTAH

DEVELOPER / PROPERTY OWNER / CLIENT  
 Developer / Property Owner: JRW & ASSOCIATES  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. E  
 REXBURG, ID 83440  
 (208)359-2309

Client / Engineer: LEI-ENGINEERING  
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LANDSCAPE ARCHITECT / PLANNER  
  
**PKJ DESIGN GROUP**  
 PKJ DESIGN GROUP L.L.C.  
 3450 N. TRIUMPH BLVD, SUITE 102  
 LEHI, UTAH 84043 (801) 960-2698  
 www.pkjdesigngroup.com

LICENSE STAMP

PM: JTA  
 DRAWN: KBA  
 CHECKED: TM  
 PLOT DATE: 7/1/2020

**LANDSCAPE PLAN**  
 LP-1.1



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
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**SHRUB LEGEND**

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**GRASSES LEGEND**

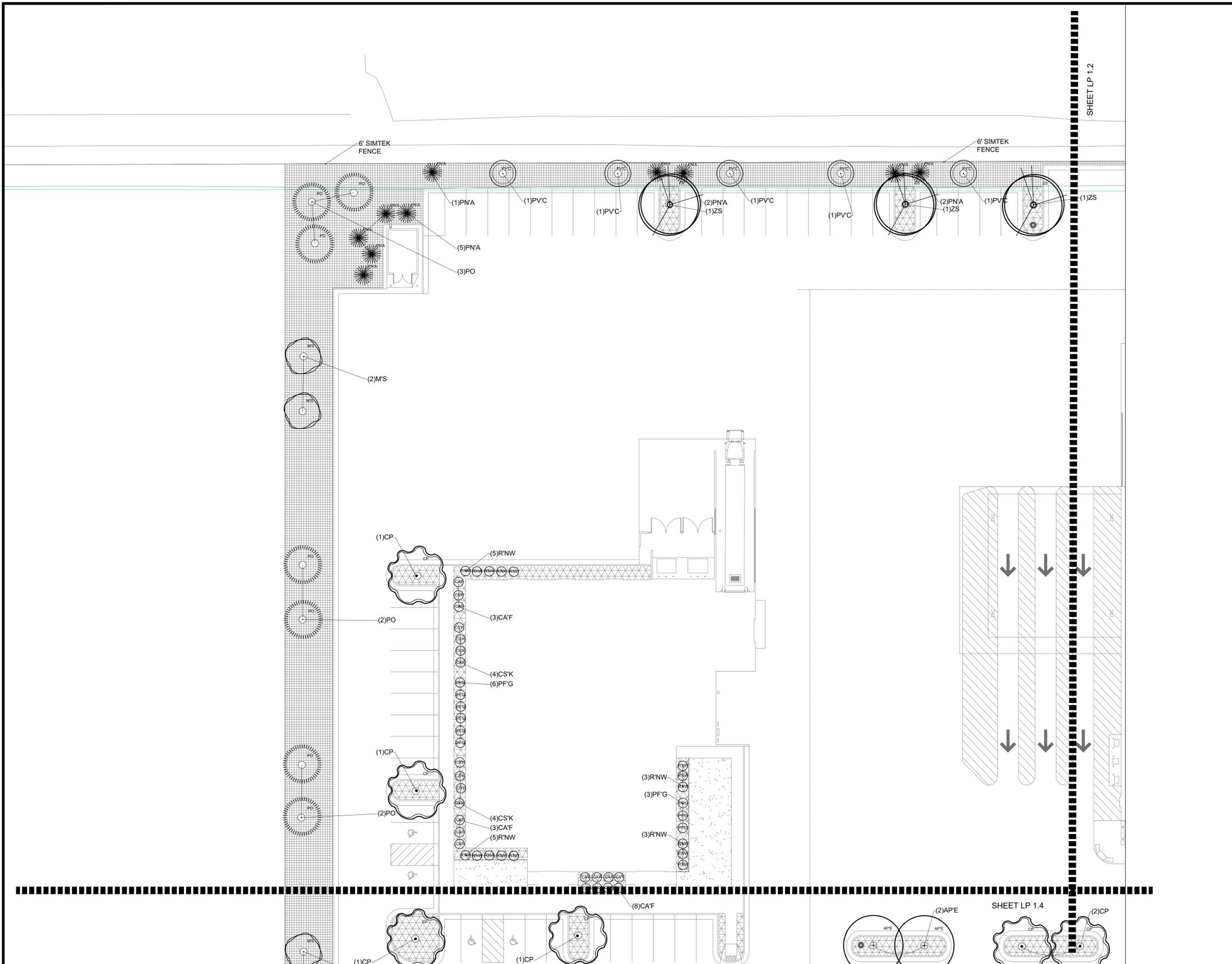
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
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**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.		MODERATE

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
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**811** BLUE STAKES OF UTAH  
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ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**

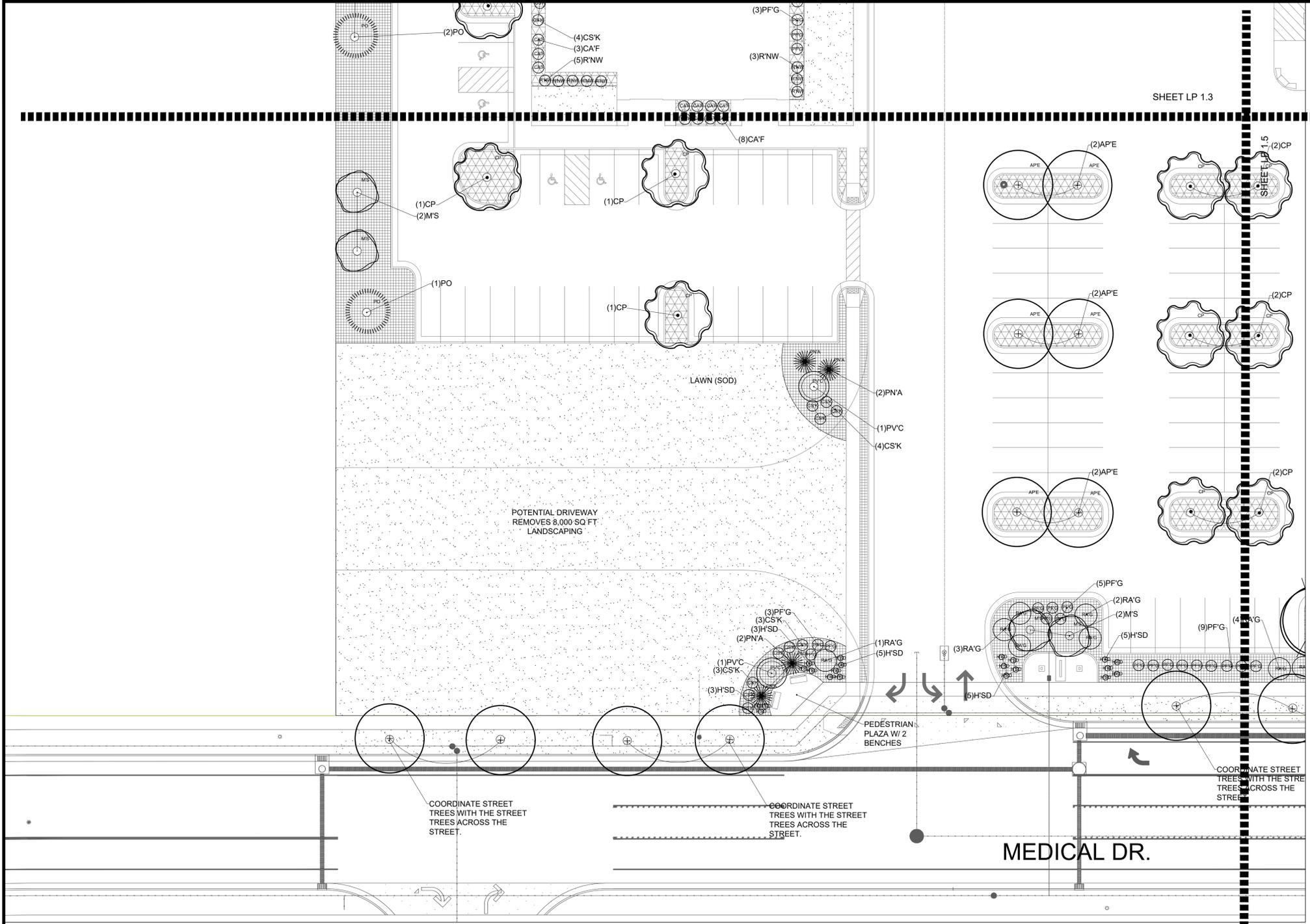
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**LANDSCAPE PLAN**

**LP-1.3**



SHEET LP 1.3

TREE LEGEND (TOTAL PLANT COUNT)						
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
AP'E	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6"-8" TALL	LOW	
PNA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6"-8" TALL	LOW	
MS	MALUS X 'SPRING SNOW' CRABAPPLE	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
	STREET TREES MATCHING TREES ACROSS THE STREET		20	2" CAL.	LOW	

SHRUB LEGEND						
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA	47	5 GAL	LOW	
CS'K	CORNUS SERICEA 'KELSEY'	KELSEY DOGWOOD	31	5 GAL	MODERATE	
RNW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	29	5 GAL	HIGH	

GRASSES LEGEND						
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CAF	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL	HIGH	

PERENNIAL LEGEND						
SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

SITE MATERIALS			
SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
	LAWN (SOD) AREA	50,591 SQ. FT.	DROUGHT TOLERANT VARIETY SEE NOTE BELOW
	1"-2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ. FT. (172.2 CU. YD.)	LOCATED WHERE SPECIFIED
	1" OQUIRH GRVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ. FT. (259 CU. YD.)	LOCATED WHERE SPECIFIED

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
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ATTN: JOHNNY WATSON  
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REXBURG, ID 83440  
(208)359-2309

Client / Engineer: LEI-ENGINEERING  
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Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
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LANDSCAPE ARCHITECT / PLANNER

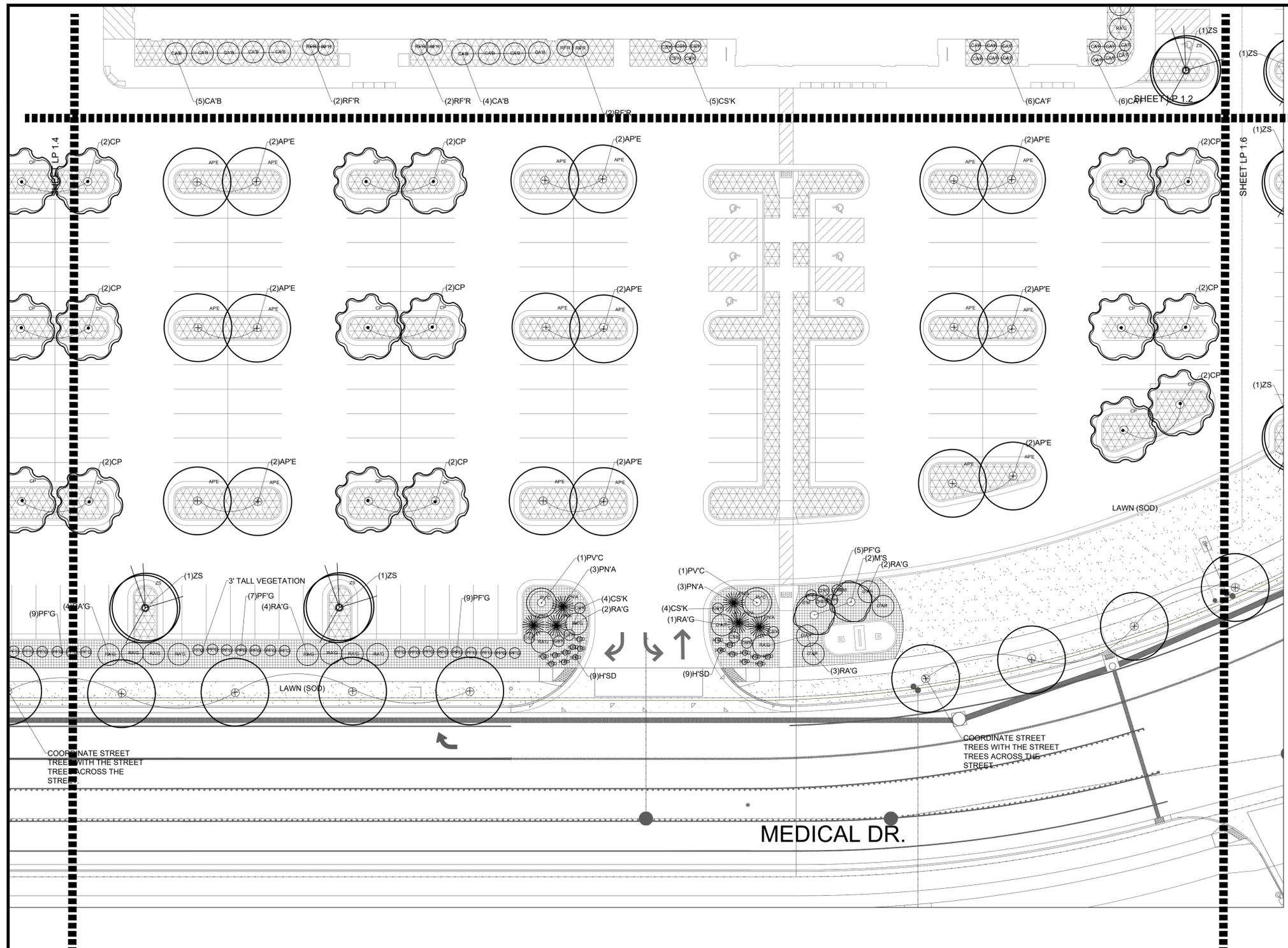
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**LANDSCAPE PLAN**

**LP-1.4**



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APE	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6'-8" TALL	LOW	
PNA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6'-8" TALL	LOW	
M'S	MALUS X 'SPRING SNOW' CRABAPPLE	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
	STREET TREES MATCHING TREES ACROSS THE STREET		20	2" CAL.	LOW	

**SHRUB LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA	47	5 GAL	LOW	
CS'K	CORNUS SERICEA 'KELSEY'	KELSEY DOGWOOD	31	5 GAL	MODERATE	
RNW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	29	5 GAL	HIGH	

**GRASSES LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'F	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL	HIGH	

**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
[Pattern]	LAWN (SOD) AREA	50,591 SQ. FT.	DROUGHT TOLERANT VARIETY (SEE NOTE BELOW)
[Pattern]	1"-2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ. FT. (172.2 CU YD)	LOCATED WHERE SPECIFIED
[Pattern]	1" OQUIRH GRVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ. FT. (259 CU YD)	LOCATED WHERE SPECIFIED

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**LANDSCAPE ARCHITECT / PLANNER**

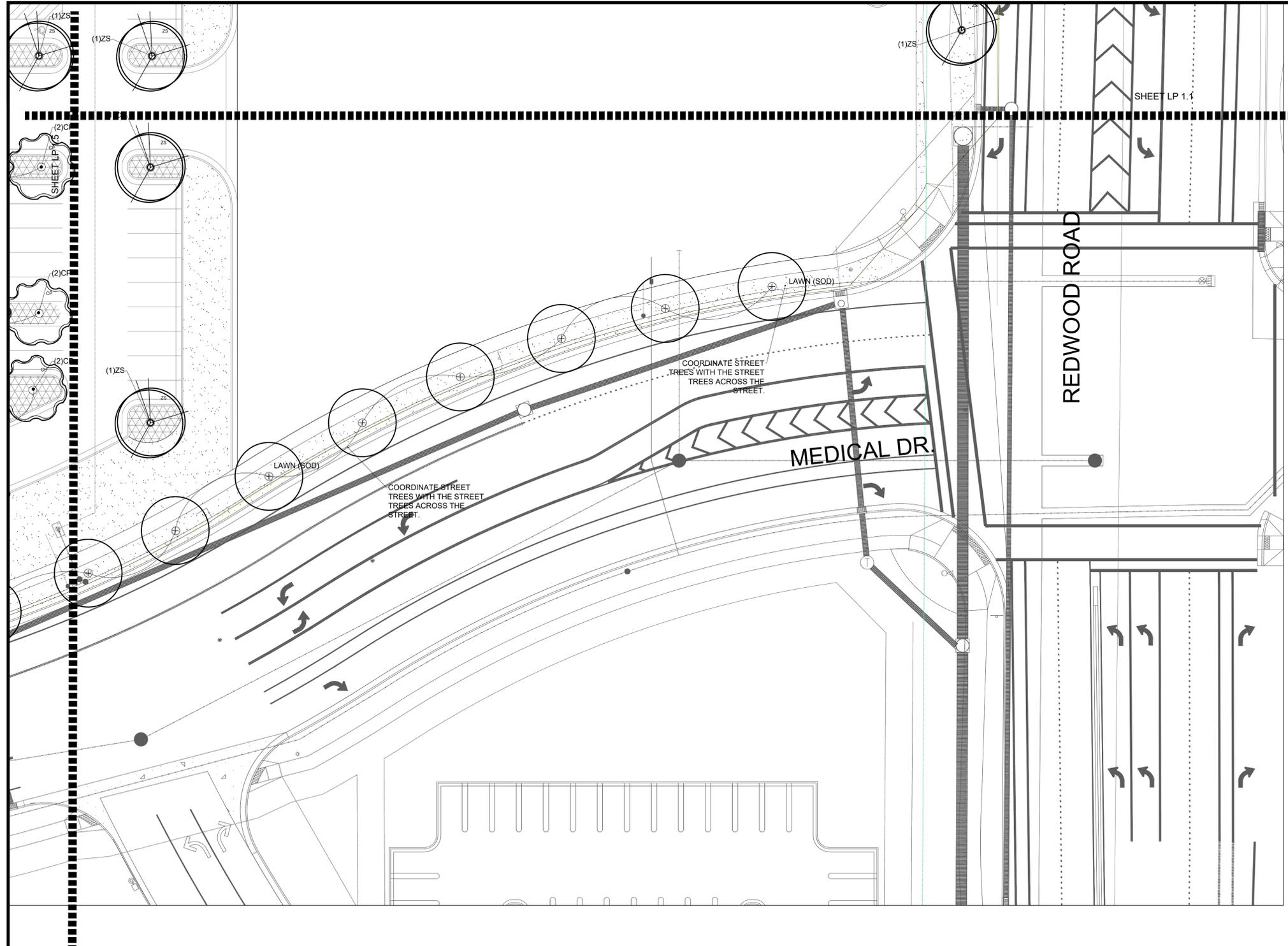
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**LANDSCAPE PLAN**

**LP-1.5**



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APF	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.		MODERATE
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.		LOW
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6'-8" TALL		LOW
PWA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6'-8" TALL		LOW
M'S	MALUS X 'SPRING SNOW' CRABAPPLE	SPRING SNOW CRABAPPLE	9	2" CAL.		LOW
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.		LOW
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.		LOW
		STREET TREES MATCHING TREES ACROSS THE STREET	20	2" CAL.		LOW

**SHRUB LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL		LOW
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA 'GOLDFINGER'	47	5 GAL		LOW
CS'K	CORNUS SERICEA 'KELSEY'	KELSEYI DOGWOOD 'KELSEY'	31	5 GAL		MODERATE
R'NW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL		HIGH
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN 'TALL HEDGE'	6	5 GAL		HIGH
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC 'AUTUMN AMBER'	29	5 GAL		HIGH

**GRASSES LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CAF	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL		HIGH

**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY 'STELLA DE ORO'	42	1 GAL.		MODERATE

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
[Symbol]	LAWN (SOD) AREA	50,591 SQ. FT.	DROUGHT TOLERANT VARIETY 'SEE NOTE BELOW'
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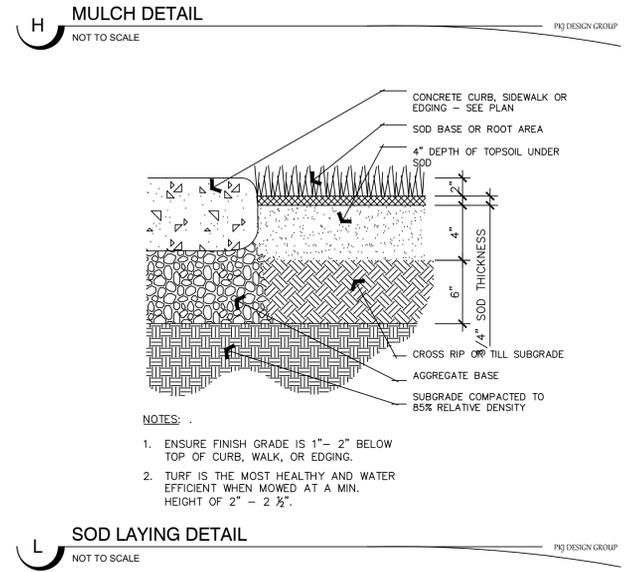
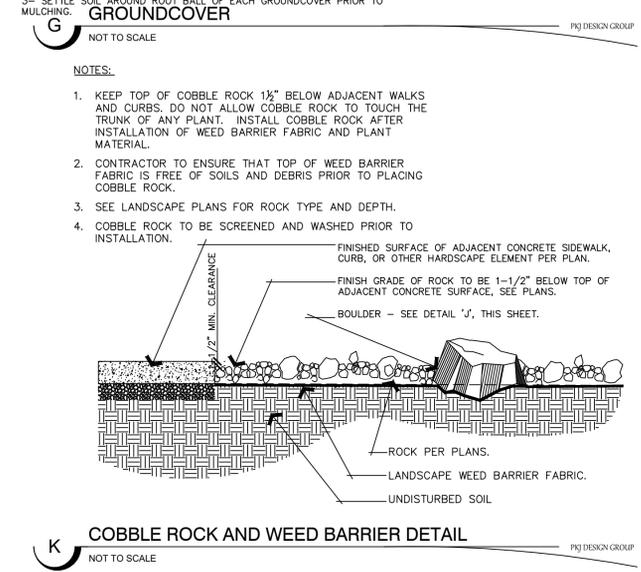
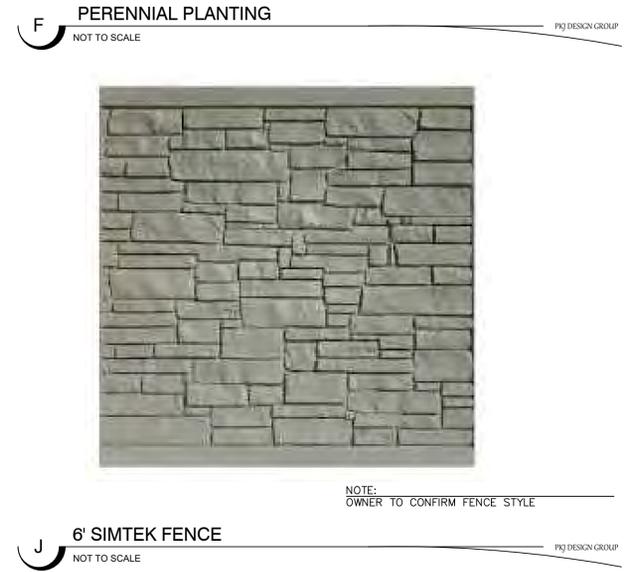
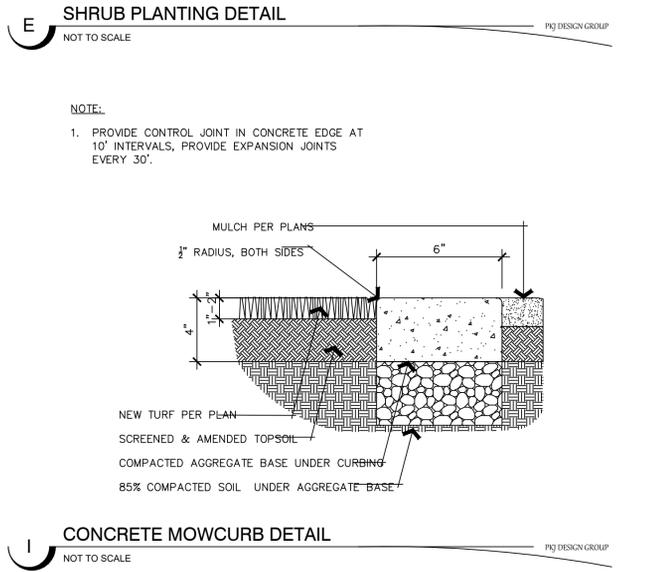
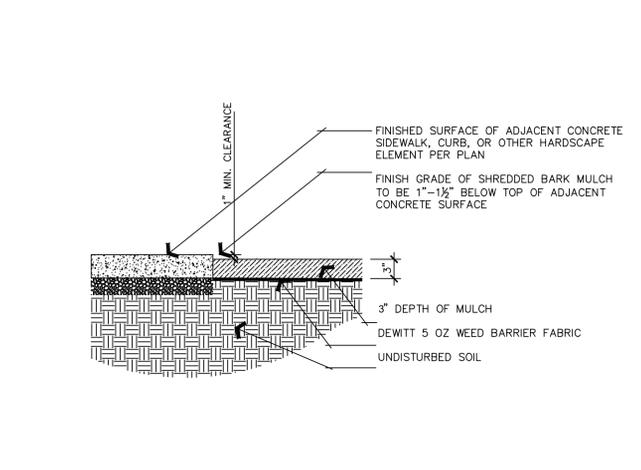
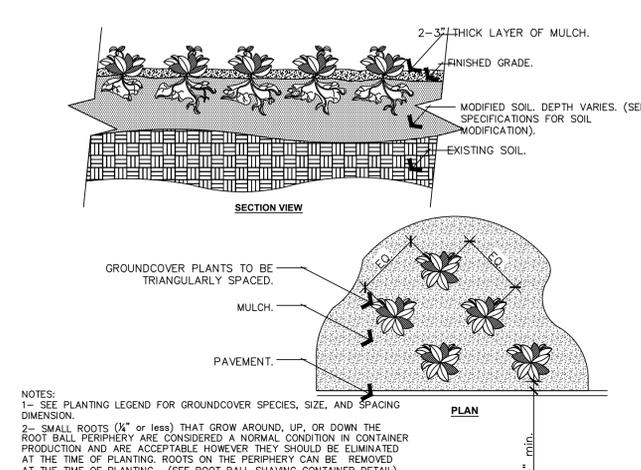
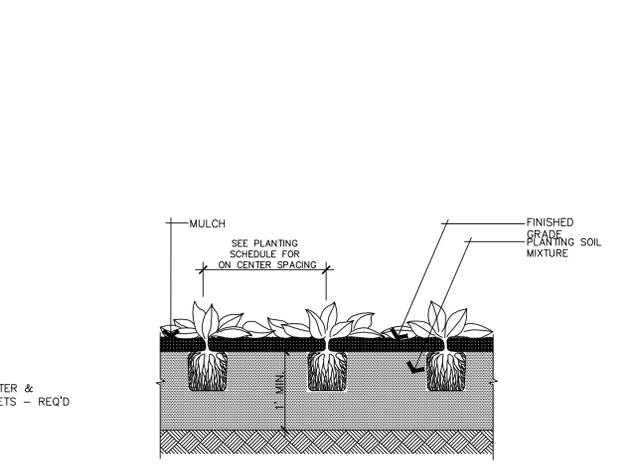
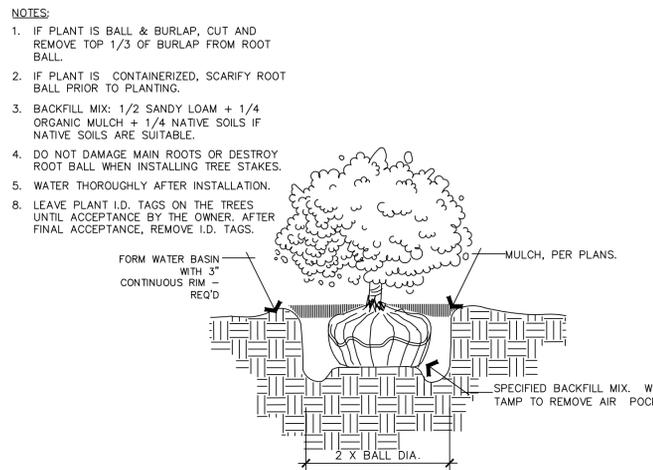
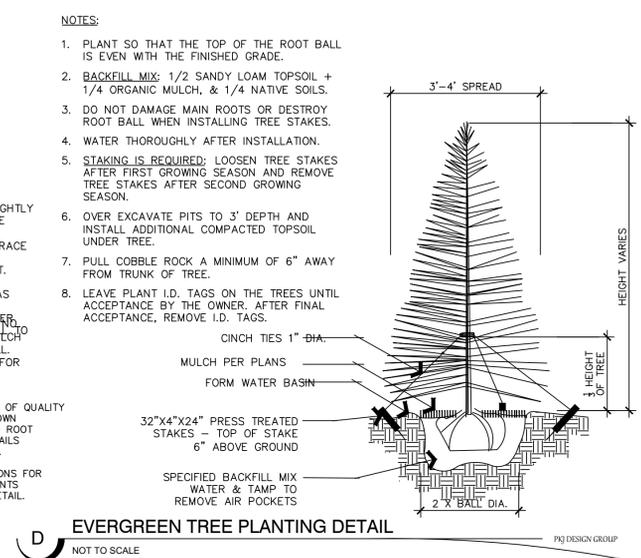
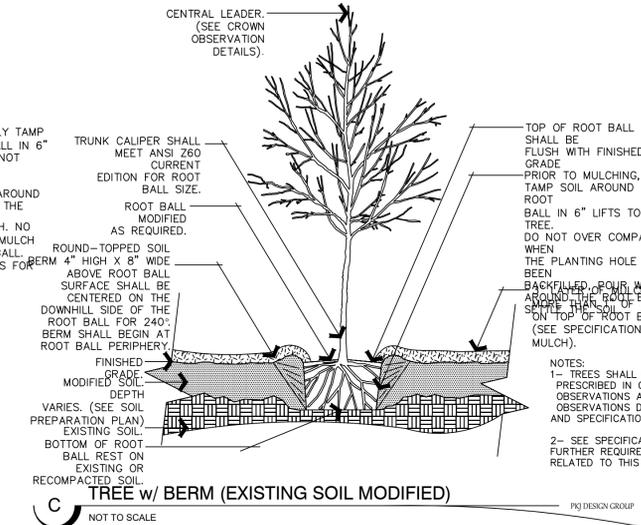
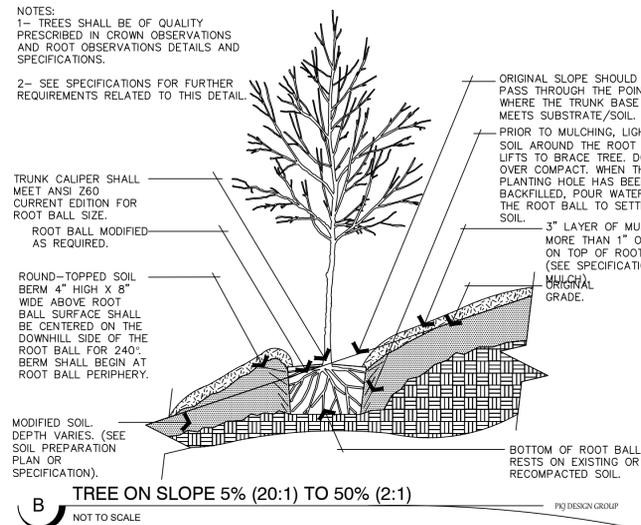
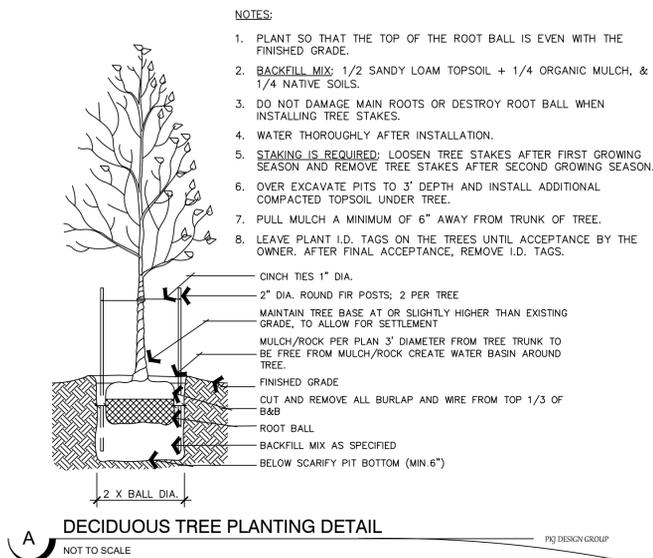
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**LP-1.6**

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# DI / BISHOP'S STOREHOUSE

## SARATOGA SPRINGS, UTAH

### IRRIGATION SPECIFICATIONS

#### IRRIGATION SPECIFICATIONS

##### PART 1 - GENERAL

###### 1.1 SUMMARY

Work to be done includes all labor, materials, equipment and services required to complete the Project irrigation system as indicated on the Construction Drawings, and as specified herein. Includes but is not limited to: Furnishing and installing underground and above ground sprinkler system complete with any accessories necessary for proper function and operation of the system. All plant material on the Project shall be irrigated. Removal and disposal of any existing sprinkler system components are not to be saved, which are disturbed during the construction process. Restoration of any altered or damaged existing landscape to original state and condition.

###### 1.2 SYSTEM DESCRIPTION

A. Design of irrigation components: Locations of irrigation components on Construction Drawings may be approximate. Piping, sleeving and/or other components shown on Construction Drawings may be shown schematically for graphic clarity and demonstration of component groupings and separations. All irrigation components shall be placed in landscaped areas, with the exception of pipe and wire in sleeving under hardscapes. Actual routing of pipe, wire or other components may be altered due to site conditions not accounted for in the design process.

B. Construction requirements: Actual placement may vary as required to achieve a minimum of 100% coverage without overspray onto hardscape, buildings or other features.

C. Layout of Irrigation Components: During layout and staking, consult with Owner Approved Representative (hereafter referred to as OAR) to verify proper placement of irrigation components and to provide Contractor recommendations for changes, where revisions may be advisable. Small or minor adjustments to system layout are permissible to avoid existing field obstructions such as utility boxes or street light poles. Contractor shall place remote control valves in groups as practical to economize on quantity of manifold isolation valves. Quick coupler valves shall be placed with manifold groups and protected by manifold isolation valves. Quick coupler valves are shown on Construction Documents in approximate locations.

###### 1.3 DEFINITIONS

A. Water Supply: Secondary water piping and components, furnished and installed by others to provide irrigation water to this Project, including but not limited to: fire hydrants, nipples, spools, shut off valves, corporation stop valves, water meters, pressure regulation valves, and piping upstream of (or prior to) the Point of Connection.

B. Point of Connection: Location where the Contractor shall tie into the water supply. May require backflow preventor, saddle, nipples, spools, isolation valves or Stop and Waste valve for landscape irrigation needs and use.

C. Main Line Piping: Pressurized piping downstream of the Point of Connection to provide water to remote control valves and quick couplers. Normally under constant pressure.

D. Lateral Line Piping: Circuit piping downstream of remote control valves to provide water to sprinkler heads, sprinkler heads, drip systems or bubblers.

###### 1.4 REFERENCES

A. The following standards will apply to the work of this Section:

- a. ASTM-American Society for Testing and Materials
- b. IA - The Irrigation Association: Main BMP Document, Landscape Irrigation Scheduling and Water Management Document.

###### 1.5 SUBMITTALS

A. At least thirty (30) days prior to ordering of any materials, the Contractor shall provide manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system. Submittals shall be in three ring binders or other similar bound form. Provide five copies of submittals to OAR for distribution. Place cover or index sheet indicating order in submittal document. No material shall be ordered, delivered or any work preceded in the field until the required submittals have been reviewed in its entirety and stamped approved. Delivered material shall match the approved samples.

B. Operation and Maintenance Manual:

- a. At least thirty (30) days prior to final inspection, the Contractor shall provide Operation and Maintenance manual to OAR, containing:
  - i. Manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system.
  - ii. Parts list for each operating element of the system
  - iii. Manufacturer printed literature on operation and maintenance of operating elements of the system.
- iv. Section listing instructions for overall system operation and maintenance. Include directions for Spring Start-up and Winterization.
- v. Project Record Copy
  - i. Maintain at project site one copy of all project documents clearly marked "Project Record Copy". Mark any deviation in material installation on Construction drawings. Maintain and update drawing at least weekly. Project Record Copy to be available to OAR on demand.
  - ii. Completed Project As-Built Drawings

1. Prior to final inspection, prepare and submit to OAR accurate as-built drawings
2. Show detail and dimension changes made during installation. Show significant details and dimensions that were not shown in original Contract Documents.
3. Field dimension locations of sleeving, points of connection, main line piping, wiring runs not contained in main line pipe trenches, valves and valve boxes, quick coupler valves.
4. Dimensions are to be taken from permanent constructed surfaces, features, or finished edges located at or above finished grade.
5. Contoller Map: upon completion of system, place in each controller a color coded copy of the area that controller services; indicating zone number, type of plant material and location on project that zone services. Laminate map with heat shrink clear plastic.

###### 1.6 QUALITY ASSURANCE

A. Acceptance: Do not install work of this section prior to acceptance by OAR of area to receive such work.

B. Regulatory Requirements: All work and materials shall be according to any and all rules, regulations or codes, whether they are State or Local laws and ordinances. Contract documents, drawings or specifications may not be construed or interpreted to permit work or materials not conforming to the above codes.

C. Adequate Water Supply: Water supply to this Project exists, installed by others. Connections to these supply lines shall be by this Contractor. Verify that proper connection is available to supply line and is of adequate size. Verify that secondary connection components may be installed if necessary. Perform static pressure test prior to commencement of work. Notify OAR in writing of problems encountered prior to proceeding.

D. Workmanship and Materials:

- a. It is the intent of this specification that all material herein specified and shown on the construction documents shall be of the highest quality available and meeting the requirements specified.
- b. All work shall be performed in accordance with the best standards of practice relating to the trade.

E. Contractor Qualifications:

- a. Contractor shall provide document or resume including at least the following items:
  - i. That Contractor has been installing sprinklers on commercial projects for five previous consecutive years.
  - ii. Contractor is licensed to perform Landscape and Irrigation construction in the State of this Project.
  - iii. Contractor is bondable for the work to be performed.
- iv. References of five projects of similar size and scope completed within the last five years. Three of the projects listed shall be local.
- v. Listing of suppliers where materials will be obtained for use on this Project.
- vi. Project site Foreman or Supervisor has at least five consecutive years of commercial irrigation installation experience. This person shall be a current Certified Irrigation Contractor in good standing as set forth by the

Irrigation Association. This person shall be on Project site at least 75% of each working day.

- vii. Evidence that Contractor currently employs workers in sufficient quantities to complete Project within time limits that are established by the Contract.
- viii. All General laborers or workers on the Project shall be previously trained and familiar with sprinkler installation and have a minimum of one-year experience. Those workers performing tasks related to PVC pipe shall have certificates designated below.

###### 1.7 DELIVERY-STORAGE-HANDLING

A. During delivery, installation and storage of materials for Project, all materials shall be protected from contamination, damage, vandalism, and prolonged exposure to sunlight. All material stored at Project site shall be neatly organized in a compact arrangement and storage shall not disrupt Project Owner or other trades on Project site. All material to be installed shall be handled by Contractor with care to avoid breakage or damage. Damaged materials attributed to Contractor shall be replaced with new at Contractor's expense.

###### 1.8 SEQUENCING

A. Perform site survey, research utility records, contact utility location services. The Contractor shall familiarize himself with all hazards and utilities prior to work commencement. Install sleeving prior to installation of concrete, paving or other permanent site elements. Irrigation system Point of Connection components, backflow prevention and pressure regulation devices shall be installed and operational prior to all downstream components. All main lines shall be thoroughly flushed of all debris prior to installation of any sprinkler heads.

###### 1.9 WARRANTY

A. Contractor shall provide one year Warranty. Warranty shall cover all materials, workmanship and labor. Warranty shall include filling and/or repairing depressions or replacing turf or other plantings due to settlement of irrigation trenches or irrigation system elements. Valve boxes, sprinklers or other components settles from original finish grade shall be restored to proper grade. Irrigation system shall have been adjusted to provide proper, adequate coverage of irrigated areas.

###### 1.10 OWNER'S INSTRUCTION

A. After system is installed, inspected, and approved, install Owner's Representatives in complete operation and maintenance procedures. Coordinate instruction with references to previously submitted Operation and Maintenance Manual.

###### 1.11 MAINTENANCE

A. Furnish the following items to Owner's Representative:

- a. Two quick coupler keys with hose swivels.
- b. One of each type or size of quick coupler valve and remote control valve. Five percent of total quantities used of each sprinkler and sprinkler nozzle.

B. Provide the following services:

- a. Winterize entire irrigation system installed under this contract. Winterize by 'blow-out' method using compressed air. Compressor shall be capable of minimum of 175 CFM. This operation shall occur at the end of first growing season after need for plant irrigation but prior to freezing. Compressor shall be capable of evacuation system of low water pressure regulation device. Compressor shall be regulated to not more than 60 PSI. Start up system the following spring after danger of freezing has passed. Contractor shall train Owner's Representative in proper start-up and winterization procedure.

##### PART 2 - PRODUCTS

###### 2.1 GENERAL NOTES

A. Contractor shall provide materials to be used on this Project. Contractor shall not remove any material purchased for this Project from the Project Site, nor mix Project materials with other Contractor owned materials. Owner retains right to purchase and provide project material.

###### 2.2 POINT OF CONNECTION

A. The Contractor shall connect onto existing irrigation or water main line as needed for Point(s) of Connection. Contractor shall install new main line as indicated.

###### 2.3 CONNECTION ASSEMBLY

A. Secondary water shall be used on this Project. Install filter and RPZ as needed.

###### 2.4 CONTROL SYSTEM

A. Power supply to the irrigation controller shall be provided for by this Contract.

B. Controller shall be as specified in the drawings. Controller shall be surge protected.

- a. Installation of wall-mount controllers: Irrigation controller shall be responsible for this task. Power configuration for wall-mount controllers shall be 120 VAC unless otherwise noted.
- b. Locate Controller(s) in general location shown on Construction drawings. Coordinate power supply and breaker allocation with electrical contractor. Contractor shall be responsible for all power connections to Controllers, whether they are wall mount or pedestal mount. Contractor shall coordinate with electrical or other Project trades as needed to facilitate installation of power to controllers.

C. Wires connecting the remote control valves to the irrigation controller are single conductors, type PE. Wire construction shall incorporate a solid copper conductor and polyethylene (PE) insulation with a minimum thickness of 0.045 inches. The wires shall be UL listed for direct burial in irrigation systems and be rated at a minimum of 30 VAC. Paige Electric Co., LP specification number P7079D.

- a. A minimum of 24" of additional wire shall be left at each valve, each splice box and at each controller.
- b. Common wire shall be white in color, 12 gauge. Control wire shall be red in color, 14 gauge. Spare wire shall be looped within each valve box of the grouping it is to service.

D. RCV wire splicing connectors shall be 3M brand DBY or DBR. Wire splicing between controller and valves shall be avoided if at all possible. Any wire splices shall be contained within a valve box. Splices within a valve box that contains no control valves shall be stamped "WIRE SPLICE" or "WS" on box lid.

###### 2.5 SLEEVING

A. Contractor shall be responsible to protect existing underground utilities and components. Sleeving minimum size shall be 2". Sleeving 2" through 4" in size shall be S/40 PVC solvent weld. Sleeving 6" and larger shall be CL 200 PVC gasketed. Sleeve diameter shall be at least two times the diameter of the pipe within the sleeve. Sleeves shall be extended 6" minimum beyond burr or edge of pavement. Wire or cable shall not be installed in the same sleeve as piping, but shall be installed in separate sleeves. Sleeve ends on sleeve sizes 4" and larger shall be capped with integral corresponding sized PVC slip cap, pressure fit, until used, to prevent contamination. Sleeves shall be installed at appropriate depths for main line pipe or lateral pipe.

###### 2.6 MAIN LINE PIPE

A. All main line pipe 4" and larger shall be Class 200 gasketed bell end. All main line pipe 3" in size and smaller shall be Schedule 40 PVC solvent weld bell end.

- a. Maximum flows allowed through main line pipe shall be:
  - 3/4" 8 GPM
  - 1" 12 GPM
  - 1-1/2" 30 GPM
  - 2" 53 GPM
  - 2-1/2" 75 GPM
  - 3" 110 GPM
  - 4" 180 GPM
- b. Main line pipe shall be buried with 24" cover

###### 2.7 MAIN LINE FITTINGS

A. All main line fittings 3" and larger shall be gasketed ductile iron material. All ductile iron fittings having change of direction shall have proper concrete thrust block installed. All main line fittings smaller than 3" in size shall be Schedule 80 PVC.

###### 2.8 ISOLATION VALVES

A. Isolation valves 3" and larger shall be Waterous brand model 2500 cast iron gate valve, resilient wedge, push on type, with 2" square operating nut. Place sleeve of 6" or larger pipe over top of valve vertically and then extend to grade. Place 10" round valve box over sleeve at grade.

B. Isolation valves 2-1/2" and smaller shall be Apollo brand 70 series brass ball valves, contained in a Carson Standard size valve box. Valves shall be installed with S/80 PVC TOE Nipples on both sides of the valve. Valve shall be placed so that the handle is vertical toward the top of the valve box in the 'off' position.

###### 2.9 MANIFOLDS

A. Action Manifold fittings shall be used to create unions on both sides of each control valve, allowing the valve to be removed from the box without cutting piping. Valves shall be located in boxes with ample space surrounding them to allow access for maintenance and repair. Where practical, group remote control valves in close proximity, and protect each grouping with a manifold isolation valve as shown in details. Manifold Main Line (or Sub-Main Line) and all manifold components and isolation valves shall be at least as large as the largest diameter lateral served by the respective manifold.

###### 2.10 REMOTE CONTROL VALVES

A. Remote control valves shall be as specified on the drawings. Remote control valves shall be located separately and individually in separate control boxes.

###### 2.11 MANUAL CONTROL VALVES

A. Quick coupler valve shall be attached to the manifold sub-main line using a Lasco G175212 swing joint assembly with snap-lock outlet and brass stabilizer elbow. Quick coupler valve shall be placed within a Carson 10" round valve box. Top of quick coupler valve cover shall allow for complete installation of valve box lid, but also allow for insertion and operation of key. Base of quick coupler valve and top of quick coupler swing joint shall be encased in 3/4" gravel. Contractor shall not place quick coupler valves further than 200 feet apart, to allow for spot watering or supplemental irrigation of new plant material. Quick coupler valve at POC shall not be eliminated or relocated.

###### 2.12 LATERAL LINE PIPE

A. All lateral piping shall be Schedule 40 PVC, solvent weld, and bell end. Lateral pipe shall be buried with 12-18" of cover typically. Lateral pipe shall be 3/4", 1", 1 1/4", 1 1/2" or 2" in size as indicated on Construction Drawings.

###### 2.13 LATERAL LINE FITTINGS

A. All lateral line fittings shall be S/40 PVC

###### 2.14 Spray Sprinklers

A. Spray head sprinklers shall be as specified on the drawings. Nozzles shall be as specified on the drawings.

###### 2.15 VALVE BOXES

A. Carson valve boxes shall be used on this project. Sizes are as directed in these Specifications, detail sheets or plan sheets. Valve boxes shall be centered over the control valve or element they cover. Valve box shall be sized large enough to allow ample room for services access, removal or replacement of valve or element. Valve box shall be set to flush to finish grade of topsoil or parked areas. Contractor shall provide extensions or stack additional valve boxes as necessary to bring valve box pit to above grade.

###### 2.16 IMPORT BACKFILL

A. All main line pipe, lateral line pipe and other irrigation elements shall be bedded and backfilled with clean soil, free of rocks 1" and larger. Contractor shall furnish and install additional backfill material as necessary due to rocky conditions. Trenches and other elements shall be compacted and/or water settled to eliminate settling. Debris from trenching operations unusable for fill shall be removed from project and disposed of properly by Contractor.

###### 2.17 OTHER PRODUCTS

A. Substitution of equivalent products is subject to the OAR's approval and must be designated as accepted in writing.

- a. The Contractor shall provide materials to make the system complete and operational.

##### PART 3 - EXECUTION

###### 3

###### 3.1 PREPARATION

A. Contractor shall repair or replace work damaged by irrigation system installation. If damaged work is new, replacement or the original installer of that work shall perform repairs. The existing landscape of this Project shall remain in place. Contractor shall protect and work around existing plant material. Coordination of trench and valve locations shall be laid out the OAR prior to any excavation occurring. Plant material deemed damaged by the OAR shall be replaced with new plant material at Contractor's expense. Contractor shall not cut existing tree roots larger than 2" to install this Project. Route pipe, wire and irrigation elements around tree canopy drip line to minimize damage to tree roots. Contractor shall have no part of existing system used by other portions of site landscape without water for without water for more than 24 hours at a time.

###### 3.2 TRENCHING AND BACKFILLING

A. Pulling of pipe shall not be permitted on this project. Over excavate trenches both in width and depth. Ensure base of trench is rock or debris free to protect pipe and wire. Grade trench base to ensure flat, even support of piping. Backfill with clean soil or import material. Contractor shall backfill no less than 2" around entire pipe with clean, rock free fill. Main line piping and fittings shall not be backfilled until OAR has inspected and pipe has passed pressure testing. Perform balance of backfill operation to eliminate any settling.

###### 3.3 SLEEVING

A. Sleeve all piping and wiring that pass under paving or hardscape features. Wiring shall be placed in separate sleeving from piping. Sleeves shall be positioned relative to structures or obstructions to allow for pipe or wire within to be removed if necessary.

###### 3.4 GRADES AND DRAINAGE

A. Place irrigation pipe and other elements at uniform grades. Winterization shall be by evacuation with compressed air. Automatic drains shall not be installed on this Project. Manual drains shall only be installed at POC where designated on Construction Drawings.

###### 3.5 PVC PIPE

A. Install pipe to allow for expansion and contraction as recommended by pipe manufacturer.

B. Install main line pipes with 18" of cover, lateral line pipes with 12" of cover.

C. Drawings show diagrammatic or conceptual location of piping. Contractor shall install piping to minimize change of direction, avoid placement under large trees or large shrubs, avoid placement under hardscape features.

D. Plastic pipe shall be cut squarely. Burrs shall be removed. Spigot ends of pipes 3" and larger shall be beveled.

E. Pipe shall not be glued unless ambient temperature is at least 50 degrees F. Pipe shall not be glued in rainy conditions unless properly tented. All solvent weld joints shall be assembled using IPS 711 glue and P70 primer according to manufacturer's specification, no exceptions. All workers performing glue operations shall provide evidence of certification. Glued main line pipe shall cure a minimum of 24 hours prior to being energized. Lateral lines shall cure a minimum of 2 hours prior to being energized and shall not remain under constant pressure unless cured for 24 hours.

F. Appropriate thrust blocking shall be performed on fittings 3" and larger. All threaded joints shall be wrapped with Teflon tape or paste unless directed by product manufacturer or sealing by o-ring.

###### 3.6 CONTROLLERS

A. All grounding for pedestal controllers shall be as directed by controller manufacturer and ASIC guidelines, not to exceed a resistance reading of 5 OHMS.

B. Locate controllers in protected, inconspicuous places, when possible. Coordinate location of pedestal controllers with Landscape Architect to minimize visibility.

C. Coordinate location of wall mount controllers with building or electrical Contractor to facilitate electrical service and future maintenance needs. Wall mount shall be securely fastened to surface. If exterior mounted, wall mount controllers shall have electrical service wire and field control wire in separate, appropriate sized weatherproof electrical conduit, PVC pipe shall not be used.

D. Wire under hardscape surfaces shall be placed continuously in conduit. Contractor shall be responsible to coordinate sleeving needs for conduit or sweeps elbows from exterior to interior of building.

E. Pedestal controllers shall be placed upon VIT-Strong Box Quick Pad as per manufacturer's recommendations. Controllers shall be oriented such that Owner's Representative maintenance personnel may access easily and perform field system tests efficiently.

F. Place Standard valve box at base of controller or nearby to allow for three to five feet of slack field control wire to be placed at each controller. This Contractor shall provide conduit access if needed for Electrical Contractor. Electrical supply and installation, as well as hook-up to controller shall be by this Contractor.

###### 3.7 VALVES

A. Isolation valves, remote control valves, and quick coupler valves shall be installed according to manufacturer recommendation and Contract Specifications and Details.

B. Valve boxes shall be set over valves so that all parts of the valve can be reached for service.

C. Valve box and lid shall be set to be flush with finished grade. Only one remote control valve may be installed in a Carson 1419124 box. Place a minimum of 4" of 3/4" washed gravel beneath valve box for drainage. Bottom of remote control valve shall be a minimum of 2" above gravel.

###### 3.8 SPRINKLER HEADS

A. No sprinkler shall be located closer than 6" to walls, fences, or buildings.

B. Heads adjacent to walks, curbs. Or paths shall be located at grade and 2" away from hardscape.

C. Control valves shall be opened and fully flush lateral line pipe and swing joints prior to installation of sprinklers.

D. Spray heads shall be installed and flushed again prior to installation of nozzles.

E. Contractor shall be responsible for adjustment if necessary due to grade changes during landscape construction.

###### 3.9 FIELD QUALITY CONTROL

A. Main line pipes shall not be backfilled or accepted until the system has been tested for 2 hours at 100 psi.

B. Main line pressure test shall include all pipe and components from the point of connection to the upstream side of remote control valves. Test shall include all manifold components under constant pressure. Piping may be tested in sections that can be isolated.

C. Contractor shall provide pressurized water pump to increase or boost pressure where existing static pressure is less than 100 psi.

D. Schedule testing with OAR 48 hours in advance for approval.

E. Leaks or defects shall promptly be repaired or rectified at the Contractors expense and retested until able to pass testing.

F. Grounding resistance at pedestal controller shall also be tested and shall not exceed 5 OHMS.

###### 3.10 ADJUSTMENT

A. Sprinkler heads shall be adjusted to proper height when installed. Changes in grade or adjustment of head height after installation shall be considered a part of the original contract and at Contractor's expense.

B. Adjust all sprinkler heads for arc, radius, proper trim and distribution to cover all landscaped areas that are to be irrigated.

C. Adjust sprinklers so they do not water buildings, structures, or other hardscape features.

D. Adjust run times of station to meet needs of plant material the station services.

###### 3.11 CLEANING

A. Contractor shall be responsible for cleanliness of jobsite. Work areas shall be swept cleanly and picker up daily.

B. Open trenches or hazards shall be protected with yellow caution tape.

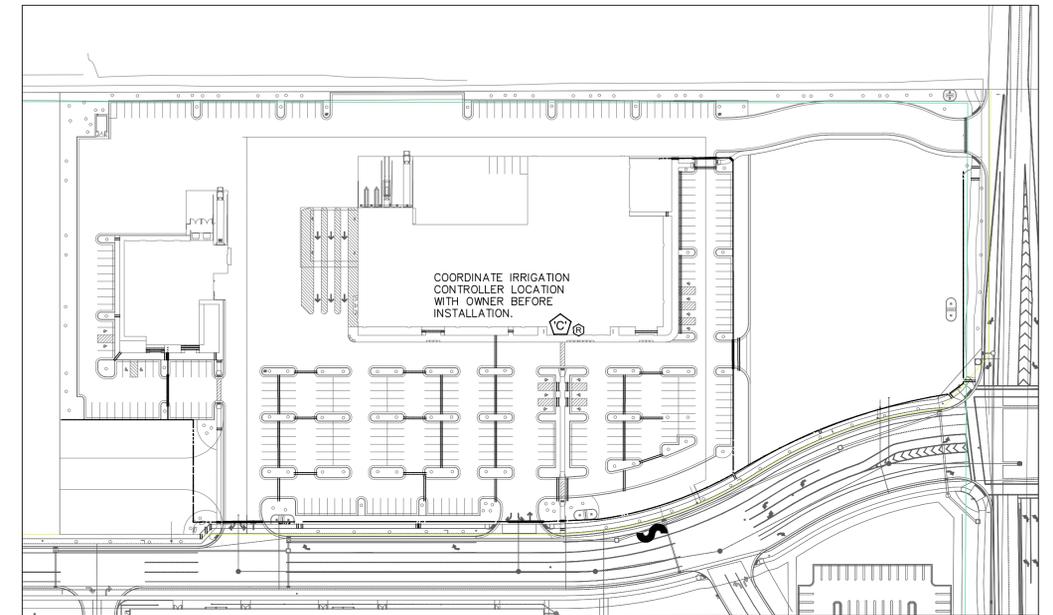
C. Contractor is responsible for removal and disposal offsite of trash and debris generated as a result of this Project.

- a. OAR shall perform periodic as well as a final cleanliness inspection.
- E. Contractor shall leave Project in at least a "broom clean" condition.

END OF SECTION

### REFERENCE MAP

IR-1.3	IR-1.2	IR-1.1
IR-1.4	IR-1.5	IR-1.6



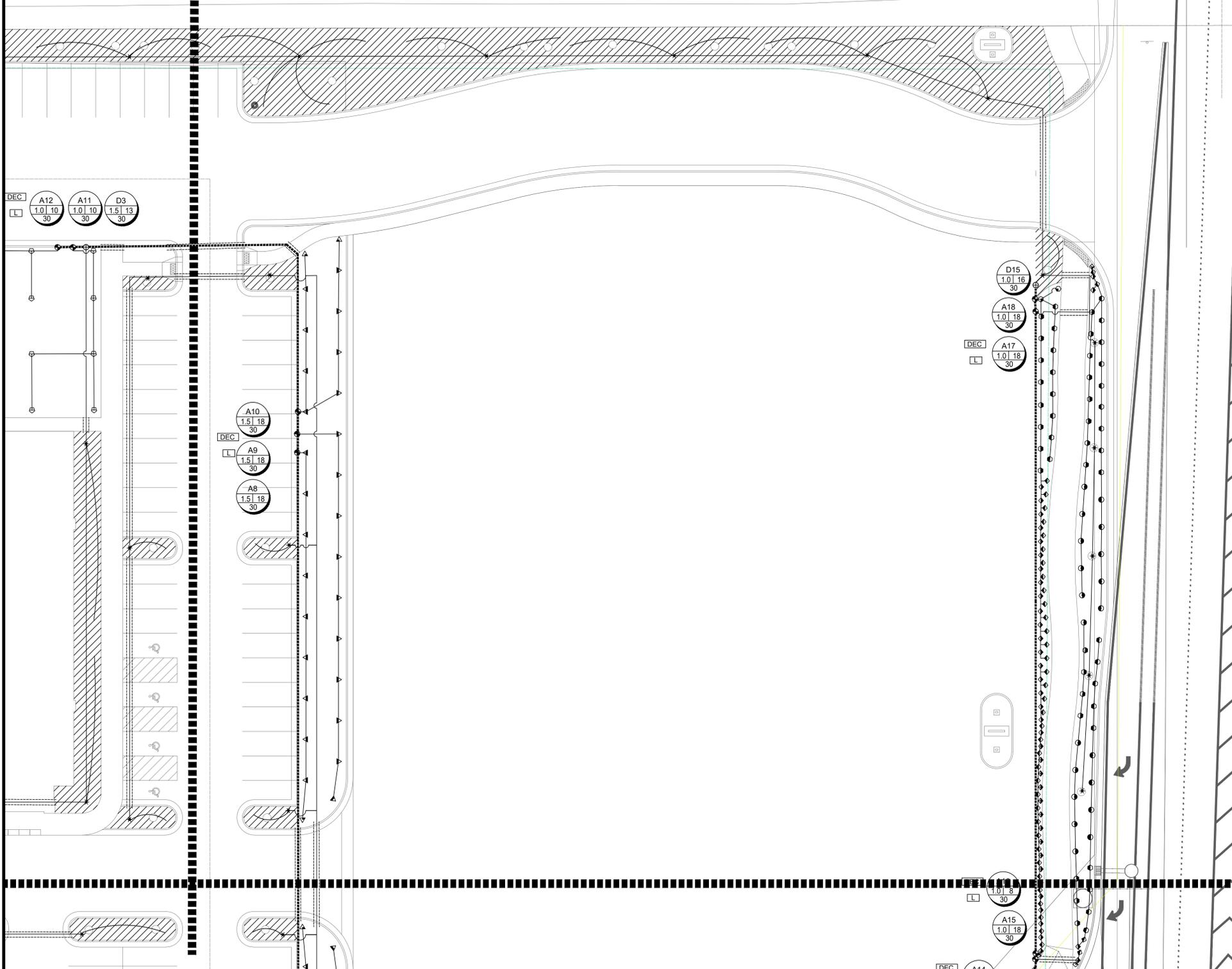
2" MAINLINE ROUTING ,CONTROLLER AND P.O.C. LOCATION OVERVIEW

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP	PM:
06-30-2020	UT19010	 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: <b>JRW &amp; ASSOCIATES</b> ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	 <b>PKJ DESIGN GROUP L.L.C.</b> 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com		JTA
NO.	REVISION	DATE		Client / Engineer:			DRAWN: KBA
1	XXXX	XX-XX-XX		LEI-ENGINEERING			CHECKED: TM
2				3302 N. Main Street			PLOT DATE: 7/11/2020
3				Spanish Fork, Ut. 84660			
4				801-798-0555 ext. 226			
5				www.lei-eng.com			
6							
7							

IRRIGATION PLAN

IR-1.0

SHEET IR 1.2



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS		
					Q	T	H	TT	TQ	F		
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						--	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
○	RAINBIRD 5000 SERIES MPR NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT, PLACE IN LXMM PERISTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
○	MASTER VALVE											
○	FLOW SENSOR											
○	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE											
○	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
○	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)											
○	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.											
○	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.											
○	REMOTE CONTROL VALVE: RAINBIRD PFS-AN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)											
○	DRIP CONTROL ZONE KIT: RAINBIRD XCZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)											
*	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.											
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER											
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER											
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART											
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT											
-----	CLASS 200 SLEEVE PER PLAN											
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM											
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.											

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM			
MAXIMUM LATERAL LENGTH OF TUBING		350 FT			
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)			
APPLICATION RATE		64 INCH PER HOUR			

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

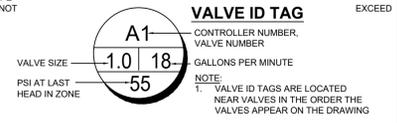
Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min						
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2" AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4" LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		

**811** BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

0' 10' 20' 40' 80'  
GRAPHIC SCALE: 1" = 20'

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

DEVELOPER / PROPERTY OWNER / CLIENT  
Developer / Property Owner:  
**JRW & ASSOCIATES**  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

Client / Engineer:  
**LEI-ENGINEERING**  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

LANDSCAPE ARCHITECT / PLANNER  
**PKJ DESIGN GROUP**  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

LICENSE STAMP

IRRIGATION PLAN  
**IR-1.1**

PLOT DATE: 1/23/2020

SHEET IR 1.3

SHEET IR 1.1

IRRIGATION LEGEND

Table with columns: SYMBOL, MANUFACTURER-MODEL NUMBER, PAT., RD., PSI, GPM (Q, T, H, TT, TQ, F), QTY, REMARKS. Lists various irrigation components like Rainbird nozzles, valves, and filters.

DRIP ZONE

Table with columns: TYPE, PART NUMBER, EMITTER FLOW, EMITTER SPACING, ROW SPACING, RECOMMENDED ROW SPACING. Includes a summary table for total drip zone flow and application rate.

90 Day Establishment Period Irrigation Schedule (April, May, June). Table with columns: Type, Day, Duration, Operating Pressure.

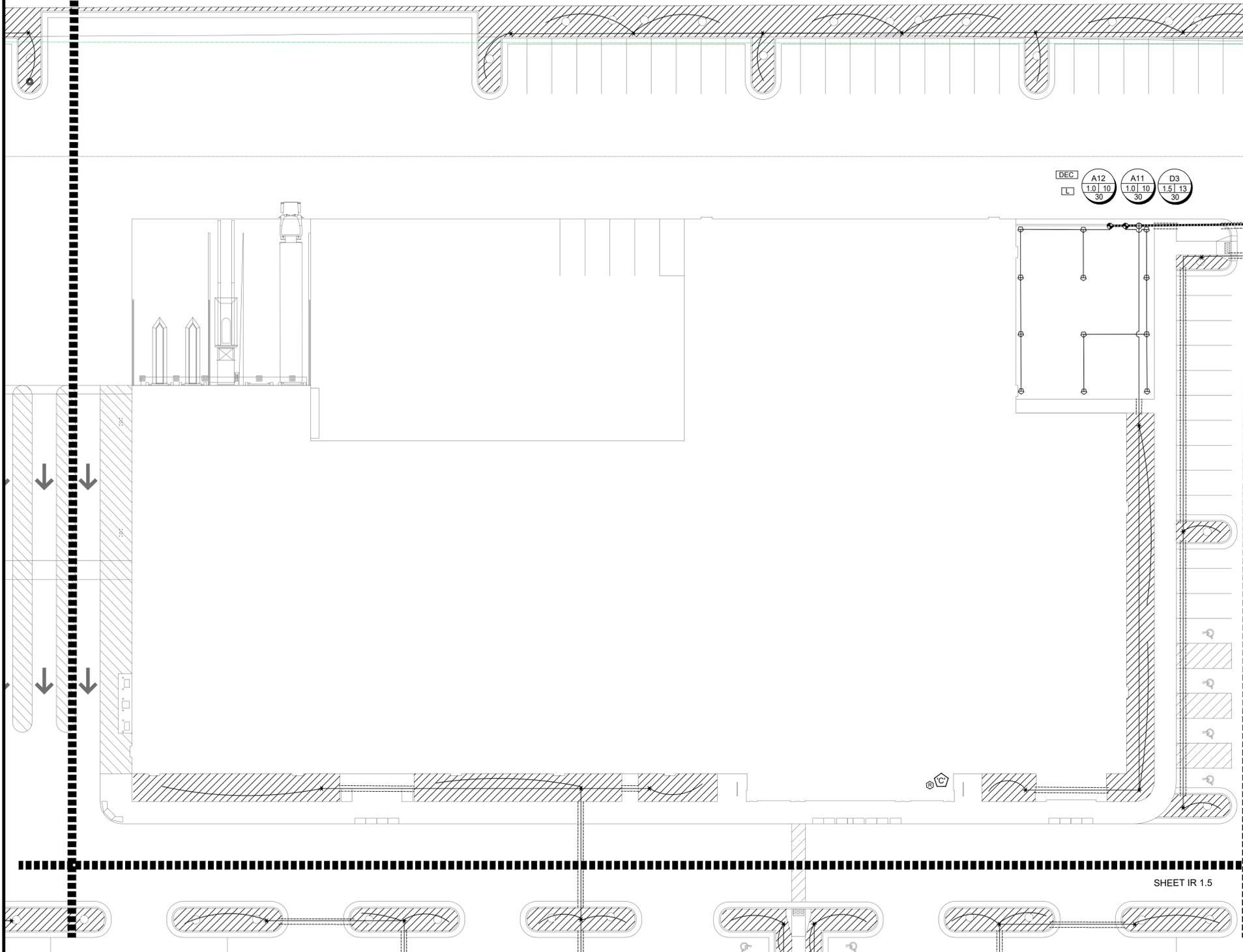
Regular Irrigation Schedule (see Seasonal Differential Chart). Table with columns: Type, Day, Duration, Operating Pressure.

Seasonal Differential. Table with columns: Month, Duration, Operating Pressure.

IRRIGATION NOTES

- 1. ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
2. ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1/2" MUST BE SCHEDULE 40 OR BETTER.
3. CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
4. PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
5. MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
6. CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
7. CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
8. INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
9. CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
10. WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25' INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
11. ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
12. IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
13. SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
14. CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
15. IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
16. MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
17. ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
18. IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
19. ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
20. CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
21. POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
22. INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
23. LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

VALVE ID TAG. Includes a circular tag with 'A1-1.0 18-55' and text: VALVE SIZE, PSI AT LAST HEAD IN ZONE, CONTROLLER NUMBER, VALVE NUMBER, GALLONS PER MINUTE. NOTE: 1. VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING.



SHEET IR 1.5

Table with columns: ISSUE DATE, PROJECT NUMBER, PLAN INFORMATION. Includes a revision table with columns: NO., REVISION, DATE.

811 BLUE STAKES OF UTAH logo and contact information. Includes a north arrow and a graphic scale: 1" = 20'.

DI STOREHOUSE SARATOGA SPRINGS, UTAH. Includes developer/property owner information: JRW & ASSOCIATES, ATTN: JOHNNY WATSON, 1152 BOND AVENUE, STE. A, REXBURG, ID 83440, (208)359-2309.

Client / Engineer: LEI-ENGINEERING, 3302 N. Main Street, Spanish Fork, Ut. 84660, 801-798-0555 ext. 226, www.lei-eng.com.

LANDSCAPE ARCHITECT / PLANNER: PKJ DESIGN GROUP L.L.C., 3450 N. TRIUMPH BLVD, SUITE 102, LEHI, UTAH 84043, (801) 960-2698, www.pkjdesigngroup.com.

LICENSE STAMP: PKJ DESIGN GROUP L.L.C. Includes a professional seal and license information. License number: 8128121-6301, expires 06/30/2022. Includes a table with columns: PLOT DATE, IRRIGATION PLAN, and License number IR-1.2.

**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM						QTY	REMARKS
					Q	T	H	TT	TQ	F		
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F.	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 9 U-SERIES	Q.T.H.F.	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F.	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F.	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						--	
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
⊙	RAINBIRD 5000 SERIES MPX NOZZLES	Q.T.H.F.	varies	30	varies	varies	varies	na	na	varies	--	
⊙	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F.	65'	30	6.6	12.6	24.3	na	na	varies	--	
⊙	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTE KIT, PLACE IN LXMM PERISTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
⊙	MASTER VALVE											
⊙	FLOW SENSOR											
⊙	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE											
⊙	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
⊙	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)											
⊙	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.											
⊙	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.											
⊙	REMOTE CONTROL VALVE: RAINBIRD PFS-BN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)											
⊙	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)											
*	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.											
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER											
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER											
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART											
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT											
-----	CLASS 200 SLEEVE PER PLAN											
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM											
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.											

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW	20 GPM	TIME TO APPLY 1/4" OF WATER	23		
MAXIMUM LATERAL LENGTH OF TUBING	350 FT	REQUIRED NUMBER OF STAKES	500		
TOTAL LENGTH OF ZONE DRIPLINE	2,000 FT (varies per plan)	NUMBER OF FLUSH POINTS	2		
APPLICATION RATE	64 INCH PER HOUR	SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"		

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	15 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

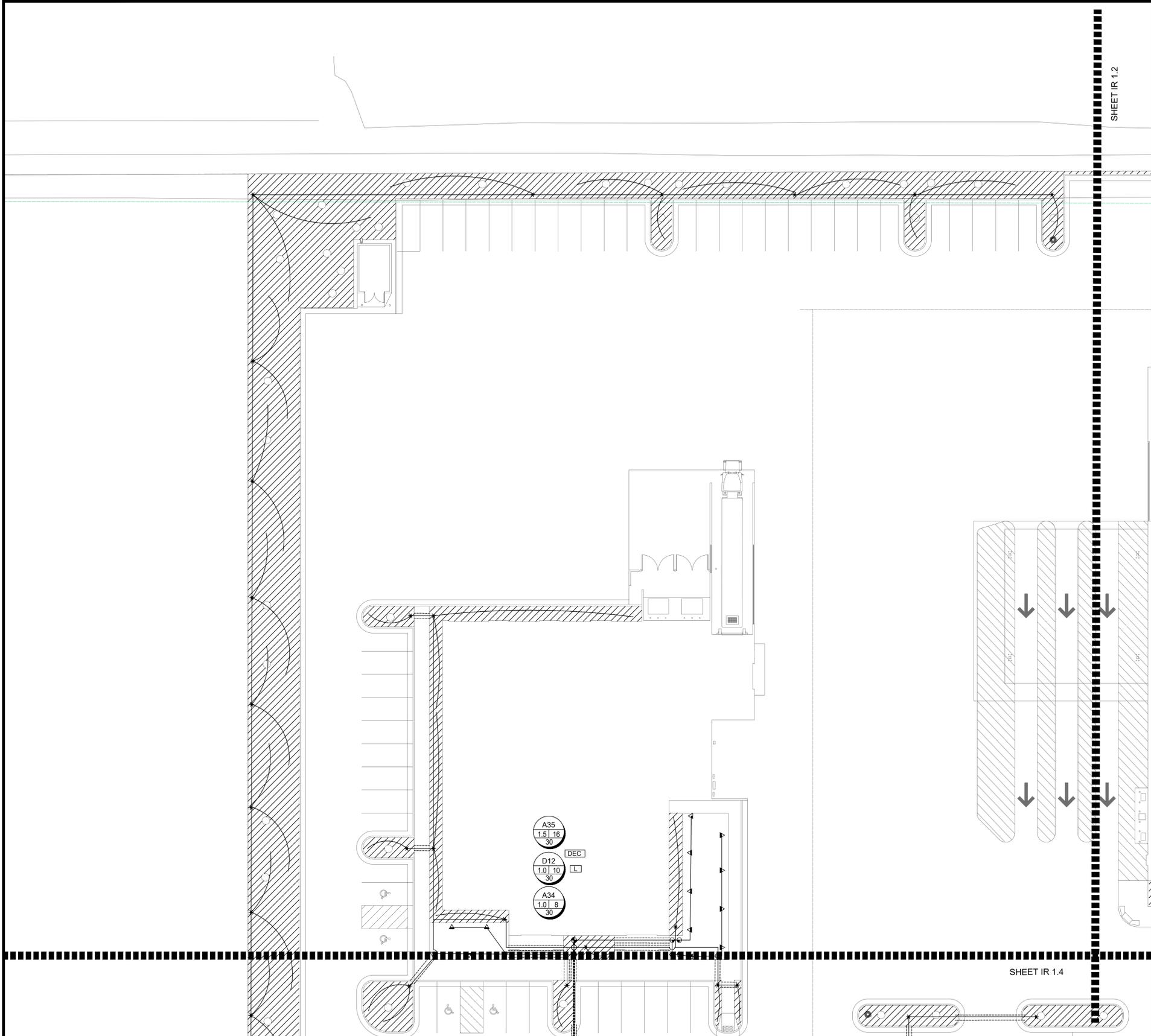
**IRRIGATION NOTES**

- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
- CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
- MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
- CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
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- WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
- ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
- IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
- SPACE ALL SPRAY HEADS 2" AWAY FROM ANY HARDSCAPE.
- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
- MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
- IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
- ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
- CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

CONTROLLER NUMBER: A1  
VALVE NUMBER: 18  
GALLONS PER MINUTE: 55

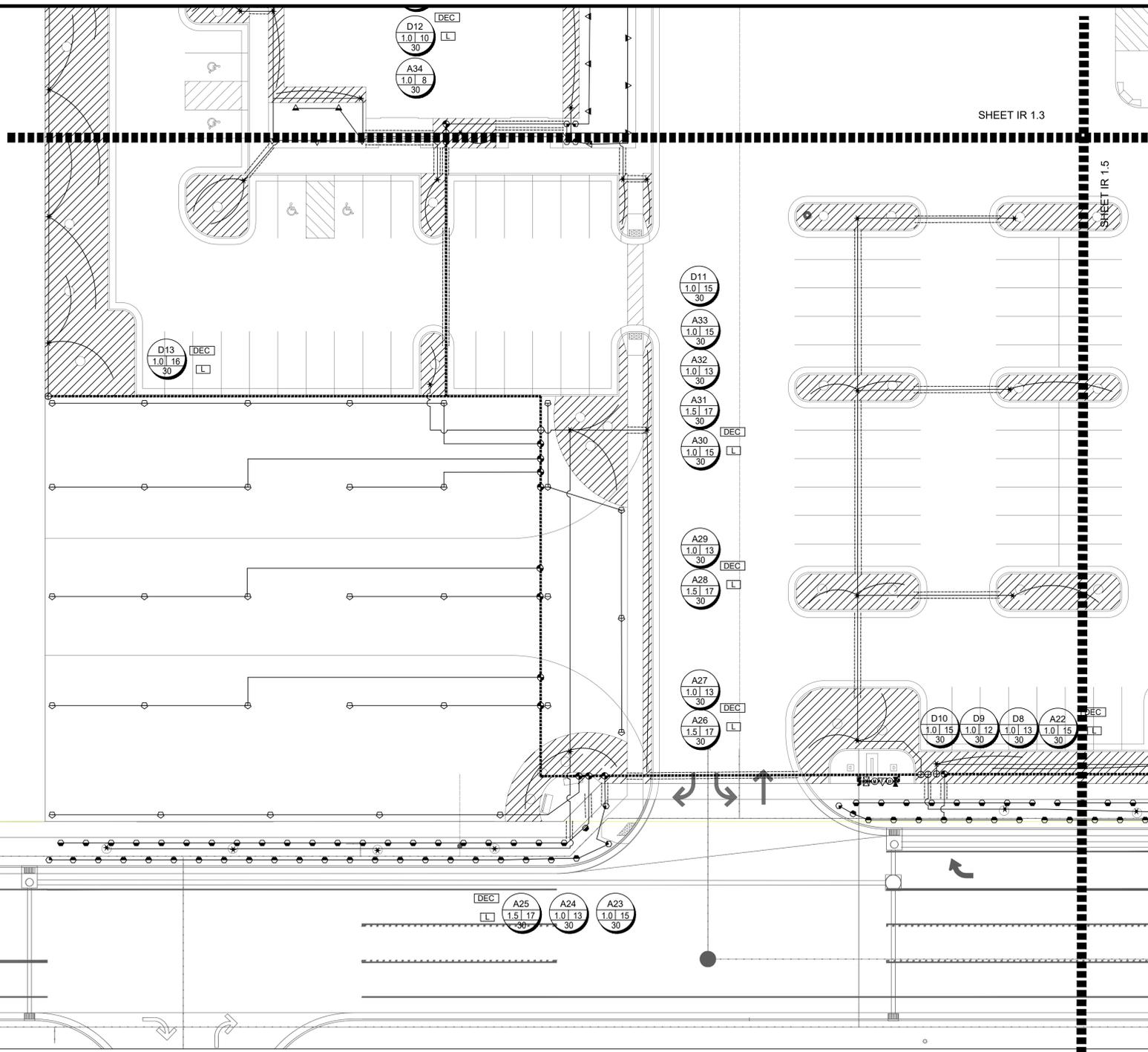
NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING



SHEET IR 1.2

SHEET IR 1.4

<p>ISSUE DATE: 06-30-2020</p> <p>PROJECT NUMBER: UT19010</p>		<p>PLAN INFORMATION</p> <p>811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC 1-800-662-4111 www.bluestakes.org</p>		<p>PROJECT INFORMATION</p> <p><b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH</p>		<p>DEVELOPER / PROPERTY OWNER / CLIENT</p> <p>Developer / Property Owner: JRW &amp; ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020</p>	
<p>NO. REVISION DATE</p> <p>1 XXXX XX-XX-XX</p>		<p>GRAPHIC SCALE: 1" = 20'</p>		<p>Developer / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020</p>		<p>IR-1.3</p>	



**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS		
					Q	T	H	TT				
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	10	15	20	na	40	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	26	35	52	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	10'	30	39	53	79	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	O.T.H.T	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	61						--	
○	RAINBIRD 5000 SERIES MPR NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT. PLACE IN LXXM PERISTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	MASTER VALVE											
□	FLOW SENSOR											
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE											
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)											
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.											
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.											
□	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)											
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)											
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.											
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER											
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER											
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART											
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT											
□	CLASS 200 SLEEVE PER PLAN											
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM											
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC.											
□	PROVIDE 2 WIRE LOOP SYSTEM											

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min	45 min	15 min	45 min	15 min	45 min	30 psi
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Seasonal Differential**

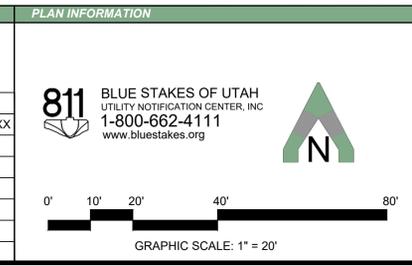
	April	May	June	July	August	Sept	October
Turf	10 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

**IRRIGATION NOTES**

- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
- CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
- MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
- CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
- INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
- CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
- WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
- ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
- SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
- MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
- IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
- ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
- CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	<p>BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org</p>



**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

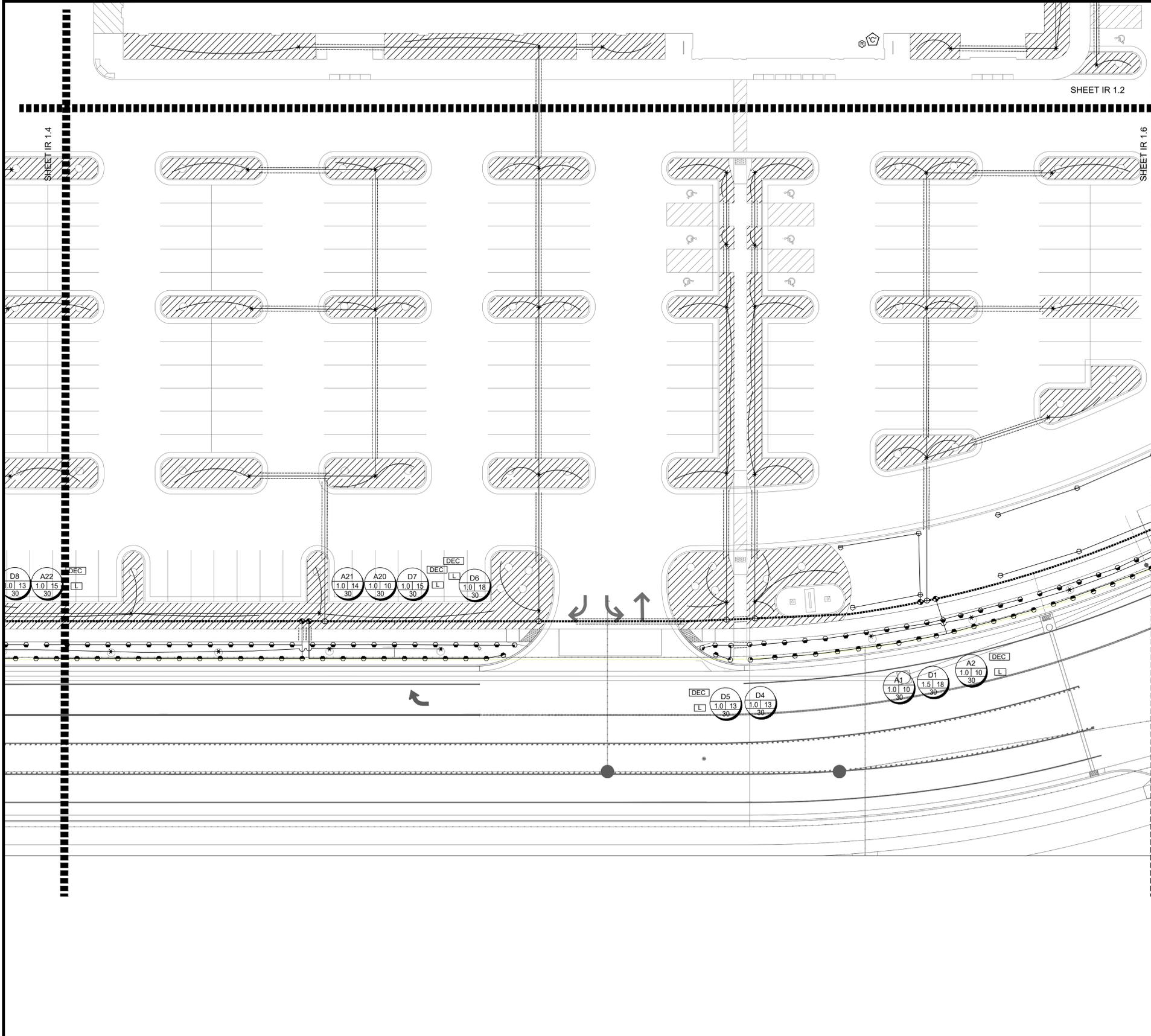
**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

**LICENSE STAMP**

PKJ DESIGN GROUP L.L.C. IRRIGATION PLAN

IR-1.4



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER - MODEL NUMBER	PAT.	RD.	PSI	GPM					QTY	REMARKS	
					Q	T	H	TQ	F			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	40	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	10'	30	26	35	52	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	15'	30	39	53	79	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	Q.T.H.T	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	61						--	
○	RAINBIRD 5000 SERIES IMPR NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTE KIT, PLACE IN LXMM PERISTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										--	WALL MOUNT. COORDINATE WITH OWNER FOR EXACT LOCATION
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	MASTER VALVE										--	SEE DETAIL
□	FLOW SENSOR										--	SEE DETAIL
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										--	SEE DETAIL
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										--	SEE DETAIL
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										--	SEE DETAIL
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										--	10" RND. VALVE BOX. SEE DETAIL
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	REMOTE CONTROL VALVE: RAINBIRD PRS-ND AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										--	SEE DETAIL JUMBO BOX-PURPLE LID
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-FRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										--	SEE DETAIL
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										--	INSTALL FLUSH CAP. SEE DETAIL
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										--	SEE DETAIL
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										--	SEE DETAIL
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										--	SEE DETAIL
□	CLASS 200 SLEEVE PER PLAN										--	SEE DETAIL
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										--	SEE DETAIL
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										--	SEE DETAIL

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	15 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
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  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
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  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

CONTROLLER NUMBER: \_\_\_\_\_  
VALVE NUMBER: \_\_\_\_\_  
GALLONS PER MINUTE: \_\_\_\_\_

NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

ISSUE DATE: 06-30-2020

PROJECT NUMBER: UT19010

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

DEVELOPER / PROPERTY OWNER / CLIENT: JRW & ASSOCIATES, ATTN: JOHNNY WATSON, 1152 BOND AVENUE, STE. A, REXBURG, ID 83440, (208)359-2309

CLIENT / ENGINEER: LEI-ENGINEERING, 3302 N. Main Street, Spanish Fork, Ut. 84660, 801-798-0555 ext. 226, www.lei-eng.com

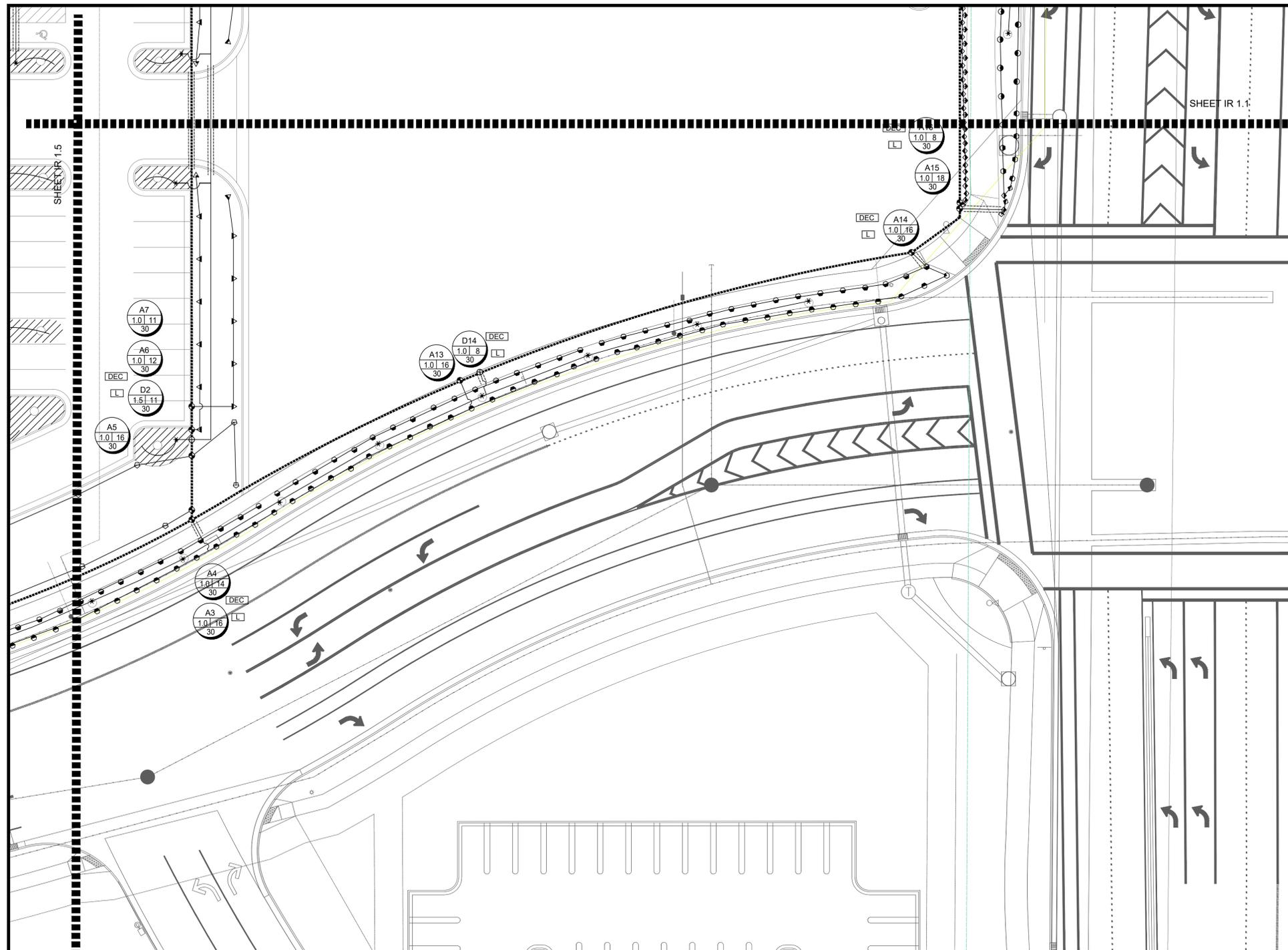
LANDSCAPE ARCHITECT / PLANNER: PKJ DESIGN GROUP L.L.C., 3450 N. TRIUMPH BLVD, SUITE 102, LEHI, UTAH 84043, (801) 960-2698, www.pkjdesigngroup.com

LICENSE STAMP: PKJ DESIGN GROUP, LICENSED LANDSCAPE ARCHITECT, STATE OF UTAH, 8128121-6301, 06/30/2020

NO. REVISION DATE

1	XXXX	XX-XX-XX
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IR-1.5



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS	
					Q	T	H	TT	F		
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	.10	.15	.20	na	na	40	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	.26	.35	.52	na	na	1.05	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	10'	30	.39	.53	.79	na	na	1.58	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	15'	30	.92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES MPR NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTEKIT. PLACE IN LXMM PEDESTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
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□	PROVIDE 2 WIRE LOOP SYSTEM.										

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
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MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

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  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3' OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25' INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.
- | SIZE   | GPM     |
|--------|---------|
| 3/4"   | 8 GPM   |
| 1"     | 12 GPM  |
| 1-1/2" | 30 GPM  |
| 2"     | 53 GPM  |
| 2-1/2" | 75 GPM  |
| 3"     | 110 GPM |
| 4"     | 180 GPM |
- VALVE ID TAG: CONTROLLER NUMBER, VALVE NUMBER, GALLONS PER MINUTE
- NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		

811 BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

Developer / Property Owner:  
**JRW & ASSOCIATES**  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. A  
 REXBURG, ID 83440  
 (208)359-2309

Client / Engineer:  
**LEI-ENGINEERING**  
 3302 N. Main Street  
 Spanish Fork, Ut. 84660  
 801-798-0555 ext. 226  
 www.lei-eng.com

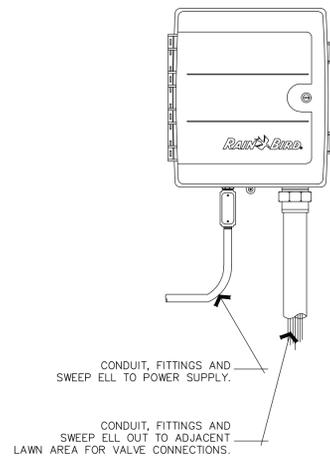
LANDSCAPE ARCHITECT / PLANNER  
**PKJ DESIGN GROUP**  
 PKJ DESIGN GROUP L.L.C.  
 3450 N. TRIUMPH BLVD, SUITE 102  
 LEHI, UTAH 84043 (801) 960-2698  
 www.pkjdesigngroup.com

LICENSE STAMP

PM: JTA  
 DRAWN: KBA  
 CHECKED: TM  
 PLOT DATE: 1/23/2020

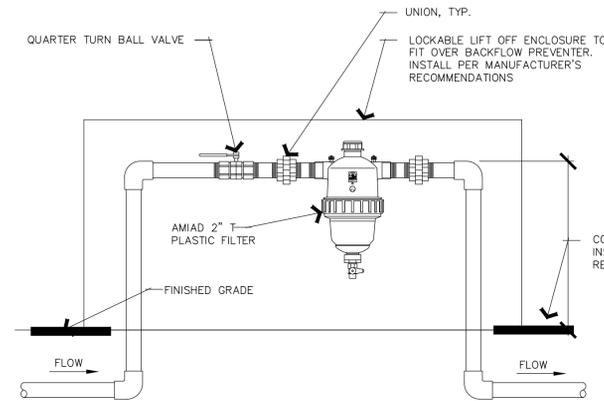
### IRRIGATION PLAN

# IR-1.6

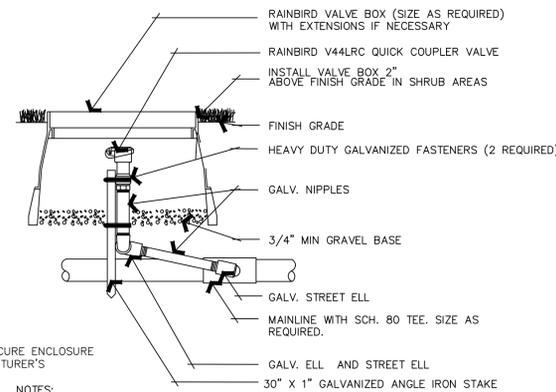


- NOTES:**
1. MOUNT CONTROLLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS AND IN ACCORDANCE WITH ALL LOCAL CODES. EXACT LOCATION TO BE APPROVED BY OWNER. GROUND CONTROLLER PER MANUFACTURER'S RECOMMENDATION AND SPECIFICATIONS. ELECTRICAL CONTRACTOR SHALL GROUND CONTROLLER AND PROVIDE SLEEVING FROM ADJACENT LAWN AREA TO CONTROLLER LOCATION.
  2. CONNECT CONTROLLER TO POWER AND VALVES.
  3. LANDSCAPE CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR TO ENSURE PROPER GROUNDING OF CONTROLLER TO BUILDING GROUNDING GRID.

**A RAINBIRD CONTROLLER DETAIL**  
NOT TO SCALE

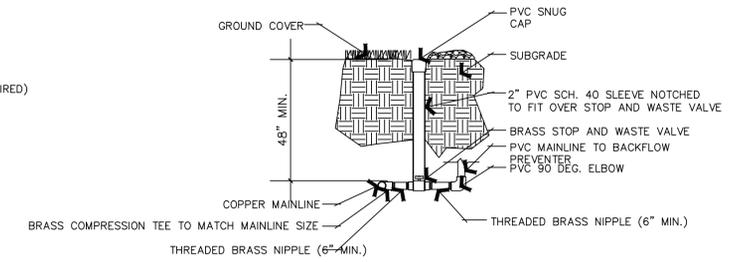


**B 2" PLASTIC FILTER DETAIL**  
NOT TO SCALE



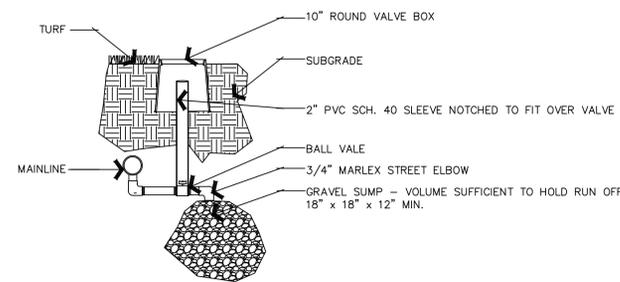
- NOTES:**
1. FLUSH ALL PIPING PRIOR TO INSTALLING VALVE.
  2. WRAP ALL THREADS WITH TEFLON TAPE. 1 1/2 TO 2 WRAPS MAXIMUM.
  3. COMPACT SOILS AROUND VALVE BOX TO 80% OF ORIGINAL DRY DENSITY.
  4. INSTALL GEOFABRIC UNDER VALVE BOXES AND TAPE TO PIPE NIPPLES AND VALVE BOX.
  5. BOX COLOR - GREEN IN TURF AND TAN IN PLANTER AREAS.
  6. IRRIGATION SYSTEM TO BE BLOWN OUT WITH AIR COMPRESSOR THROUGH QUICK COUPLERS BEFORE FREEZING TEMPERATURES OCCUR, TYP.

**C RAINBIRD QUICK COUPLER**  
NOT TO SCALE



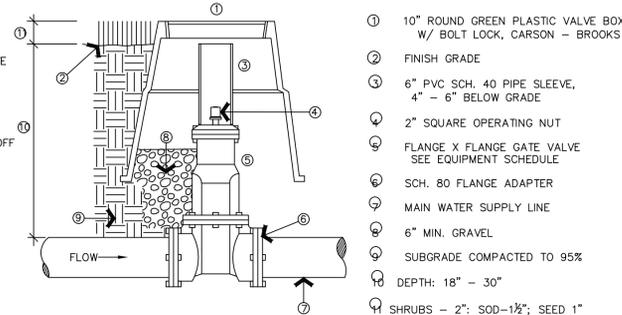
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 40 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**D STOP AND WASTE VALVE ASSEMBLY**  
NOT TO SCALE



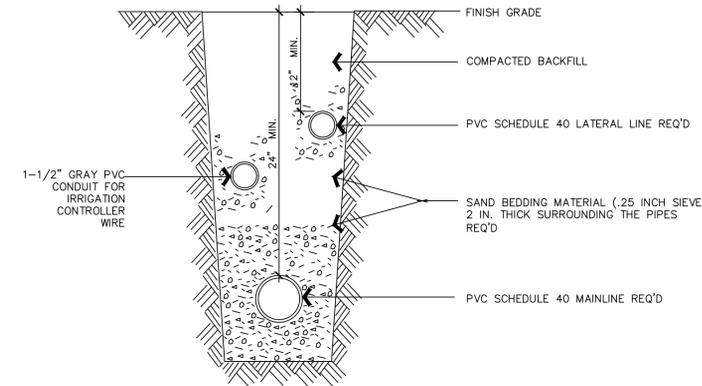
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 80 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**E MANUAL DRAIN ASSEMBLY**  
NOT TO SCALE

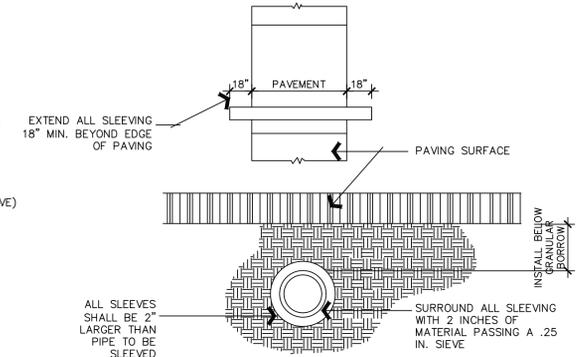


- 1 10" ROUND GREEN PLASTIC VALVE BOX W/ BOLT LOCK, CARSON - BROOKS
- 2 FINISH GRADE
- 3 6" PVC SCH. 40 PIPE SLEEVE, 4" - 6" BELOW GRADE
- 4 2" SQUARE OPERATING NUT
- 5 FLANGE X FLANGE GATE VALVE SEE EQUIPMENT SCHEDULE
- 6 SCH. 80 FLANGE ADAPTER
- 7 MAIN WATER SUPPLY LINE
- 8 6" MIN. GRAVEL
- 9 SUBGRADE COMPACTED TO 95%
- 10 DEPTH: 18" - 30"
- 11 SHRUBS - 2": SOD-1 1/2"; SEED 1"

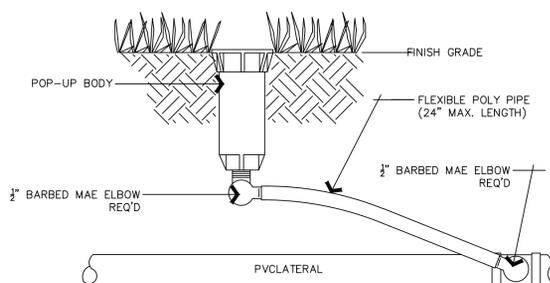
**F GATE VALVE ASSEMBLY**  
NOT TO SCALE



**G TRENCHING DETAIL**  
NOT TO SCALE

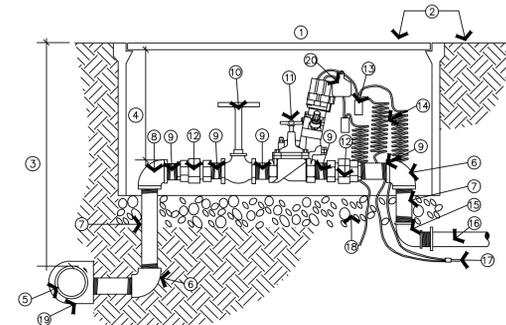


**H TYPICAL SLEEVING**  
NOT TO SCALE



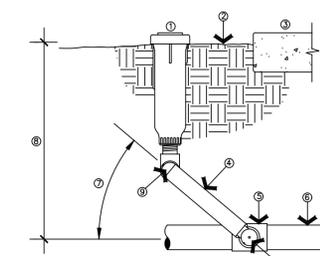
- NOTES:**
1. INSTALL SPRAY AND ROTARY HEADS PER THIS DETAIL.
  2. INSTALL 2" AWAY FROM HARDSCAPES.

**I SPRAY HEAD DETAIL**  
NOT TO SCALE



- NOTES:**
1. ONE REMOTE CONTROL VALVE PER BOX .
  2. ALL FITTINGS AND PIPE IN MANIFOLD SHALL BE THREADED SCH. 80 PVC USING TEFLON TAPE AND #5 RECTOR SEAL.

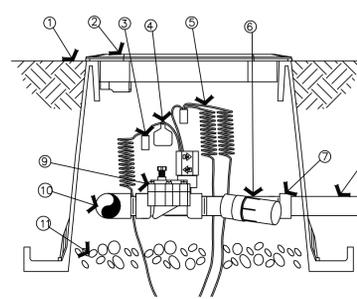
**J CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- 1 POP-UP ROTOR SPRINKLER - SEE LEGEND
- 2 FINISH GRADE
- 3 NOTE: ALL ROTOR HEADS TO BE PLACED 2" CLEAR OF ALL HARDSCAPE SURFACES
- 4 SCH. 80 THREADED NIPPLE
- 5 PVC SCH. 40 SxSxT TEE (OR ELL)
- 6 PVC LATERAL LINE, SIZE AS NOTED ON PLAN
- 7 SWING JOINT ARM INSTALLED AT ANGLE BETWEEN 30 AND 45 DRG. OF LATERAL PIPE. USE MALE THREAD MODEL
- 8 DEPTH - SEE NOTES & TRENCH DETAIL
- 9 MARLEX STREET ELL'S (3)

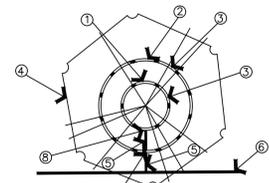
**K POP UP ROTOR DETAIL**  
NOT TO SCALE

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP																								
06-30-2020	UT19010	811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com																									
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7						Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com		
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						<b>IRRIGATION DETAILS</b> IR-2.5																								



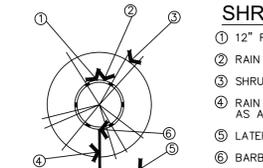
- 1 FINISH GRADE
- 2 STANDARD VALVE BOX WITH COVER:  
RAIN BIRD VB-STD
- 3 WATERPROOF CONNECTION:  
RAIN BIRD DB SERIES
- 4 VALVE ID TAG
- 5 30-INCH LINEAR LENGTH OF WIRE, COILED
- 6 PRESSURE REGULATING FILTER:  
RAIN BIRD PRF-100-RBY (INCLUDED IN  
XCZ-100-PRF KIT)
- 7 PVC SCH 40 FEMALE ADAPTOR
- 8 LATERAL PIPE
- 9 REMOTE CONTROL VALVE:  
RAIN BIRD 100-DV (INCLUDED IN  
XCZ-100-PRF KIT)
- 10 PVC SCH 40 TEE OR ELL TO MANIFOLD
- 11 3-INCH MINIMUM DEPTH OF 3/4-INCH WASHED  
GRAVEL

**L DRIP CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- TREE**
- 1 8' RADIUS
  - 2 16' RADIUS
  - 3 RAIN BIRD XFS-09-18-100 OR  
EQUIVALENT
  - 4 TREE (DECIDUOUS OR EVERGREEN)
  - 5 RAIN BIRD XT-700 TUBING OR  
EQUIVALENT AS APPROVED BY  
ARCHITECT
  - 6 LATERAL LINE
  - 7 4-WAY BARBED TEE
  - 8 BARBED TEE

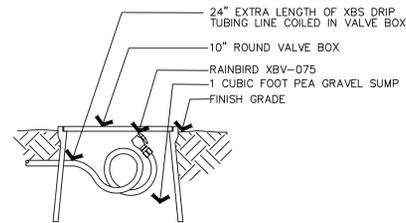
NOTES:  
1. LAYOUT DRIPLINE SO EMITTERS ARE IN  
TRIANGULAR PATTERN AS SHOWN



- SHRUB**
- 1 12" RADIUS
  - 2 RAIN BIRD XFS-09-18-100 OR EQUIVALENT
  - 3 SHRUB
  - 4 RAIN BIRD XT-700 TUBING OR EQUIVALENT  
AS APPROVED BY ARCHITECT
  - 5 LATERAL LINE
  - 6 BARBED TEE

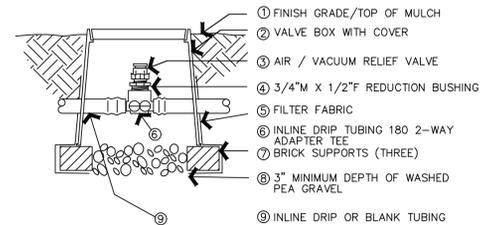
NOTE:  
1. APPROXIMATELY 5.4 GPH PER SHRUB

**M DRIP IRRIGATION - IN LINE EMITTERS**  
NOT TO SCALE



NOTE:  
1. INSTALL AT END OF DRIP LINE RUNS FOR WINTERIZATION IN THE FALL.

**N FLUSH CAP BOX**  
NOT TO SCALE



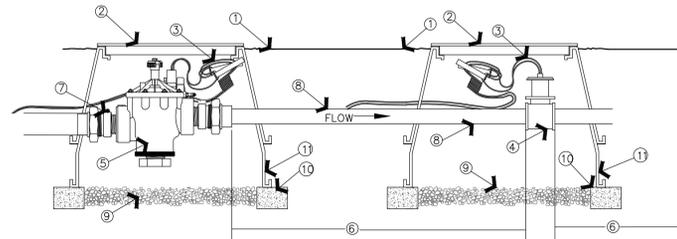
NOTES:  
1. SECURE ALL BARB FITTINGS WITH A STAINLESS STEEL PINCH  
CLAMP.

2. INSTALL AN AIR/VACUUM RELIEF VALVE AT HIGH POINTS WITHIN  
DRIP ZONE.

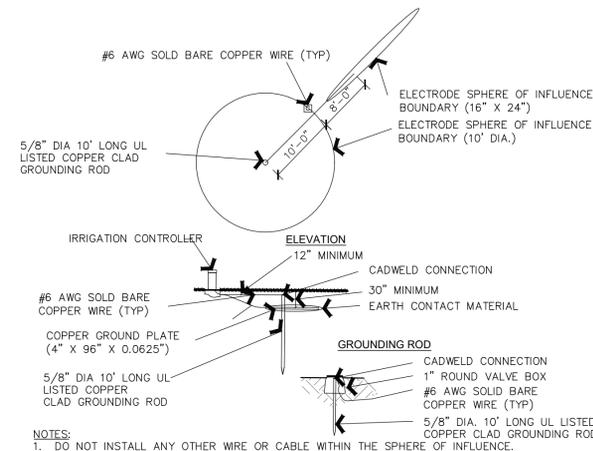
3. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE  
DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.

**O DRIP AIR/VACUUM RELIEF VALVE ASSEMBLY**  
NOT TO SCALE

- 1 FINISH GRADE
- 2 GREEN VALVE BOX AND COVER
- 3 CONTROL WIRES WITH 12" MIN. SERVICE COIL AND  
WATERPROOF WIRE SPLICE CONNECTORS -
- 4 FLOW SENSOR PER IRRIGATION LEGEND
- 5 RAIN BIRD PESB SERIES MASTER VALVE
- 6 STRAIGHT PIPE REQUIRED: MINIMUM 10x PIPE DIAMETER  
UPSTREAM & MINIMUM 5x PIPE DIAMETER DOWNSTREAM
- 7 UNIONS
- 8 PVC MAINLINE - LENGTH AS REQUIRED
- 9 6" DEPTH OF WASHED 3/4" GRAVEL
- 10 CONTINUOUS BRICK SUPPORTS
- 11 VALVE BOX EXTENSIONS REQUIRED



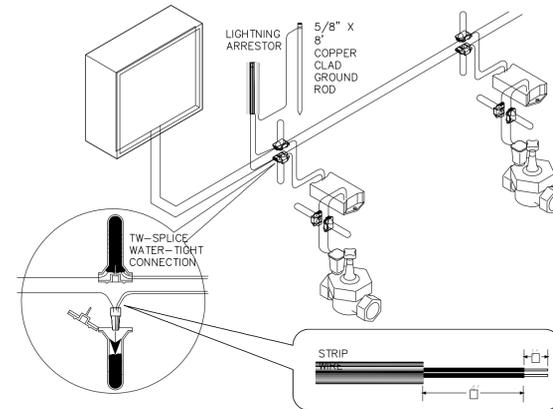
**P MASTER VALVE & FLOW SENSOR**  
NOT TO SCALE



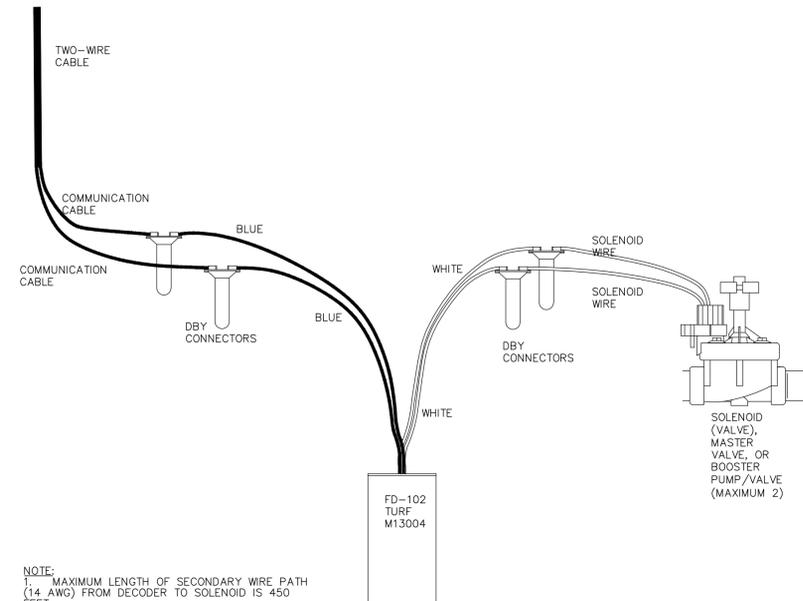
NOTES:  
1. DO NOT INSTALL ANY OTHER WIRE OR CABLE WITHIN THE SPHERE OF INFLUENCE.

2. PLACE 100 LB POWER SET SOIL AMENDMENT TO EACH PLATE AS PER MANUFACTURER'S  
RECOMMENDATIONS.

**Q GROUNDING DETAIL**  
NOT TO SCALE



**R 2-WIRE CONNECTION**  
NOT TO SCALE



NOTE:  
1. MAXIMUM LENGTH OF SECONDARY WIRE PATH  
(14 AWG) FROM DECODER TO SOLENOID IS 450  
FEET.

**S DECODER WIRING**  
NOT TO SCALE

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP
06-30-2020	UT19010	<p>BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org</p>	<p><b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH</p>	<p>Developer / Property Owner: JRW &amp; ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309</p> <p>Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com</p>	<p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>	<p>PM: JTA DRAWN: KBA CHECKED: TM PLOT DATE: 7/1/2020</p> <p><b>IRRIGATION DETAILS</b></p> <p><b>IR-2.6</b></p>

## APPENDIX C - PRELIMINARY STORM DRAIN ANALYSIS

# Deseret Industries and Bishop Storehouse

## PRELIMINARY DRAINAGE REPORT

November 25, 2019

Prepared By:



ENGINEERS

SURVEYORS

PLANNERS

3302 N Main Street  
Spanish Fork, UT 84660  
(801) 798-0555

## **DESCRIPTION OF DEVELOPMENT**

The Deseret Industries and Bishop Storehouse site is located within the city of Saratoga Springs, on the west side of Redwood Road and north of Medical Drive. The development area will be divided into two lots. Lot 1 will remain vacant until future development. Lot 2 will consist of the Deseret Industries and Bishop Storehouse site. There is approximately 10.15 acres in the development associated with Lot 2. It currently consists of a vacant field with natural vegetation.

## **OFF-SITE DRAINAGE FEATURES**

There are no offsite drainage features discharging to the site.

## **EXISTING STORM DRAINAGE FEATURES**

The site is currently vacant and is covered with native vegetation. There will be storm drain pipes installed in Medical Drive on the south side of the site with improvements to the Costco site to the south. These downstream pipes will be installed prior to the construction of the Deseret Industries and Bishops Storehouse Site. See the construction drawings for details on the location and sizing of these structures.

## **PROPOSED STORM DRAINAGE FACILITIES**

The proposed storm drain system within the site will consist of inlets and pipes that will be used to route runoff to a series of underground storm chambers before discharging the storm water into the existing downstream system. All pipe sizing and underground detention will be designed according standards set by Saratoga Springs City. The actual storm drain layout and design will be finalized as the site plan design progresses.

## **DRAINAGE CALCULATIONS**

See Appendix A for a complete summary of the calculations including the storage requirements for the underground detention chambers. Due to the size of the site, the rational method was used for the storm drain calculations. The runoff coefficient (c-value) was calculated taking a weighted average of the c-value of all types of proposed ground cover. The rainfall intensities used were taken from data provided in the City Standards. The storm chambers were sized to accommodate the runoff from a 100-year 24-hour storm. The release rate of 0.12 cfs/acre is based on the latest Market Street Storm Drain Capacity Analysis. Refer to Appendix A for the chamber sizing and c-value calculations.

## **STORM DRAIN DRAWINGS**

The exact layout and design of the on-site storm drain inlets, pipes, and underground detention system will be provided with final site plan drawings.

## **CONCLUSION**

Storm water runoff will be collected and detained before being discharged to the downstream system. See the storm drain report submitted for the Costco improvements as well as the Market Street Storm Drain Capacity Analysis for details on the downstream storm drain infrastructure.

## **APPENDIX A: STORM DRAIN CALCULATIONS**



Consulting Engineers and Surveyors, Inc.  
3302 N. Main, Spanish Fork, UT 84660 (801)798-0555

## Storm Drainage Calculations

**Deseret Industries and Bishop's Storehouse  
Saratoga Springs, UT**

Date: September 3, 2019  
Project #: 2019-0012  
Prepared By: EKB  
Revisions:

### Design Criteria

Intensity Table: **Saratoga Springs City Standards**  
Return Period: 100 year  
Allowable Discharge: 0.12 cfs/Ac

### Allowable Discharges

Orifice Discharge: 1.22 cfs  
Total Discharge: 1.22 cfs

### Weighted "C" Value

Surface Type	Area (ac)	C-Value	C*A
Roof	1.60	0.84	1.34
Pavement	6.51	0.89	5.79
Landscape/Open Space	2.04	0.44	0.90
<b>Totals</b>	<b>10.15</b>		<b>8.0</b>
<b>Weighted "C" Value</b>		<b>0.79</b>	

### Drainage Calculations

Duration	Intensity		Area	Rainfall	Accumulated		Discharge	Required
<i>min</i>	<i>in/hr</i>		<i>Ac</i>	<i>cfs</i>	<i>cf</i>		<i>cf</i>	<i>cf</i>
5.0	6.12	0.79	10.15	49.18	14,753	1.22	365	14,388
10.0	4.68	0.79	10.15	37.61	22,564	1.22	731	21,833
15.0	3.84	0.79	10.15	30.86	27,771	1.22	1,096	26,674
30.0	2.58	0.79	10.15	20.73	37,317	1.22	2,192	35,124
60.0	1.60	0.79	10.15	12.86	46,284	1.22	4,385	41,900
120.0	0.87	0.79	10.15	6.95	50,045	1.22	8,770	41,275
180.0	0.58	0.79	10.15	4.66	50,334	1.22	13,154	37,180
360.0	0.31	0.79	10.15	2.46	53,227	1.22	26,309	26,918
720.0	0.17	0.79	10.15	1.38	59,591	1.22	52,618	6,974
1440.0	0.09	0.79	10.15	0.71	61,038	1.22	105,235	-44,198

Maximum Storage Requirement: 41,900

### Detention Pond

Required Detention Volume: 41,900 cf  
Provided Detention Volume: 42,824 cf

### Notes / Details

Storm Tech MC-4500 Chamber and End Cap  
Number of Rows 10  
Number of End Caps 20  
Storage per End Cap 108.70 ft<sup>3</sup>  
Number of Chamber 250  
Storage per Chamber 162.60 ft<sup>3</sup>

Actual underground detention system to be designed with final site plan drawings.

## APPENDIX D - GEOTECHNICAL INVESTIGATION REPORT



**IGES**®

Intermountain GeoEnvironmental Services, Inc.  
12429 South 300 East, Suite 100, Draper, Utah, 84020  
Phone (801) 748-4044 | Fax (801) 748-4045  
www.igesinc.com

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Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah  
IGES Project No. 03019-001  
June 7, 2019

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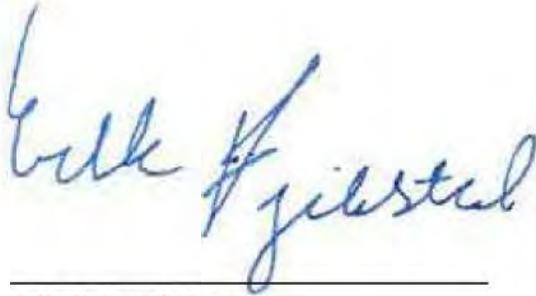
Prepared for  
**JRW & Associates**  
**1152 Bond Avenue, Suite A**  
**Rexburg, Idaho 83440**  
**Attn: Johnny Watson**

**Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah**

IGES Job No. 03019-001

June 7, 2019

Prepared by:

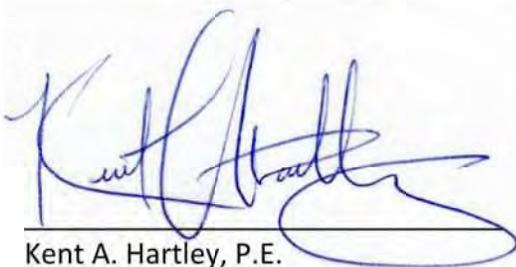


Erik Fjelsted, P.E.  
Staff Engineer



David A. Petersen, P.E.  
Project Engineer

Reviewed by



Kent A. Hartley, P.E.  
Principal

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## 1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North and Redwood Road in Saratoga Springs, Utah. Based on the subsurface conditions encountered, the subject site is suitable for development provided that the recommendations presented in this report are incorporated into the design and construction of the project. A summary of the critical observations and recommendations are included below:

- Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
- The site is covered by approximately 12 to 24 inches of topsoil, which will need to be removed before constructing footings.
- Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
- Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
- Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
- Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
- Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.
- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least

12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction. IGES staff should be on site to verify compliance with these recommendations.

This executive summary is not intended to replace the complete report and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

## 2.0 INTRODUCTION

### 2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North Redwood Road in Saratoga Springs, Utah as shown on the *Site Vicinity Map* (Figure A-1). The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading and design and construction of foundations, pavements, slabs-on-grade and exterior concrete flatwork.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses and preparation of this report.

The recommendations contained in this report are subject to the limitations presented in Section 7.0 of this report.

### 2.2 PROJECT DESCRIPTION

It is our understanding that the development at the site will include two buildings, roadways, parking lots, landscaping and a detention pond on a 10.5-acre site. The bishop's storehouse is currently planned as a single-story, at-grade structure with a foot print of approximately 23,000 square feet. The Deseret Industries Retail store is currently planned as a single-story, at-grade structure with a foot print of approximately 60,000 square feet. It is anticipated that the parking lots, roadways and loading areas will be paved with either asphalt or concrete. It is anticipated that the proposed structures will be lightly loaded and will be constructed on conventional strip and spread footings.

### 3.0 METHOD OF STUDY

#### 3.1 FIELD INVESTIGATION

As part of this investigation, near-surface soil conditions were explored by completing 8 test pits to a maximum of 14 feet below existing grade and advancing two Cone Penetration Test (CPT) soundings to 50 feet below existing grade. A member of our technical staff visually logged soils at the time of exploration in general accordance with the *Unified Soil Classification System (USCS)*. The approximate locations of the test pits, CPTs, and infiltration test are shown on the *Site Map* (Figure A-2). The geologic conditions are discussed in greater detail in Section 5 of this report. The *Test Pit Logs* are included at the end of this report (Figures A-3 through A-11); a *Key to Soil Symbols and Terminology* is provided as Figure A-12. The CPT Logs are included as part of Appendix B. A discussion of the subsurface conditions encountered is provided in Section 4.0 of this report.

The test pits were completed using a JCB-4CX rubber-tired backhoe. Soil sampling was completed to collect representative samples of the various layers observed at the site. Disturbed samples were placed in plastic baggies and relatively undisturbed soil samples were collected with the use of a 6-inch long brass tube attached to a hand sampler driven with a 2-lb sledge hammer. All samples were transported to our laboratory to evaluate the engineering properties of the various earth materials observed. The soils were classified in accordance with the *Unified Soil Classification System (USCS)* by our field personnel. Classifications for the individual soil units are shown on the attached test pit logs (Figures A-3 through A-11).

The CPT was completed using a 25-ton box-truck. Additional calculations and analysis included as part of the CPT exploration completed at the site are included in Appendix B. These calculations include pore pressure dissipation (PPD) tests to assess groundwater levels and artesian conditions along with seismic tests to assess the representative shear wave velocity of site soils.

##### 3.1.1 Infiltration Testing

Infiltration tests were completed for the project in TP-1 at approximately 4 feet below existing site grade.

The test was performed as follows: a hole approximately 6 inches in diameter and 13 inches in depth was hand-excavated at the bottom of the test pit, and then filled with water. The soil was presoaked for approximately 30 minutes, after which periodic readings were made and recorded to measure the water level at time increments of approximately 10 minutes.

The test was continued until a steady-state infiltration rate could be identified in the records – testing continued for about 90 minutes after pre-soak.

Our test results indicated that the native Lean CLAY (CL) soils were moderately permeable, with measured infiltration measurements given in tables 3.3.1.

**Table 3.3.1 - Infiltration Test Summary – TP-1**

Diameter ~ 6 inches				
Time Elapsed (minutes)	Change in Depth (inch)	Infiltration Rate (min/in)	Infiltration Rate (in/hr)	Comments
0	0	0	0	Intermediate Reading
11	2.0	5.5	10.9	Intermediate Reading
20	1.0	9.0	6.7	Intermediate Reading
30	1.0	10.0	6.0	Intermediate Reading
41	0.88	12.6	4.8	Intermediate Reading
50	0.50	18.0	3.3	Intermediate Reading
60	0.63	16.0	3.8	Intermediate Reading
70	0.50	20.0	3.0	Intermediate Reading
81	0.50	22.0	2.7	Intermediate Reading
90	0.50	<b>18.0</b>	<b>3.3</b>	<b>Final Reading</b>

### 3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on representative relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Laboratory Compaction Characteristics of Soil (Standard Proctor - ASTM D698/D1557)
- California Bearing Ratio (CBR) (ASTM D1883)
- Collapse/Swell Potential (ASTM D4546)

The results of laboratory tests are presented on the Boring Logs in Appendix A (Figures A-3 through A-11) and in Appendix C.

### 3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Analyses were performed using formulas, calculations and software that represent current methods accepted by the geotechnical industry. These methods include settlement, bearing capacity, lateral earth pressures, trench stability and pavement design. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care. The results of our engineering analysis are presented in the recommendations section of this report.

## 4.0 GENERALIZED SITE CONDITIONS

### 4.1 SURFACE CONDITIONS

At the time of our subsurface investigation, the site was vacant and appeared to be used for farming. The surficial soils appeared to be comprised of topsoil consisting of lean clay. The site is relatively flat sloping very gradually down to the east between an elevation of approximately 4,540 feet above mean sea level.

### 4.2 SUBSURFACE CONDITIONS

#### 4.2.1 Soils

Based on our observations the site is overlain by 12 to 24 inches of topsoil comprised of Lean CLAY (CL). Based on our observations, native soils consisted primarily of Lean CLAY (CL) with some isolated layers of Silty SAND (SM) and Poorly Graded GRAVEL with silt (GP-GM).

##### Lean CLAY (CL)

The Lean CLAY (CL) was observed below the topsoil in each test pit. The clay extended to a depth of 10.5 to 14 feet below existing grade. It was generally medium stiff, slightly moist to moist, and moderate brown. Pinholes were observed primarily within the upper 6 feet.

##### Silty SAND (SM)

The Silty SAND was observed in TP-3, TP-5, TP-6 and TP-7. The silty sand was generally medium dense, moist and tan.

##### Poorly Graded GRAVEL with silt (GP-GM)

The Poorly Graded GRAVEL with silt (GP-GM) was observed in TP-5. The gravel was generally medium dense to dense and slightly moist to dry. These gravels have 5 to 12 percent fines. The typical gravel size is 1 inch with 3 inches being the maximum size.

Refer to the boring logs for a more detailed description of the soils encountered (Appendix A).

#### 4.2.2 Groundwater

Groundwater was not encountered in any test pits, however based on the CPT data groundwater was encountered at 29 and 43 feet below grade in CPT-01 and CPT-02, respectively. Seasonal fluctuations in precipitation, snowmelt, surface runoff from

adjacent properties, or other on or offsite sources including irrigation or other sources may increase moisture conditions; groundwater conditions can be expected to fluctuate several feet seasonally depending on the time of year. Groundwater is not anticipated to impact the planned construction.

### 4.2.3 Collapsible Soils

Collapse is a phenomenon where undisturbed native soils under increased loading can exhibit volumetric strain and consolidation upon wetting. Collapsible soils can cause differential settling of structures and roadways. Collapsible soils do not necessarily preclude development and can be mitigated by over-excavating porous, potentially collapsible soils and replacing with engineered fill and by controlling surface drainage and runoff. Collapsible soils are typically characterized by a pinhole structure and relatively light in-situ density. Pinholes were observed in the native clay soil mainly in the upper 6 feet. IGES completed four collapse tests on representative soil samples; test results are summarized below in Table 4.2.3 . The complete results of the one-dimensional collapse tests can be seen in Appendix C.

**Table 4.2.3 - Summary Collapse Test Results**

Location	Depth	Collapse Load	Percent Collapse
TP-2	4.5	2000	5.1%
TP-3	6.0	2000	0.5%
TP-5	4.5	2000	2.6%
TP-7	3.5	2000	3.5%

## 5.0 GEOLOGIC CONDITIONS

### 5.1 GEOLOGIC SETTING

The site is located at an elevation between approximately 4,540 feet in the northwestern portion of Utah Valley. Utah Valley represents a deep, sediment-filled structural basin of Cenozoic-age flanked by uplifted blocks; the Wasatch Range on the east, and the Lake and East Tintic Mountains to the west (Hintze, 1980). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott et al., 1983; Hintze, 1993; Machette, 1992). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover.

Surface sediments at the subject site are mapped as Upper Pleistocene lacustrine silt and clay (QImp) (Biek, 2004). QImp is described as calcareous silt with minor clay and laminated fine-grained sand that was deposited below the Provo shoreline of Lake Bonneville.

### 5.2 FAULTING AND SEISMICITY

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is generally defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black et al., 2003). The site is located approximately 9.2 miles west of the main trace of the Provo segment of the Wasatch Fault Zone, the closest mapped active fault. Smaller detached splays of the Provo segment are located approximately 3.8 miles northeast and 7.8 miles east-northeast of the project site respectively. The Provo segment is one of the longest sections of the Wasatch Fault Zone (Hecker, 1993) and is estimated to be approximately 43 miles long with a reported rupture length of 37 miles and a maximum potential to produce earthquakes up to magnitude ( $M_s$ ) 7.5 to 7.7 (Black et al., 2003). The site is also located approximately 2.1 miles northwest of the Utah Lake Faults and Folds (ULFF). The ULFF consists of several northeast to northwest trending faults and folds located beneath Utah Lake and are reported to

have been active in the past 15 ka (Black et al., 2003). However, since the ULFF is at the bottom of a large lake these faults are poorly understood – as such, the USGS does not include ULFF in their fault database for seismic hazard analysis. Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Salt Lake City region.

Following the criteria outlined in the 2015 International Building Code (IBC, 2015), spectral response at the site was evaluated for the Maximum Considered Earthquake (MCE) which equates to a probabilistic seismic event having a two percent probability of exceedance in 50 years (2PE50). Spectral accelerations were determined based on the location of the site using the *U.S. Seismic Design Maps* USGS website. This tool incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and *the International Building Code* (IBC) (International Code Council, 2015).

Based on our understanding of the proposed project, it is recommended the building be designed with a structural *Building Risk Category* of *II*. To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and *Site Class* are used. Site classification is based on the upper 100 feet of the site soil profile; based on our field exploration and understanding of the geology in this area, the subject site is best classified as Site Class D (*Stiff Soil*). Based on IBC criteria, the short-period ( $F_a$ ) and long-period ( $F_v$ ) site coefficients are 1.109 and 1.740, respectively. The Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) *Spectral Response Accelerations* are presented in Table 3.3.1; a summary of the *Design Maps* data is presented in Appendix C. The *peak ground acceleration* (PGA) may be taken as 0.395g (see Appendix C). It should be noted that to more accurately determine the site classification and site-specific seismic design parameters a geotechnical investigation to a minimum depth of 100 feet is needed. The seismic design category for this site is D.

**Table 5.2.1 - Short- and Long-Period Spectral Accelerations for MCE**

Parameter	Short Period (0.2 sec)	Long Period (1.0 sec)
MCE Spectral Response Acceleration (g)	$S_S = 0.977$	$S_1 = 0.330$
MCE Spectral Response Acceleration Modified for Site Class D (g)	$S_{MS} = S_S F_a = 1.083$	$S_{M1} = S_1 F_v = 0.574$
Design Spectral Response Acceleration (g)	$S_{DS} = S_{MS}^2 / 3 = 0.722$	$S_{D1} = S_{M1}^2 / 3 = 0.383$

### 5.3 OTHER GEOLOGIC HAZARDS AND CONDITIONS

Geologic hazards and conditions can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property or result in impacts to conventional construction procedures. These hazards and conditions must be considered before development of the site. There are several hazards and conditions in addition to seismicity and faulting which, if present at a site, should be considered in the design of the site facilities. Liquefaction is the only other geologic hazard considered for this site.

#### 5.3.1 Liquefaction

Certain areas within the Intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Referring to the *Liquefaction-Potential Map for Utah County, Utah* published by the Utah Geological Survey, the site is located within an area currently designated as "moderate" for liquefaction potential. Therefore, IGES completed two CPT explorations to depths of approximately 50 feet to evaluate the liquefaction potential at this site.

We have evaluated the liquefaction potential of the soil profile encountered in the CPT completed for this site in accordance with procedures detailed by Youd et al. (2001), and

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*Recommended Procedures for Implementation of CDMG Special Publication 117* (Martin and Lew, 1999). Our analysis considered groundwater levels directly observed with the CPT explorations and PPD tests; however, the groundwater level modeled for our liquefaction analysis was conservatively assumed to be about 4 feet higher than the groundwater level observed in the subsurface explorations to account for possible future groundwater level increases.

Our liquefaction model incorporates the PGA corresponding to the 2PE50 ground motion (see Section 5.2). The PGA is estimated to be 0.4g.

Liquefaction analysis also considers the *deaggregated* moment magnitude for a site (the moment magnitude that has the highest contribution to the hazard for the ground motion under consideration). Based on our experience in this area, IGES has used a deaggregated moment magnitude of 7.4 Mw.

For the purpose of our analysis, we have used a factor-of-safety against liquefaction of 1.4 to differentiate between potentially liquefiable and non-liquefiable soils (a factor-of-safety below 1.1 is considered liquefiable, between 1.1 and 1.4 *may* liquefy, and greater than 1.4 is considered to not liquefy). Potential dynamic settlement was evaluated using the methods developed by Tokimatsu and Seed (1987). A summary of the calculations is presented in Appendix E. No liquefaction induced settlement was calculated in CPT-02 and ¼-inch of settlement was calculated for CPT-01. This value is the cumulative sum of multiple small layers, most of which are isolated to 4 to 6 inches or less. These layers are also observed at depths of approximately 30 feet or greater. Based on a boundary curve chart used to predict liquefaction-induced ground damage (Ishihara, 1985), the potential for these discrete layers to manifest liquefaction-induced phenomena at the surface is low (e.g., settlement, sand boils, loss of bearing capacity, etc.).

## 6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

### 6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for development provided that the recommendations included in this report are incorporated into the design and construction of the project. If development at the site does take place, IGES should be notified and allowed to review the proposed development in order to assess the suitability of this report in regard to the planned improvements and to recommend additional explorations, analysis and recommendations.

In general, 12 to 18 inches of topsoil was identified on site. Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. The following sub-sections present our recommendations for general site grading, design of foundations, slabs-on-grade, pavements, moisture protection and soil corrosivity that should be considered prior to developing this site.

### 6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

#### 6.2.1 General Site Preparation and Grading

Within the areas to be graded (below proposed structures, fill sections, concrete flatwork, and pavement sections) any existing surface vegetation, debris, undocumented fill, asphalt, concrete or other miscellaneous debris should be removed. All topsoil should be removed from below footings. Over-excavated soils can be used as structural fill if relatively free of deleterious material and organics and compacted in accordance with the recommendations presented in this report (Section 6.2.4). Topsoil shall be segregated from other soil and not be permitted to be used as structural fill.

An IGES representative should be on site at key points in construction to observe the site preparation and grading operations to assess whether the recommendations presented in this report have been complied with.

### 6.2.2 Trench Excavations

Based on our soil observations, fine-grained soils are prevalent at the site and are considered to be Type A soils (OSHA). Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. When the trench is deeper than 5 feet we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Alternatively, excavations deeper than 5 feet (up to 20 feet) may be constructed with side slopes no steeper than one and three quarters horizontal to one vertical ( $1\frac{3}{4}H:1V$ ). When undocumented fill soils, saturated soils or wet conditions are encountered, side slopes may need to be further flattened to maintain stability. If excavations greater than 20 feet in depth are anticipated a registered professional engineer must design the protective system.

The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, IGES can respond and provide recommendations as needed.

We recommend that IGES observe all excavations to assess the exposed foundation soils. We also recommend that the geotechnical engineer be allowed to review the grading plans when they are prepared in order to evaluate their compatibility with these recommendations.

### 6.2.3 Excavations

Excavations should extend laterally at least two feet beyond slabs-on-grade, footings and pavements. Structural fill should be placed and compacted in accordance with and meet the recommendations included in this report.

Prior to placing structural fill, utilities or constructing footings any loose soils observed in excavation bottoms should be removed or moisture conditioned to within 2 percent of the optimum moisture content (OMC) and compacted to at least 95 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (modified Proctor). If over-excavation is required, it should extend a minimum of 1 foot laterally for every foot of depth of over-excavation.

### 6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill may consist of excavated onsite native fine-grained soils or an

approved imported granular soil. The native fine-grained soils may be challenging to work with to obtain the desired level of compaction. If native fine-grained soils are used as structural fill, they should be pulverized and moisture conditioned beyond the optimum moisture content (OMC) before being placed as structural fill. If import structural fill is used, it should be relatively well graded and have a minimum fines (material passing the No. 200 sieve) of 30 percent. A less permeable fill is desired due to the collapsible soils, hence the reason for requiring a “minimum” of 30% fines. In all cases, structural fill should be free of vegetation and debris, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension).

Soil not meeting the aforementioned criteria may be suitable for use as structural fill; alternate borrow sources may be considered but should be reviewed and approved by IGES prior to use. All structural fill soils should be approved by the Geotechnical Engineer prior to placement.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 12-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. These lift thicknesses are *maximums*; the contractor should understand that thinner lifts may be necessary to achieve the required compaction. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. The moisture content should be at or above the OMC based on the modified proctor (ASTM D1557) for all structural fill. Prior to placing any fill, the excavations should be observed by IGES to assess compliance with our recommendations. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report. All structural fill below footings, pavement, sidewalks and curb and gutter and other concrete slab on grade construction should be compacted to a minimum of 95 percent of the maximum dry density (MDD) based on the modified proctor (ASTMD 1557).

Specifications from governing authorities such as cities and special service districts having their own precedence for backfill and compaction should be followed where applicable. Structural fill as defined above or native soils may be used to backfill around the foundation walls and that it be placed in lifts not exceeding 12 inches prior to compaction, compacted to approximately 90 percent of the MDD and moisture conditioned to within 2 percent of the OMC.

### 6.2.5 Utility Trench Fill and Compaction

All utility trenches backfilled below footings, pavement sections, concrete flatwork, curb and gutter and/or sidewalks should be backfilled with structural fill that is at or slightly above the OMC when placed and compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches in landscape areas should be backfilled and compacted to a minimum of 90 percent of the MDD and within 2 percent of the OMC as determined by ASTM D-1557.

Utility trenches should be backfilled with structural fill as discussed in Section 6.2.5 of this report. Pipe bedding should *not* be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean  $\frac{3}{4}$ -inch gravel which generally does not require compaction. More stringent specifications from utility companies, cities or other governing authorities having their own precedence for backfill and compaction should be followed where applicable.

### 6.2.6 Soft Soil Stabilization

Due to the presence of fine-grained clayey soils, soft soils may be encountered at the site due to the presence of water following precipitation events; this condition may be exacerbated in cold weather. These soils may cause equipment mobility problems and may make it difficult to place and properly compact structural fill overlying the soft soils. If encountered, we recommend stabilizing these soils prior to placing structural fill, constructing pavement sections or foundation elements such as footings.

Stabilization can be accomplished by placing a woven geotextile over the soft subgrade; seams should be overlapped a minimum of 24 inches or as recommended by the manufacturer. The geotextile should be covered with a minimum of 18 inches of crushed, angular  $\frac{3}{4}$ - to 3-inch diameter drain rock. Structural fill (Section 6.2.4) may then be placed and compacted as recommended in this report. The woven geotextile should consist of TenCate Mirafi HP370 or an approved equivalent. The geotextile should be placed to cover the entire excavation bottom.

Alternatively, stabilization of soft or pumping subgrade can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 3 inches in nominal diameter, but less than 6 inches. The stabilization material should be worked (pushed) into the soft subgrade soils until a relatively firm and unyielding surface is established. Once a relatively firm and unyielding surface is achieved, the area may be brought to final design grade using structural fill. Other earth materials not meeting aforementioned criteria may also be suitable but will likely require a thicker section of aggregate; however, such material should be evaluated on a case-by-case basis and should be approved by IGES prior to use. The area should be

wheel-rolled with heavy equipment to evaluate whether a firm working surface has been achieved and that soft/pumping soils have been “bridged” to the greatest extent reasonably possible based on existing subsurface conditions. An IGES representative should be present during this evaluation.

The area of stabilization should extend a minimum of 3 feet beyond the footings and/or footprint of the structure, whichever is greater.

### 6.3 FOUNDATIONS

Prior to constructing footings, all topsoil and any undocumented fill soils should be removed before constructing footings. Footings should be established entirely on competent native soils or on a zone of structural fill that extends to competent native soils located at a minimum depth of 6 feet below existing side grade. Loose soils remaining in the excavation following excavation should either be removed or compacted in place. To reduce the potential for differential settlement, transition zones between fill and native soil are generally not recommended but can be evaluated on a case by case basis. If structural fill is used it should meet the criteria described in Section 6.2.5 and have a minimum thickness of 12 inches. The structural fill should also extend a minimum of 24 inches beyond the edge of the footings. Strip footings should be a minimum of 24 inches wide and no greater than 48 inches wide; spread footings should be a minimum of 30 inches wide and no greater than 9 feet wide. Exterior footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior footings not exposed to the full effects of frost (i.e., a continuously headed structure) should be embedded at least 18 inches for confinement.

Conventional strip footings founded as described above may be proportioned for a maximum net allowable bearing capacity of **1,500 pounds per square foot (psf)**. The bearing capacity may be increased to 2,000 if placed on a zone of structural fill having a minimum thickness of 24 inches. these values are for dead load plus live load conditions.

Static settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

### 6.4 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 4 inches of gravel overlying a zone of structural fill (reworked native soils) with a minimum thickness of 18 inches due to the collapse potential of native soils. Native soils should be removed to a depth of at least 12 inches, the exposed soils may then be scarified to a minimum depth of 6 inches

and compacted in place and then the removed native soils can be replaced as structural fill in 6 inch lifts). The slab may be designed with a Modulus of Subgrade Reaction of **120 psi/inch**. The gravel should consist of clean drain rock with a  $\frac{3}{4}$ -inch maximum particle size and no more than 5 percent fines passing the No. 200 mesh sieve. The gravel layer should be vibrated in place until tight and relatively unyielding.

The maximum load on the floor slab should not exceed 300 psf; greater loads may be allowed but must be evaluated by IGES or a structural engineer on a case-by-case basis. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fiber mesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of W4.0 x W4.0 welded wire mesh within the middle third of the slab.

Our experience indicates that use of reinforcement in slabs and foundations can generally reduce the potential for drying and shrinkage cracking. However, some cracking can be expected as the concrete cures. Minor cracking is considered normal; however, it is often increased by a high water/cement ratio, high concrete temperature at the time of placement, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking; saw cuts in the concrete at strategic locations can help to control and reduce undesirable shrinkage cracks.

We recommend a **minimum slab thickness of 4 inches**; a thicker slab section may be required if the slab-on-grade is designed to bear a significant structural load (i.e., a structural slab or mat foundation, which is different than slab-on-grade flooring). We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI).

## 6.5 EARTH PRESSURE AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance, a coefficient of friction of 0.43 should be used for concrete in contact with native granular (sandy and gravelly) soils or granular structural fill.

Ultimate lateral earth pressures from backfill acting against retaining walls and buried structures may be computed from lateral pressure coefficients or equivalent fluid

densities. In general, foundation and other walls that are fixed at the top should be designed using at-rest lateral earth pressures. Retaining walls allowed to rotate at the top (unfixed) can be designed for active pressures based on the International Building Code (IBC, 2015). Foundation walls for buried or partially buried structures may also be designed for active pressures if no more than 8 feet of the wall extends below grade and is laterally supported by flexible diaphragms.

Based on an internal angle of friction of 28°, the ultimate lateral earth pressures for native fine-grained soils acting against buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 6.5.1:

**Table 6.5.1 - Lateral Pressure Coefficients and Equivalent Fluid Densities**

Earth Pressure Condition	Lateral Pressure Coefficient (symbol)	Equivalent Fluid Density (pounds per cubic foot)
Active*	0.36 ( $k_A$ )	42
At-rest**	0.53 ( $k_0$ )	60
Passive*	2.77 ( $k_p$ )	310

\* Based on Coulomb's equation

\*\* Based on Jaky

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation the at-rest condition should be used unless the wall has 8 feet or less of depth below grade according to the IBC, as mentioned previously. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

Lateral pressures can increase during a seismic event and should be accounted for in the design of retaining walls. The interaction of dynamic loads from earthquakes and retaining walls is complex; assessing this interaction can require sophisticated analysis. The Mononobe-Okabe (M-O) pseudo-static approach simplifies this analysis and provides reasonable design values. With the M-O approach for seismic analyses, the *active* and *passive* earth pressure coefficients provided in the following table account for the both the dynamic horizontal thrust produced by ground motion and the static lateral earth pressure; therefore, for seismic analysis the static and seismic values reported below do not need to be added together, the seismic value alone can be used.

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**Table 6.5.2 – Recommended Lateral Earth Pressure Coefficients for Dynamic Conditions**

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active (K <sub>ae</sub> )	0.75	90
Passive (K <sub>pe</sub> )	2.10	240

The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients and densities presented in the tables above for static and dynamic conditions assume no buildup of hydrostatic pressures, a vertical wall face and flat back slope. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. Proper grading and other drainage recommendations provided previously in this report will help to reduce the potential for buildup of hydrostatic pressures if implemented.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils with a potential for swelling should not be used as retaining wall backfill. Backfill should consist of soil with an Expansion Index (EI) less than 20.

## 6.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

Moisture should not be allowed to infiltrate the soils near, or upslope from, the structures. Precautions should be taken during and after construction to minimize the potential for saturation of foundation soils beneath footings, exterior slab on grade construction, sidewalks and roadways. We recommend the following be implemented during and/or after construction is complete:

- We recommend rain gutters be installed around the entire perimeter of the buildings to collect and direct all roof runoff a minimum of 10 feet away from structures.
- The grade within 10 feet of the structures should be sloped a minimum of 5% away from the structure (6-inches). Alternatively, if the surface within 10 feet of the structure consists of a hard surface such as concrete or asphalt, the minimum recommended slope would be 2% away from the structure.

- No pressurized irrigation lines should be placed within 5 feet of the structures and we recommend the area within 5 feet of the structure be hardscaped, xeriscaped or planted with drought tolerant plants that do not require irrigation.
- Compact backfill against the foundation walls in maximum 12-inch loose lifts to approximately 90 to 95 percent of the MDD (ASTM D1557); native soils may be used as backfill.

## 6.7 ASPHALT & CONCRETE PAVEMENT DESIGN

IGES completed one CBR lab test (See Appendix C) to assess the suitability of native soils to support a pavement section. The laboratory test indicated a CBR value of 4.1 for near surface soils. For the pavement section designs presented below, IGES has used a CBR of 4.1. IGES has prepared pavement section designs for three different traffic scenarios: parking, drives and a trash enclosure approach slab (high traffic area). The pavement section designs presented below have been prepared for a 40-year design life assuming an annual growth rate of 0%.

IGES has estimated an equivalent single axle load (ESAL) of approximately 200,000 over a 40-year design life for the Parking Lot. IGES recommends that one of the following pavement thicknesses be used for the parking lot:

**Table 6.7.1 - Flexible (Asphalt) Pavement Section – Parking Lot**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Parking Lot 1</b>	<b>4</b>	<b>7</b>	<b>8</b>	<b>18</b>
<b>Parking Lot 2</b>	<b>5</b>	<b>9</b>	<b>-</b>	<b>18</b>

**Table 6.7.2 - Rigid (Concrete) Pavement Section – Parking Lot**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Parking Lot 3</b>	<b>6</b>	<b>8</b>	<b>18</b>

IGES has estimated an equivalent single axle load (ESAL) of approximately 500,000 over a 40-year design life for the Drive areas. IGES recommends that one of the following pavement thicknesses be used for the Drive areas at the site:

**Table 6.7.3 - Flexible (Asphalt) Pavement Section – Drives**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Main Drive 1</b>	<b>4</b>	<b>9</b>	<b>10</b>	<b>18</b>
<b>Main Drive 2</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>18</b>

**Table 6.7.4 - Rigid (Concrete) Pavement Section – Drives**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Main Drive 3</b>	<b>7</b>	<b>10</b>	<b>18</b>

It is our experience that pavement in areas where trucks frequently turn around, backup, or load and unload, including round-a-bouts, docks, trash enclosures, exit and entrances from the main roadways, etc., experience more distress. If the owner wishes to prolong the life of the pavement in these areas consideration should be given to using a Portland cement concrete (rigid) pavement in these areas. The following rigid pavement section is recommended:

**Table 6.7.5 - Rigid Pavement Section – High Traffic Areas**

Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>7</b>	<b>12</b>	<b>18</b>

All undocumented fill soils should have been removed or compacted in place as structural fill in accordance with Section 6.2.5 of this report prior to starting construction on the pavement section. IGES recommends that the upper 18 inches be removed and replaced with structure fill (Section 6.2.4) prior to constructing the pavement sections. This can be accomplished by removing the upper 12 inches and scarifying the exposed subgrade soils to a minimum depth of 6 inches; the scarified soils should moisture conditioned and compacted as structural fill as recommended in Section 6.2.4. Additionally, if the subgrade soils are soft or pumping, they should be stabilized as recommended in section 6.2.6 prior to placing granular borrow or road base.

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Asphalt has been assumed to be a high stability plant mix; base coarse material should be composed of crushed stone with a minimum CBR of 70. Granular borrow has been assumed to be a pit-run type material with a minimum CBR of 30. Asphalt should be compacted to a minimum density of 96% of the Marshall value; base coarse and granular borrow should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

If traffic conditions vary significantly from our stated assumptions, IGES should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to revise the pavement section design as necessary. The pavement section thicknesses above assume that most construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed the owner should anticipate maintenance or a decrease in the design life of the pavement.

The owner should also consider the benefits of maintenance in extending the life of the pavement. Some heavy traffic areas may need to be repaired or replaced. Crack seal should be applied every 2-3 years to new cracks that have developed to help reduce the effects infiltrated water can have on deteriorating the pavement support materials.

The pavement section thicknesses above have been designed with the assumption that there is no mixing over time between the road base and the softer native layers below. In order to prevent mixing or fines migration, and thereby prolong the life of the pavement section, we recommend placing a non-woven filter fabric such as Mirafi TenCate 160N between the native soils and the road base.

## 6.8 SOIL CORROSIVITY

Chemical testing was not completed as a part of this investigation however the soils were predominantly fine-grained. It would be expected to get test results indicating that the corrosion potential of native soils on site can be characterized as **moderate to severe** with respect to steel that is in direct contact with native soils. Consideration should be given to consulting with a corrosion engineer to design appropriate cathodic protection or sacrificial thicknesses for metal that will be in contact with native site soils.

The soluble sulfate content is likely to be in a range that indicates a low to moderate risk of sulfate attack on concrete. Type I/II cement should be used for all concrete at this

project site. The provisions in American Concrete Institute (ACI) 318 Section 4.3 should be reviewed for further clarification.

No chemical testing was completed, however chemical testing can be completed upon request.

## 6.9 OTHER CONSIDERATIONS

Moderate to highly collapsible soils were prevalent in the top 4.5 feet with minor pinholes observed up to 6 feet below existing grade. To reduce the risk associated with collapsible soils, we recommend removing all collapsible soils to a depth of 6 feet below existing grade where footings are planned. For parking lots, roadways or sidewalks, it is recommended to scarify and moisture condition the top 18 inches. Before placing structural fill, an IGES representative should be on site to observe that the exposed soils have been prepared as recommended in this report.

## 7.0 CLOSURE & LIMITATIONS

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment and experience. As such the solutions and resulting recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and designs, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warranties, guarantees or other representations are made.

The information contained in this report is based on limited field testing and understanding of the project. The subsurface data used in the preparation of this report were obtained largely from the explorations made for this project. It is very likely that variations in the soil, rock, and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs and additional explorations are completed. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for the Welfare Complex. Use of the data, recommendations or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

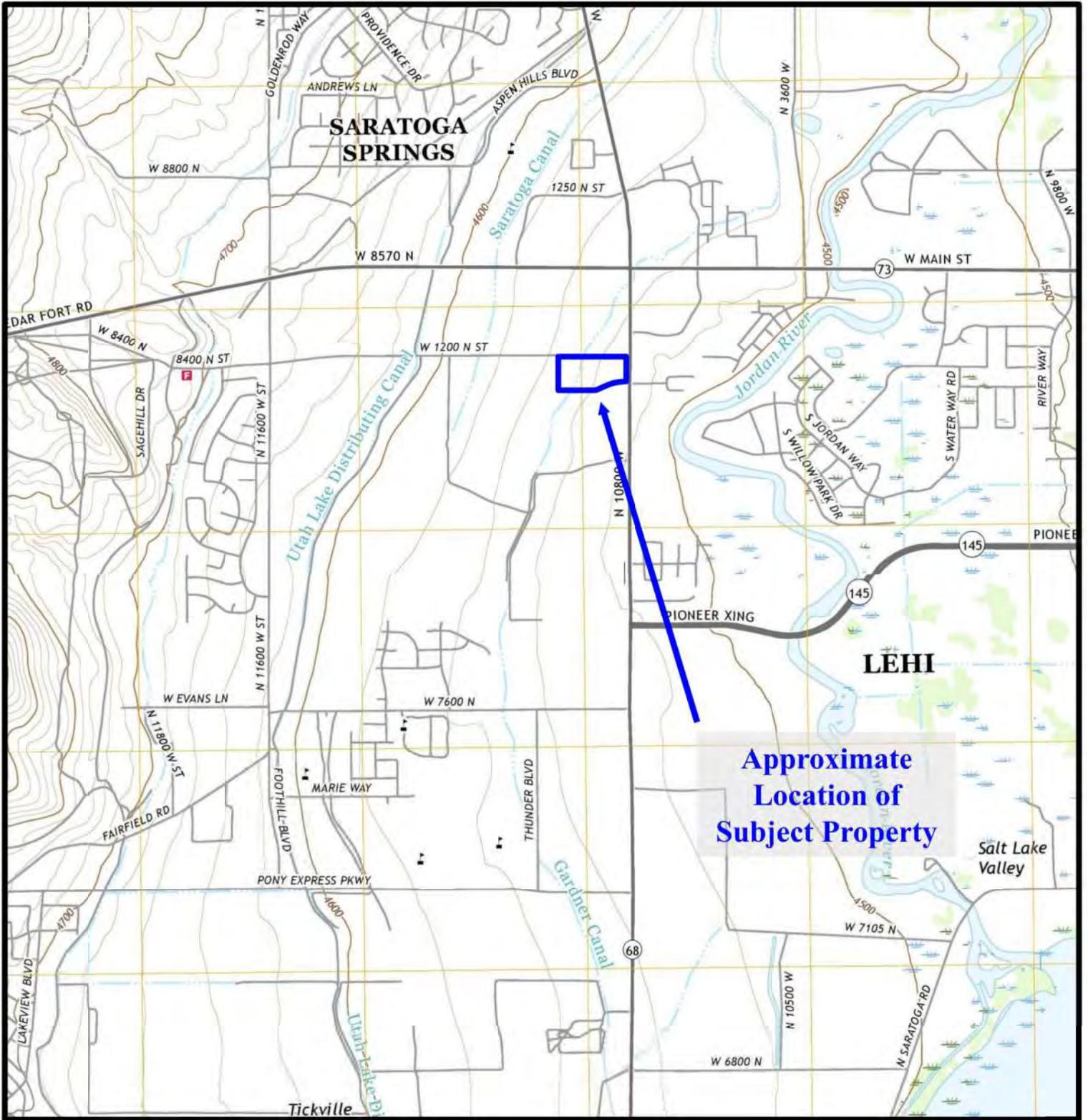
We recommend that IGES be retained to review the final design plans, grading plans and specifications to determine if our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate, construction performance and other geotechnical aspects of the projects as construction initiates and progresses through its completion.

## 8.0 REFERENCES CITED

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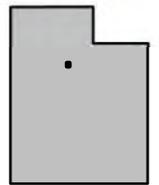
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# **APPENDIX A**



Base Map:  
 USGS Jordan Narrows  
 USGS Saratoga Springs  
 7.5-Minute Quadrangle Topographic Maps (2017)

0' 1000' 2000'  
 SCALE 1:24,000  
 Contour Interval – 20 feet



MAP LOCATION



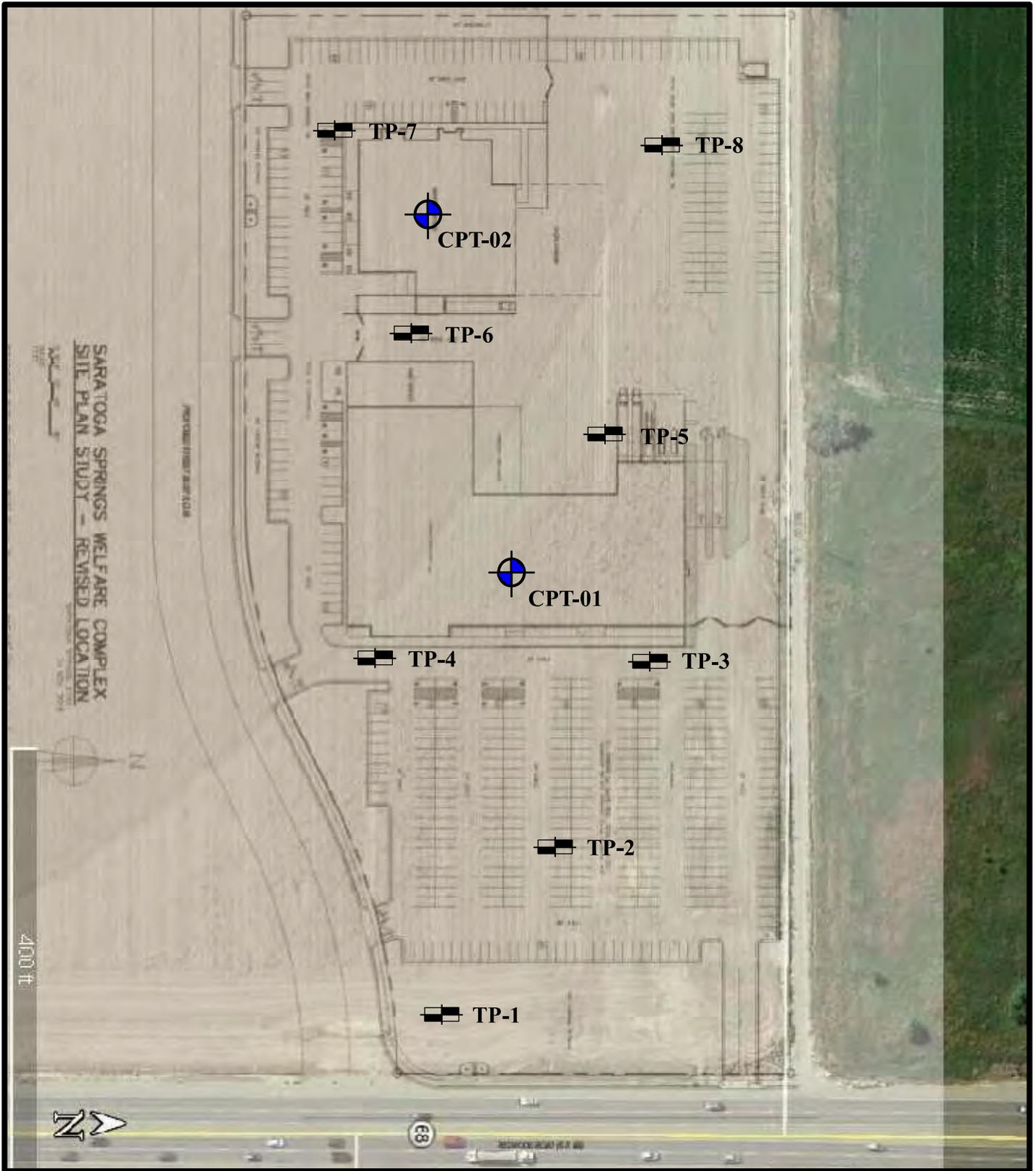
**IGES**<sup>®</sup>

Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE VICINITY MAP**

**Figure  
 A-1**



-  Approximate Test Pit Location
-  Approximate CPT Location



Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE MAP**

**Figure**  
**A-2**

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-1</b>											
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1											
COMPLETED: 3/11/19																			
BACKFILLED: 3/11/19																			
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits								
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION						MATERIAL DESCRIPTION	Plastic Limit	Moisture Content	Liquid Limit					
0	0					Topsoil - Lean CLAY - medium stiff to stiff, moist, dark brown													
					CL	Lean CLAY - stiff, moist, brown frequent pinholes													
						- light brown													
						- occasional pinholes													
						- few to no pinholes													
						No groundwater was encountered													
						Bottom of test pit @ 14 Feet													

10	20	30	40	50	60	70	80	90
----	----	----	----	----	----	----	----	----



**SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 3**







LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-5</b>			
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1			
COMPLETED: 3/11/19											
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Moisture Content and Atterberg Limits			
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Percent minus 200			Liquid Limit	Plasticity Index	Plastic Limit	Moisture Content
		MATERIAL DESCRIPTION									
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown									
		Lean CLAY - stiff, moist, brown pinholes present									
		CL									
		- few to no pinholes									
		- gray to brown									
5						89.7	19.5				
		SM Silty SAND with gravel - medium dense, moist, tan with cobbles									
		GP-GM Poorly Graded GRAVEL with silt and sand - dense, moist, tan with cobbles									
		No groundwater was encountered									
		Bottom of test pit @ 12.5 Feet									



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- SAMPLE TYPE**
- GRAB SAMPLE
  - 3" O.D. THIN-WALLED HAND SAMPLER
- WATER LEVEL**
- MEASURED
  - ESTIMATED

**NOTES:**

**Figure**  
**A - 7**



DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-7</b>													
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1													
COMPLETED: 3/11/19																					
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits										
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Plastic Limit						Moisture Content	Liquid Limit									
		MATERIAL DESCRIPTION									10	20	30	40	50	60	70	80	90		
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown																			
		Lean CLAY - stiff, moist, brown to light brown pinholes present				79.1	17.2														
1		- few to no pinholes - brown																			
3	10	Silty SAND - medium dense, moist, tan																			
4		No groundwater was encountered																			
		Bottom of test pit @ 12.5 Feet																			



**SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 9**



# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		USCS SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS <small>(More than half of material is larger than the #4 sieve)</small>	GRAVELS <small>(More than half of coarse fraction is larger than the #4 sieve)</small>	Clean gravels with little or no fines	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		Gravels with over 12% fines	GP POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		SANDS <small>(More than half of coarse fraction is smaller than the #4 sieve)</small>	Clean sands with little or no fines	GM SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
	Sands with over 12% fines		GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
			Clean sands with little or no fines	SW WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
	FINE GRAINED SOILS <small>(More than half of material is smaller than the #200 sieve)</small>	SILTS AND CLAYS <small>(Liquid limit less than 50)</small>	ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
CL			INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL			ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY	
MH			INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT	
CH			INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
SILTS AND CLAYS <small>(Liquid limit greater than 50)</small>		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY	
		US	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	
		MS		
HIGHLY ORGANIC SOILS		PT		

## LOG KEY SYMBOLS

	BORING SAMPLE LOCATION		TEST-PIT SAMPLE LOCATION
	WATER LEVEL (level after completion)		WATER LEVEL (level where first encountered)

## CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

## OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

## MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

## MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

## STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

## GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

## APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

## CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE	POCKET PENETROMETER	FIELD TEST
		UNTRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.



Figure  
A-11

# **APPENDIX B**

# PRESENTATION OF SITE INVESTIGATION RESULTS

## JRW

*Prepared for:*

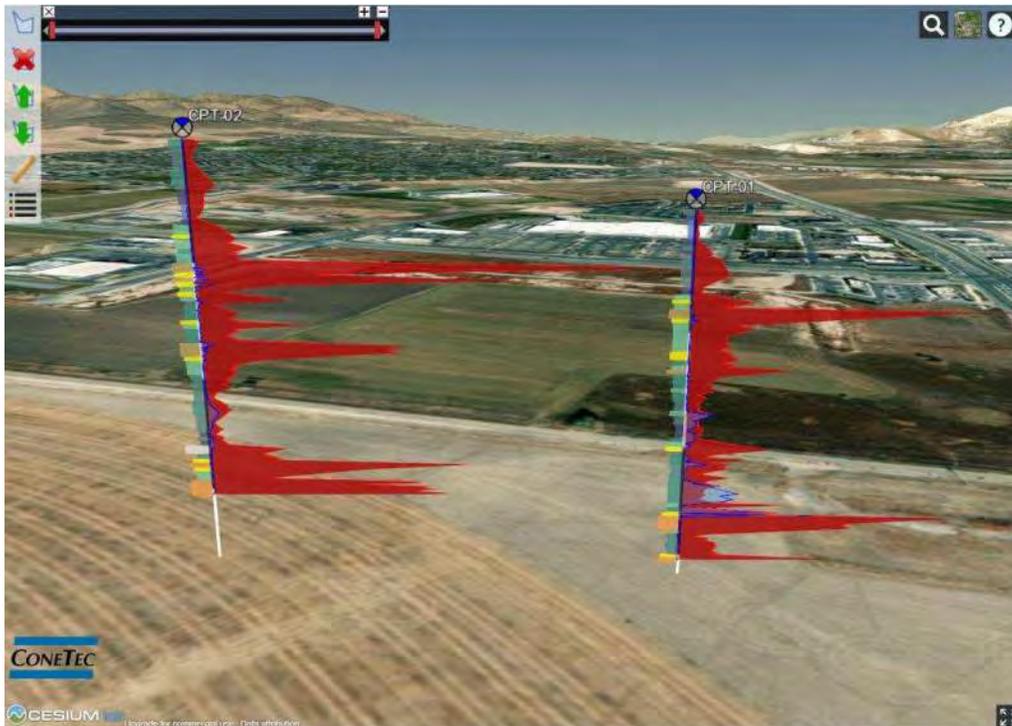
IGES, Inc.

ConeTec Job No: 19-52023

Project Start Date: 16-May-2019

Project End Date: 16-May-2019

Report Date: 24-May-2019



*Prepared by:*

ConeTec Inc.  
3750 West 500 South  
Salt Lake City, UT 84104

Tel: (801) 973-3801

Fax: (801) 973-3802

Email: [saltlakecity@conetec.com](mailto:saltlakecity@conetec.com)

[www.conetec.com](http://www.conetec.com)

[www.conetecdataservices.com](http://www.conetecdataservices.com)



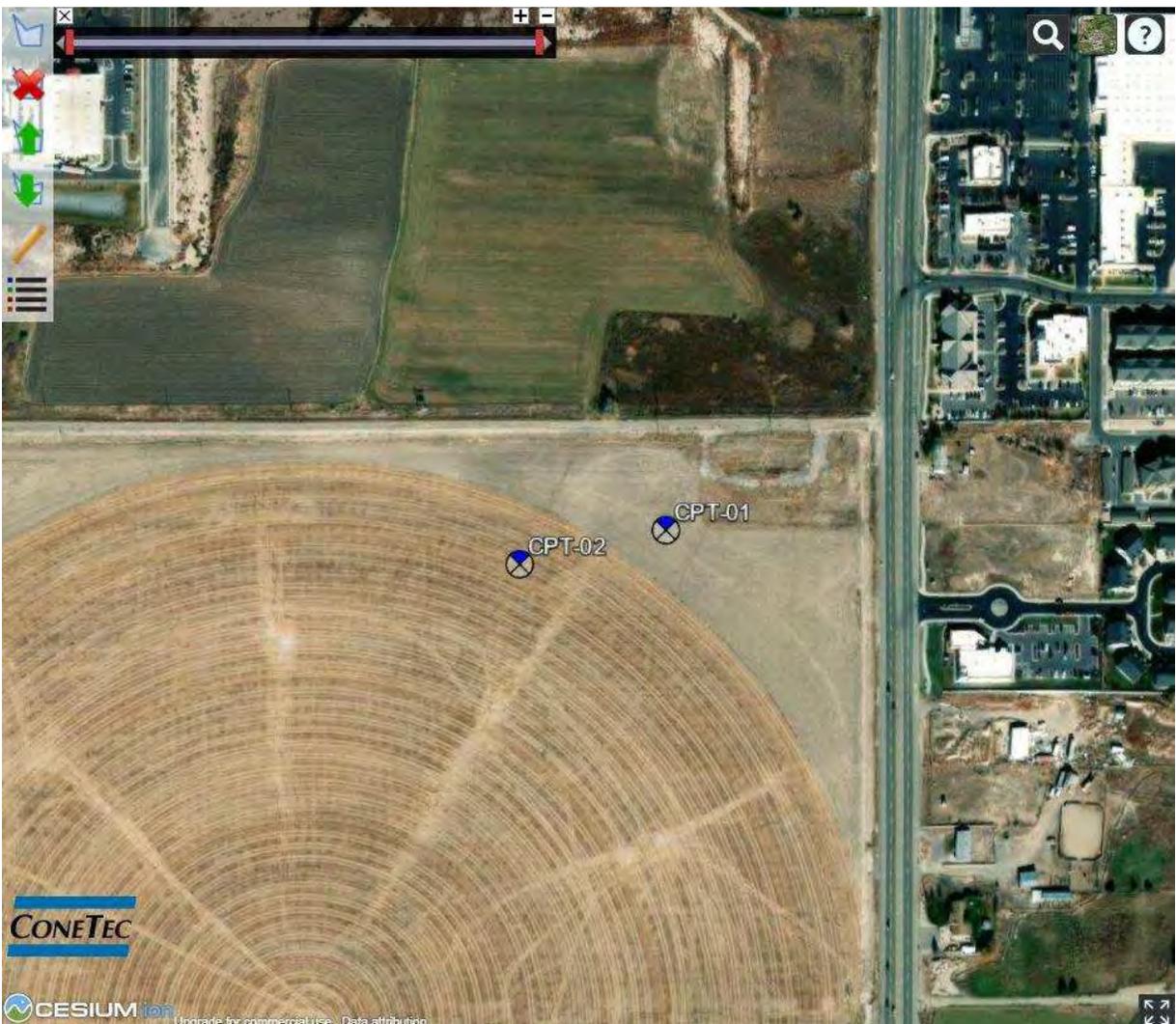
## Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for IGES, Inc. of Draper, Utah. The program consisted of cone penetration testing (CPT) at two (2) locations. Shear wave velocities were recorded in one (1) of the soundings. Pore pressure dissipation testing was performed as directed by IGES, Inc. field personnel. The water table used in the CPT interpretations is based on the results of the pore pressure dissipation tests performed within each sounding.

## Project Information

Project	
Client	IGES, Inc.
Project	JRW
ConeTec Project #	19-52023

A map from Bing maps including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT truck rig	25-ton truck mounted cylinder	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	USB/Serial GPS	4326 (WGS 84 / LatLong)

Cone Penetration Test (CPT)	
Depth reference	Existing ground surface at the time of the investigation
Tip and sleeve data offset	0.1 Meter This has been accounted for in the CPT data files
Additional Comments	None

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm <sup>2</sup> )	Sleeve Area (cm <sup>2</sup> )	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
418:T1500F15U500	418	15	225	1500	15	500
Cone 418 was used in all soundings						

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behavior Type Chart based on Qtn (SBT Qtn) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (qt) sleeve friction (fs), and pore pressure (u2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile.

**Limitations**

This report has been prepared for the exclusive use of IGES, Inc. (Client) for the project titled “JRW”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec, Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.



The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm<sup>2</sup> and 15 cm<sup>2</sup> tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm<sup>2</sup> penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm<sup>2</sup> piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u<sub>2</sub>" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

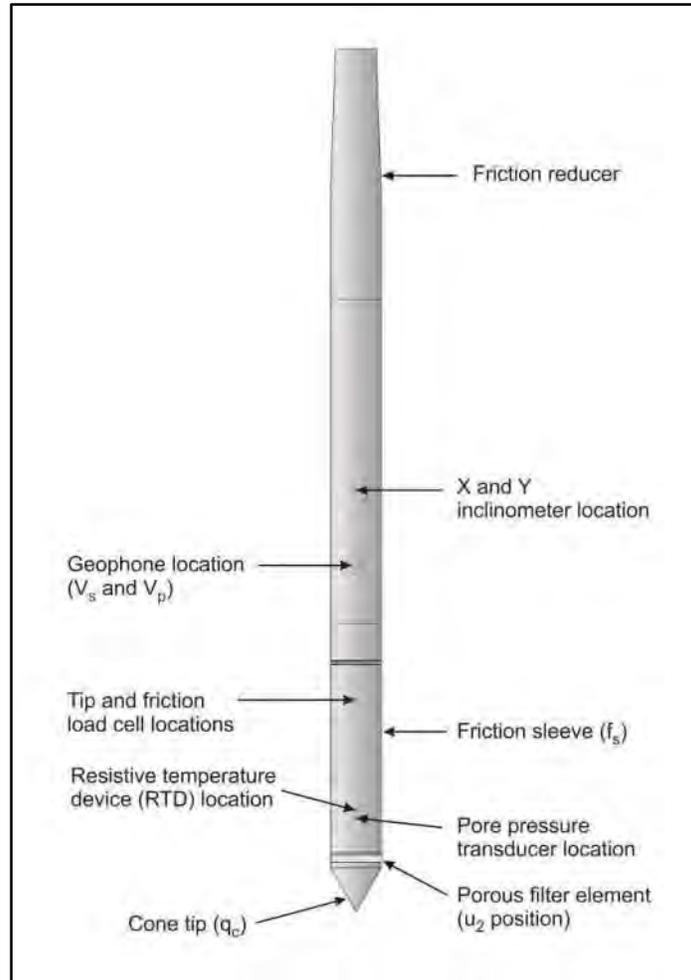


Figure CPTu. Piezocone Penetrometer (15 cm<sup>2</sup>)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ( $q_c$ )
- Sleeve friction ( $f_s$ )
- Dynamic pore pressure ( $u$ )
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ( $q_t$ ), sleeve friction ( $f_s$ ) and pore water pressure ( $u$ ). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance ( $q_c$ ) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ( $q_t$ ) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where:  $q_t$  is the corrected tip resistance

$q_c$  is the recorded tip resistance

$u_2$  is the recorded dynamic pore pressure behind the tip ( $u_2$  position)

$a$  is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ( $f_s$ ) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure ( $u$ ) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio ( $R_f$ ) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave ( $V_p$ ) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

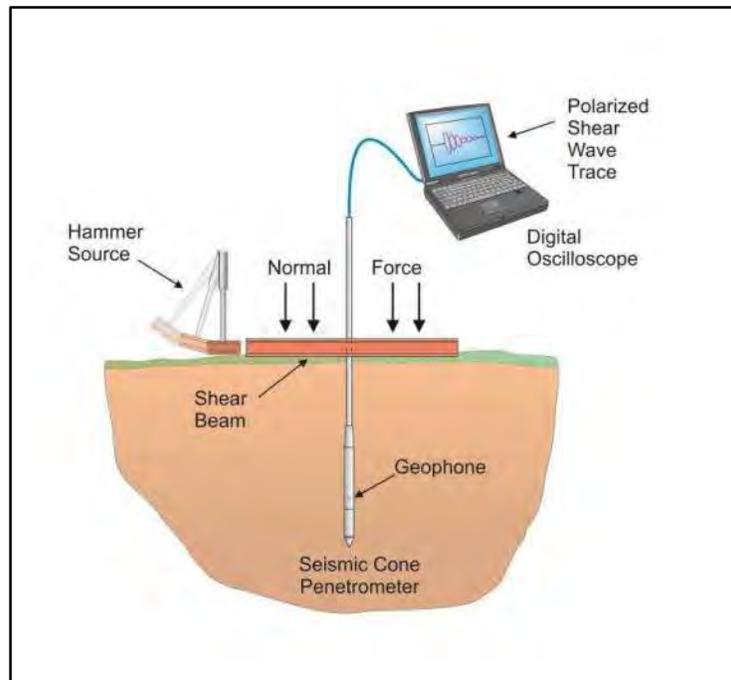


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

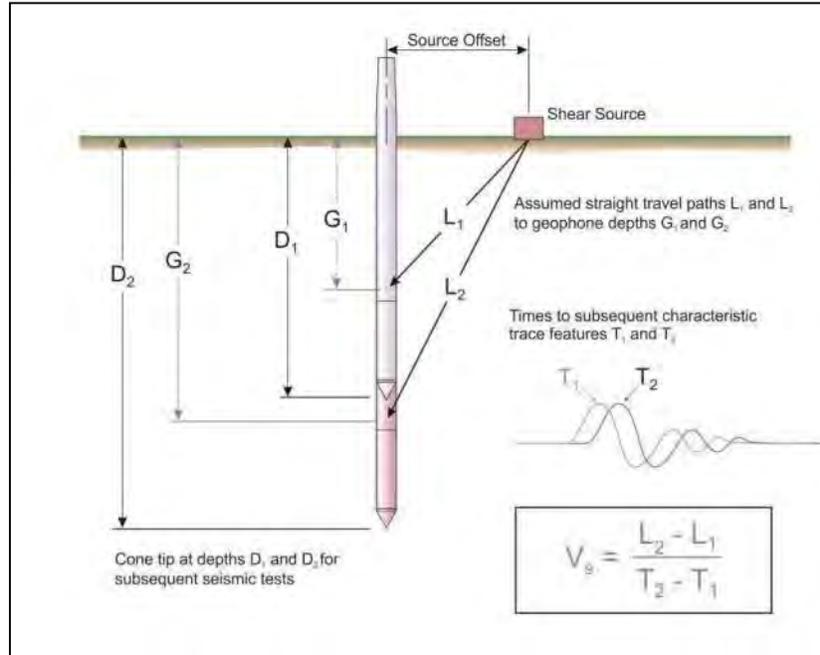


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ( $\bar{v}_s$ ) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}}$$

where:  $\bar{v}_s$  = average shear wave velocity ft/s (m/s)  
 $d_i$  = the thickness of any layer between 0 and 100 ft (30 m)  
 $v_{si}$  = the shear wave velocity in ft/s (m/s)  
 $\sum_{i=1}^n d_i = 100 \text{ ft (30 m)}$

Average shear wave velocity,  $\bar{v}_s$  is also referenced to  $V_{s100}$  or  $V_{s30}$ .

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure ( $u$ ) with time ( $t$ ).

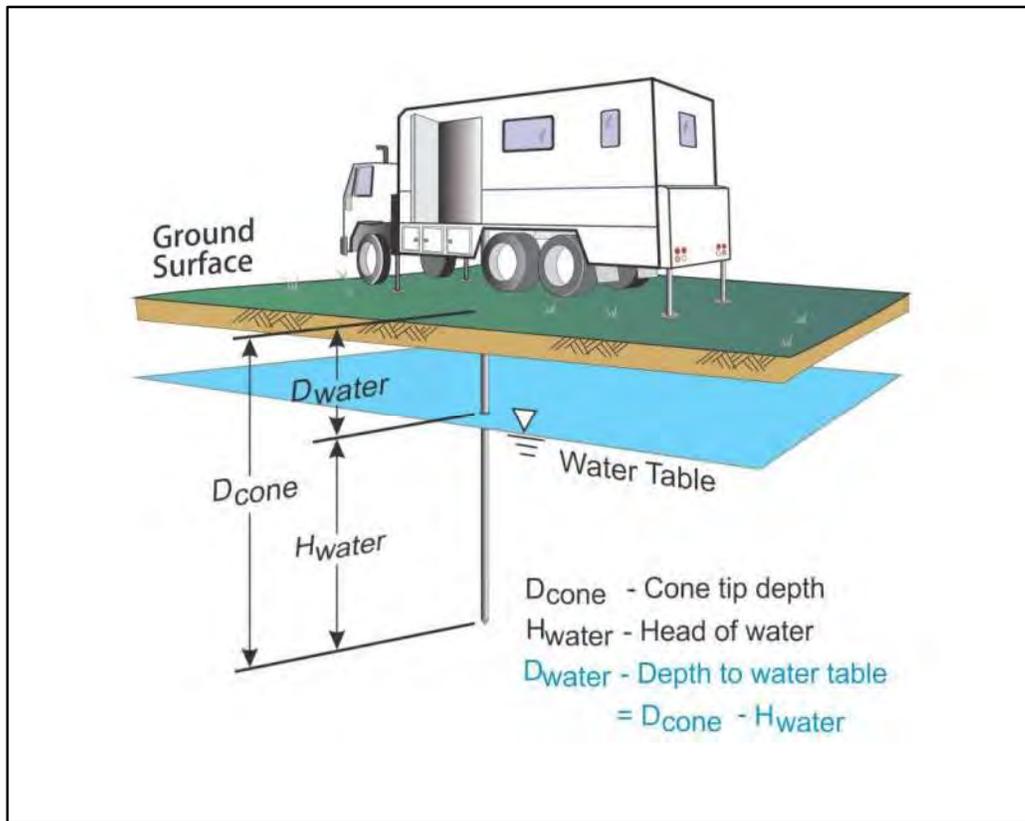


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

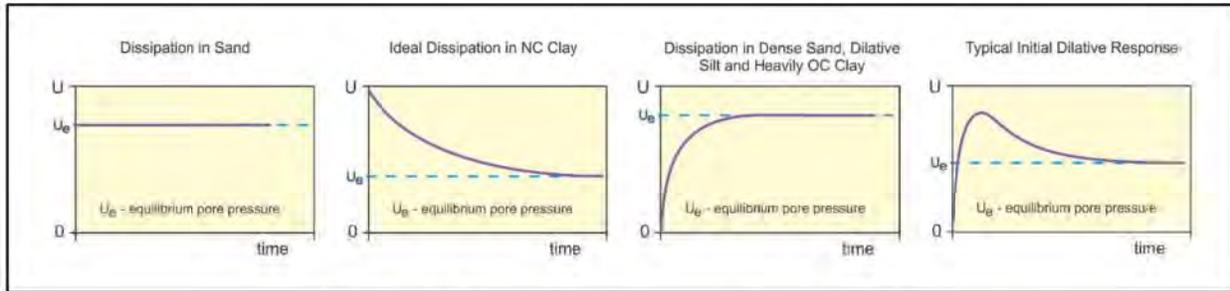


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure ( $u_{eq}$ ) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as  $t_{100}$ . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to  $t_{100}$ . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor ( $T^*$ ) may be used to calculate the coefficient of consolidation ( $c_h$ ) at various degrees of dissipation resulting in the expression for  $c_h$  shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- $T^*$  is the dimensionless time factor (Table Time Factor)
- $a$  is the radius of the cone
- $I_r$  is the rigidity index
- $t$  is the time at the degree of consolidation

Table Time Factor.  $T^*$  versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time ( $t_{50}$ ) corresponding to a degree of dissipation of 50% ( $u_{50}$ ). In order to determine  $t_{50}$ , dissipation tests must be taken to a pressure less than  $u_{50}$ . The  $u_{50}$  value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as  $u_{100}$ . To estimate  $u_{50}$ , both the initial maximum pore pressure and  $u_{100}$  must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure ( $u$  at  $t_{100}$ ) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ( $u_{100}$ ), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of  $c_h$  (Teh and Houlsby, 1991),  $t_{50}$  values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ( $I_r$ ) is assumed. For curves having an initial dilatatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining  $t_{50}$ . In cases where the time to peak is excessive,  $t_{50}$  values are not calculated.

Due to possible inherent uncertainties in estimating  $I_r$ , the equilibrium pore pressure and the effect of an initial dilatatory response on calculating  $t_{50}$ , other methods should be applied to confirm the results for  $c_h$ .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Normalized Cone Penetration Test Plots
- SBT Zone Scatter Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Seismic Cone Penetration Wave Traces
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and  
Standard Cone Penetration Test Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

### CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface <sup>1</sup> (ft.)	Final Depth (ft.)	Latitude <sup>2</sup>	Longitude	Elevation <sup>3</sup> (ft.)	Refer to Notation Number
CPT-01	19-52023_SP01	16-May-2019	418:T1500F15U500	29.5	50.03	40.383219	-111.918333	4540	
CPT-02	19-52023_SP02	16-May-2019	418:T1500F15U500	43.4	50.03	40.383012	-111.919514	4549	

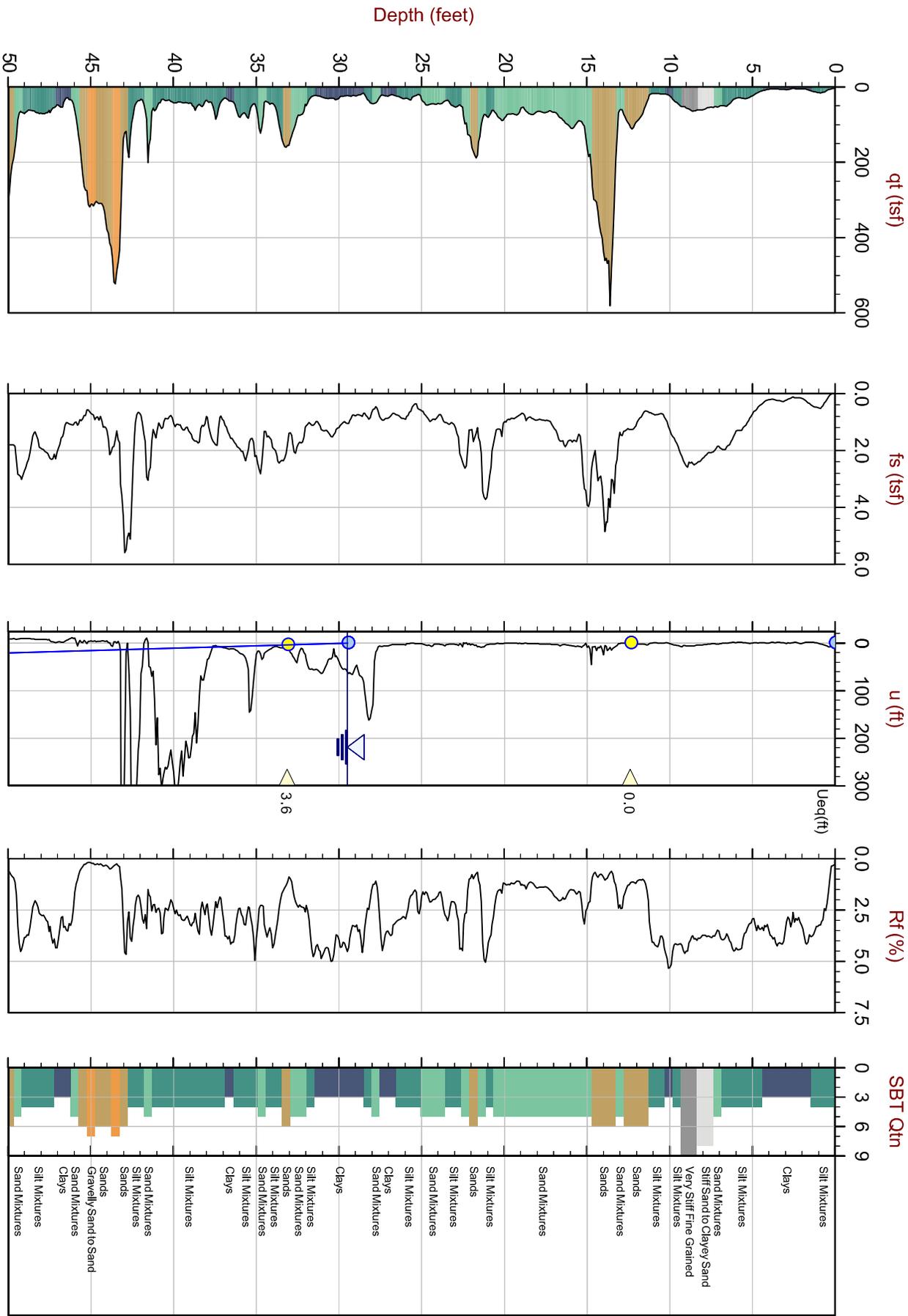
1. The assumed phreatic surface used in the CPT interpretations are based on the pore pressure dissipation tests performed within each sounding.
2. The coordinates are based on the WGS84 Datum and have an accuracy of ±30 feet.
3. Elevations are referenced to the ground surface and are derived from the Google Earth Elevation for the recorded coordinates.



# IGES

Job No: 19-52023  
Date: 2019-05-16 09:01  
Site: JRW

Sounding: CPT-01  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: 0.150 m

File: 19-52023\_CP01.COR  
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 40.383220 Long: -111.918330

- Ueq
- Assumed Ueq
- ▲ Dissipation, Ueq achieved
- ▲ Dissipation, Ueq not achieved
- Hydrostatic Line
- Phreatic Surface

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



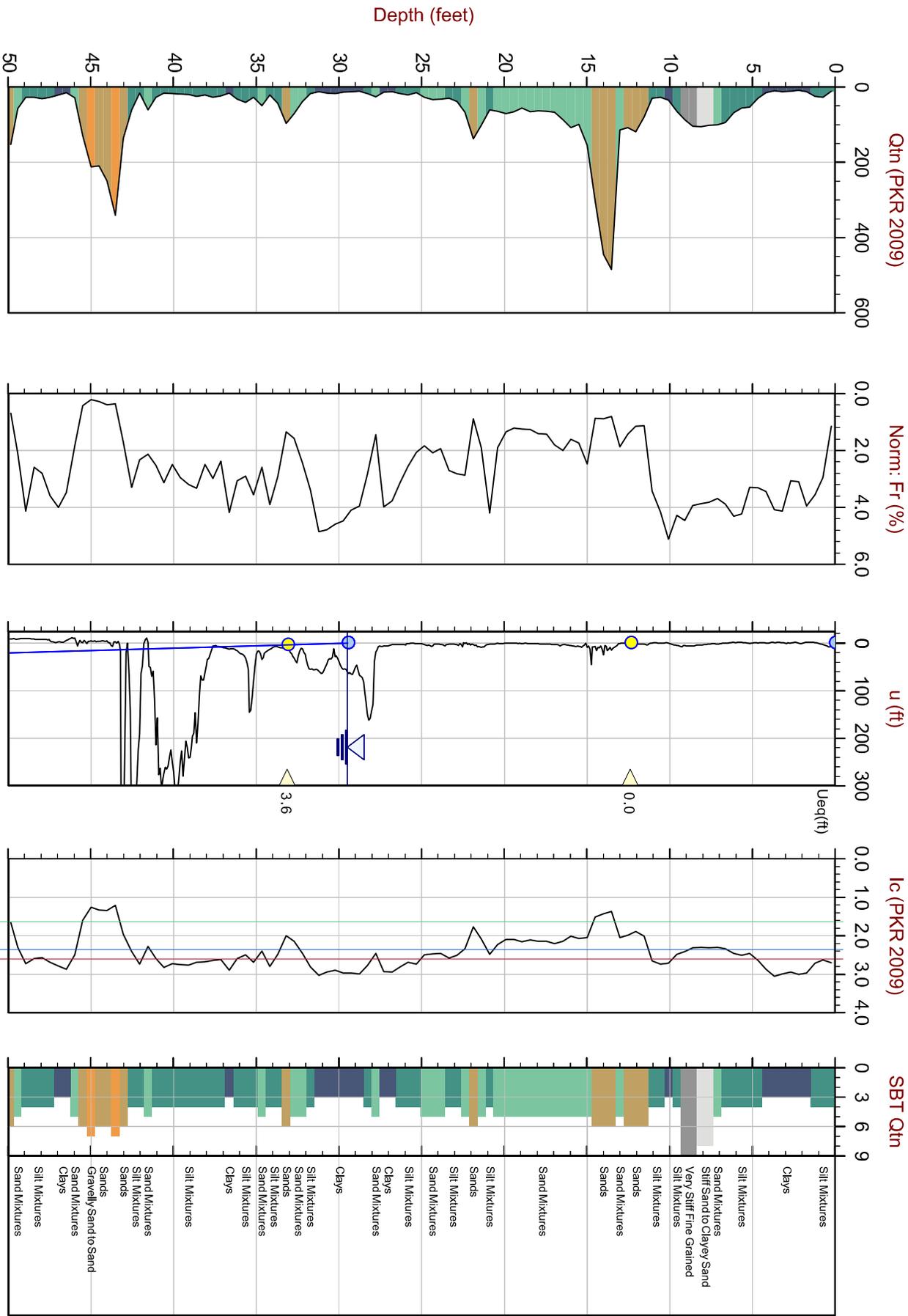
## Normalized Cone Penetration Test Plots



# IGES

Job No: 19-52023  
Date: 2019-05-16 09:01  
Site: JRW

Sounding: CPT-01  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: 0.150 m  
OverplotItem: Ueq (Assumed Ueq)

File: 19-52023\_CP01.COR  
Unit Wt: SBTQtn (PKR2009)  
Dissipation, Ueq achieved

Dissipation, Ueq not achieved

SBT: Robertson, 2009 and 2010  
Coords: Lat: 40.383220 Long: -111.918330  
Hydrostatic Line  
Pneumatic Surface

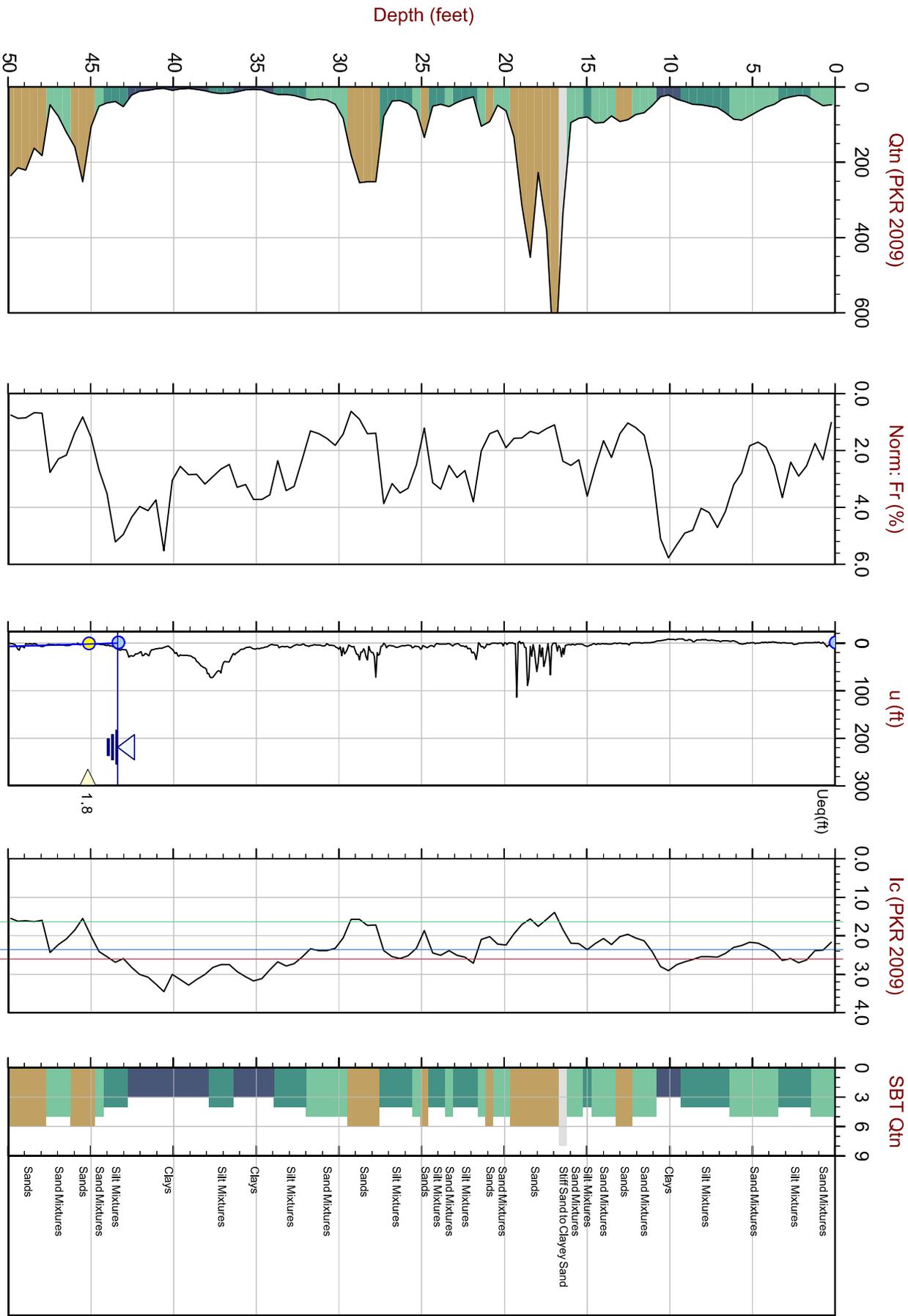
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m

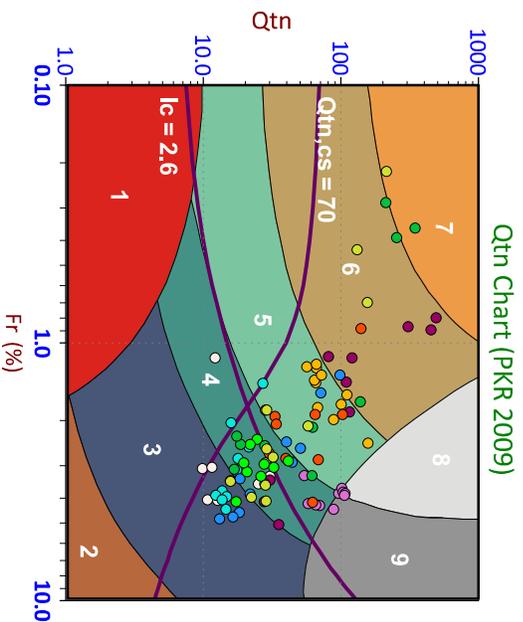
File: 19-52023\_SP02.COR  
 Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq ● Assumed Ueq ▲ Dissipation, Ueq achieved ▼ Dissipation, Ueq not achieved — Hydrostatic Line — Phreatic Surface

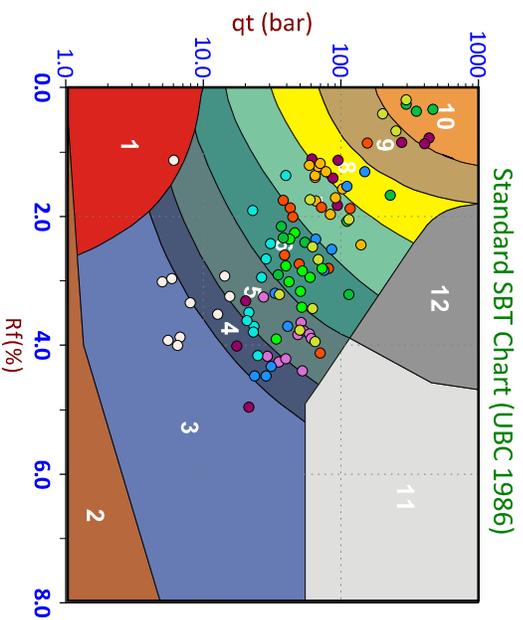
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## SBT Zone Scatter Plots

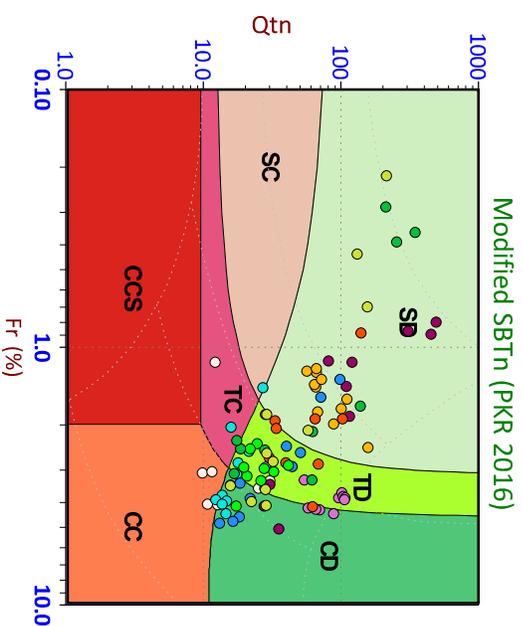


- #### Depth Ranges
- >0.0 to 5.0 ft
  - >5.0 to 10.0 ft
  - >10.0 to 15.0 ft
  - >15.0 to 20.0 ft
  - >20.0 to 25.0 ft
  - >25.0 to 30.0 ft
  - >30.0 to 35.0 ft
  - >35.0 to 40.0 ft
  - >40.0 to 45.0 ft
  - >45.0 to 50.0 ft
  - >50.0 ft

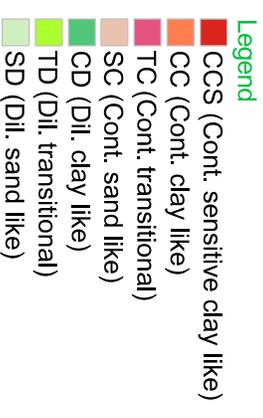
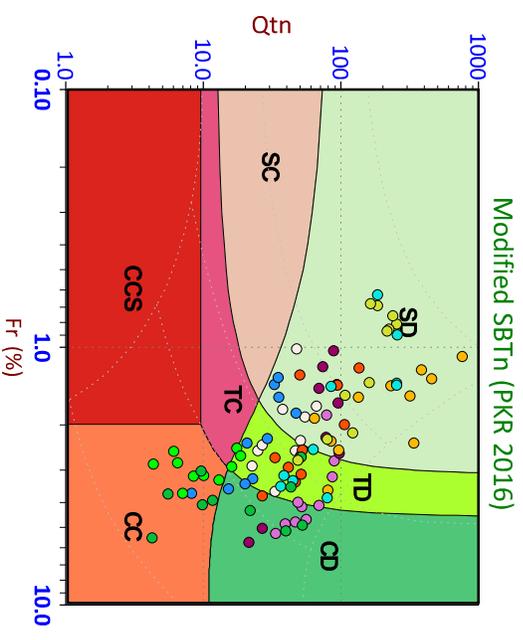
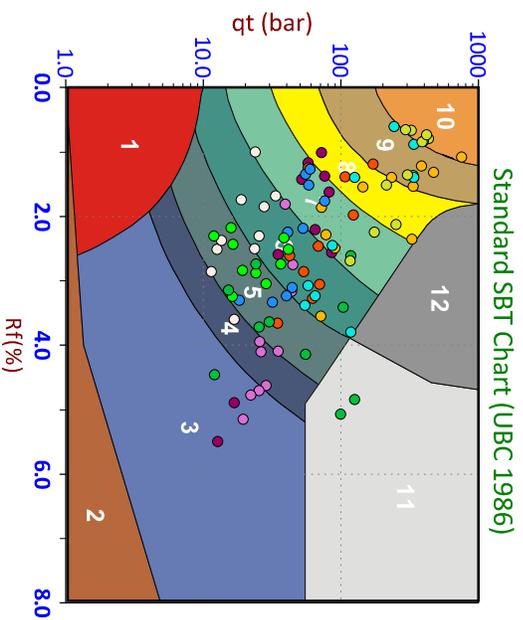
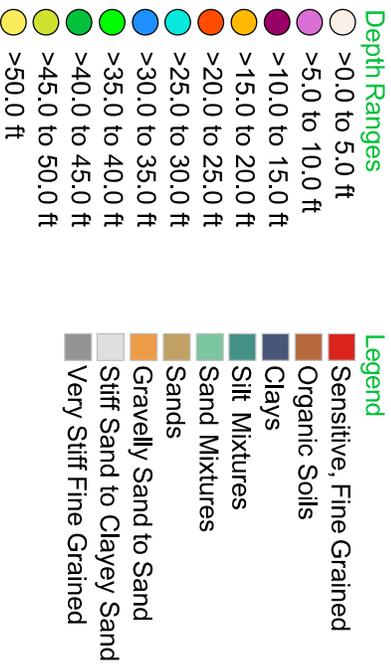
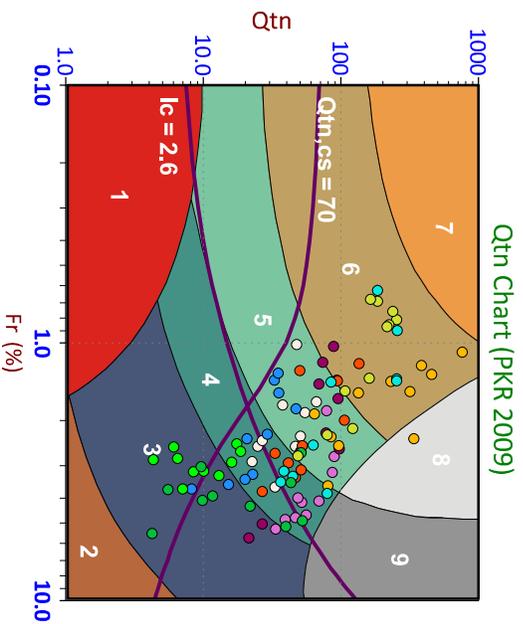
- #### Legend
- Sensitive, Fine Grained
  - Organic Soils
  - Clays
  - Silt Mixtures
  - Sand Mixtures
  - Sands
  - Gravelly Sand to Sand
  - Stiff Sand to Clayey Sand
  - Very Stiff Fine Grained



- #### Legend
- Sensitive Fines
  - Organic Soil
  - Clay
  - Silty Clay
  - Clayey Silt
  - Silt
  - Sandy Silt
  - Silty Sand/Sand
  - Sand
  - Gravelly Sand
  - Stiff Fine Grained
  - Cemented Sand



- #### Legend
- CCS (Cont. sensitive clay like)
  - CC (Cont. clay like)
  - TC (Cont. transitional)
  - SC (Cont. sand like)
  - CD (Dil. clay like)
  - TD (Dil. transitional)
  - SD (Dil. sand like)



Seismic Cone Penetration Test Plots

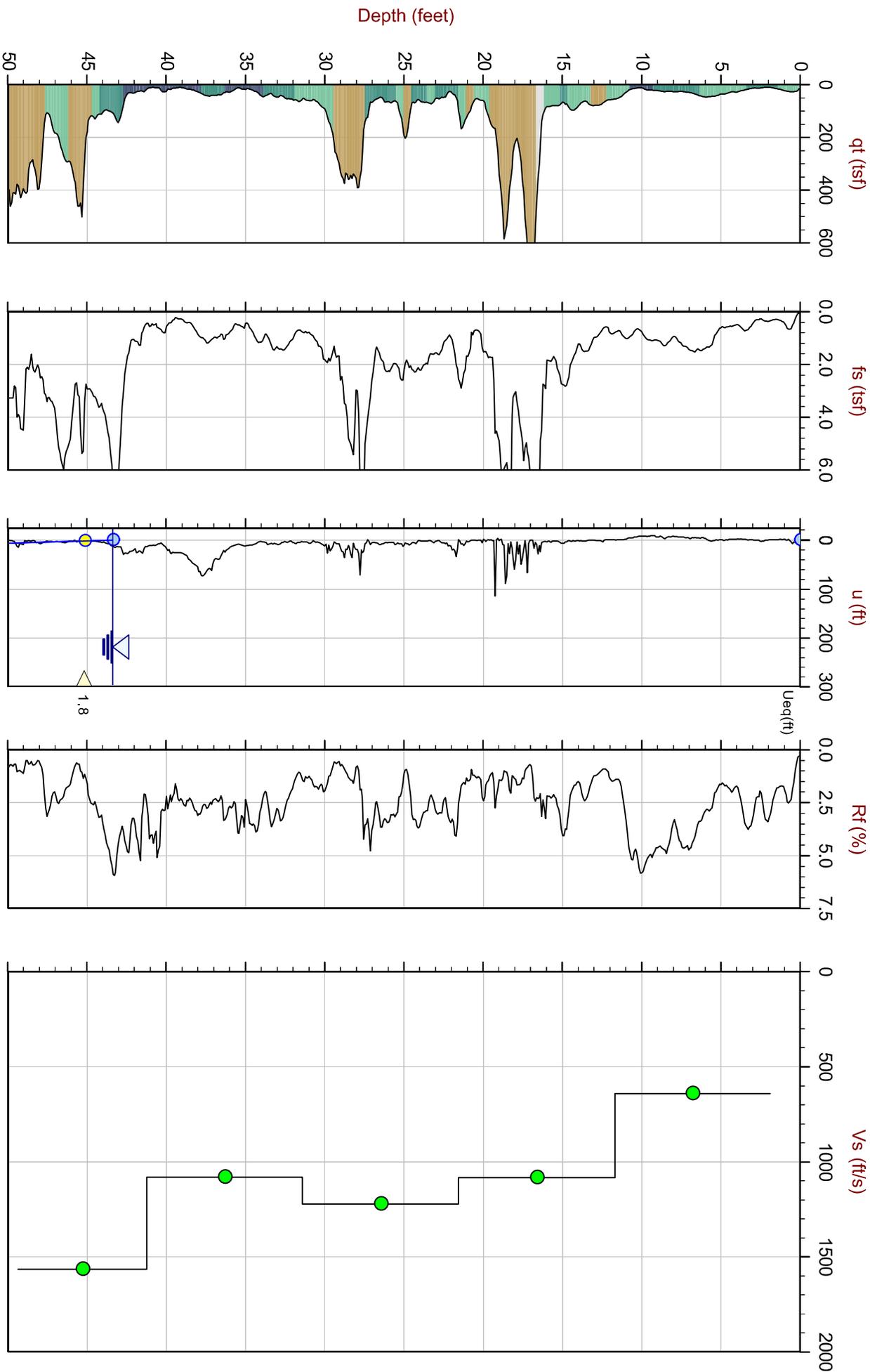




# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m  
 File: 19-52023\_SP02.COR  
 Unit Wt: SBTQIn (PKR2009)  
 SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq ● Assumed Ueq ▲ Dissipation, Ueq achieved ▲ Dissipation, Ueq not achieved — Hydrostatic Line — Phreatic Surface

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## Seismic Cone Penetration Test Tabular Results



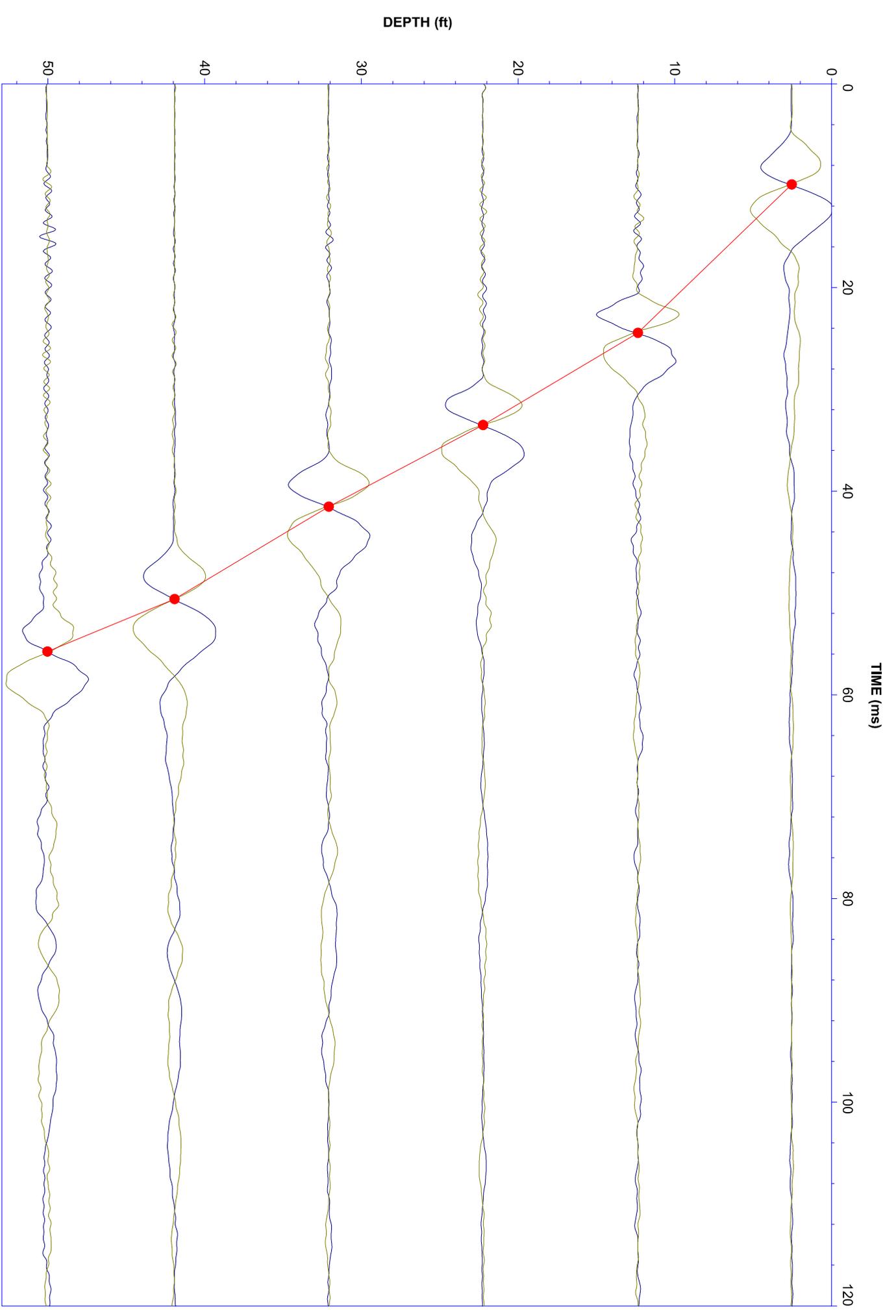
Job No: 19-52023  
Client: IGES  
Project: JRW  
Sounding ID: SCPT-02  
Date: 16-May-2019

Seismic Source: Beam  
Source Offset (ft): 1.50  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

**SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>**

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
2.56	1.90	2.42			
12.37	11.71	11.81	9.39	14.56	644
22.24	21.59	21.64	9.83	9.05	1087
32.09	31.43	31.47	9.83	8.02	1225
41.93	41.27	41.30	9.83	9.07	1084
50.03	49.38	49.40	8.10	5.16	1569

## Seismic Cone Penetration Wave Traces



Pore Pressure Dissipation Summary and  
Pore Pressure Dissipation Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

**CPT<sub>u</sub> PORE PRESSURE DISSIPATION SUMMARY**

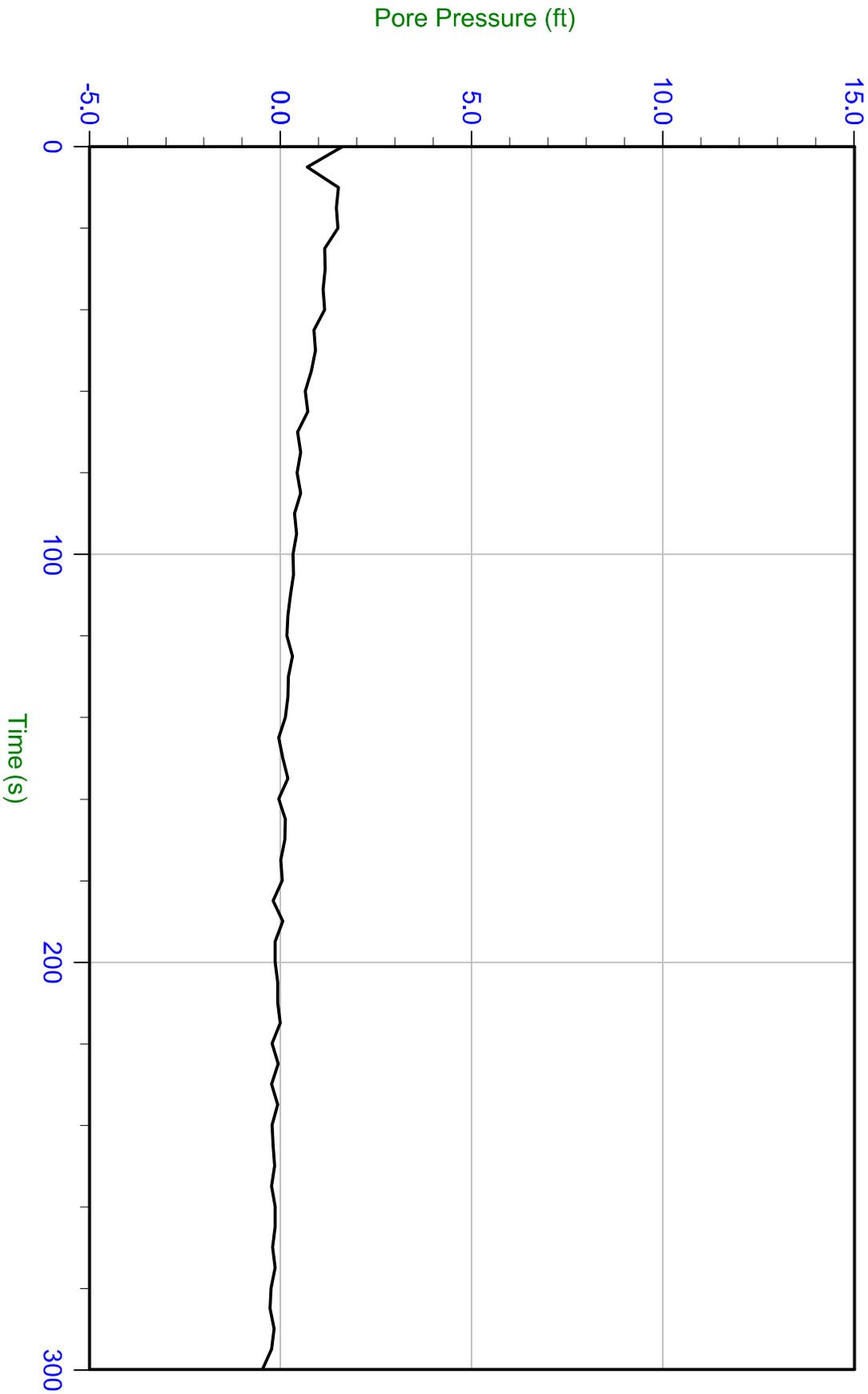
Sounding ID	File Name	Cone Area (cm <sup>2</sup> )	Duration (s)	Test Depth (ft.)	Estimated Equilibrium Pore Pressure U <sub>eq</sub> (ft.)	Calculated Phreatic Surface (ft.)	Refer to Notation Number
CPT-01	19-52023_CP01	15	300	12.39	0.0	12.4	
CPT-01	19-52023_CP01	15	1000	33.14	3.6	29.5	
CPT-02	19-52023_SP02	15	500	45.19	1.8	43.4	



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_CP01.PPD  
Depth: 3.775 m / 12.385 ft  
Duration: 300.0 s

u Min: -0.5 ft  
u Max: 1.6 ft  
u Final: -0.5 ft

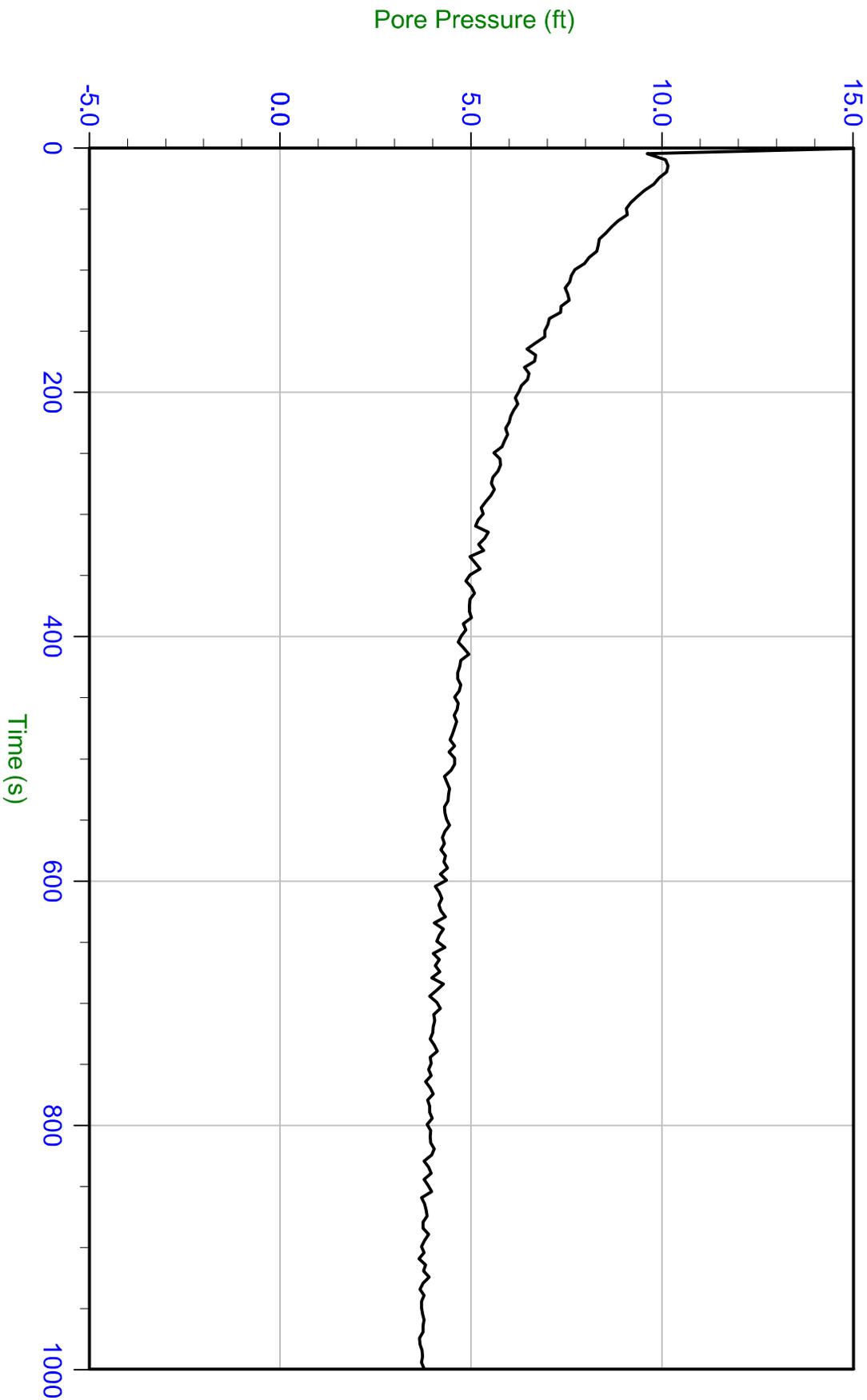
WT: 3.772 m / 12.374 ft  
Ueq: 0.0 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



**Trace Summary:**

Filename: 19-52023\_CP01.PPD  
Depth: 10.100 m / 33.136 ft  
Duration: 1000.0 s

u Min: 3.6 ft  
u Max: 15.5 ft  
u Final: 3.8 ft

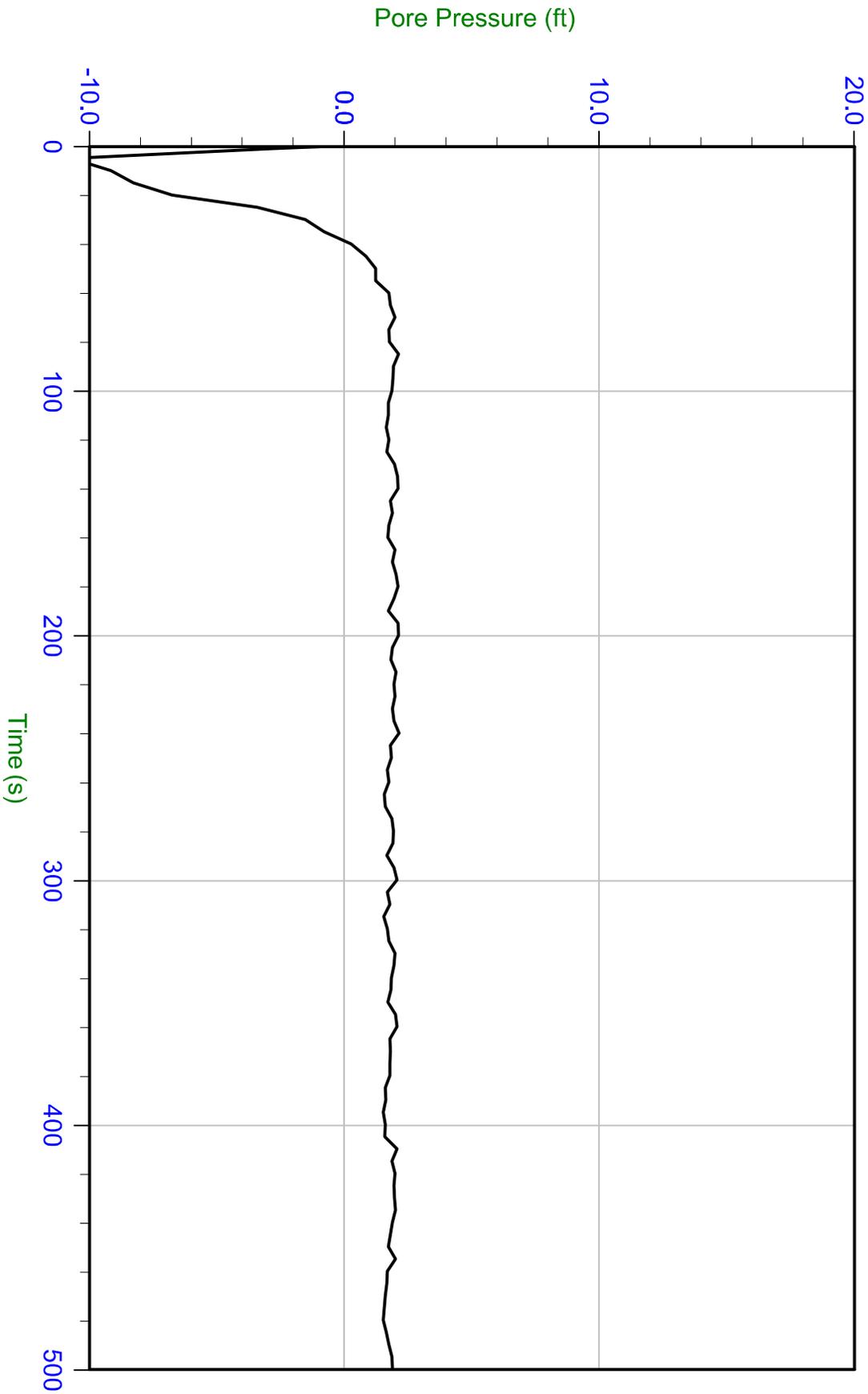
WT: 8.989 m / 29.491 ft  
Ueq: 3.6 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 10:19:35  
Site: JRW

Sounding: CPT-02  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_SP02.PPD  
Depth: 13.775 m / 45.193 ft  
Duration: 500.0 s

u Min: -10.7 ft  
u Max: 2.2 ft  
u Final: 1.9 ft  
WT: 13.233 m / 43.415 ft  
Ueq: 1.8 ft

# **APPENDIX C**

# Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

**Project: GTI Welfare Complex**  
**No: 03019-001**

Location: **Saratoga Springs**

Date: **3/18/2019**

By: **JAB**

Method: **ASTM D698 B**

Mold Id. **Inc 1**

Mold volume (ft<sup>3</sup>): **0.0333**

**Boring No.: TP-2**

**Sample:**

**Depth: 2.0-4.0'**

Sample Description: **Brown clay**

Engineering Classification: **Not requested**

As-received water content (%): **Not requested**

Preparation method: **Moist**

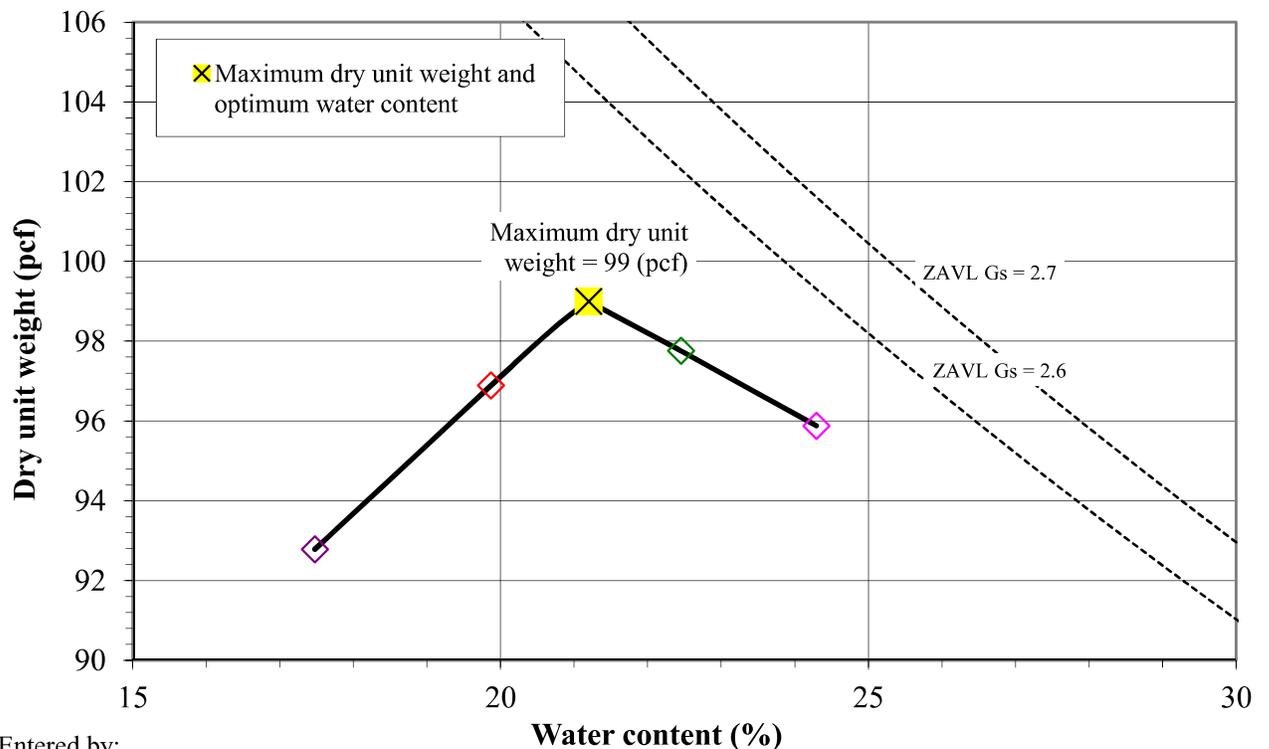
Rammer: **Mechanical-circular face**

Rock Correction: **No**

**Optimum water content (%): 21.2**

**Maximum dry unit weight (pcf): 99**

Point Number	As-Is	+2%	+4%	+6%				
Wt. Sample + Mold (g)	5876.9	5984.7	6038.6	6030.5				
Wt. of Mold (g)	4231.4	4231.4	4231.4	4231.4				
Wet Unit Wt., $\gamma_m$ (pcf)	109.0	116.1	119.7	119.2				
Wet Soil + Tare (g)	1297.47	1411.96	1563.23	1561.59				
Dry Soil + Tare (g)	1153.89	1232.32	1351.73	1317.51				
Tare (g)	332.26	328.19	409.82	312.77				
Water Content, w (%)	17.5	19.9	22.5	24.3				
Dry Unit Wt., $\gamma_d$ (pcf)	92.8	96.9	97.8	95.9				



Entered by: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**California Bearing Ratio**

(ASTM D 1883)



© IGES 2004, 2019

**Project: GTI Welfare Complex**

**Number: 03019-001**

Location: **Saratoga Springs**

Date: **3/26/2019**

By: **JWB**

Maximum Dry Unit Weight (pcf): **99**

Optimum Water Content (%): **21.2**

Relative Compaction (%): **101.3**

**0.1 in. Corrected CBR (%): 4.1**

**0.2 in. Corrected CBR (%): 5.3**

**Boring No.: TP-2**

**Sample:**

**Depth: 2.0-4.0'**

Original Method: **ASTM D698 B**

Engineering Classification: **Not requested**

Condition of Sample: **Soaked**

Scalp and Replace: **No**

As Compacted Data		Before	After	
Mold Id.	<b>E</b>	Wet Soil + Tare (g)	<b>1661.81</b>	<b>1919.54</b>
Wt. of Mold + Sample (g)	<b>11346.6</b>	Dry Soil + Tare (g)	<b>1430.37</b>	<b>1639.72</b>
Wt. of Mold (g)	<b>7224.9</b>	Tare (g)	<b>327.89</b>	<b>315.02</b>
Dry Unit Weight (pcf)	<b>100.3</b>	Water Content (%)	<b>21.0</b>	<b>21.1</b>
After Soaking Data		Average	Top 1 in.	
Wt. of Mold + Sample (g)	<b>11454.3</b>	Wet Soil + Tare (g)	<b>1730.68</b>	<b>483.43</b>
Dry Unit Weight (pcf)	<b>98.9</b>	Dry Soil + Tare (g)	<b>1439.57</b>	<b>411.33</b>
		Tare (g)	<b>222.26</b>	<b>122.4</b>
		Water Content (%)	<b>23.9</b>	<b>25.0</b>

**Swell Data**

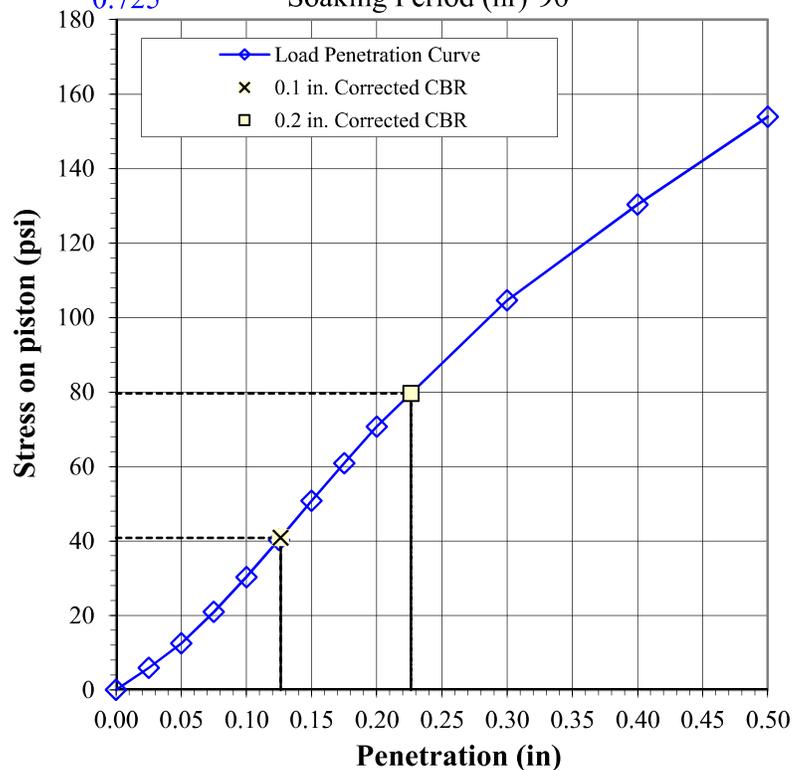
Date: **3/21/2019** Time: **11:15** Dial: **0.661** Surcharge (psf) **50**  
 Date: **3/25/2019** Time: **11:00** Dial: **0.725** Swell (%) **1.40**  
 Soaking Period (hr) **96**

Penetration Data	Piston ID	CBR T1
------------------	-----------	--------

Zero load (lb) = **0**

Area of Piston (in<sup>2</sup>) = **3.0**

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	18	6	
0.050	37	12	
0.075	63	21	
0.100	91	30	1000
0.125	121	40	1125
0.150	152	51	1250
0.175	182	61	1375
0.200	212	71	1500
0.300	314	105	1900
0.400	391	130	2300
0.500	462	154	2600



Entered By: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-2**

Sample:

Depth: **4.5'**

Sample Description: **Brown silt**

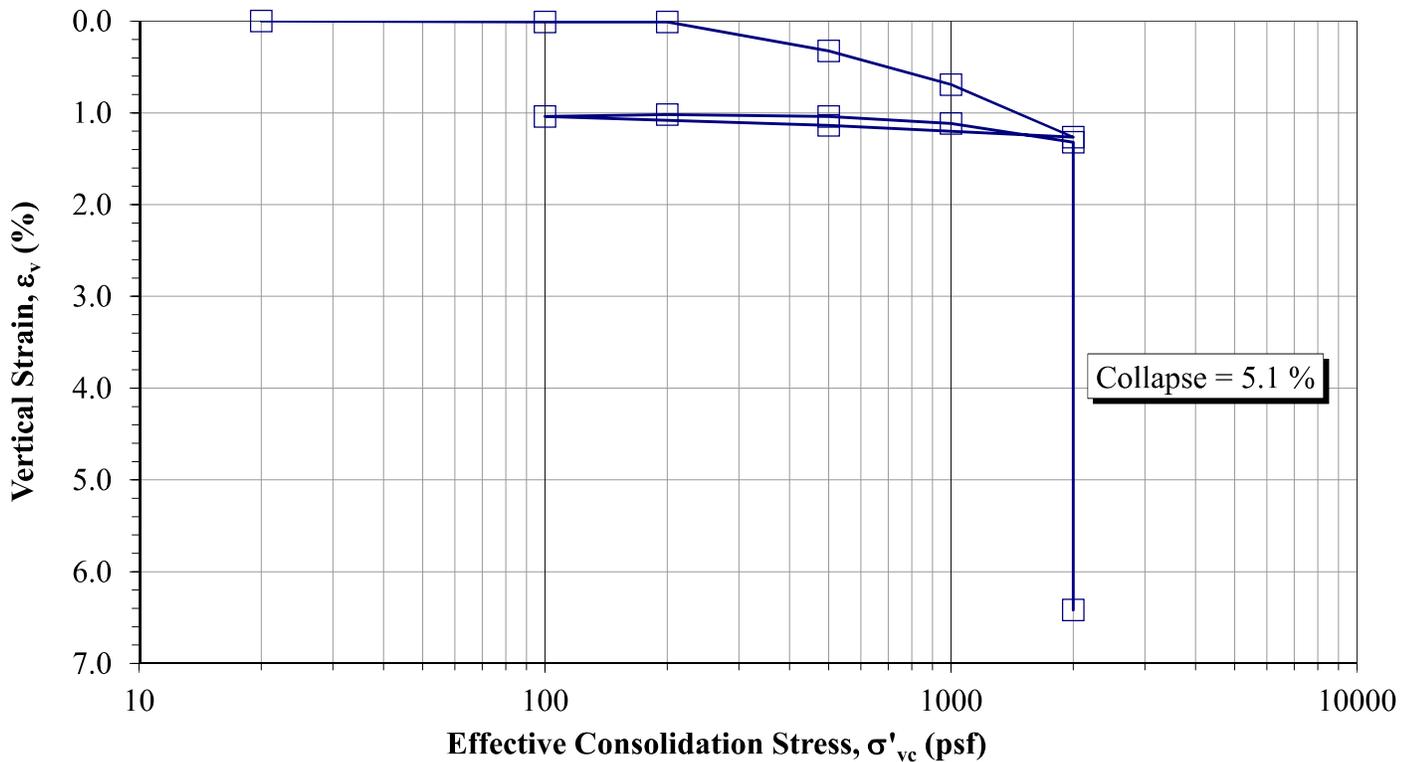
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 4  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 5.1  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.924	0.865
Sample diameter, D (in.)	2.419	2.419
Mass rings + wet soil (g)	149.22	161.41
Mass rings/tare (g)	46.11	46.11
Moist unit wt., $\gamma_m$ (pcf)	92.50	110.53
Wet soil + tare (g)	231.92	236.70
Dry soil + tare (g)	217.75	211.02
Tare (g)	126.53	123.05
Water content, w (%)	15.5	29.2
Dry unit wt., $\gamma_d$ (pcf)	80.06	85.55
Saturation	37.95	81.24

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.0732	0.00	0.9240	1.105
20	0.0732	0.00	0.9240	1.105
100	0.0733	0.01	0.9239	1.105
200	0.0733	0.01	0.9239	1.105
500	0.0762	0.32	0.9210	1.098
1000	0.0796	0.69	0.9176	1.091
2000	0.0849	1.27	0.9123	1.079
500	0.0837	1.14	0.9135	1.081
100	0.0828	1.04	0.9144	1.083
200	0.0826	1.02	0.9146	1.084
500	0.0828	1.04	0.9144	1.083
1000	0.0835	1.11	0.9137	1.082
2000	0.0854	1.32	0.9118	1.077
2000	0.1325	6.42	0.8647	0.970



Comments: **Test specimen contains pinholes.**

Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-3**

Sample:

Depth: **6.0'**

Sample Description: **Brown clay**

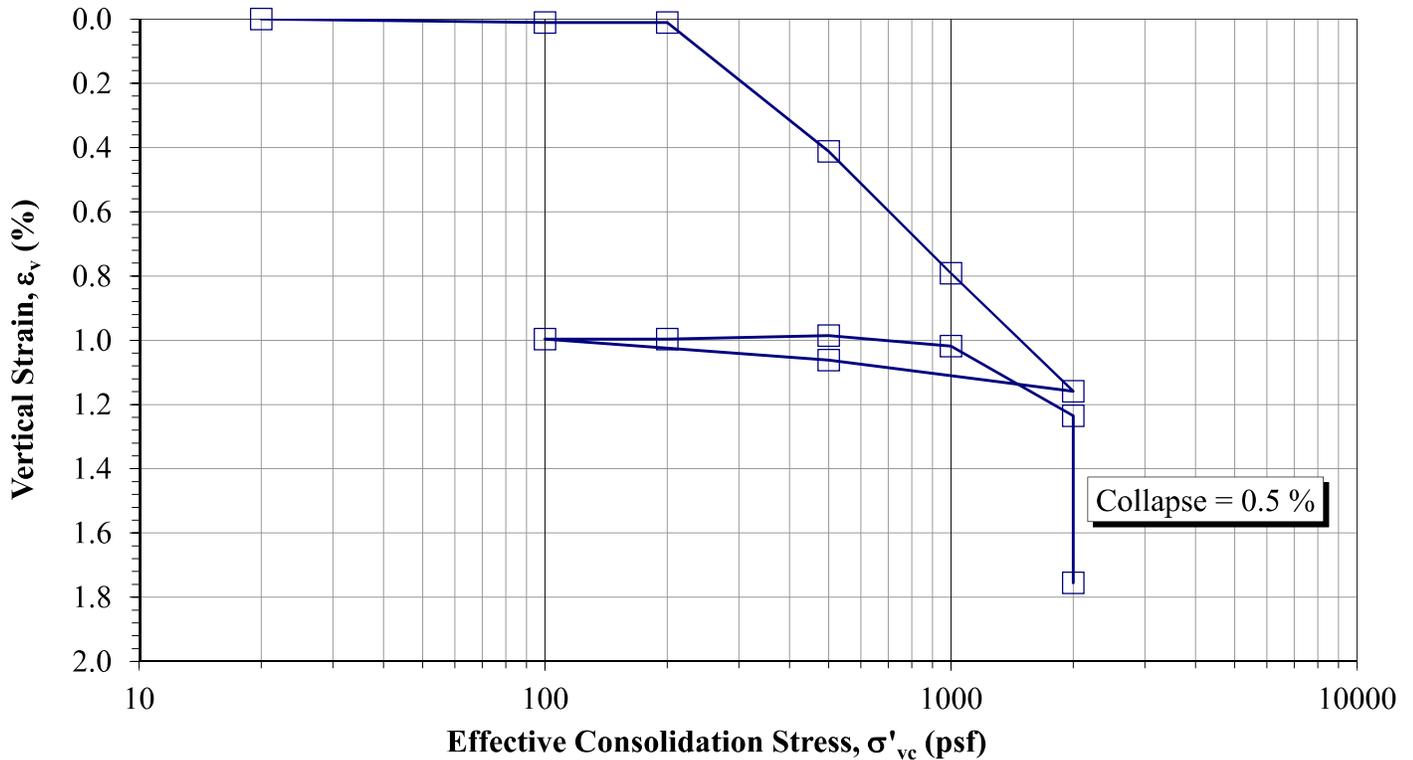
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 7  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 0.5  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.923	0.907
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	163.95	172.94
Mass rings/tare (g)	44.87	44.87
Moist unit wt., $\gamma_m$ (pcf)	107.38	117.56
Wet soil + tare (g)	242.53	247.71
Dry soil + tare (g)	224.50	221.21
Tare (g)	121.61	120.83
Water content, w (%)	17.5	26.4
Dry unit wt., $\gamma_d$ (pcf)	91.37	93.01
Saturation	56.01	87.75

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1466	0.00	0.9230	0.845
20	0.1466	0.00	0.9230	0.845
100	0.1467	0.01	0.9229	0.844
200	0.1467	0.01	0.9229	0.844
500	0.1504	0.41	0.9192	0.837
1000	0.1539	0.79	0.9157	0.830
2000	0.1573	1.16	0.9123	0.823
500	0.1564	1.06	0.9132	0.825
100	0.1558	1.00	0.9138	0.826
200	0.1558	1.00	0.9138	0.826
500	0.1557	0.99	0.9139	0.826
1000	0.1560	1.02	0.9136	0.826
2000	0.1580	1.24	0.9116	0.822
2000	0.1628	1.76	0.9068	0.812



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

### Collapse/Swell Potential of Soils

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-5**

Sample:

Depth: **4.5'**

Sample Description: **Brown clay with sand**

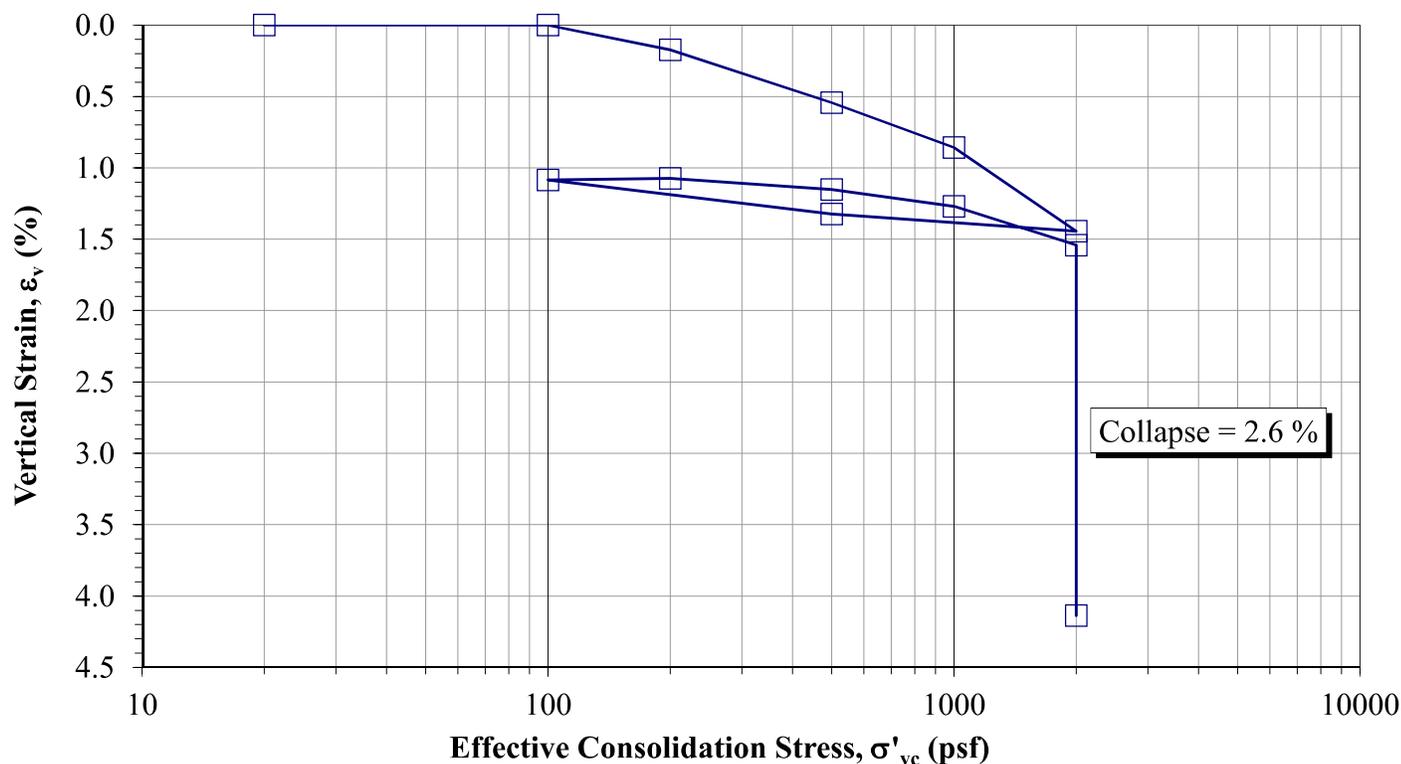
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 8  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 2.6  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.883
Sample diameter, D (in.)	2.415	2.415
Mass rings + wet soil (g)	164.24	171.73
Mass rings/tare (g)	45.55	45.55
Moist unit wt., $\gamma_m$ (pcf)	107.18	118.86
Wet soil + tare (g)	281.26	253.68
Dry soil + tare (g)	256.11	226.92
Tare (g)	127.36	128.09
Water content, w (%)	19.5	27.1
Dry unit wt., $\gamma_d$ (pcf)	89.66	93.53
Saturation	59.94	91.15

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1597	0.00	0.9210	0.880
20	0.1597	0.00	0.9210	0.880
100	0.1597	0.00	0.9210	0.880
200	0.1613	0.17	0.9194	0.877
500	0.1647	0.54	0.9160	0.870
1000	0.1676	0.86	0.9131	0.864
2000	0.1730	1.44	0.9077	0.853
500	0.1719	1.32	0.9088	0.855
100	0.1697	1.09	0.9110	0.859
200	0.1696	1.07	0.9111	0.860
500	0.1703	1.15	0.9104	0.858
1000	0.1714	1.27	0.9093	0.856
2000	0.1739	1.54	0.9068	0.851
2000	0.1978	4.14	0.8829	0.802



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-7**

Sample:

Depth: **3.5'**

Sample Description: **Brown clay**

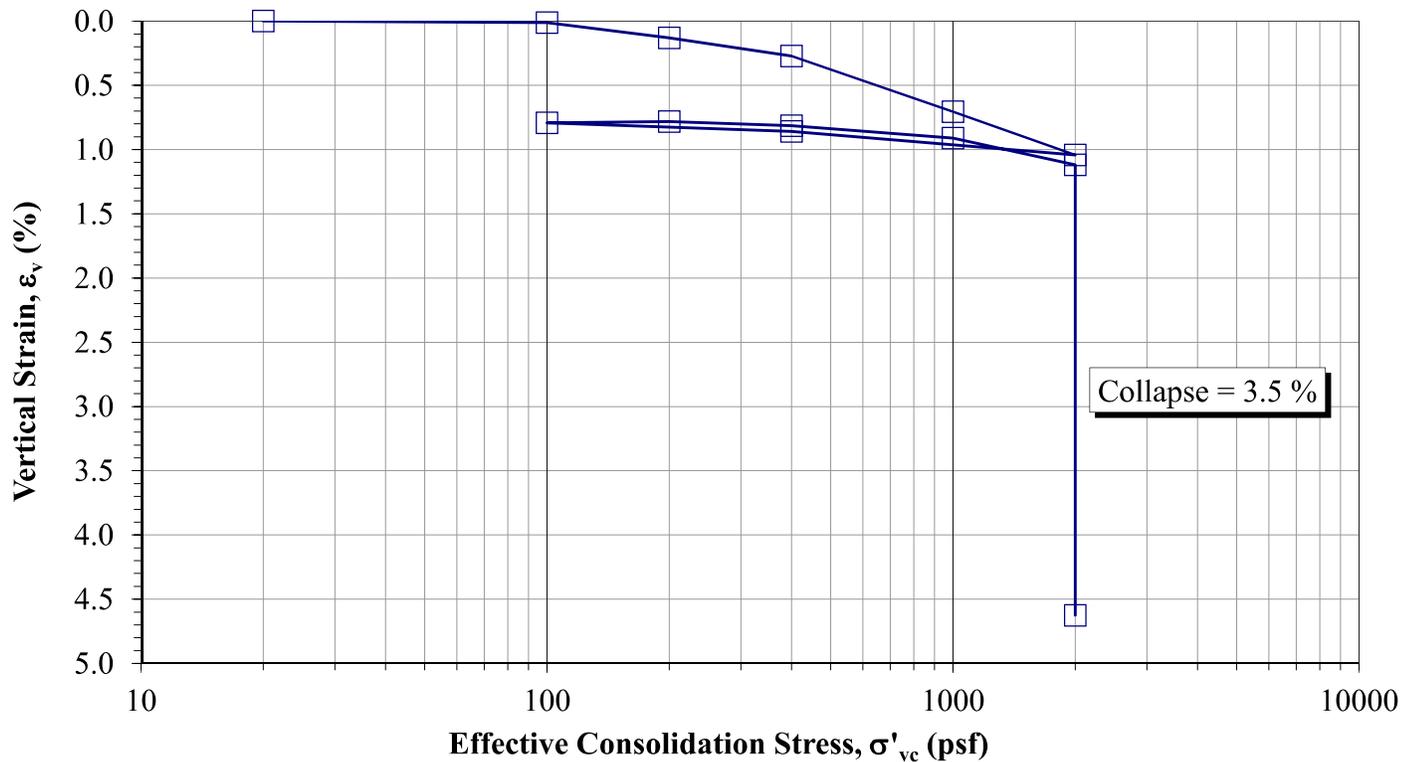
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: **9**  
 Specific gravity,  $G_s$ : **2.70** Assumed  
 Collapse (%): **3.5**  
 Collapse stress (psf): **2000**  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.878
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	148.00	161.60
Mass rings/tare (g)	45.46	45.46
Moist unit wt., $\gamma_m$ (pcf)	92.67	110.05
Wet soil + tare (g)	248.57	237.33
Dry soil + tare (g)	229.70	208.72
Tare (g)	120.17	121.44
Water content, w (%)	17.2	32.8
Dry unit wt., $\gamma_d$ (pcf)	79.05	82.88
Saturation	41.08	85.63

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1130	0.00	0.9210	1.132
20	0.1130	0.00	0.9210	1.132
100	0.1131	0.01	0.9209	1.132
200	0.1142	0.13	0.9198	1.129
400	0.1155	0.27	0.9185	1.126
1000	0.1195	0.71	0.9145	1.117
2000	0.1226	1.04	0.9114	1.110
400	0.1209	0.86	0.9131	1.114
100	0.1203	0.79	0.9137	1.115
200	0.1202	0.78	0.9138	1.116
400	0.1205	0.81	0.9135	1.115
1000	0.1214	0.91	0.9126	1.113
2000	0.1233	1.12	0.9107	1.108
2000	0.1556	4.63	0.8784	1.034



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

# **APPENDIX D**



Date: 2019-05-24T19:18:40.163Z

Reference Document: IBC-2015

URL: [https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare Complex](https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare%20Complex)

Parameters: latitude: 40.383064, longitude: -111.918064

Risk Category: II

Site Class: D

Title: Welfare Complex

Response Data:

pgauh: 0.395

pgad: 0.612

pga: 0.395

fpga: 1.105

pgam: 0.437

ssrt: 0.974

crs: 0.855

ssuh: 1.139

ssd: 1.759

ss: 0.974

fa: 1.11

sms: 1.082

sds: 0.721

sdcs: D

s1rt: 0.329

cr1: 0.854

s1uh: 0.385

s1d: 0.658

s1: 0.329

fv: 1.741

sm1: 0.573

sd1: 0.382

sd1: D

sd1: D



Project Number 03019-001

Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah

**MCE-PGA DESIGN RESONSE SPECTRA**

**Figure**

**C-1**

# **APPENDIX E**















Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

0.001

Lamp	Material	In	Q	R	S	T	U	V	W	X	Y	Z	Temperature		Density		Viscosity		Surface Tension		Contact Angle		Wettability		Adhesion		Spreading		Evaporation		Boiling Point		Freezing Point	
													Temp	Density	Viscosity	Surface Tension	Contact Angle	Adhesion	Spreading	Evaporation	Boiling Point	Freezing Point												
401	Aluminum	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	

## APPENDIX E - TRAFFIC STUDY

# Welfare Complex

## Traffic Impact Study



## Saratoga Springs, Utah

July 2, 2020

UT19-1451



## EXECUTIVE SUMMARY

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The Welfare Complex project is located on the west side of Redwood Road (SR-68), just north of 1140 North.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.

The evening peak hour level of service (LOS) was computed for each study intersection. The results of this analysis are shown in Table ES-1. Recommended storage lengths are shown in Table ES-2.

TABLE ES-1 LOS Analysis - Evening Peak Hour Saratoga Springs - Welfare Complex TIS Update				
Intersection	Level of Service (Sec/Veh) <sup>1</sup>			
	Existing (2020)		Future (2025)	
	Background	Plus Project	Background	Plus Project
Medical Drive (1140 North) / Redwood Road (SR-68)	B (11.4)	B (14.8)	B (17.1)	C (27.1)
Market Street / Redwood Road (SR-68)	A (8.0)	A (8.7)	B (10.9)	B (18.7)
Market Street / Pioneer Crossing (SR-145)	B (14.8)	B (14.8)	B (18.5)	B (14.6)
Commerce Drive / Redwood Road (SR-68)	f (>50) / WBL	f (>50) / WBL	B (12.7)	B (11.6)
Medical Drive / Exchange Drive	-	-	a (6.4) / EBT	a (6.5) / EBT
Access 1 / Redwood Road (SR-68) <sup>2</sup>	-	f (>50) / EBL	-	f (>50) / EBL
Access 2 / Medical Drive <sup>2</sup>	-	a (4.6) / SBL	-	a (6.1) / SBL
Access 3 / Medical Drive <sup>2</sup>	-	a (4.0) / SBL	-	a (6.2) / SBL

1. Intersection LOS and delay (seconds/vehicle) values represent the overall intersection average for roundabout, signalized, all-way stop-controlled intersections and the worst movement for all other unsignalized intersections. Uppercase LOS used for signalized, roundabout, and all-way stop-controlled intersections. Lowercase LOS used for one-way & two-way stop-controlled intersections.

2. This intersection is a project access and was only analyzed in "plus project" scenarios.

Source: Hales Engineering, July 2020

**TABLE ES-2**  
**Recommended Storage Lengths**  
**Saratoga Springs - Welfare Complex TIS Update**

Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

## **SUMMARY OF KEY FINDINGS/RECOMMENDATIONS**

The following is a summary of key findings and recommendations:

- The Commerce Drive / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour in existing (2020) background conditions. All other study intersections are currently operating at an acceptable LOS.
  - Commerce Drive / Redwood Road (SR-68) is anticipated to be signalized by the year 2025 with the completion of the Foothill Boulevard project as per UDOT agreement.
- The development will consist of welfare facilities, including a Deseret Industries thrift store and a Bishop's Storehouse/LDS Family Services facility.
- The Access 1 / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour with project traffic added. All other study intersections are anticipated to operate at an acceptable LOS.
  - It is anticipated that traffic will reroute to avoid left-turn movement delays onto Redwood Road. There is excess capacity at the accesses on Medical Drive that will accommodate these volumes. It is recommended that safety and operations be evaluated at this access and left-turn movements restricted if future problems are observed.
- All study intersections are anticipated to operate at an acceptable LOS during the evening peak hour in future (2025) background and plus project conditions.
- While no operational problems were observed between the offset of the western Costco access and the Access 2 / Medical Drive intersection, it is recommended that this access be evaluated for safety and restricted to right-in right-out (RIRO) access only if safety concerns are present.

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## I. INTRODUCTION

### A. Purpose

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The proposed project is located on the west side of Redwood Road (SR-68), just north of 1140 North. Figure 1 shows a vicinity map of the proposed development.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.



Figure 1: Vicinity map showing the project location in Saratoga Springs, Utah

## **B. Scope**

The study area was defined based on conversations with the development team. This study was scoped to evaluate the traffic operational performance impacts of the project on the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)
- Commerce Drive / Redwood Road (SR-68)
- Medical Drive / Exchange Drive (completed by 2025)
- Project Access / Redwood Road (SR-68)
- Project Accesses (2) / Medical Drive

## **C. Analysis Methodology**

Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. Table 1 provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections. Figure 2 provides a visual representation of each LOS letter designation.

The *Highway Capacity Manual* (HCM), 6<sup>th</sup> Edition, 2016 methodology was used in this study to remain consistent with “state-of-the-practice” professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized and all-way stop intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For all other unsignalized intersections, LOS is reported based on the worst movement.

Using Synchro/SimTraffic software, which follow the HCM methodology, the peak hour LOS was computed for each study intersection. Multiple runs of SimTraffic were used to provide a statistical evaluation of the interaction between the intersections. The detailed LOS reports are provided in Appendix B. Hales Engineering also calculated the 95<sup>th</sup> percentile queue lengths for the study intersections using SimTraffic. The detailed queue length reports are provided in Appendix D.

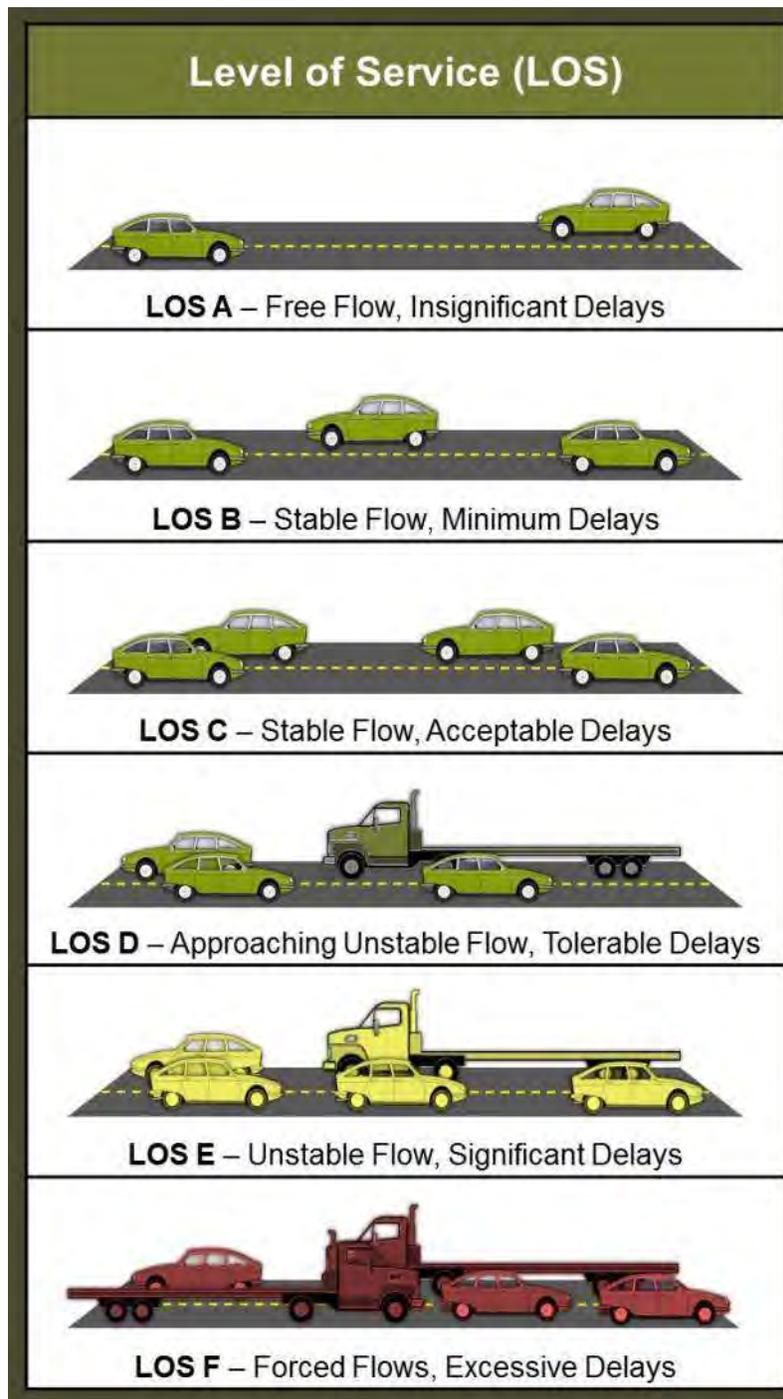
## **D. Level of Service Standards**

For the purposes of this study, a minimum acceptable intersection performance for each of the study intersections was set at LOS D. If levels of service E or F conditions exist, an explanation and/or mitigation measures will be presented. A LOS D threshold is consistent with “state-of-the-practice” traffic engineering principles for urbanized areas.

**Table 1: Level of Service Description**

Level of Service	Description of Traffic Conditions	Average Delay (seconds/vehicle)
		Signalized Intersections
A	Extremely favorable progression and an extremely low level of control delay. Individual users are virtually unaffected by others in the traffic stream.	0 ≤ 10.0
B	Good progression and a low level of control delay. The presence of other users in the traffic stream becomes noticeable.	> 10.0 and ≤ 20.0
C	Fair progression and a moderate level of control delay. The operation of individual users becomes somewhat affected by interactions with others in the traffic stream.	>20.0 and ≤ 35.0
D	Marginal progression with relatively elevated levels of control delay. Operating conditions are noticeably more constrained.	> 35.0 and ≤ 55.0
E	Poor progression with unacceptably elevated levels of control delay. Operating conditions are at or near capacity.	> 55.0 and ≤ 80.0
F	Unacceptable progression with forced or breakdown operating conditions.	> 80.0
Unsignalized Intersections		Worst Approach
A	Free Flow / Insignificant Delay	0 ≤ 10.0
B	Stable Operations / Minimum Delays	>10.0 and ≤ 15.0
C	Stable Operations / Acceptable Delays	>15.0 and ≤ 25.0
D	Approaching Unstable Flows / Tolerable Delays	>25.0 and ≤ 35.0
E	Unstable Operations / Significant Delays Can Occur	>35.0 and ≤ 50.0
F	Forced Flows / Unpredictable Flows / Excessive Delays Occur	> 50.0

Source: Hales Engineering Descriptions, based on the *Highway Capacity Manual (HCM)*, 6<sup>th</sup> Edition, 2016 Methodology (Transportation Research Board)



**Figure 2: Visual representation of the LOS letter designations**

## **II. EXISTING (2020) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the background analysis is to study the intersections and roadways during the peak travel periods of the day with background traffic and geometric conditions. Through this analysis, background traffic operational deficiencies can be identified, and potential mitigation measures recommended. This analysis provides a baseline condition that may be compared to the build conditions to identify the impacts of the development.

### **B. Roadway System**

The primary roadways that will provide access to the project site are described below:

Redwood Road (SR-68) – is a state-maintained roadway (classified by UDOT access management standards as a “Regional – Priority Urban Importance” facility, or access category 5 roadway). Redwood Road (SR-68) has two travel lanes in each direction separated by a two-way left-turn lane (TWLTL). As identified and controlled by UDOT, a “Regional – Priority Urban Importance” access classification identifies minimum signalized intersection spacing of one-half mile (2,640 feet), minimum unsignalized street spacing of 660 feet, and minimum driveway spacing of 350 feet. The posted speed limit on Redwood Road (SR-68) is 45 mph.

Medical Drive – is a future city-maintained roadway which is classified by the Saratoga Springs Transportation Master Plan (January 2019) as a local road. It was assumed that the roadway will have one lane in each direction separated by a TWLTL. The posted speed limit was assumed to be 30 mph in the study area.

### **C. Traffic Volumes**

Weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak period traffic counts were performed at the following intersections:

- Commerce Drive / Redwood Road (SR-68)

The counts were performed on Wednesday, June 24, 2020. The morning peak hour was determined to be between 7:45 and 8:45 a.m., and the evening peak hour was determined to be between 5:00 and 6:00 p.m. The evening peak hour volumes were approximately 70% higher than the morning peak hour volumes. Therefore, the evening peak hour volumes were used in the analysis to represent the worst-case conditions. Detailed count data are included in Appendix A.

*These traffic counts were collected during the COVID-19 pandemic when traffic volumes were slightly reduced due to social distancing measures. According to the UDOT Automatic Traffic Signal Performance Measures (ATSPM) website, the traffic volumes on March 10 (pre-social*

*distancing) were approximately 15% higher than those on June 14. Therefore, the collected data were increased by 15% to represent normal conditions.*

In addition to the counts conducted at the Commerce Drive / Redwood Road (SR-68) intersection, volumes from the previously conducted Kittelson & Associates Saratoga Springs Costco and Hales Engineering Osmond Development traffic impact studies were used for the evening peak hour background volumes at the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)

Figure 3 shows the existing evening peak hour volumes as well as intersection geometry at the study intersections.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement.

In addition to the two planned signals, the previously completed Kittelson & Associates TIS for the Costco development recommends a signal at the Medical Drive (1140 South) / Redwood Road (SR-68) intersection, which is also warranted by the projected volumes. While this signal does not meet current spacing requirements with the planned signal at Commerce Drive, it is anticipated that the necessary administrative decisions will be made to allow a signal at this location. Thus, for the 2020 background conditions analysis, it is assumed that the Market Street / Pioneer Crossing (SR-145), Commercial Drive / Redwood Road (SR-68), and Market Street (1140 North) / Redwood Road (SR-68) signals have been installed with the completion of the Costco development.

#### **D. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) intersection is currently operating at LOS F. All other study intersections are currently operating at acceptable levels of service during the evening peak hour, as shown in Table 2. These results serve as a baseline condition for the impact analysis of the proposed development during existing (2020) conditions.

#### **E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. Queuing of up to 800 feet was present on the westbound leg of the Commerce Drive / Redwood

Road (SR-68) intersection. No other significant queuing was observed during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended. The Commerce Drive / Redwood Road (SR-68) intersection is planned to be signalized with the completion of the Foothill Boulevard project as per UDOT agreement. Until then, traffic will reroute to adjacent signals if heavy delays are present.



**Table 2: Existing (2020) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	11.4	B
Market Street / Redwood Road (SR-68)	Signal	-	8.0	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
 2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

### **III. PROJECT CONDITIONS**

#### **A. Purpose**

The project conditions discussion explains the type and intensity of development. This provides the basis for trip generation, distribution, and assignment of project trips to the surrounding study intersections defined in Chapter I.

#### **B. Project Description**

The proposed Welfare Complex development is located on the west side of Redwood Road (SR-68), just north of 1140 North. The development will consist of welfare facilities owned and operated by The Church of Jesus Christ of Latter-day Saints including a Deseret Industries store, a Bishop's Storehouse, and a Family Services office. A concept plan for the proposed development is provided in Appendix C.

The proposed land use for the development has been identified as follows:

- Deseret Industries ~60,000 square feet
- Bishop's Storehouse / Family Services ~20,000 square feet

#### **C. Trip Generation**

Trip generation for the development is normally calculated using trip generation rates published in the Institute of Transportation Engineers (ITE), *Trip Generation*, 10<sup>th</sup> Edition, 2017. However, due to the unique land use of this development, Hales Engineering used trip generation data provided by the developer. Data were collected at the Welfare Complex in Springville, Utah in April 2019 for an entire week. According to the developer, the proposed facility will be practically identical to the Springville facility in size and operations. Detailed trip generation data is provided in Appendix E.

The peak days for trip generation were observed to be Friday and Saturday. However, it is anticipated that the highest combined volumes will be observed on a standard weekday when the background traffic volumes are highest. The Thursday trip generation was observed to be the highest of Tuesday, Wednesday, and Thursday. Therefore, the Thursday trip generation was applied as the proposed project's trip generation.

Trip generation for the proposed project is included in Table 3 and is as follows.

- Daily Trips: 3,014
- Morning Peak Hour Trips: 31
- Evening Peak Hour Trips: 266

**Table 3: Trip Generation**

<b>Saratoga Springs - Welfare Complex TIS Trip Generation</b>					
<b>Weekday Daily</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total Daily Trips
Deseret Industries	60	1,000 sq. ft.	1,356	1,356	2,712
Bishop's Storehouse	20	1,000 sq. ft.	108	108	216
Family Services			43	43	86
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>1,507</b>	<b>1,507</b>	<b>3,014</b>
<b>Morning Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total a.m. Trips
Deseret Industries	60	1,000 sq. ft.	17	9	26
Bishop's Storehouse	20	1,000 sq. ft.	2	0	2
Family Services			3	0	3
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>22</b>	<b>9</b>	<b>31</b>
<b>Evening Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total p.m. Trips
Deseret Industries	60	1,000 sq. ft.	109	119	228
Bishop's Storehouse	20	1,000 sq. ft.	15	15	30
Family Services			3	5	8
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>127</b>	<b>139</b>	<b>266</b>
1. Trip generation based on data collection completed at the Springville Welfare Complex in April 2019.					
SOURCE: Hales Engineering, July 2020					

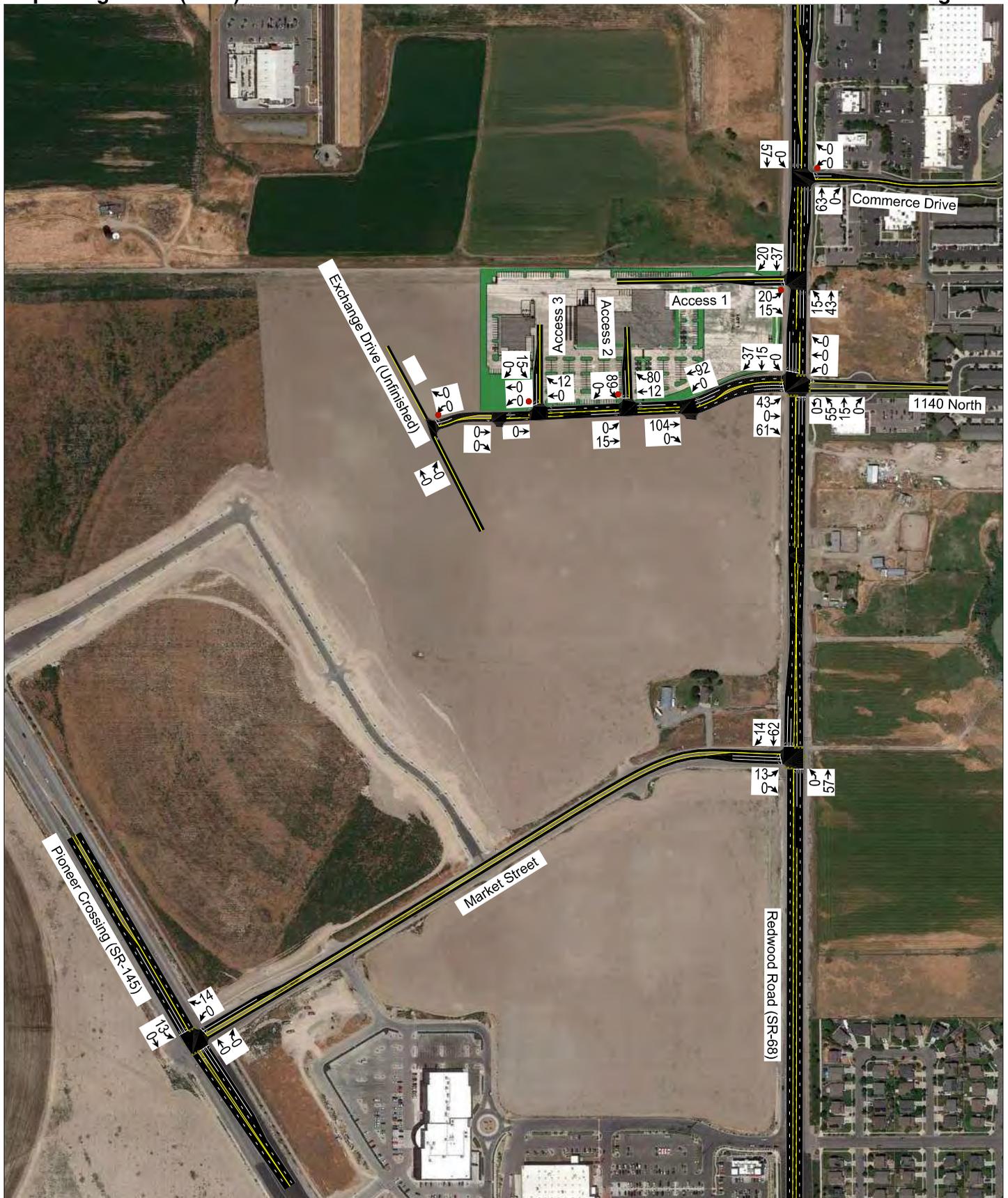
**D. Trip Distribution and Assignment**

Project traffic is assigned to the roadway network based on the type of trip and the proximity of project access points to major streets, high population densities, and regional trip attractions. Existing travel patterns observed during data collection also provide helpful guidance to establishing these distribution percentages, especially near the site. The resulting distribution of project generated trips during the evening peak hour is as follows:

To/From Project:

- 45% North
- 45% South
- 10% West

These trip distribution assumptions were used to assign the evening peak hour generated traffic at the study intersections to create trip assignment for the proposed development. Trip assignment for the development in 2020 conditions is shown in Figure 4. Considering future roadway connections via Exchange Drive to the north, south, and west, the trip assignment for the development in 2025 conditions is shown in Figure 5.





## **E. Access**

The proposed access for the site will be gained at the following locations (see also concept plan in Appendix C):

### Redwood Road (SR-68):

- Access 1 will be located approximately 320 feet south of the Commerce Drive / Redwood Drive (SR-68) intersection and approximately 350 north of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection. It will access the project on the west side of Redwood Road (SR-68). *It is anticipated that a variance will be needed for this access because it does not meet driveway spacing (350 feet) to the north.* It was assumed that this would be a full-movement access.
- The primary access road to the project will be Medical Drive. Medical Drive will be located on the west side of Redwood Road (SR-68), directly across from the existing 1140 North alignment. Medical Drive will eventually be a through road to Pioneer Crossing with other development in the area.

### Medical Drive:

- Access 2 will be located approximately 675 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.
- Access 3 will be located approximately 925 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.

It is recommended that separate egress left- and right-turn lanes be provided at all project accesses.

## **F. Auxiliary Lane Requirements**

Based on Administrative Rule R930-6, the following auxiliary lanes may be required for the proposed accesses onto Redwood Road (SR-68) (UDOT Access Category 5 roadway):

### Left-turn Deceleration Lane:

*Required when the projected peak hour left-turn ingress volume is greater than 10 vph:*

- With 15 northbound left-turns assumed, a left-turn lane may be required at Access 1. A center TWLTL currently exists and will serve as a left-turn lane for this access.
- With 55 northbound left-turns assumed, a left-turn lane may be required at Medical Drive. A center TWLTL currently exists and will serve as a left-turn lane at Medical Drive.

### Right-turn Deceleration Lane:

*Required when the projected peak hour right-turn ingress volume is greater than 25 vph:*

- With 20 southbound right-turns assumed, a southbound right-turn deceleration lane may not be required at Access 1. Therefore, a right-turn deceleration lane was not assumed for this access.
- With 37 southbound right-turns assumed, a southbound right-turn deceleration lane may be required at Medical Drive. It is recommended that a southbound right-turn lane be installed at this location.

Right-turn Acceleration Lane:

*Required when the projected peak hour right-turn egress volume is greater than 50 vph when the posted speed limit on the highway is greater than 40 mph.*

- With 15 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may not be required at Access 1. Therefore, a right-turn acceleration lane was not assumed for this access.
- With 61 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may be required at Medical Drive. However, a right-turn acceleration lane was not assumed for this access.

Left-turn Acceleration Lane:

*May be required if such a design will be a benefit to the safety and operation of the roadway.*

- A left-turn acceleration lane is not recommended at either access to Redwood Road (SR-68) due to the greater need for left-turn deceleration lane space in the TWLTL.

## **IV. EXISTING (2020) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the existing (2020) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for existing background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the existing (2020) background traffic volumes to predict turning movement volumes for existing (2020) plus project conditions. Existing (2020) plus project evening peak hour turning movement volumes are shown in Figure 6.

### **C. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) and Access 1 / Redwood Road (SR-68) intersections are anticipated to operate at LOS F during the evening peak hour with project traffic added. All other intersections are anticipated to operate at acceptable levels of service, as shown in Table 4.

### **D. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

The delay at the Access 1 / Redwood Road (SR-68) intersection is due to the difficulty in turning left onto Redwood Road during peak hours. Drivers at this access will learn to reroute to the accesses onto Medical Drive to avoid delays. Additional connections in the future with the construction of Exchange Drive and other roadways to the southwest of the development will provide other connection options. Drivers will continue to reroute at the Commerce Drive / Redwood Road (SR-68) intersection to avoid delays.



**Table 4: Existing (2020) Plus Project Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	14.8	B
Market Street / Redwood Road (SR-68)	Signal	-	8.7	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	4.6	a
Access 3 / Medical Drive	SB Stop	SBL	4.0	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **V. FUTURE (2025) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) background analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions. Through this analysis, future background traffic operational deficiencies can be identified, and potential mitigation measures recommended.

### **B. Roadway Network**

According to the Wasatch Front Regional Council (WFRC) Regional Transportation Plan, there are no projects planned before 2025 in the study area. Therefore, no changes were made to the roadway network for the future (2025) analysis.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement; therefore, the signal has been included within this analysis.

### **C. Traffic Volumes**

Hales Engineering obtained future (2025) forecasted volumes from the previously completed Saratoga Springs Costco TIS conducted by Kittelson & Associates in July 2019. This was done to maintain uniformity with other projects in the area and to layer these project volumes with those of previous studies. The Kittelson & Associates study assumed an annual growth rate of 2%, based on historic trends. In addition to the projected future background and Costco traffic, trip assignment from the nearby Osmond Development was also added into the background. Future (2025) evening peak hour turning movement volumes are shown in Figure 7.

### **D. Level of Service Analysis**

Hales Engineering determined that all study intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) background conditions, as shown in Table 5. These results serve as a baseline condition for the impact analysis of the proposed development for future (2025) conditions.

**E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended.



**Table 5: Future (2025) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	17.1	B
Market Street / Redwood Road (SR-68)	Signal	-	10.9	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	18.5	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	12.7	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.4	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **VI. FUTURE (2025) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on future background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the future (2025) background traffic volumes to predict turning movement volumes for future (2025) plus project conditions. Future (2025) plus project evening peak hour turning movement volumes are shown in Figure 8.

### **C. Level of Service Analysis**

Hales Engineering determined that all intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) plus project conditions, as shown in Table 6.

### **D. Queuing Analysis**

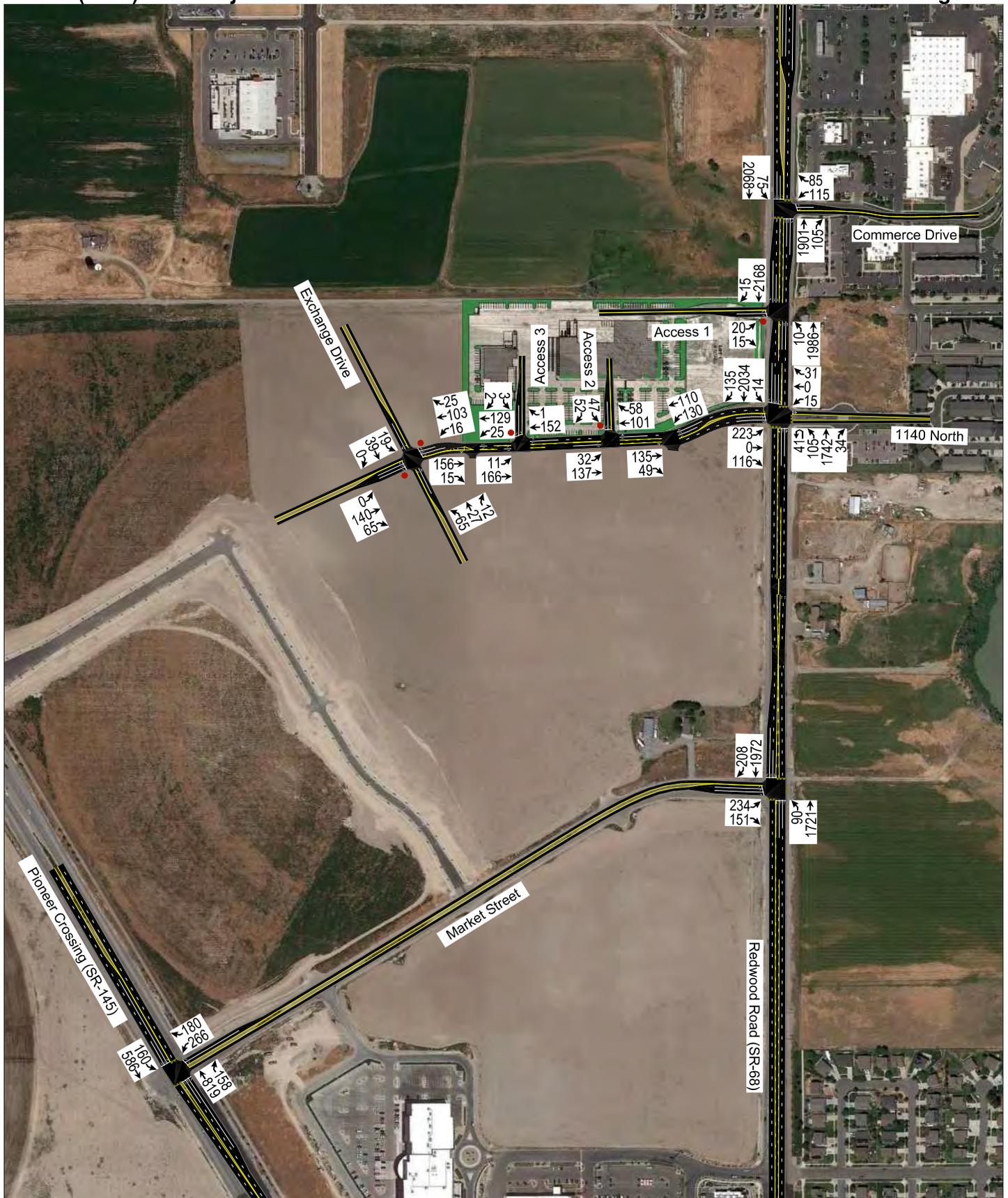
Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

No mitigation measures are recommended.

### **F. Recommended Storage Lengths**

Hales Engineering determined recommended storage lengths based on the 95<sup>th</sup> percentile queue lengths given in the future (2040) plus project scenario. These storage lengths do not include the taper length. Recommended storage lengths for the study intersections are shown in Table 7. Intersections shown in Table 7 include new intersections and existing intersections that have recommended storage length changes.



**Table 6: Future (2025) Plus Project Evening Peak Hour LOS**

Intersection Description	Control	Movement <sup>1</sup>	Level of Service	
			Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	27.1	C
Market Street / Redwood Road (SR-68)	Signal	-	18.7	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.6	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	11.6	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.5	a
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	6.1	a
Access 3 / Medical Drive	SB Stop	SBL	6.2	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

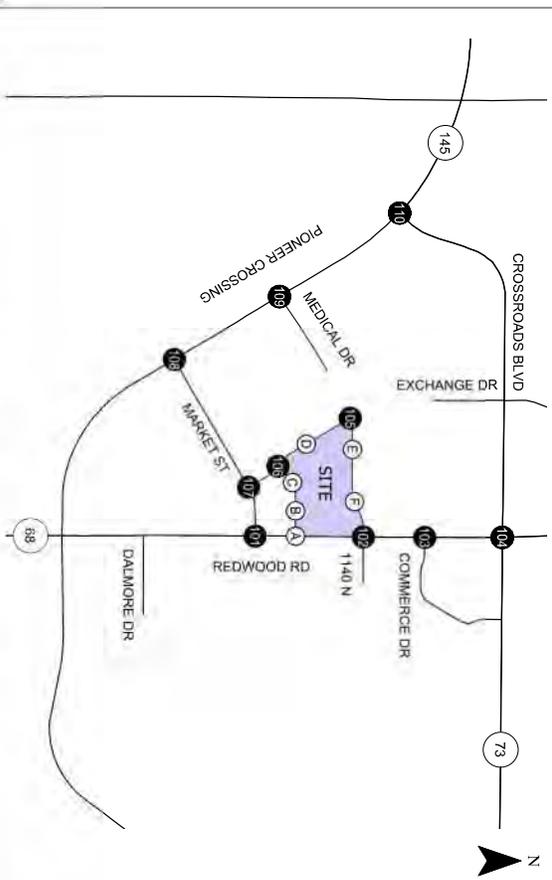
**Table 7: Recommended Storage Lengths**

Recommended Storage Lengths Saratoga Springs - Welfare Complex TIS Update								
Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

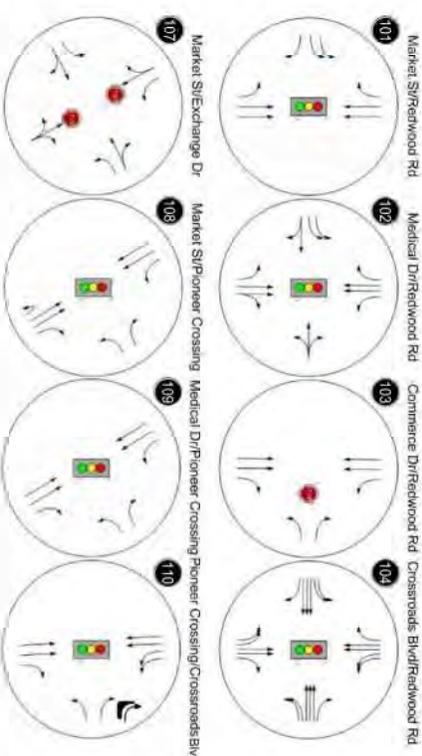
*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

# **APPENDIX A**

## Turning Movement Counts



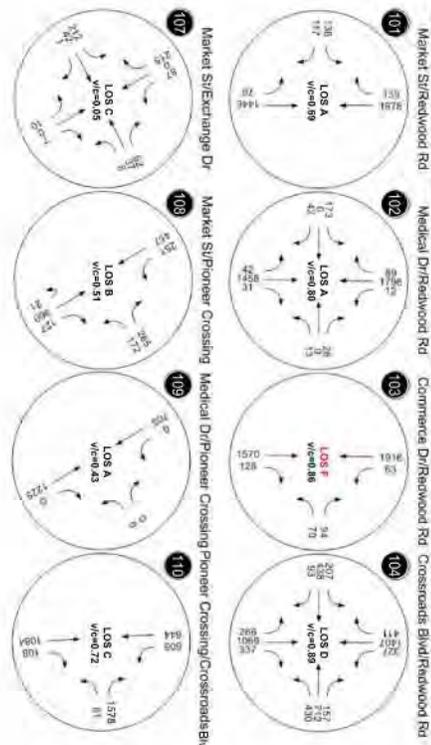
Lane Configurations



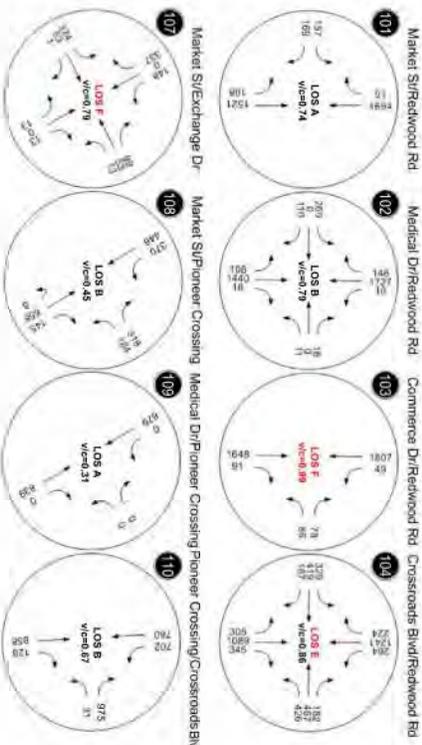
- Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



Weekday PM Peak Hour

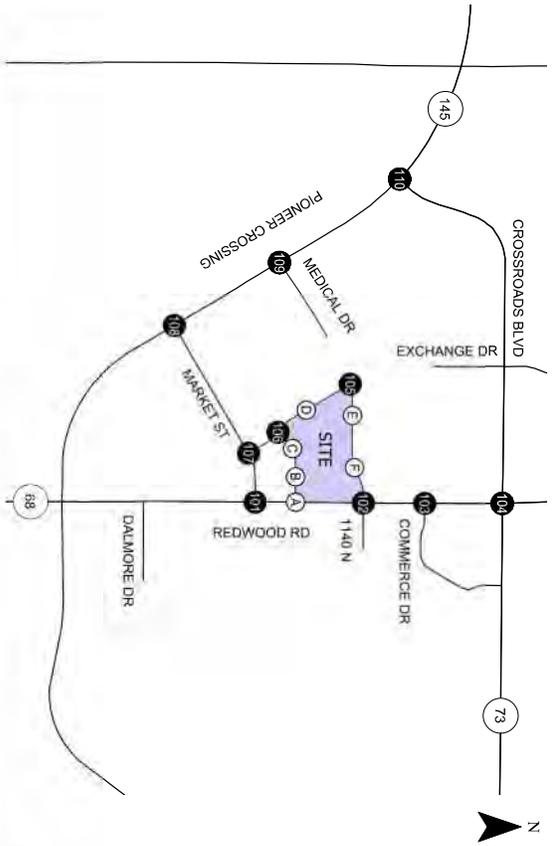


Saturday Midday Peak Hour

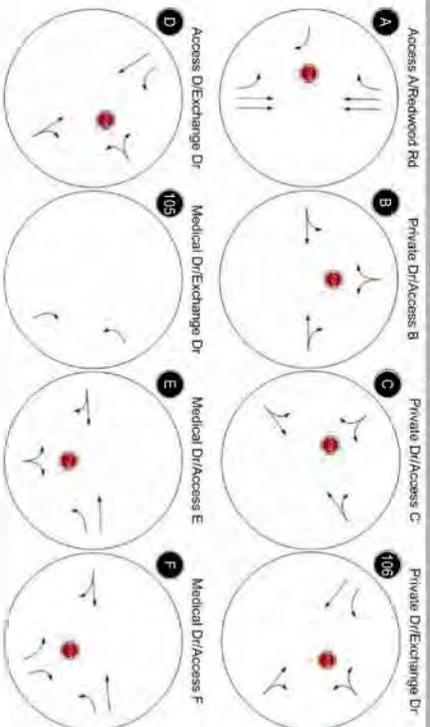


Year 2020 Total Traffic Conditions (Offsite Intersections)  
 Weekday PM and Saturday Midday Peak Hour  
 Saratoga Springs, Utah

Figure 9A



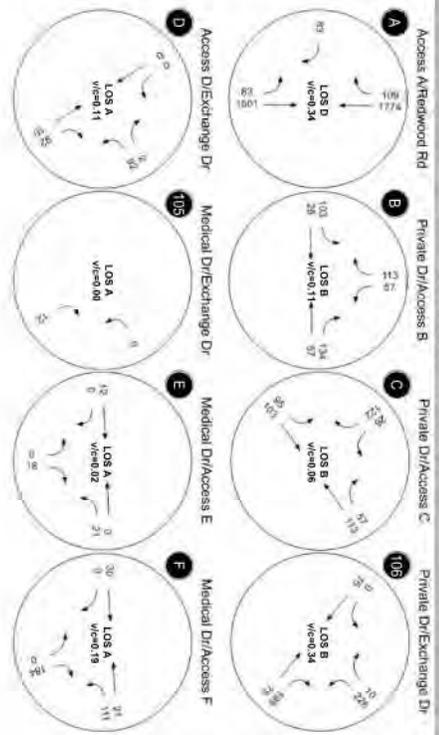
Lane Configurations



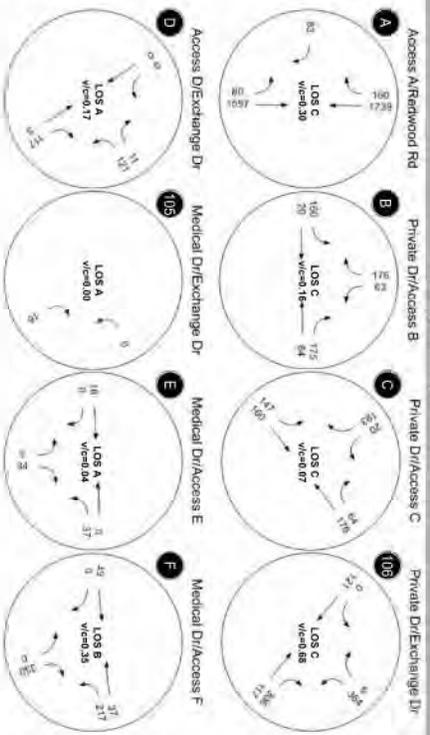
- Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



Weekday PM Peak Hour



Saturday Midday Peak Hour



Year 2020 Total Traffic Conditions (Onsite Intersections)  
 Weekday PM and Saturday Midday Peak Hour  
 Saratoga Springs, Utah  
 Figure 9B



# **APPENDIX B**

## **LOS Results**

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## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	42	43	102	56.6	E
	T	1,472	1,476	100	6.2	A
	R	31	33	106	3.7	A
	Subtotal	1,545	1,552	100	7.5	A
SB	L	12	12	100	22.6	C
	T	1,818	1,814	100	7.0	A
	R	89	88	99	3.0	A
	Subtotal	1,919	1,914	100	6.9	A
EB	L	173	172	99	73.2	E
	T	1	1	133	0.4	A
	R	42	44	104	32.8	C
	Subtotal	216	217	100	64.7	E
WB	L	13	12	92	67.9	E
	R	28	30	106	21.2	C
	Subtotal	41	42	102	34.5	C
<b>Total</b>		3,763	3,767	100	11.4	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	45.9	D
	T	1,486	1,502	101	4.8	A
	Subtotal	1,556	1,570	101	6.6	A
SB	T	1,723	1,719	100	2.2	A
	R	166	165	99	1.4	A
	Subtotal	1,889	1,884	100	2.1	A
EB	L	163	156	96	79.9	E
	T	98	103	105	1.9	A
	R	117	116	99	30.1	C
	Subtotal	378	375	99	43.1	D
<b>Total</b>		3,823	3,829	100	8.0	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	971	101	11.4	B
	R	127	129	102	4.6	A
	Subtotal	1,087	1,100	101	10.6	B
SB	L	251	248	99	27.5	C
	T	457	457	100	4.1	A
	Subtotal	708	705	100	12.3	B
WB	L	172	175	102	52.9	D
	R	265	263	99	13.2	B
	Subtotal	437	438	100	29.1	C
<b>Total</b>		2,232	2,243	101	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,576	1,576	100	2.8	A
	R	97	98	101	2.4	A
	Subtotal	1,673	1,674	100	2.8	A
SB	L	66	64	97	31.3	D
	T	1,814	1,825	101	7.8	A
	Subtotal	1,880	1,889	100	8.6	A
WB	<b>L</b>	<b>105</b>	<b>88</b>	<b>84</b>	<b>412.9</b>	<b>F</b>
	R	78	68	87	258.9	F
	Subtotal	183	156	85	345.8	F
<b>Total</b>		3,736	3,719	100	22.2	C

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour Project #: UT19-1451

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>12</b>	<b>100</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	12	100	0.0	A
<b>Total</b>		12	12	100	0.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	3.6	0.0	0.4	0.2	0.2	0.7	0.7	2.6	0.0	0.1	3.5	0.1
Total Del/Veh (s)	73.2	0.4	32.8	67.9	21.2	56.8	56.6	6.2	3.7	22.6	7.0	3.0
Vehicles Entered	172	1	44	12	30	41	43	1475	33	12	1813	88
Vehicles Exited	172	1	44	12	30	42	43	1476	33	12	1814	88
Hourly Exit Rate	172	1	44	12	30	42	43	1476	33	12	1814	88
Input Volume	173	1	42	13	28	41	42	1472	31	12	1818	89
% of Volume	99	133	104	92	106	102	102	100	106	100	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	12.0
Total Del/Veh (s)	11.4
Vehicles Entered	3764
Vehicles Exited	3767
Hourly Exit Rate	3767
Input Volume	3763
% of Volume	100

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.5	0.1	1.0	0.9	2.0	1.0	0.1	8.6
Total Del/Veh (s)	79.9	1.9	30.1	45.9	4.8	2.2	1.4	8.0
Vehicles Entered	157	104	116	68	1505	1718	164	3832
Vehicles Exited	156	103	116	68	1502	1719	165	3829
Hourly Exit Rate	156	103	116	68	1502	1719	165	3829
Input Volume	163	98	117	70	1486	1723	166	3823
% of Volume	96	105	99	97	101	100	99	100

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.4	1.7	0.3	2.5	3.1	0.2	0.9
Total Delay (hr)	2.6	1.0	3.1	0.2	1.9	0.5	9.3
Total Del/Veh (s)	52.9	13.2	11.4	4.6	27.5	4.1	14.8
Vehicles Entered	174	264	973	129	248	457	2245
Vehicles Exited	175	263	971	129	248	457	2243
Hourly Exit Rate	175	263	971	129	248	457	2243
Input Volume	172	265	960	127	251	457	2232
% of Volume	102	99	101	102	99	100	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	2.0	1.2	0.0	0.0	0.0	0.0	3.2
Denied Del/Veh (s)	68.3	58.3	0.0	0.0	0.0	0.0	3.1
Total Delay (hr)	12.0	5.3	1.2	0.1	0.6	4.0	23.2
Total Del/Veh (s)	412.9	258.9	2.8	2.4	31.3	7.8	22.2
Vehicles Entered	98	74	1580	98	65	1826	3741
Vehicles Exited	88	68	1576	98	64	1825	3719
Hourly Exit Rate	88	68	1576	98	64	1825	3719
Input Volume	105	78	1576	97	66	1814	3736
% of Volume	84	87	100	101	97	101	100

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	12	12
Vehicles Exited	12	12
Hourly Exit Rate	12	12
Input Volume	12	12
% of Volume	100	100

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Total Zone Performance

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Denied Delay (hr)	4.0
Denied Del/Veh (s)	3.7
Total Delay (hr)	58.9
Total Del/Veh (s)	25.1
Vehicles Entered	3813
Vehicles Exited	8271
Hourly Exit Rate	8271
Input Volume	21708
% of Volume	38

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	146	173	77	90	136	243	274	38	284	308	118
Average Queue (ft)	71	97	25	33	67	103	104	10	106	126	17
95th Queue (ft)	130	157	59	74	117	209	218	32	227	257	81
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			180			180
Storage Blk Time (%)	4	14			1	4			2	4	
Queuing Penalty (veh)	3	12			8	3			0	4	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	136	162	150	118	214	197	134	127	59
Average Queue (ft)	71	79	58	50	71	56	35	35	13
95th Queue (ft)	124	136	116	97	172	150	99	95	39
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0	0	1			0	
Queuing Penalty (veh)	0	0	1	2	1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	243	189	360	299	99	236	120	98
Average Queue (ft)	133	72	180	127	36	113	50	36
95th Queue (ft)	213	140	318	264	79	196	105	84
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	4	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	SB	SB	SB
Directions Served	L	R	R	L	T	T
Maximum Queue (ft)	671	150	23	101	122	8
Average Queue (ft)	443	103	2	42	6	0
95th Queue (ft)	785	208	13	84	51	8
Link Distance (ft)	658				865	865
Upstream Blk Time (%)	25					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		50	130	85		
Storage Blk Time (%)	98	11		2	0	
Queuing Penalty (veh)	76	11		15	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 142

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	97	96	99	65.6	E
	T	1,487	1,492	100	7.9	A
	R	31	31	99	5.6	A
	Subtotal	1,615	1,619	100	11.3	B
SB	L	12	12	100	34.0	C
	T	1,833	1,792	98	9.0	A
	R	126	123	98	2.1	A
	Subtotal	1,971	1,927	98	8.7	A
EB	L	216	218	101	69.0	E
	T	1	1	100	0.5	A
	R	103	104	101	38.0	D
	Subtotal	320	323	101	58.8	E
WB	L	13	11	85	72.8	E
	R	28	32	113	25.1	C
	Subtotal	41	43	105	37.3	D
<b>Total</b>		3,988	3,952	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	44.3	D
	T	1,543	1,541	100	5.4	A
	Subtotal	1,613	1,609	100	7.0	A
SB	T	1,784	1,752	98	2.9	A
	R	180	178	99	1.6	A
	Subtotal	1,964	1,930	98	2.8	A
EB	L	176	175	99	76.3	E
	T	98	103	105	2.0	A
	R	117	113	97	30.8	C
	Subtotal	391	391	100	43.6	D
<b>Total</b>		3,968	3,930	99	8.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	942	98	10.8	B
	R	127	132	104	4.5	A
	Subtotal	1,087	1,074	99	10.0	A
SB	L	264	258	98	27.2	C
	T	457	451	99	4.3	A
	Subtotal	721	709	98	12.6	B
WB	L	172	170	99	55.6	E
	R	279	275	99	13.3	B
	Subtotal	451	445	99	29.5	C
<b>Total</b>		2,259	2,228	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,639	1,642	100	1.2	A
	R	97	102	105	0.5	A
	Subtotal	1,736	1,744	100	1.2	A
SB	L	66	70	106	41.0	E
	T	1,872	1,856	99	8.6	A
	Subtotal	1,938	1,926	99	9.8	A
WB	<b>L</b>	<b>105</b>	<b>79</b>	<b>75</b>	<b>535.8</b>	<b>F</b>
	R	78	58	75	339.5	F
	Subtotal	183	137	75	452.7	F
<b>Total</b>		3,856	3,807	99	25.2	D

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>11</b>	<b>92</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	11	92	0.0	A
<b>Total</b>		12	11	92	0.0	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	L	15	15	100	76.3	F
	T	1,716	1,725	101	2.0	A
	Subtotal	1,731	1,740	101	2.6	A
<b>SB</b>	T	1,956	1,914	98	2.0	A
	R	20	20	100	0.4	A
	Subtotal	1,976	1,934	98	2.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>189.8</b>	<b>F</b>
	R	15	16	107	45.2	E
	Subtotal	35	35	100	123.7	F
<b>Total</b>		3,742	3,709	99	3.5	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>89</b>	<b>90</b>	<b>101</b>	<b>4.6</b>	<b>A</b>
	Subtotal	89	90	101	4.6	A
EB	T	45	47	104	0.3	A
	Subtotal	45	47	104	0.3	A
WB	T	34	33	97	0.3	A
	R	80	79	99	0.2	A
	Subtotal	114	112	98	0.2	A
<b>Total</b>		248	249	101	1.8	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>15</b>	<b>17</b>	<b>113</b>	<b>4.0</b>	<b>A</b>
	Subtotal	15	17	113	4.0	A
EB	T	31	31	100	0.2	A
	Subtotal	31	31	100	0.2	A
WB	T	22	20	91	0.1	A
	R	12	12	100	0.2	A
	Subtotal	34	32	94	0.1	A
<b>Total</b>		80	80	100	1.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.1	0.2	0.2	0.8	1.7	3.3	0.0	0.1	4.5	0.1
Total Del/Veh (s)	69.0	0.5	38.0	72.8	25.1	68.1	65.6	7.9	5.6	34.0	9.0	2.1
Vehicles Entered	217	1	104	11	32	40	96	1495	31	12	1795	123
Vehicles Exited	218	1	104	11	32	40	96	1492	31	12	1792	123
Hourly Exit Rate	218	1	104	11	32	40	96	1492	31	12	1792	123
Input Volume	216	1	103	13	28	41	97	1487	31	12	1833	126
% of Volume	101	100	101	85	113	97	99	100	99	100	98	98

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	16.3
Total Del/Veh (s)	14.8
Vehicles Entered	3957
Vehicles Exited	3952
Hourly Exit Rate	3952
Input Volume	3988
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.8	0.1	1.0	0.8	2.3	1.4	0.1	9.5
Total Del/Veh (s)	76.3	2.0	30.8	44.3	5.4	2.9	1.6	8.7
Vehicles Entered	175	103	113	68	1541	1751	178	3929
Vehicles Exited	175	103	113	68	1541	1752	178	3930
Hourly Exit Rate	175	103	113	68	1541	1752	178	3930
Input Volume	176	98	117	70	1543	1784	180	3968
% of Volume	99	105	97	97	100	98	99	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.3	1.6	0.2	2.6	3.0	0.2	0.9
Total Delay (hr)	2.7	1.0	2.9	0.2	2.0	0.5	9.3
Total Del/Veh (s)	55.6	13.3	10.8	4.5	27.2	4.3	14.8
Vehicles Entered	170	274	943	132	259	451	2229
Vehicles Exited	170	275	942	132	258	451	2228
Hourly Exit Rate	170	275	942	132	258	451	2228
Input Volume	172	279	960	127	264	457	2259
% of Volume	99	99	98	104	98	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	6.2	4.5	0.0	0.0	0.0	0.0	10.7
Denied Del/Veh (s)	210.3	211.4	0.0	0.0	0.0	0.0	10.0
Total Delay (hr)	14.7	6.4	0.5	0.0	0.8	4.4	26.9
Total Del/Veh (s)	535.8	339.5	1.2	0.5	41.0	8.6	25.2
Vehicles Entered	90	64	1642	102	69	1858	3825
Vehicles Exited	79	58	1642	102	70	1856	3807
Hourly Exit Rate	79	58	1642	102	70	1856	3807
Input Volume	105	78	1639	97	66	1872	3856
% of Volume	75	75	100	105	106	99	99

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	11	11
Vehicles Exited	11	11
Hourly Exit Rate	11	11
Input Volume	12	12
% of Volume	92	92

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.1	0.2	0.3	1.0	1.0	0.0	3.6
Total Del/Veh (s)	189.8	45.2	76.3	2.0	2.0	0.4	3.5
Vehicles Entered	19	16	15	1727	1916	20	3713
Vehicles Exited	19	16	15	1725	1914	20	3709
Hourly Exit Rate	19	16	15	1725	1914	20	3709
Input Volume	20	15	15	1716	1956	20	3742
% of Volume	95	107	100	101	98	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1
Total Delay (hr)	0.0	0.0	0.0	0.1	0.1
Total Del/Veh (s)	0.3	0.3	0.2	4.6	1.8
Vehicles Entered	47	32	79	90	248
Vehicles Exited	47	33	79	90	249
Hourly Exit Rate	47	33	79	90	249
Input Volume	45	34	80	89	248
% of Volume	104	97	99	101	101

27: Medical Drive & Access 3 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.2	0.1	0.2	4.0	1.0
Vehicles Entered	31	20	12	17	80
Vehicles Exited	31	20	12	17	80
Hourly Exit Rate	31	20	12	17	80
Input Volume	31	22	12	15	80
% of Volume	100	91	100	113	100

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Total Zone Performance

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Denied Delay (hr)	11.5
Denied Del/Veh (s)	10.4
Total Delay (hr)	71.8
Total Del/Veh (s)	29.8
Vehicles Entered	3947
Vehicles Exited	8447
Hourly Exit Rate	8447
Input Volume	26562
% of Volume	32

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	171	195	148	97	220	271	268	67	272	294	130
Average Queue (ft)	88	114	63	34	111	132	133	9	142	154	22
95th Queue (ft)	153	175	124	75	193	242	239	37	257	277	77
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)									0	1	0
Queuing Penalty (veh)									4	5	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	21			11	6			15	11	
Queuing Penalty (veh)	8	22			85	8			2	14	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	165	169	145	104	207	193	166	167	61
Average Queue (ft)	82	90	56	49	77	64	57	63	18
95th Queue (ft)	137	147	116	90	184	164	137	146	48
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0		2			0	
Queuing Penalty (veh)	0	1	0		1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	238	171	335	306	89	227	115	94
Average Queue (ft)	131	73	168	121	37	118	51	35
95th Queue (ft)	211	137	297	261	72	199	107	81
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	5	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	R	L	T	T
Maximum Queue (ft)	679	150	4	32	114	122	47
Average Queue (ft)	506	92	0	3	49	11	2
95th Queue (ft)	844	203	4	19	97	67	25
Link Distance (ft)	658		303			865	865
Upstream Blk Time (%)	44						
Queuing Penalty (veh)	0						
Storage Bay Dist (ft)		50		130	85		
Storage Blk Time (%)	97	8			3	0	
Queuing Penalty (veh)	75	8			32	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	96	48	63	40	55	2
Average Queue (ft)	31	12	17	3	4	0
95th Queue (ft)	84	35	50	29	35	2
Link Distance (ft)	595			303	303	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		100	100			150
Storage Blk Time (%)	3		1		0	
Queuing Penalty (veh)	0		5		0	

Intersection: 24: Medical Drive & Access 2

Movement	SB
Directions Served	L
Maximum Queue (ft)	67
Average Queue (ft)	35
95th Queue (ft)	56
Link Distance (ft)	256
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 27: Medical Drive & Access 3

Movement	SB
Directions Served	L
Maximum Queue (ft)	28
Average Queue (ft)	10
95th Queue (ft)	29
Link Distance (ft)	278
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 278

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	75	75	100	79.2	E
	T	1,732	1,728	100	9.6	A
	R	34	34	99	7.4	A
	Subtotal	1,841	1,837	100	12.4	B
SB	L	14	14	100	54.7	D
	T	2,134	2,079	97	13.3	B
	R	106	102	96	6.7	A
	Subtotal	2,254	2,195	97	13.3	B
EB	L	208	209	100	71.3	E
	R	81	79	98	40.6	D
	Subtotal	289	288	100	62.9	E
WB	L	15	14	93	71.4	E
	R	31	36	115	31.9	C
	Subtotal	46	50	109	43.0	D
<b>Total</b>		4,472	4,407	99	17.1	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	74	73	99	57.0	E
	T	1,681	1,670	99	7.6	A
	Subtotal	1,755	1,743	99	9.7	A
SB	T	1,922	1,864	97	3.2	A
	R	208	204	98	1.8	A
	Subtotal	2,130	2,068	97	3.1	A
EB	L	234	239	102	68.5	E
	R	139	141	101	39.0	D
	Subtotal	373	380	102	57.6	E
<b>Total</b>		4,258	4,191	98	10.9	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	822	100	7.2	A
	R	158	159	101	3.8	A
	Subtotal	977	981	100	6.6	A
SB	L	160	165	103	22.5	C
	T	586	578	99	4.5	A
	Subtotal	746	743	100	8.5	A
WB	L	266	256	96	91.1	F
	R	180	177	98	18.8	B
	Subtotal	446	433	97	61.5	E
<b>Total</b>		2,169	2,157	99	18.5	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,866	1,866	100	6.5	A
	R	105	107	102	4.3	A
	Subtotal	1,971	1,973	100	6.4	A
SB	L	75	69	92	61.8	E
	T	2,140	2,083	97	12.4	B
	Subtotal	2,215	2,152	97	14.0	B
WB	L	115	116	101	76.6	E
	R	85	84	99	40.1	D
	Subtotal	200	200	100	61.3	E
<b>Total</b>		4,385	4,325	99	12.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	65	100	1.7	A
	T	27	26	95	0.1	A
	R	2	2	100	0.1	A
	Subtotal	94	93	99	1.2	A
SB	T	39	37	94	0.1	A
	Subtotal	39	37	95	0.1	A
<b>EB</b>	<b>T</b>	<b>126</b>	<b>126</b>	<b>100</b>	<b>6.4</b>	<b>A</b>
	R	65	65	100	3.1	A
	Subtotal	191	191	100	5.3	A
WB	T	90	86	95	5.2	A
	Subtotal	90	86	96	5.2	A
<b>Total</b>		416	407	98	3.9	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.9	0.3	0.3	0.8	1.7	4.7	0.1	0.2	7.8	0.2	21.1
Total Del/Veh (s)	71.3	40.6	71.4	31.9	76.9	79.2	9.6	7.4	54.7	13.3	6.7	17.1
Vehicles Entered	208	79	13	36	37	76	1726	33	14	2082	102	4406
Vehicles Exited	209	79	14	36	37	75	1728	34	14	2079	102	4407
Hourly Exit Rate	209	79	14	36	37	75	1728	34	14	2079	102	4407
Input Volume	208	81	15	31	41	75	1732	34	14	2134	106	4472
% of Volume	100	98	93	115	90	100	100	99	100	97	96	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.0	0.3
Denied Del/Veh (s)	0.2	0.5	1.9	0.4	0.0	0.0	0.2
Total Delay (hr)	4.6	1.6	1.2	3.6	1.7	0.1	12.8
Total Del/Veh (s)	68.5	39.0	57.0	7.6	3.2	1.8	10.9
Vehicles Entered	238	141	73	1673	1864	204	4193
Vehicles Exited	239	141	73	1670	1864	204	4191
Hourly Exit Rate	239	141	73	1670	1864	204	4191
Input Volume	234	139	74	1681	1922	208	4258
% of Volume	102	101	99	99	97	98	98

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.4	0.2	2.7	3.0	0.2	0.7
Total Delay (hr)	6.7	0.9	1.7	0.2	1.0	0.7	11.2
Total Del/Veh (s)	91.1	18.8	7.2	3.8	22.5	4.5	18.5
Vehicles Entered	257	178	822	159	165	579	2160
Vehicles Exited	256	177	822	159	165	578	2157
Hourly Exit Rate	256	177	822	159	165	578	2157
Input Volume	266	180	819	158	160	586	2169
% of Volume	96	98	100	101	103	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.9	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	0.9	3.4	0.1	1.2	7.2	15.4
Total Del/Veh (s)	76.6	40.1	6.5	4.3	61.8	12.4	12.7
Vehicles Entered	117	84	1865	107	69	2082	4324
Vehicles Exited	116	84	1866	107	69	2083	4325
Hourly Exit Rate	116	84	1866	107	69	2083	4325
Input Volume	115	85	1866	105	75	2140	4385
% of Volume	101	99	100	102	92	97	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBT	NBL	NBT	NBR	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.4	3.8	0.0	4.0	0.3	0.2	0.1	1.4
Total Delay (hr)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	6.4	3.1	5.2	1.7	0.1	0.1	0.1	3.9
Vehicles Entered	126	65	86	65	26	2	37	407
Vehicles Exited	126	65	86	65	26	2	37	407
Hourly Exit Rate	126	65	86	65	26	2	37	407
Input Volume	126	65	90	65	27	2	39	416
% of Volume	100	100	95	100	95	100	94	98

Total Zone Performance

Denied Delay (hr)	1.0
Denied Del/Veh (s)	0.8
Total Delay (hr)	67.5
Total Del/Veh (s)	26.4
Vehicles Entered	4257
Vehicles Exited	8999
Hourly Exit Rate	8999
Input Volume	24695
% of Volume	36

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	176	200	125	101	236	338	354	81	379	398	248
Average Queue (ft)	86	113	50	40	106	170	169	16	193	212	35
95th Queue (ft)	152	175	103	84	191	306	309	53	335	351	146
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	20			9	9			20	15	
Queuing Penalty (veh)	8	20			77	10			3	16	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	174	238	206	150	282	282	180	188	63
Average Queue (ft)	94	113	83	60	134	112	70	66	20
95th Queue (ft)	150	186	163	115	237	225	140	141	53
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	1	1	4			0	
Queuing Penalty (veh)	2	6	2	6	3			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	495	279	263	216	95	150	147	124
Average Queue (ft)	260	110	139	77	40	76	70	47
95th Queue (ft)	498	292	227	174	78	129	128	102
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	29	0		0				
Queuing Penalty (veh)	53	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	281	150	188	179	74	129	179	202
Average Queue (ft)	119	63	80	83	12	56	78	94
95th Queue (ft)	220	136	162	168	46	108	161	185
Link Distance (ft)	658		675	675			865	865
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	14		2		6	5	
Queuing Penalty (veh)	48	16		2		64	4	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	NB	SB
Directions Served	T	R	T	L	TR
Maximum Queue (ft)	80	45	62	30	2
Average Queue (ft)	38	27	25	3	0
95th Queue (ft)	66	44	46	19	3
Link Distance (ft)	501		151		492
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100		100	
Storage Blk Time (%)	0		0		
Queuing Penalty (veh)	0		0		

Zone Summary

Zone wide Queuing Penalty: 341

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	105	98	94	219.6	F
	T	1,743	1,689	97	20.2	C
	R	34	34	99	13.3	B
	Subtotal	1,882	1,821	97	30.8	C
SB	L	14	13	93	54.4	D
	T	2,034	2,037	100	14.0	B
	R	135	133	99	3.3	A
	Subtotal	2,183	2,183	100	13.6	B
EB	L	223	223	100	67.8	E
	T	1	1	133	0.6	A
	R	116	118	102	48.3	D
	Subtotal	340	342	101	60.9	E
WB	L	15	16	107	73.3	E
	R	31	30	96	39.3	D
	Subtotal	46	46	100	51.1	D
<b>Total</b>		4,492	4,432	99	27.1	C

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	90	91	101	70.3	E
	T	1,721	1,682	98	24.5	C
	Subtotal	1,811	1,773	98	26.9	C
SB	T	1,972	1,967	100	4.6	A
	R	208	214	103	2.6	A
	Subtotal	2,180	2,181	100	4.4	A
EB	L	234	246	105	68.6	E
	R	151	153	101	44.7	D
	Subtotal	385	399	104	59.4	E
<b>Total</b>		4,376	4,353	99	18.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	824	101	10.5	B
	R	158	165	104	3.7	A
	Subtotal	977	989	101	9.4	A
SB	L	160	167	104	23.2	C
	T	586	578	99	6.0	A
	Subtotal	746	745	100	9.9	A
WB	L	266	273	103	48.1	D
	R	180	184	102	10.3	B
	Subtotal	446	457	102	32.9	C
<b>Total</b>		2,169	2,191	101	14.6	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,902	1,844	97	5.2	A
	R	105	106	101	2.0	A
	Subtotal	2,007	1,950	97	5.0	A
SB	L	75	74	99	60.7	E
	T	2,069	2,075	100	11.2	B
	Subtotal	2,144	2,149	100	12.9	B
WB	L	115	113	98	79.8	E
	R	85	82	97	41.8	D
	Subtotal	200	195	98	63.8	E
<b>Total</b>		4,350	4,294	99	11.6	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	61	93	1.6	A
	T	27	26	95	0.2	A
	R	12	12	100	0.2	A
	Subtotal	104	99	95	1.1	A
SB	L	19	19	100	1.6	A
	T	39	38	97	0.1	A
	Subtotal	58	57	98	0.6	A
<b>EB</b>	<b>T</b>	<b>140</b>	<b>136</b>	<b>97</b>	<b>6.5</b>	<b>A</b>
	R	65	68	104	3.3	A
	Subtotal	205	204	100	5.4	A
WB	L	16	15	94	5.1	A
	T	103	101	98	5.7	A
	R	25	28	111	2.4	A
	Subtotal	144	144	100	5.0	A
<b>Total</b>		512	504	98	3.9	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	10	8	80	71.8	F
	T	1,987	1,933	97	3.7	A
	Subtotal	1,997	1,941	97	4.0	A
SB	T	2,168	2,172	100	4.0	A
	R	15	15	100	1.0	A
	Subtotal	2,183	2,187	100	4.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>296.9</b>	<b>F</b>
	R	15	15	100	75.7	F
	Subtotal	35	34	97	199.3	F
<b>Total</b>		4,214	4,162	99	5.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	47	47	99	6.1	A
	R	52	53	101	3.0	A
	Subtotal	99	100	101	4.5	A
EB	L	32	28	87	2.2	A
	T	138	140	102	0.1	A
	Subtotal	170	168	99	0.5	A
WB	T	101	99	98	0.3	A
	R	58	59	101	0.4	A
	Subtotal	159	158	99	0.3	A
<b>Total</b>		428	426	99	1.3	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	3	3	100	6.2	A
	R	2	3	150	2.6	A
	Subtotal	5	6	120	4.4	A
EB	L	11	9	82	2.0	A
	T	166	164	99	0.1	A
	Subtotal	177	173	98	0.2	A
WB	T	152	151	99	0.2	A
	R	1	1	100	0.2	A
	Subtotal	153	152	99	0.2	A
<b>Total</b>		335	331	99	0.3	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.6	0.3	0.3	2.8	6.5	9.6	0.1	0.2	8.0	0.1
Total Del/Veh (s)	67.8	0.6	48.3	73.3	39.3	235.1	219.6	20.2	13.3	54.4	14.0	3.3
Vehicles Entered	223	1	117	16	30	41	103	1696	35	13	2041	133
Vehicles Exited	223	1	118	16	30	40	98	1689	34	13	2037	133
Hourly Exit Rate	223	1	118	16	30	40	98	1689	34	13	2037	133
Input Volume	223	1	116	15	31	41	105	1743	34	14	2034	135
% of Volume	100	133	102	107	96	97	94	97	99	93	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	33.8
Total Del/Veh (s)	27.1
Vehicles Entered	4449
Vehicles Exited	4432
Hourly Exit Rate	4432
Input Volume	4492
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.3	0.0	0.0	0.4
Denied Del/Veh (s)	0.2	0.6	2.0	0.5	0.0	0.0	0.3
Total Delay (hr)	4.8	1.9	1.8	11.7	2.5	0.2	22.9
Total Del/Veh (s)	68.6	44.7	70.3	24.5	4.6	2.6	18.7
Vehicles Entered	244	153	92	1698	1969	214	4370
Vehicles Exited	246	153	91	1682	1967	214	4353
Hourly Exit Rate	246	153	91	1682	1967	214	4353
Input Volume	234	151	90	1721	1972	208	4376
% of Volume	105	101	101	98	100	103	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.3	0.2	2.7	2.9	0.2	0.7
Total Delay (hr)	3.8	0.5	2.4	0.2	1.1	1.0	9.0
Total Del/Veh (s)	48.1	10.3	10.5	3.7	23.2	6.0	14.6
Vehicles Entered	273	186	822	165	167	578	2191
Vehicles Exited	273	184	824	165	167	578	2191
Hourly Exit Rate	273	184	824	165	167	578	2191
Input Volume	266	180	819	158	160	586	2169
% of Volume	103	102	101	104	104	99	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.8	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	1.0	2.7	0.1	1.3	6.5	14.0
Total Del/Veh (s)	79.8	41.8	5.2	2.0	60.7	11.2	11.6
Vehicles Entered	113	83	1845	106	73	2076	4296
Vehicles Exited	113	82	1844	106	74	2075	4294
Hourly Exit Rate	113	82	1844	106	74	2075	4294
Input Volume	115	85	1902	105	75	2069	4350
% of Volume	98	97	97	101	99	100	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.3	3.8	0.0	0.0	0.0	4.0	0.3	0.3	4.2	0.2	1.3
Total Delay (hr)	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Total Del/Veh (s)	6.5	3.3	5.1	5.7	2.4	1.6	0.2	0.2	1.6	0.1	3.9
Vehicles Entered	136	68	15	102	28	61	26	12	19	38	505
Vehicles Exited	136	68	15	101	28	61	26	12	19	38	504
Hourly Exit Rate	136	68	15	101	28	61	26	12	19	38	504
Input Volume	140	65	16	103	25	65	27	12	19	39	512
% of Volume	97	104	94	98	111	93	95	100	100	97	98

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	0.3	0.2	2.0	2.4	0.0	6.6
Total Del/Veh (s)	296.9	75.7	71.8	3.7	4.0	1.0	5.7
Vehicles Entered	20	15	8	1933	2172	15	4163
Vehicles Exited	19	15	8	1933	2172	15	4162
Hourly Exit Rate	19	15	8	1933	2172	15	4162
Input Volume	20	15	10	1987	2168	15	4214
% of Volume	95	100	80	97	100	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	4.0	0.5
Total Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Total Del/Veh (s)	2.2	0.1	0.3	0.4	6.1	3.0	1.3
Vehicles Entered	28	140	99	60	47	53	427
Vehicles Exited	28	140	99	59	47	53	426
Hourly Exit Rate	28	140	99	59	47	53	426
Input Volume	32	138	101	58	47	52	428
% of Volume	87	102	98	101	99	101	99

27: Medical Drive & Access 3 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	3.9	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.0	0.1	0.2	0.2	6.2	2.6	0.3
Vehicles Entered	9	164	151	1	3	3	331
Vehicles Exited	9	164	151	1	3	3	331
Hourly Exit Rate	9	164	151	1	3	3	331
Input Volume	11	166	152	1	3	2	335
% of Volume	82	99	99	100	100	150	99

---

Total Zone Performance

---

Denied Delay (hr)	1.2
Denied Del/Veh (s)	0.9
Total Delay (hr)	94.0
Total Del/Veh (s)	35.8
Vehicles Entered	4486
Vehicles Exited	9209
Hourly Exit Rate	9209
Input Volume	30150
% of Volume	31

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	169	200	185	118	284	550	564	107	307	319	265
Average Queue (ft)	88	111	80	41	230	340	315	14	226	243	42
95th Queue (ft)	142	169	155	87	339	619	644	61	339	351	165
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)						9	6		2	4	0
Queuing Penalty (veh)						89	58		23	40	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	18			73	11		0	25	22	
Queuing Penalty (veh)	9	20			639	16		0	4	30	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	209	264	224	187	654	624	205	221	81
Average Queue (ft)	102	118	92	94	255	231	94	94	21
95th Queue (ft)	165	199	170	201	804	776	173	185	59
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)					1	0			
Queuing Penalty (veh)					0	0			
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	2	2	14			1	
Queuing Penalty (veh)	3	6	5	21	13			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	350	258	298	262	87	176	168	154
Average Queue (ft)	193	60	157	107	38	79	77	56
95th Queue (ft)	311	167	270	230	71	136	144	123
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	9			0				
Queuing Penalty (veh)	16			0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	258	150	235	230	110	124	239	143
Average Queue (ft)	117	63	88	91	17	57	36	39
95th Queue (ft)	221	138	208	210	80	104	151	99
Link Distance (ft)	658		303	303			865	865
Upstream Blk Time (%)			1	1			0	
Queuing Penalty (veh)			5	7			0	
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	13		4		6	1	
Queuing Penalty (veh)	48	15		4		58	1	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	R	L	T	R	L	L
Maximum Queue (ft)	84	56	30	59	41	32	19
Average Queue (ft)	40	29	10	26	13	5	1
95th Queue (ft)	67	46	31	45	33	22	9
Link Distance (ft)	501			151			
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		100	50		50	100	100
Storage Blk Time (%)	0		0	0	0		
Queuing Penalty (veh)	0		0	0	0		

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	T	T
Maximum Queue (ft)	140	62	42	80	85	165	179
Average Queue (ft)	48	15	9	8	9	22	34
95th Queue (ft)	128	51	33	85	89	100	126
Link Distance (ft)	595			291	291	303	303
Upstream Blk Time (%)				0	0		0
Queuing Penalty (veh)				1	2		0
Storage Bay Dist (ft)		100	100				
Storage Blk Time (%)	9			1			0
Queuing Penalty (veh)	1			0			0

Intersection: 24: Medical Drive & Access 2

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	34	6	55	54
Average Queue (ft)	5	0	26	26
95th Queue (ft)	23	4	52	49
Link Distance (ft)		150	256	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 27: Medical Drive & Access 3

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	18	24	15
Average Queue (ft)	1	2	2
95th Queue (ft)	11	13	10
Link Distance (ft)		278	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	25		100
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Zone Summary

Zone wide Queuing Penalty: 1137

# APPENDIX C

## Site Plan

---



# **APPENDIX D**

## **95<sup>th</sup> Percentile Queue Length Reports**



# SimTraffic Queuing Report



**Project: Saratoga Springs - Welfare Complex TIS Update**

Analysis: Existing (2020) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)

Project #: UT19-1451

Intersection	NB			SB			EB			WB				
	L	R	T	TR	UL	L	R	T	L	R	TR	L	LTR	R
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	209	218	117	32	81	242	144	--	59	--	74	--
02: Redwood Road (SR-68) & Market Street	97	--	161	--	--	--	39	97	130	116	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	79	291	--	--	196	--	95	--	--	--	213	--	140
04: Redwood Road (SR-68) & Commerce Drive	--	13	--	--	--	84	--	30	--	--	--	785	--	208



# SimTraffic Queuing Report

Project: Saratoga Springs - Welfare Complex TIS Update

Analysis: Future (2025) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)



Project #: UT19-1451

Intersection	NB				SB				EB				WB				
	L	R	T	TR	UL	L	R	T	TR	L	R	T	TR	L	LTR	R	T
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	306	309	191	53	146	343	--	164	--	--	103	--	84	--	--
02: Redwood Road (SR-68) & Market Street	115	--	231	--	--	--	53	141	--	168	163	--	--	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	78	201	--	--	129	--	115	--	--	--	--	--	498	--	292	--
04: Redwood Road (SR-68) & Commerce Drive	--	46	165	--	--	108	--	173	--	--	--	--	--	220	--	136	--
05: Exchange Drive & Medical Drive	19	--	--	--	--	--	--	--	3	--	44	66	--	--	--	--	46



# **APPENDIX E**

## Trip Generation Data

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## MEMORANDUM

Date: July 9, 2020  
To: Gordon L. Miner, M.E.M., P.E.  
From: Hales Engineering  
Subject: **Saratoga Springs Welfare Complex Access 3 Analysis**

UT19-1451

This memorandum discusses the study completed for the proposed Welfare Complex in Saratoga Springs. Plans currently exist for a property access onto Medical Drive on the west end of the project, designated as "Access 3" in the TIS report. This proposed access is negatively offset from the existing Costco access (labeled as "Access E" in the Kittelson & Associates Costco TIS) on the south side of Medical Drive, approximately 150 feet to the west of the proposed access.

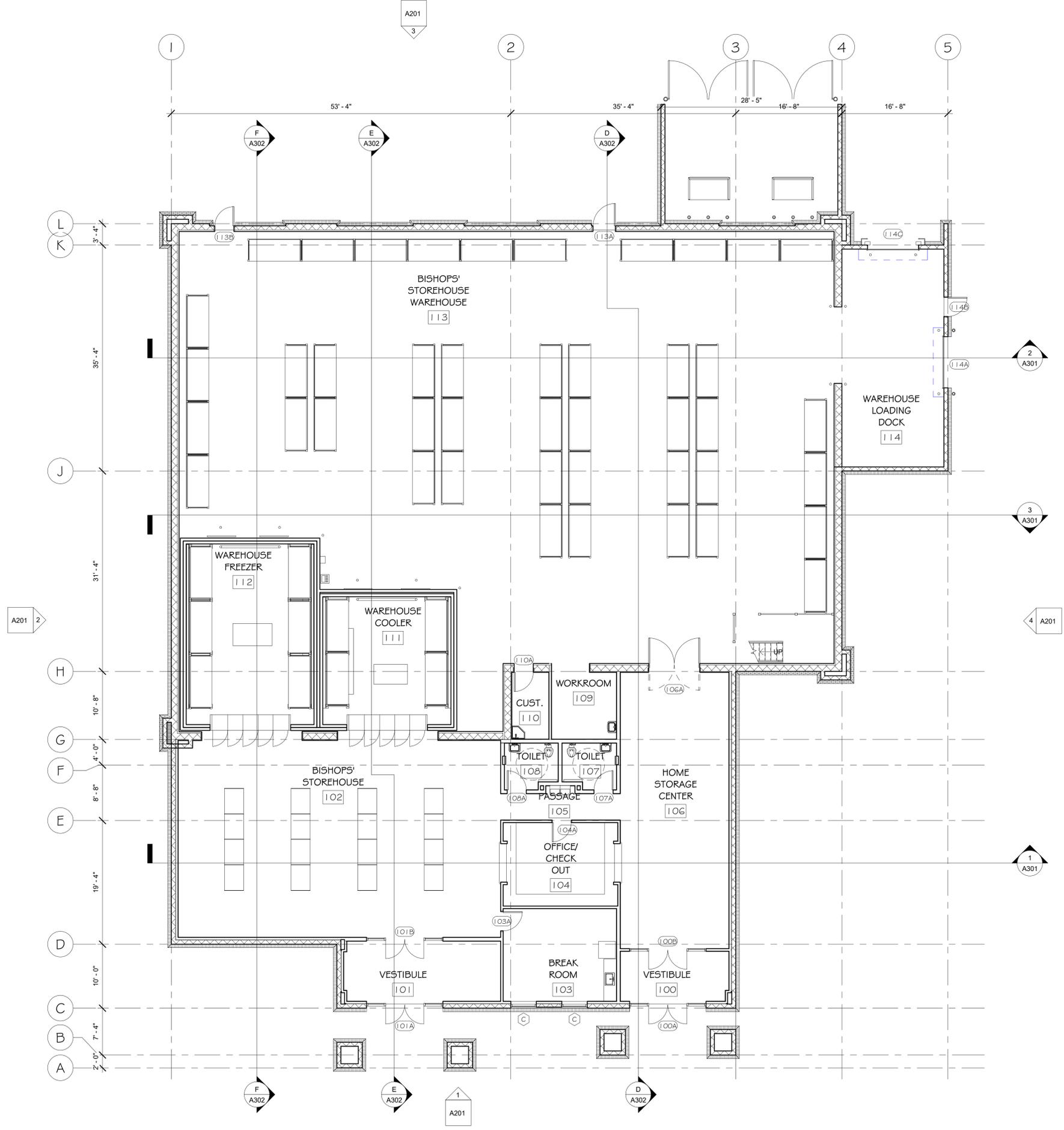
Based on projected 2020 evening peak hour traffic volumes on Medical Drive, as estimated by the Kittelson & Associates Costco TIS as well as additional traffic from the Welfare Complex, no major left-turning movement conflict is expected to exist going into these accesses prior to the completion of Exchange Drive.

In the 2025 plus project evening peak hour traffic condition, only 25 westbound left-turning vehicles are projected with 11 conflicting eastbound left-turning vehicles. Synchro and SimTraffic analysis of these offset accesses yield excellent levels of service in the report and show a 95<sup>th</sup> percentile eastbound left-turn queue of 15 feet at Access 3 and a 95<sup>th</sup> percentile westbound left-turn queue of 25 feet. This indicates that ample storage length would exist for both eastbound left-turn and westbound left-turn movements to queue and make their movements with minimal delay during the evening peak hour in future (2025) conditions.

**Hales Engineering recommends that a center two-way left-turn lane (TWLTL) be utilized for left-turn movements between the Costco Access E and the project Access 3 on Medical Drive.** It is not anticipated that significant queuing will occur by the year 2025 that would create safety concerns at this location. However, it is important to consider that future traffic on Medical Drive may continue to increase beyond the 2025 horizon year and that these offset accesses should be monitored and evaluated if potential left-turn queuing conflicts arise after the year 2025.



## APPENDIX F - ARCHITECTURAL RENDERING AND ELEVATIONS



1 A101/1 - FLOOR PLAN 12,303 sqft. 1/8" = 1'-0" NORTH

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Project For:  
**THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

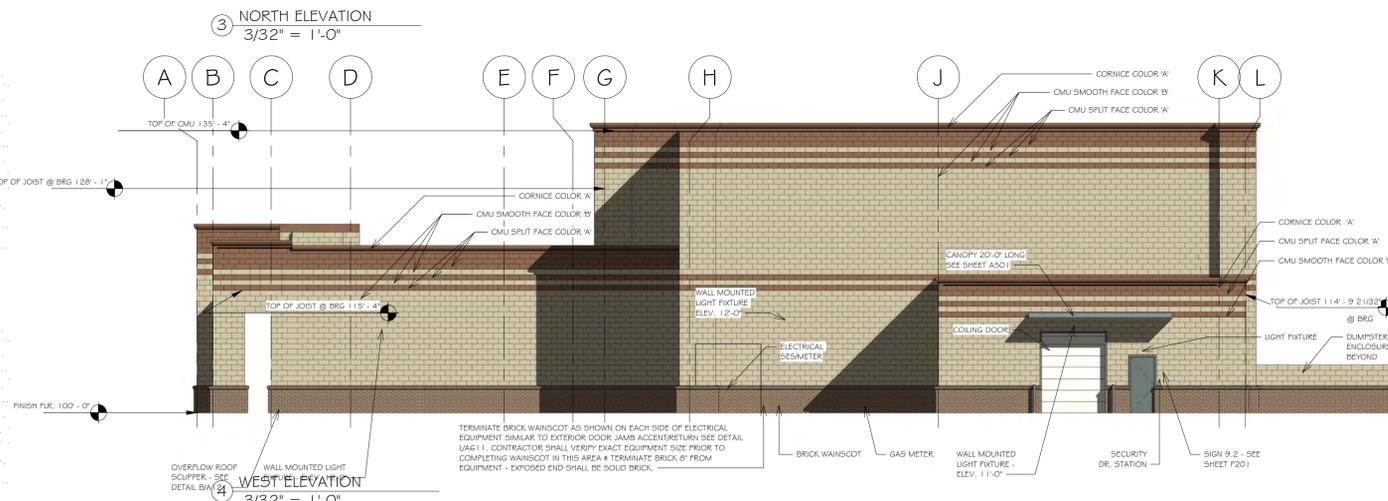
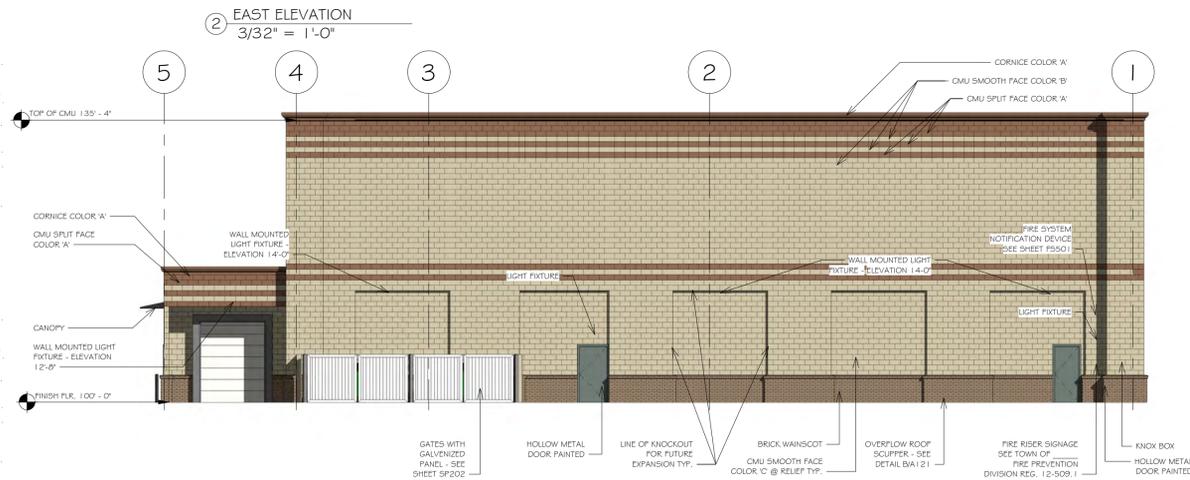
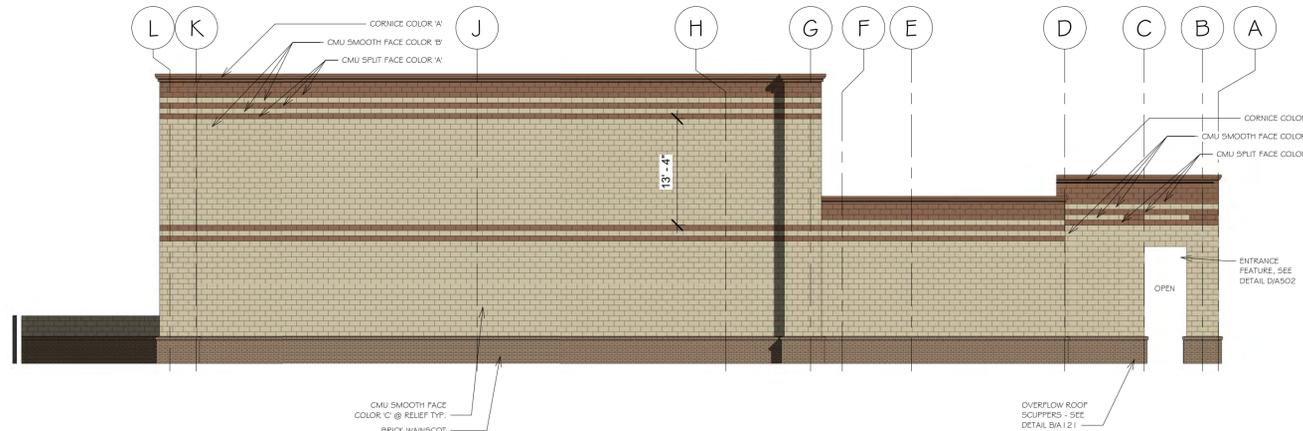
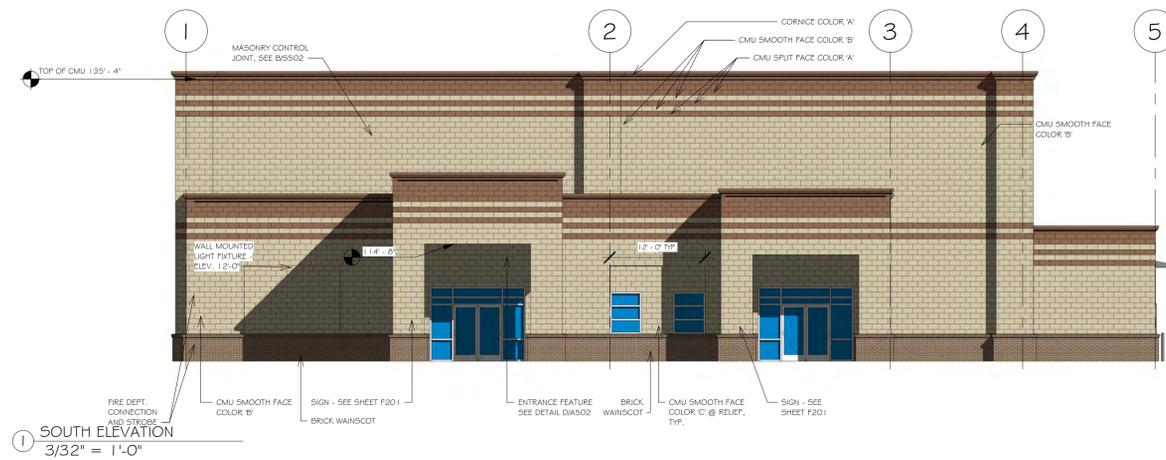
**SARATOGA SPRINGS BISHOPS' STOREHOUSE**  
 PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123  
 Plan Series: 123 JRWA Project: 757  
 Property Number: 123

SHEET:  
**FLOOR PLANS**

# Original Elevations



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Project For:  
**THE CHURCH OF  
JESUS CHRIST  
OF LATTER-DAY SAINTS**

**SARATOGA SPRINGS  
BISHOPS' STOREHOUSE**  
PROJECT ADDRESS

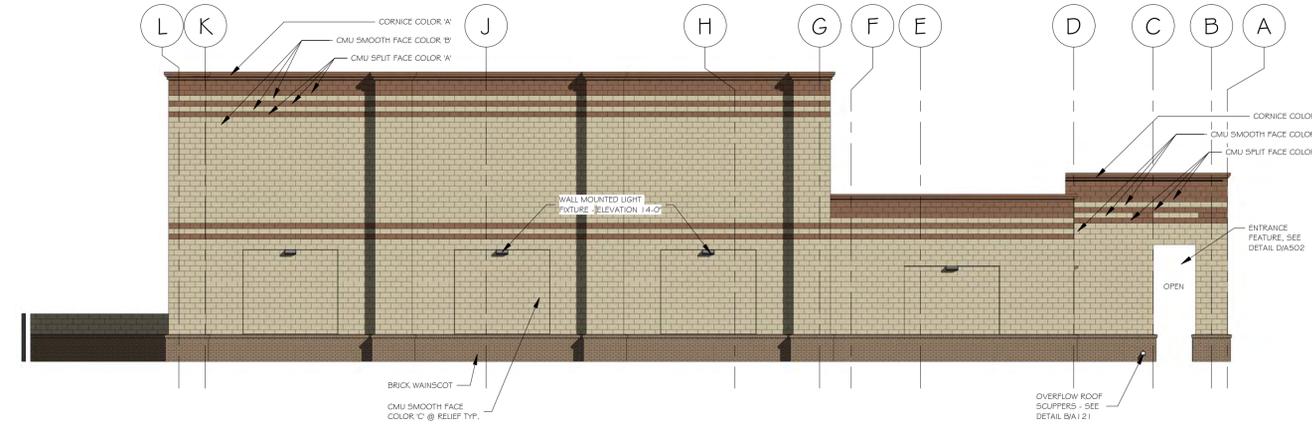
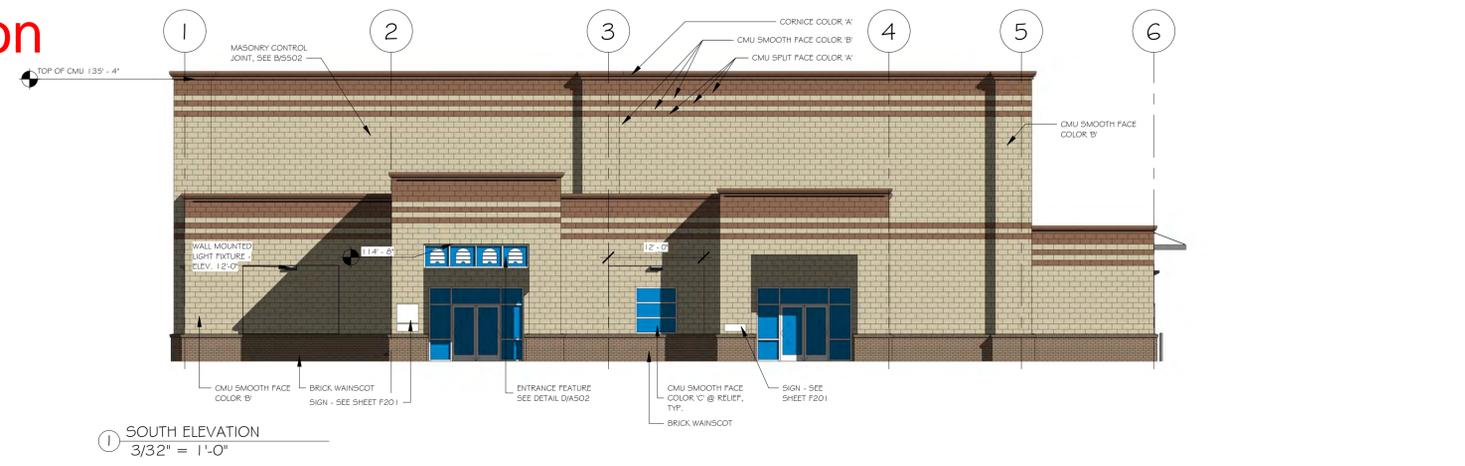
MARK	DATE (D-M-Y)	DESCRIPTION

Project Number:  
123  
Plan Series:  
123  
Property Number:  
123

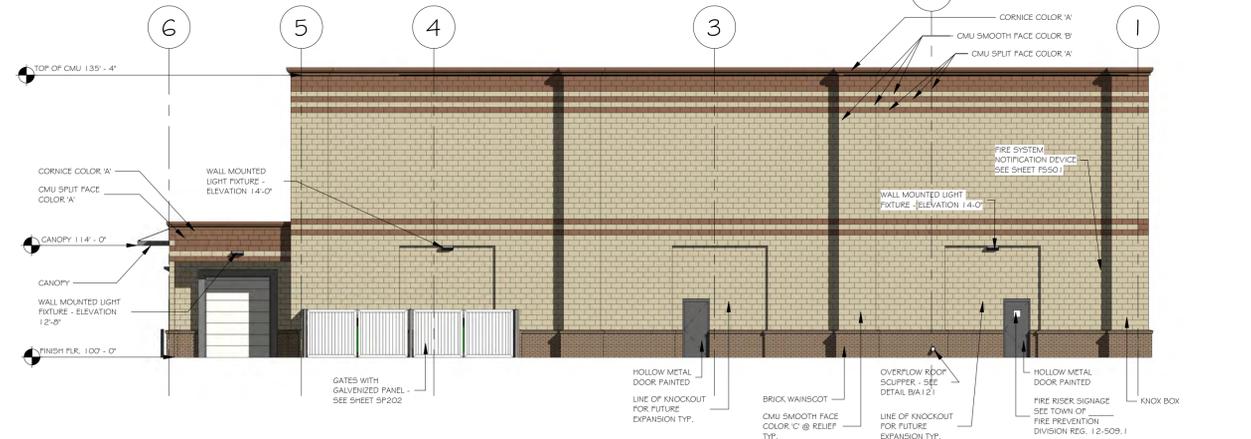
SHEET:  
**EXTERIOR  
ELEVATIONS**

A201

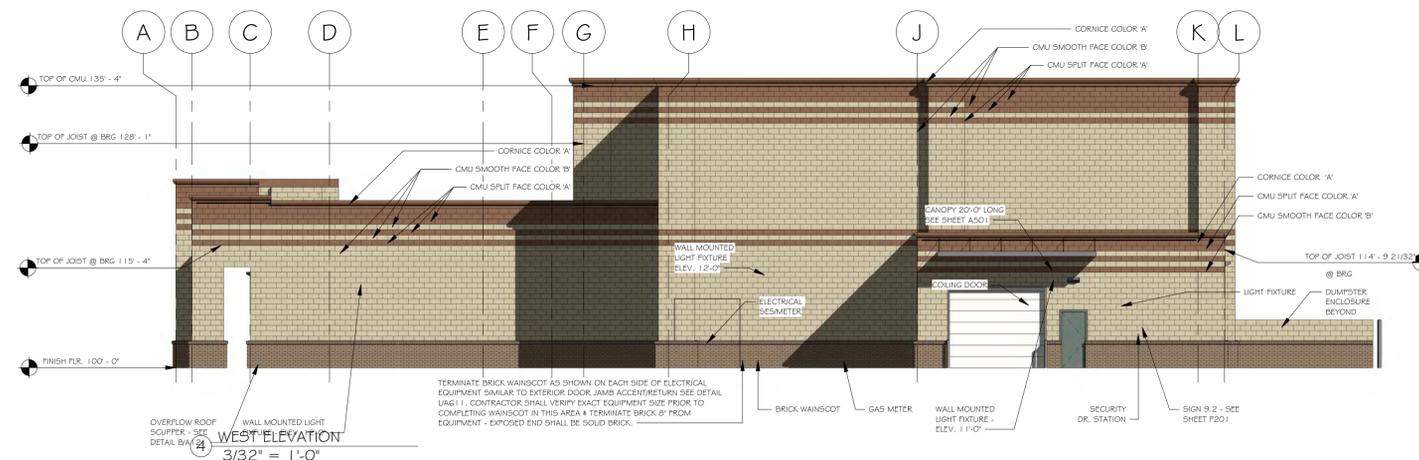
# Revised elevations as per PC recommendation



② EAST ELEVATION  
3/32" = 1'-0"



③ NORTH ELEVATION  
3/32" = 1'-0"



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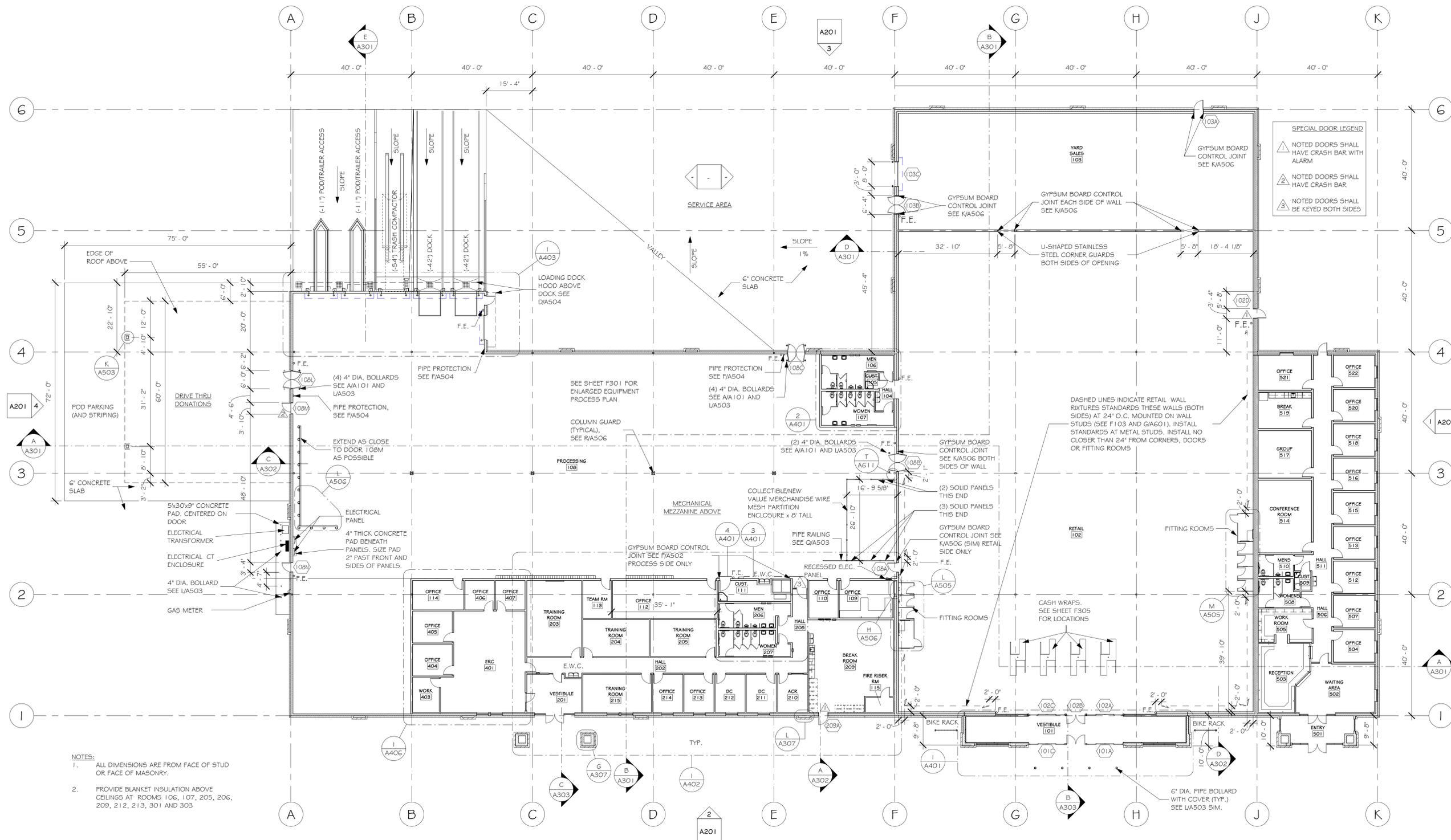
Project For:  
**THE CHURCH OF  
JESUS CHRIST  
OF LATTER-DAY SAINTS**

**SARATOGA SPRINGS  
BISHOPS' STOREHOUSE**  
PROJECT ADDRESS

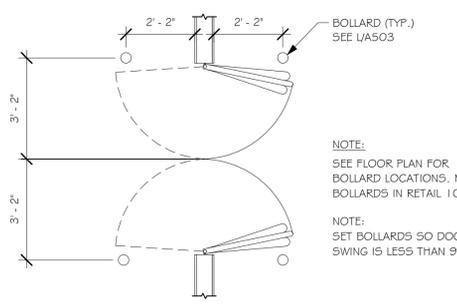
MARK	DATE (D-M-Y)	DESCRIPTION

Project Number:  
123  
Plan Series:  
123  
Property Number:  
123

SHEET:  
**EXTERIOR  
ELEVATIONS**



- NOTES:
- ALL DIMENSIONS ARE FROM FACE OF STUD OR FACE OF MASONRY.
  - PROVIDE BLANKET INSULATION ABOVE CEILINGS AT ROOMS 106, 107, 205, 206, 209, 212, 213, 301 AND 303



② BOLLARD PLACEMENT  
3/8" = 1'-0"

A FLOOR PLAN  
1/16" = 1'-0" 57,497 sqft

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Project For:  
**THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

SARATOGA SPRINGS, UTAH  
DESERET INDUSTRIES  
PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123  
Plan Series: 123  
Property Number: 123

JRWA Project: 757

SHEET:  
**MAIN FLOOR PLAN**

A101

Issue Date

COMMUNITY AND  
VILLAGE PLAN

# Saratoga Springs UT Welfare Complex



July, 2020

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## PREFACE

The following Community and Village Plan document addresses the proposed improvements as they pertain to the proposed Deseret Industries and Bishop’s Storehouse located in Saratoga Springs, Utah. The property and the proposed improvements for the development are discussed in detail and follow the requirements set forth within the Community and Village Plan requirements of the City Code of Saratoga Springs. The purpose of the document is to inform the City (Staff, Planning Commission, and City Council) and Public of the proposed general design elements, open space plans, guiding design principles and land uses for the Saratoga Springs Welfare UT Welfare Complex. In addition, utility capacities based on conceptual plans, will outline the methods used to anticipate the demands and service requirements necessary to provide adequate utility service and infrastructure for the proposed improvements.

## EXECUTIVE SUMMARY

The proposed Saratoga Springs UT Welfare Complex is an approximate 11.82-acre parcel located on the northwest corner of State Route 68 (Redwood Road) and Medical Drive in Saratoga Springs. The project is ideally situated to provide connectivity and minimize impact with local and major transportation corridors.

The proposed Community and Village Plan incorporates the following units and approximate acreages:

- *11.82 Total Acres*

## LEGAL DESCRIPTION

The proposed Village Plan contains approximately 11.82-acres of property. Please see Appendix A for a copy of the ALTA survey for the property. The parcel metes and bounds legal description is as follows:

A portion of the Southwest Quarter of Section 14, Township 5 South, Range 1 West, Salt Lake Base and Meridian, located in Saratoga Springs, Utah, more particularly described as follows:

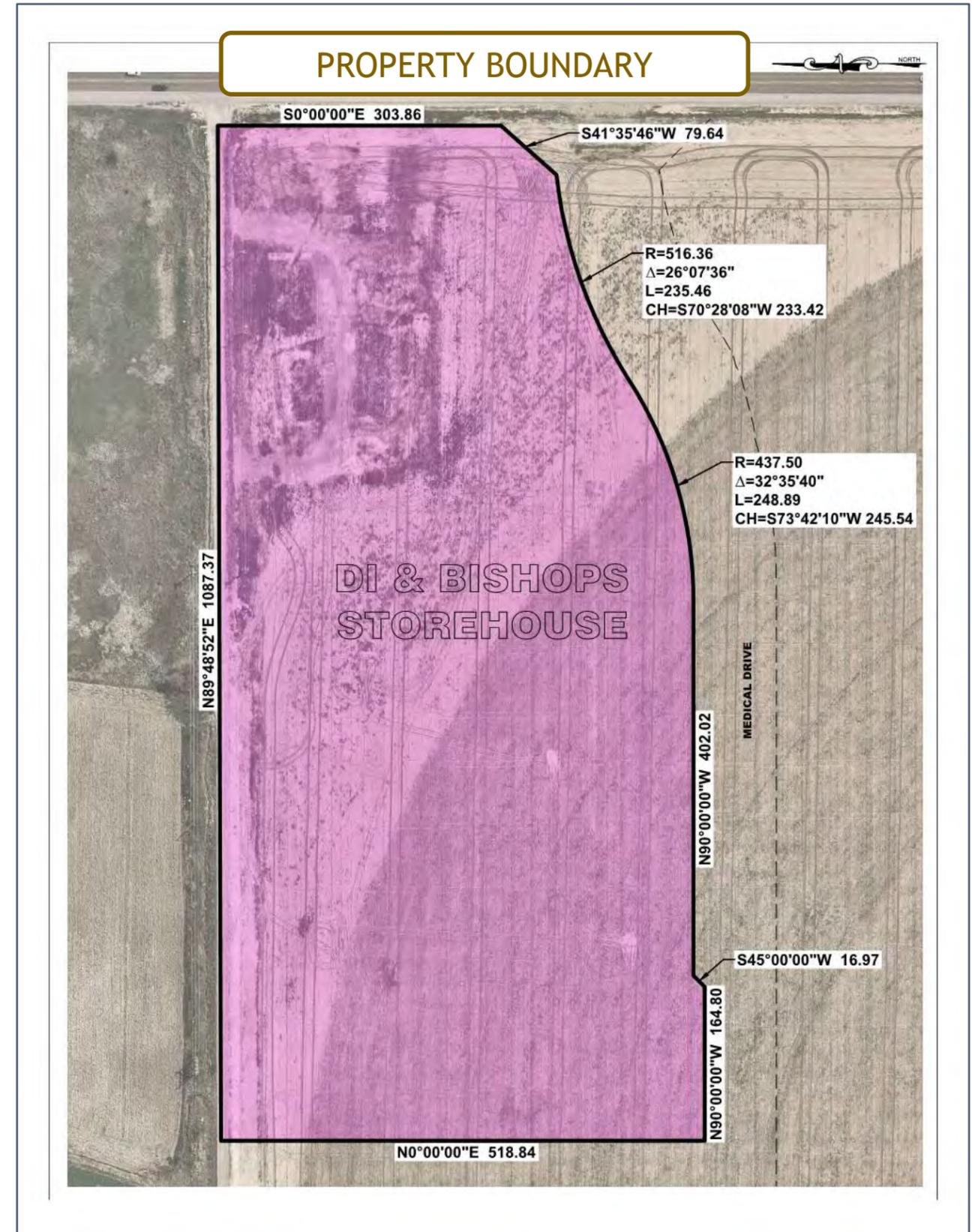
Beginning at a point on the north right-of-way line of Medical Drive, Being located  $N0^{\circ}20'51''E$  along the Section Line 2137.03 feet and east 1512.99 feet from the southwest corner of Section 14, Township 5 South, Range 1 West, Salt Lake Base & Meridian; thence north 518.84 feet to the Quarter Section Line; THENCE  $N89^{\circ}48'52''E$  along the Quarter Section Line 1087.37 feet; thence south 303.86 feet; thence  $S41^{\circ}35'46''W$  79.65 feet; thence southwesterly along the arc of a 516.36 foot radius non-tangent curve to the left (radius bears:  $S6^{\circ}28'05''E$ ) 235.46 feet through a central angle of  $26^{\circ}07'37''$  (chord:  $S70^{\circ}28'09''W$  233.43 feet); thence along the arc of a 437.50 foot radius curve to the right 248.89 feet through a central angle of  $32^{\circ}35'40''$  (chord:  $S73^{\circ}42'10''W$  245.54 feet); thence west 402.02 feet; thence  $S45^{\circ}00'00''W$  16.97 feet to the north right-of-way line of Medical Drive; thence west along said right-of-way line 164.80 feet to the point of beginning

Contains:  $\pm 11.82$  Acres

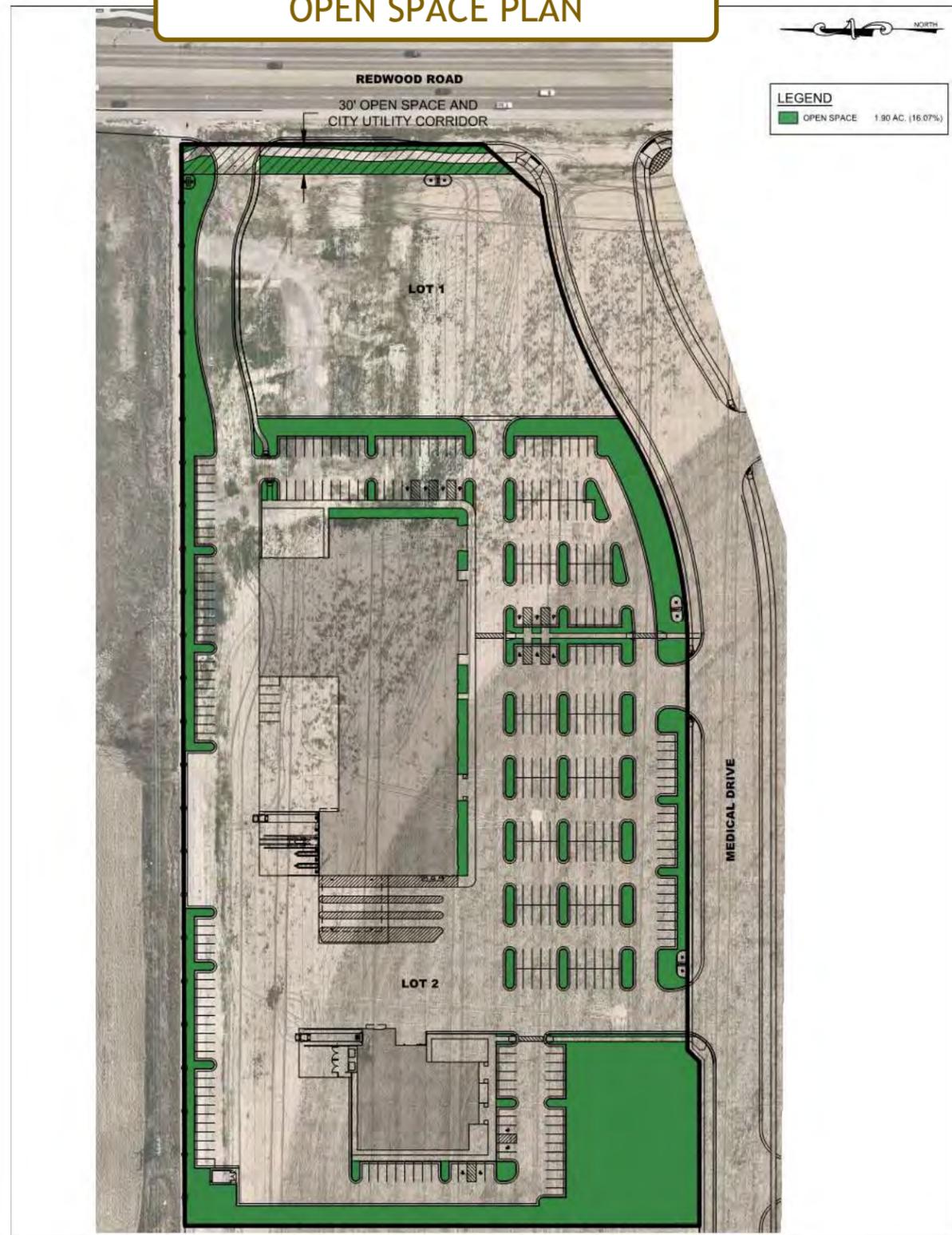
The intersection at Medical Drive and Redwood Road (SR-68) is currently being designed with the proposed development to the south. Depending on the design review and final platting from the Utah Department of Transportation and City staff, the following conditions are proposed related to this Community/Village Plan:

- If the project's acreage increases or decreases from the amount listed above, City Staff can approve the updated acreage by amending the Community/Village Plan as a minor amendment.

The 11.82 acres of land is part of an overall parcel that will require a City approved subdivision exception through a metes and bounds description to be divided from the parent parcel. This will be completed prior or concurrently with the site plan approval.



## OPEN SPACE PLAN



## OPEN SPACE PLAN

Open space for the proposed Saratoga Springs UT Welfare Complex will continue the City's goal for pedestrian wayfinding and safety by incorporating the following key elements that are based on the current City Code requirements:

**Public Sidewalks.** Sidewalks are to be installed along the entire property frontage. Sidewalk connections points will be at Medical Drive and Redwood Road (south). Roadway frontage improvements will adhere to City Roadway Standards. Sidewalk widths and placements will follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.

- **Open Space / Landscaping.** The proposed Saratoga Springs UT Welfare Complex will follow the Regional Retail place type as specified in the DAP. The DAP specifies a landscaping requirement for Regional Retail of approximately 11 to 14-percent which is exceeded for the site at approximately 16-percent. In addition to the sidewalk and pedestrian access throughout the project and along the City ROWs, the project will utilize the Parkway (Boulevard) Open Space Type by placing a pedestrian plaza with benches at the corner of the shared access to the Bishop's Storehouse and Deseret Industries. The backdrop to the pedestrian plaza will feature landscaping that will create a warm and inviting location for those passing by. See the Conceptual Landscaping Plans found in Appendix B for more detail.
- **Public Open Space.** A 30-foot landscape and utility easement/buffer will be provided along Redwood Road that will be owned and maintained by the Church of Jesus Christ of Latter-day Saints. The buffer will include a meandering trail located within a pedestrian access easement and follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.
- **Monumentation and Signage.** Signage will be specific and similar to other uses within the City. Monumentation and signage will meet the regional commercial sign requirements set forth in Title 19.18 of the City Code. See the signage example provided in the following section.



## USE MAP AND BUILDOUT ALLOCATION

The following Use Map depicts the proposed land uses for the Saratoga Springs UT Welfare Project. There will be two lots within the boundary of the Saratoga Springs UT Welfare Project Community/Village Plan. The Village will incorporate the following place type as specified in the District Area Plan:

- Regional Retail.** This area is located just west of State Route 68 and adjacent to Medical Drive in Saratoga Springs. The anticipated land use of Regional Retail coincides with the land uses within the City Center District Area Plan for Saratoga Springs. The DAP place type of Regional Retail will follow the Regional Commercial (RC) zone standards of Title 19 unless expressly identified herein.

Lot 1 will remain vacant until such time a commercial use is determined for the site. Lot 1 will need to follow the appropriate City approval process (Title 19.04 – Regional Commercial [RC]) once a commercial use has been determined. The remaining portion of this document will address the anticipated improvements of Lot 2 which will be completed in a single phase.

Two different methods were requested in determining the land use intensities for Lot 2 within this Village. Both methods illustrate the process used in determining the Equivalent Residential Units (ERUs) for this specific project. They are as follows:

**Method 1 – District Area Plan Guidelines.** The District Area Plan (DAP) states that one ERU is equivalent to 2,165 square feet (sf) of “non-residential area.” The 2,165 sf is generated by dividing 10,000,000 sf commercial area by 4,620 non-residential ERUs as per the DAP. The total proposed building square footage within the boundaries is approximately 69,788 sf. The following yields:

$$(69,788 \text{ sf}) / (2,165 \text{ sf/ERU}) = 32.2 \text{ ERUs}$$

**Method 2 – Water Supply Fixture Unit (wsfu).** A plumbing fixture analysis was completed and based on the anticipated uses for this project. Calculations provided within the utility section of this Community and Village Plan generate approximately **6.5 ERUs** for the two proposed buildings within the project.

The ERU density calculation method (Method 1) identified in the District Area Plan will be used and results in **32.2 ERUs** for the proposed Lot 2 of this Village. Method 2 will be used later within this document for determining the anticipated utility capacities for the project and eventual impacts to the City system.

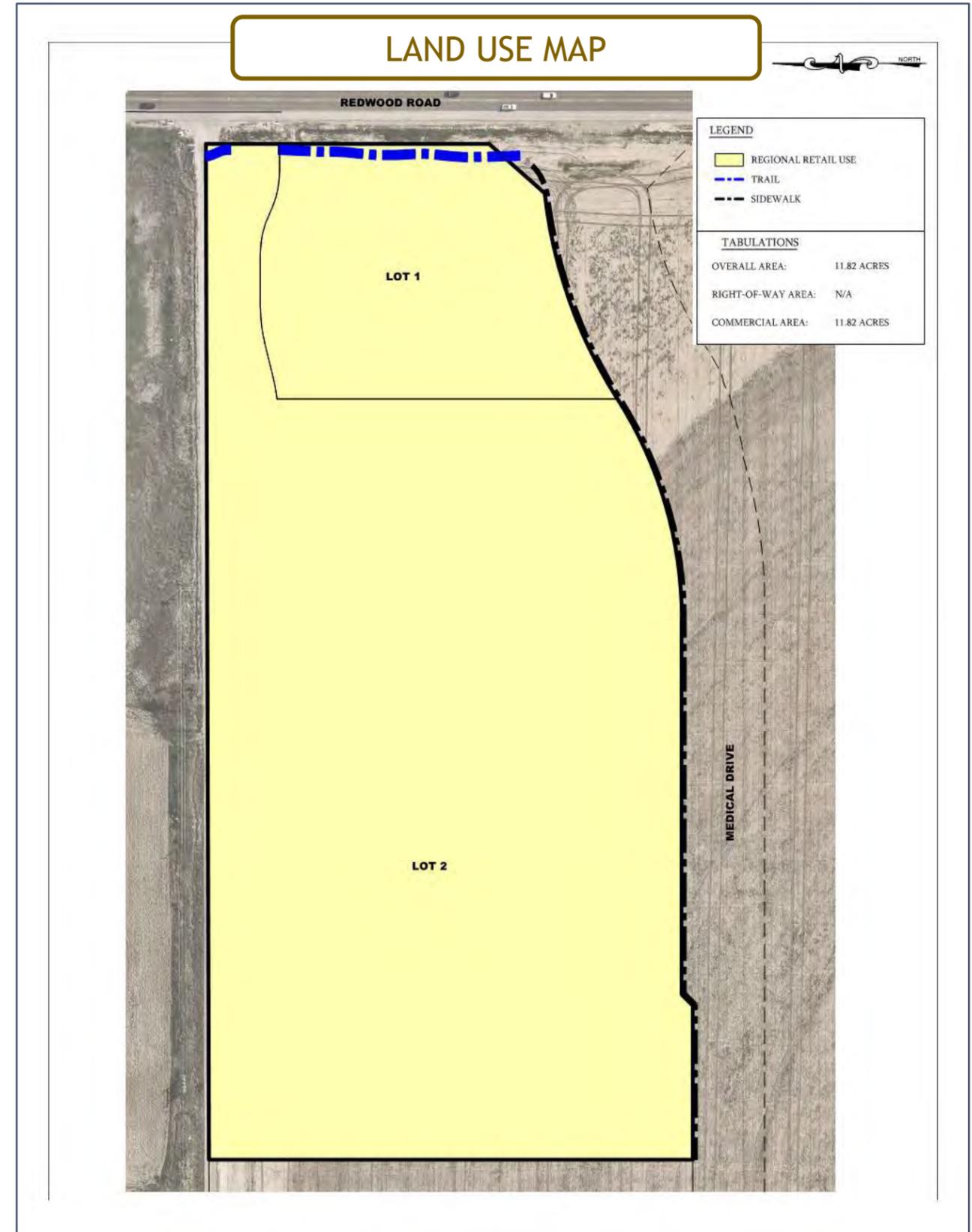
### Village Plan

Lot 2 of this Village will only contain a single use. The Welfare Complex will contain a commodity resource center and a retail thrift store, both of which are a non-profit organization and a division of the Welfare Services of The Church of Jesus Christ of Latter-day Saints.

Overall Village Area (Regional Retail):	11.8 Ac (100%)	32 ERUs based on floor area (100%)
Lot 1 Area:	2.0 Ac (17%)	ERUs to be determined.
Lot 2 Area:	9.8 Ac (83%)	32 ERUs based on floor area (100%)
Projected Population:	0 Persons	
Projected Employment:	255 Equivalent Full Time Jobs	
Deseret Industries:	220 Equivalent Full Time Jobs (includes Employment Center)	
Bishop’s Storehouse:	35 Equivalent Full Time Jobs	

## DEVELOPMENT STANDARDS AND LOTTING MAP

The Saratoga Springs UT Welfare Complex is the only use within this proposed area. Development standards will adhere to the City Code (RC Zone) and the latest approved version of the Standards and Specifications if not specified in the CP/VP.



**Fencing.** There is only one type of fencing anticipated for the site. The fencing type is as follows:

- **6-Foot SimTek Fence.** This fence type will typically follow the rear exterior property lines on the north side of the Village. An authentic stone texture or material pattern is anticipated to contain and restrict access and viewership to the non-public areas and help the anticipated uses for the site to function uninhibited. Pattern and material may vary and to be approved by City Staff during the site plan approval process.
- **Trash Enclosure.** The proposed trash enclosure will follow Title 19 of the City Code.

**Lighting.** Section 19.11 Lighting shall govern with the exception that parking lot light poles may include fixtures of the type and design shown in below. Parking light poles of 36-feet 6-inches in height are permitted provided such lighting poles are bronze in color and designed to blend into existing backgrounds. Additional building accent and security lighting may be provided on the building not to exceed 16-feet in height. Lighting along public roads will be maintained by the City (Redwood Road) and shall be per City standard details and specifications. All exterior lighting shall comply with the City of Saratoga Springs Dark Sky ordinance/requirements.

#### **MAINTENANCE PLAN**

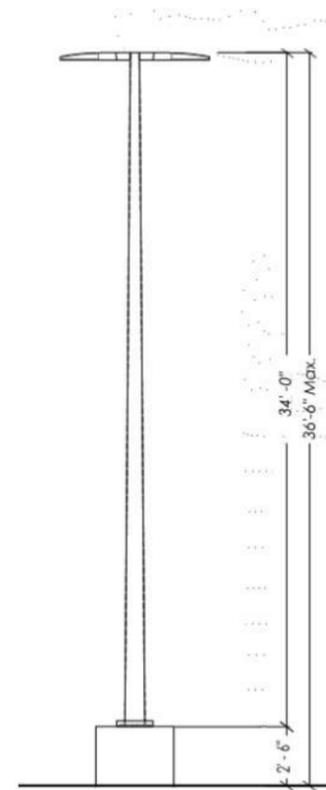
All the proposed open space or landscaping improvements as discussed above will be owned and maintained by The Church of Jesus Christ of Latter-day Saints. The planter strips within a public right-of-way along each property boundary will be owned by the City or UDOT but maintained by The Church of Jesus Christ of Latter-day Saints.

#### **PHASING PLAN**

All improvements for the proposed Village Plan will be completed in a single construction phase.

## **HOMEOWNERS ASSOCIATION**

No homeowners association is anticipated for the project with all open space and amenities in and around the proposed Village Plan to be owned and maintained by The Church of Jesus Christ of Latter-day Saints.



## **GUIDING PRINCIPLES**

The guiding principles for the proposed Saratoga Springs UT Welfare Complex will stay consistent with similar uses provided by the Church of Jesus Christ of Latter-day Saints within Saratoga Springs. It is the Church's goal to integrate with the local surroundings and keep in harmony with the standards set forth by the City of Saratoga Springs. The following provides the guiding principles anticipated for the project:

- **Establishment of Standards.** Architectural design of the building will be similar to what is shown in the rendering shown in Appendix F with final design to be reviewed at site plan approval. No Covenants, Conditions and Restrictions (CC&Rs) are anticipated for the project.
- **United Theme.** It is the desire of the Church of Jesus Christ of Latter-day Saints to keep consistent with similar uses within Saratoga Springs. Any and all street signage and monumentation will keep consistent with similar uses within the City. See the example previously provided. Colors and dimensions may vary with final design.
- **Minimize Impacts.** A variety of techniques have been incorporated within proposed Saratoga Springs UT Welfare Complex to decrease the impacts on the surrounding area and adjacent neighbors to the project. This is accomplished through project orientation and transportation corridors.
  - **Project Orientation.** The front of the Deseret Industries and Bishop's Storehouse are oriented to the south facing Medical Drive. A shared access point will be placed between the two buildings onto Medical Drive.
  - **Transportation Corridors.** Primary access to the Saratoga Springs UT Welfare Complex will be from Medical Drive with a single primary access and two secondary access points. Medical Drive and Redwood Road (State Route 68) is planned to be a controlled access point or traffic light. An additional secondary access point is planned on the northeast end of the project on to Redwood Road (State Route 68).
- **Community Plan Character.** Properly designed and placed landscaping can create a sense of character similar to other uses within the City. The conceptual landscape plan in Appendix B provides an example of the anticipated landscaping for the proposed Saratoga Springs UT Welfare Complex. Landscaping within the planter strips of the City right-of-way will adhere to City Standards and Specifications. Interior landscaping exhibits are conceptual by nature but show the general placement of trees, shrubs and other vegetation.

## UTILITY CAPACITIES

The location of the proposed Village Plan has utilities located within two of the existing rights-of-way: Redwood Road (State Route 68 and Medical Drive. The existing utilities within these two-existing rights-of-way will serve as the backbone infrastructure for the culinary water, secondary water, storm drain and sanitary sewer. Internal line connections from one right-of-ways to the other will provide the necessary looping and sizing required to service the proposed uses within Village Plan. The following addresses each of the different utilities and any specific requirements for each:

### CULINARY WATER

There is an existing 12-inch culinary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. An additional loop will be created by extending an 8-inch culinary water main interior to the project to serve the necessary fire line and fire hydrants required on-site. The interior loop is not anticipated to connect with the existing culinary infrastructure within Redwood Road due to traffic and utility locations in this area.

#### Fire Flow Requirements

A fire flow test has not been conducted in the area but could be completed following the completion of the roadway and utility improvements completed by Costco. The expected fire flow available to the Saratoga Springs UT Welfare Complex is expected to be adequate with the connection and looping to the existing Zone 1 water zone in the area.

There are two proposed buildings within Village Plan which vary in size and use. Building #1 is a single-story, approximately 57,485 square foot, Type II-B structure with a fire flow requirement of 5,000-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 75-percent reduction with the proposed full sprinkler protection. It is anticipated that the 75-percent reduction will be accepted by the State Fire Marshal and local fire authority.

Building #2 is a single story, approximately 12,303 square foot, Type II-B structure with a fire flow requirement of 2,250-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 44-percent reduction with the proposed full sprinkler protection. It is anticipated that the 44-percent reduction will be accepted by the State Fire Marshal and local fire authority.

#### Water Demands

Based on estimations for the proposed uses, the following provides a breakdown of the anticipated plumbing fixtures within the proposed Village Plan. The plumbing fixture requirements were based on the International Building Code (IBC) 2015, Section 2902.1. The following provides a summary of the anticipated uses:

Type	Fixtures Provided	wsfu per Fixture	Total wsfu
Lavatories	15	2.0	30.0
Water Closet	16	10.0	160.0
Urinal	5	5.0	25.0
Drinking Fountains	12	0.25	3.0
Laundry Unit	3	4.0	12.0
Service Sinks	10	3.0	30.0
<b>Total Fixtures</b>	<b>61</b>		<b>260</b>

A total of **260.0 wsfu** is equivalent to **6.5 Equivalent Residential Connections (ERCs)** (260.0/40) as per the Saratoga Springs Drinking Water Impact Fee Plan, Section 2.4, Existing Equivalent Residential Connections.

The anticipated demand for the proposed Village Plan is approximately 61 fixtures. The architectural plans provide more specific detail to the types of fixtures that can be reviewed and compared to the standards set in the International Plumbing Code (IPC).

### SECONDARY WATER

There is an existing 8-inch secondary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. There will be no anticipated water loop planned interior to Village Plan. The landscaping needs for Lot 2 of the project will be served by existing secondary water laterals installed with the Costco roadway and utility improvements.

#### Overall Water Demand

The following design criteria was used in determining the secondary water demand for the project:

- Water Rights (WR) Required: 3.13 ac-ft/Irrigated Acre (IA) per year
- Storage Required: 9,216 gal/IA
- Peak Day Demand: 7.5 gpm/IA

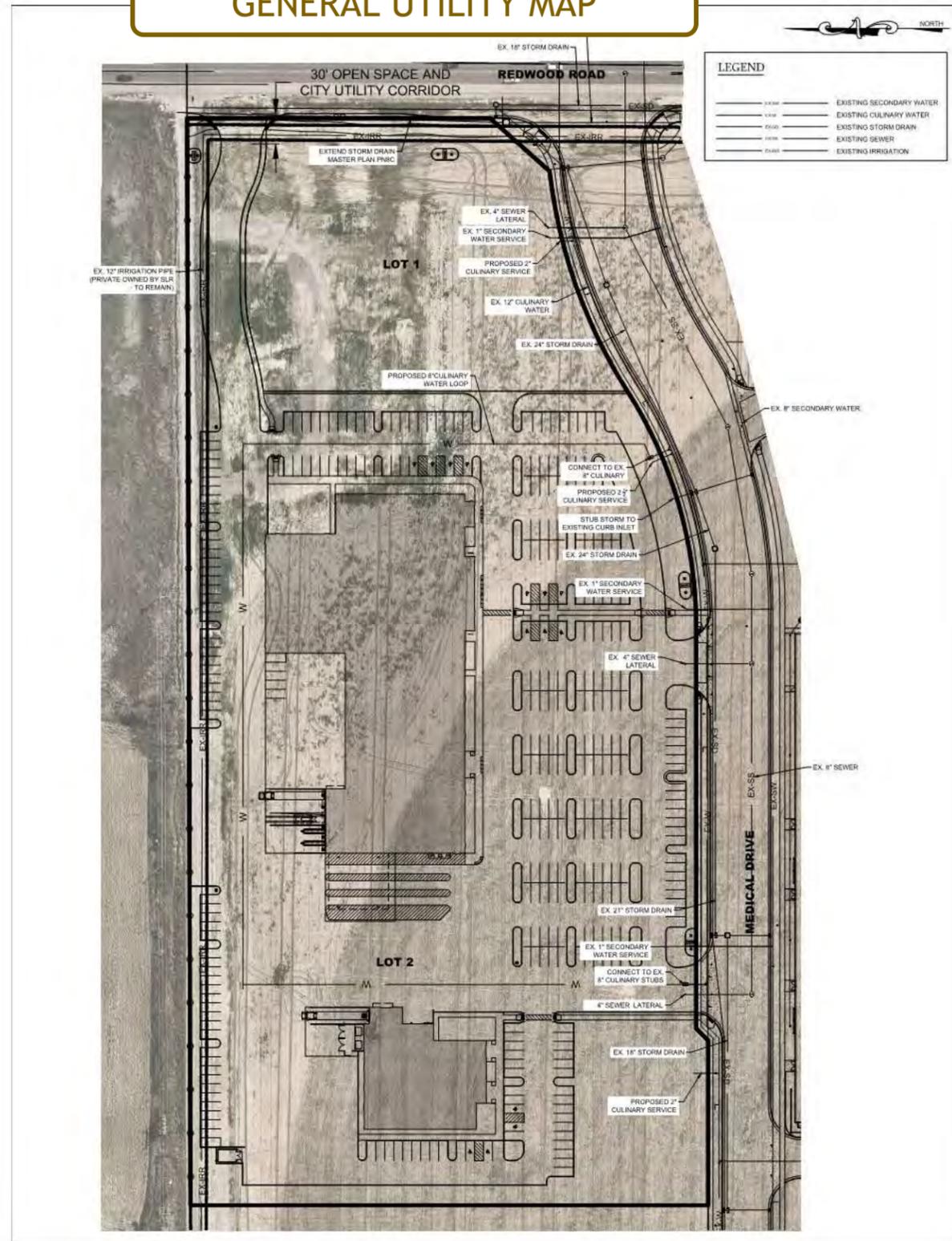
The overall secondary water demand for source and storage is as follows:

Type of Use	Irrigated Area (acres)	Water Right Req'd (ac-ft/IA)	Total Water Right Req'd (ac-ft)	Storage Req'd (gal/IA)	Total Storage (gal)
Regional Retail	1.90	3.13	5.95	9,216	17,510

### SANITARY SEWER

There is an existing 8-inch sanitary sewer main located within Medical Drive that will collect the sanitary sewer waste for Building #1 and Building #2 of the Saratoga Springs UT Welfare Complex. Necessary sanitary sewer infrastructure and service laterals will be installed as per City Standards.

## GENERAL UTILITY MAP



### STORM DRAIN

A preliminary storm drain study in the Appendix C – Storm Drain Analysis was completed for the proposed Saratoga Springs UT Welfare Project and follows the design requirements provided within the Market Street Storm Drain Capacity Analysis dated May 3, 2019. The proposed uses within the site have been evaluated on a preliminary basis to determine the best methodology to discharge from the site with little impact to the downstream system. The following provides a summary of the findings with the full report:

- All storm water runoff from the site will be collected using curb inlets or similar devices at various points within the project. The runoff will then be conveyed using pipes to the southeast corner of the project to a discharge point or pipe installed with Costco roadway and utility improvements.
- A total of 1.30 cfs will be discharged during a 100-year storm event which coincides with the allowed discharge specified in the Market Street Storm Drain Capacity Analysis. All downstream pipes have been sized to accept this stormwater discharge along with runoff from the surrounding area.
- The storm drain design is based on the latest Market Street Storm Drain Capacity Analysis for the overall development area.

### OFFSITE UTILITIES

There are no offsite utilities required with the improvement of the proposed Saratoga Springs UT Welfare Complex. Each of the utilities discussed above are adjacent to the property as depicted in the General Utility Map.

### POWER

All primary power infrastructure improvements within the right-of-way will be installed and buried with the subdivision improvements. All secondary power infrastructure to the site and buildings will be placed underground in conduit or boxes.

## TRANSPORTATION

The following addresses various elements related to the transportation design and service to the proposed Saratoga Springs UT Welfare Complex and is in harmony with the City's Transportation Master Plan. This includes design parameters for proposed roadways and cross sections as it is applicable to the site.

### VEHICULAR AND PEDESTRIAN PLAN

Transportation and pedestrian access in and around Saratoga Springs UT Welfare Complex is a key element for the Church of Jesus Christ of Latter-day Saints and the proposed uses on the site. Transportation access points to the site are planned at three different locations to two different existing right-of-ways adjacent to the site: two on the south and one on the east. These various access points have been strategically placed to spread the flow of traffic rather than concentrating at one or two points of access. The access from Redwood Road (SR-68) will require a Utah Department of Transportation (UDOT) permit and final alignment will be determined during the UDOT approval process. The existing Medical Drive is planned as a 77-foot collector class transportation corridor. Redwood Road will follow the City's standard 180-foot right-of-way with access limited and controlled by the UDOT.

Pedestrian access to the site will be provided with connections to the adjacent City right-of-ways. Each use will connect to the existing five-foot sidewalk installed with Medical Drive and convey foot traffic to the proposed 10-foot trail running parallel to Redwood Road within the City 30-foot pedestrian and utility easement.

### ROADWAY SECTIONS

There are no proposed changes to the existing roadway sections adjacent to the project.

### FIRE DEPARTMENT ACCESS

There are no proposed modifications to the City Standards and Specifications as it relates to the fire department accesses. The internal traffic circulation of the site will be addressed at the time of site plan approval with City Staff.

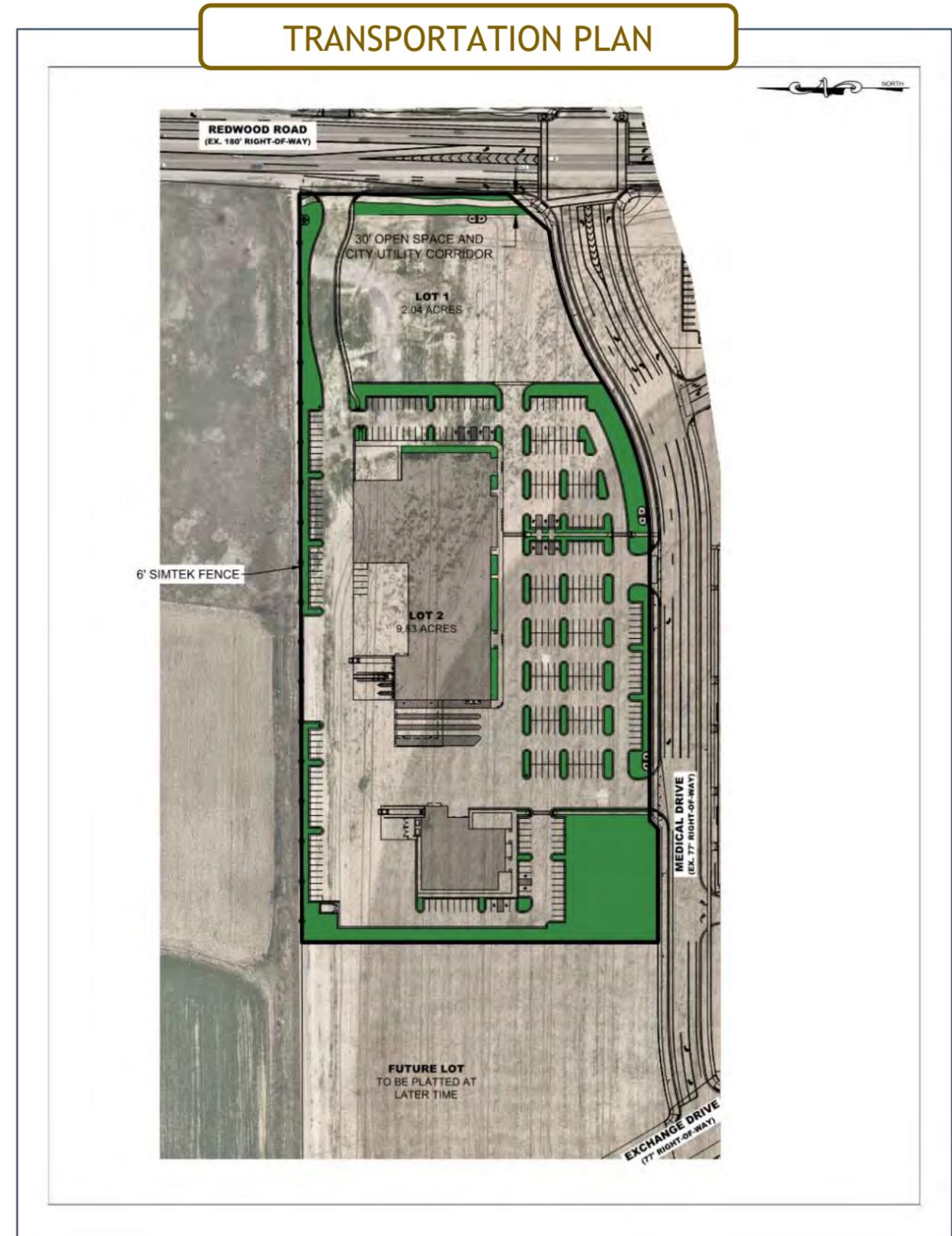
### ROAD NAME AND ADDRESSING

As shown on the exhibit to the right, the main roadways have been named. The existing roadways around Saratoga Springs UT Welfare Complex will remain the same as dedicated with Costco's roadway improvements: Medical Drive (south) and Redwood Road (west). No other additional roadways are planned internally to the property.

### OFF-STREET PARKING

The anticipated parking layout and final quantity will meet the requirements of Title 19 in the City Code. A breakdown of the required parking has been provided below based on the conceptual floor plans provided later in this Village Plan. Although floor plans may vary, approximately 197 parking stalls are required with 334 parking stalls provided. The appropriate number of accessible stalls will be provided as required by the International Building Code (IBC) and the Americans with Disabilities Act (ADA). The final layout, quantity and placement of these stalls will be reviewed at the site plan submittal to the City.

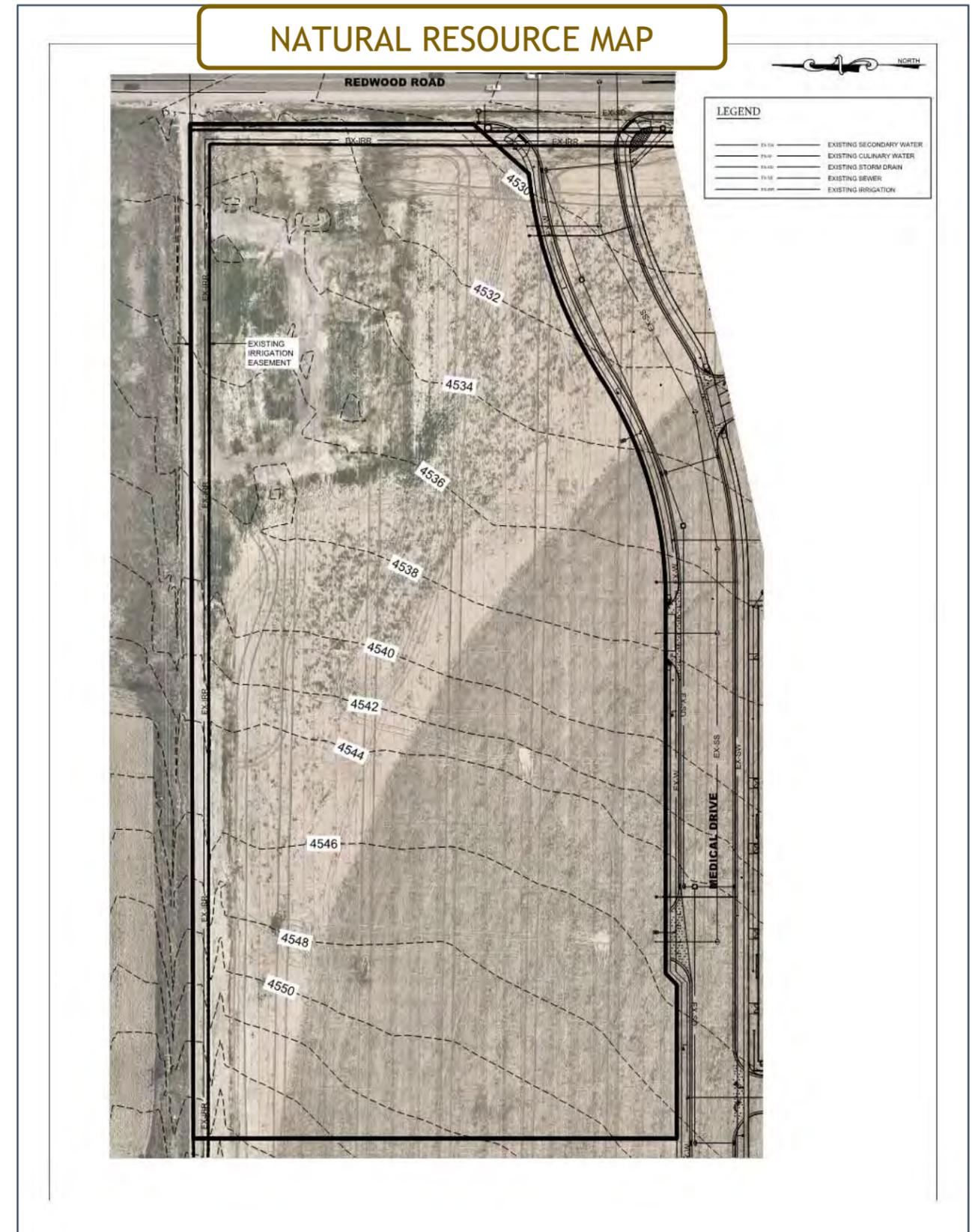
Type	Area (sf)	Parking Requirement	Required Parking
<b>Deseret Industries</b>			
Office	13,200	4 stalls per 1000 sf	53
Retail	24,700	4 stalls per 1000 sf	99
Warehouse	19,900	1 stall per 1000 sf	20
<b>Bishop's Storehouse</b>			
Office	3,800	4 stalls per 1000 sf	16
Warehouse	8,700	1 stall per 1000 sf	9
<b>Total</b>			<b>197</b>



## ADDITIONAL ELEMENTS

The Natural Resource Inventory Map contains information regarding specific site elements such as:

- **Waterways.** There are no existing waterways traversing the site.
- **Geological Information.** Geological information has been obtained from Utah County Hazards Mapping as published by Utah County Public Works Department, in coordination with USGS, MAG and other applicable agencies:
  - This area of the project falls within a low to moderate potential for liquefaction.
  - No flood hazards have been identified. The project area is within flood zone "X" according to FIRM map 4955170115B, dated 17 July, 2002.
  - No landslides hazards have been identified in the project site.
  - No rock fall hazards have been identified in the project site.
  - No wildfire hazards have been identified in the project site.
  - No dam failure risks have been identified in the project site.
  - No avalanche hazards have been identified in the project site.
- **Fault Lines.** According to Utah County Hazards Mapping as published by Utah County Public Works Department, no fault lines or fault ruptures are identified within the project.
- **General Soils Data.** A geotechnical investigation has been conducted on the development. A copy of the investigation results has been included in Appendix D. Excerpts from the investigation include:
  - Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
  - The site is covered by approximately 12 to 24 of inches of topsoil, which will need to be removed before constructing footings.
  - Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
  - Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
  - Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
  - Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
  - Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.



- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least 12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.
- **Slopes.** There are no slopes in the project greater than 30-percent.
- **Statement of Findings.** A statement regarding the findings of this submittal can be found in the Findings section towards the end of the document.
- **Environmental Issues.**
  - **Wetlands.** No wetlands or sources of surface or shallow groundwater have been identified in the project site.
  - **Historical Sites.** No historical sites have been identified in the project site.
  - **Existing Trees.** No existing trees are present on the site.
    - **Traffic Study.** A full traffic study has been included within Appendix E of the Community Plan.
- **Compliance Issues.**
  - **Architectural Standards.** Architectural design of the building will be similar to what is shown in the rendering and typical elevations found in Appendix F.
  - **Common Area Maintenance.** No common area maintenance is anticipated for this project.

## CONCEPTUAL PLANS

- A. **Wildlife Mitigation Plans.** The United States Fish and Wildlife Service has been contacted to determine whether there are any endangered species or wildlife that needs to be mitigated at this time. The Division responded and do not have any concerns due to the current agricultural use of the land.
- B. **Open Space Management Plans.** All the proposed open space as discussed above will be owned and maintained by the Church of Jesus Christ of Latter-day Saints including the 30-foot landscape and utility easement/buffer along Redwood Road. The planter islands within the City right-of-way along each property boundary will be owned by the City but maintained by the Church of Jesus Christ of Latter-day Saints. This includes the frontage along State Route 68 (Redwood Road) outside of the 30-foot landscape and utility easement/buffer.
- C. **Hazardous Material Remediation Plans.** No hazardous materials have been identified within the site. Should any hazardous materials be identified through further geotechnical investigation or site observation, acceptable mitigation must be completed prior to development.

## DESIGN GUIDELINES

The following evaluates various design guideline items as required within the Community and Village Plan requirements:

- **Architectural Standards.** There are a total of two different buildings anticipated within Saratoga Springs UT Welfare Complex. Each of the buildings will be described below with the general architectural standards anticipated with each use. Each building will be constructed of high-quality materials and have high quality architectural design. Final design and materials will be determined at the building permit phase and approved by City Staff. The grounds around these buildings will be beautifully landscaped with trees, shrubs, flowers and grasses.
  - **Building #1.** This building shall be the Bishop's Storehouse for the Church of Jesus Christ of Latter-day Saints and will be comprised of a single floor above grade. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
  - **Building #2.** This building shall be a single-story Deseret Industries for the Church of Jesus Christ of Latter-day Saints. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
- **Floor Area Ratios** – The approximate anticipated building footprints on a 9.83-acre site (Lot 2) produces an FAR of 0.20 maximum.

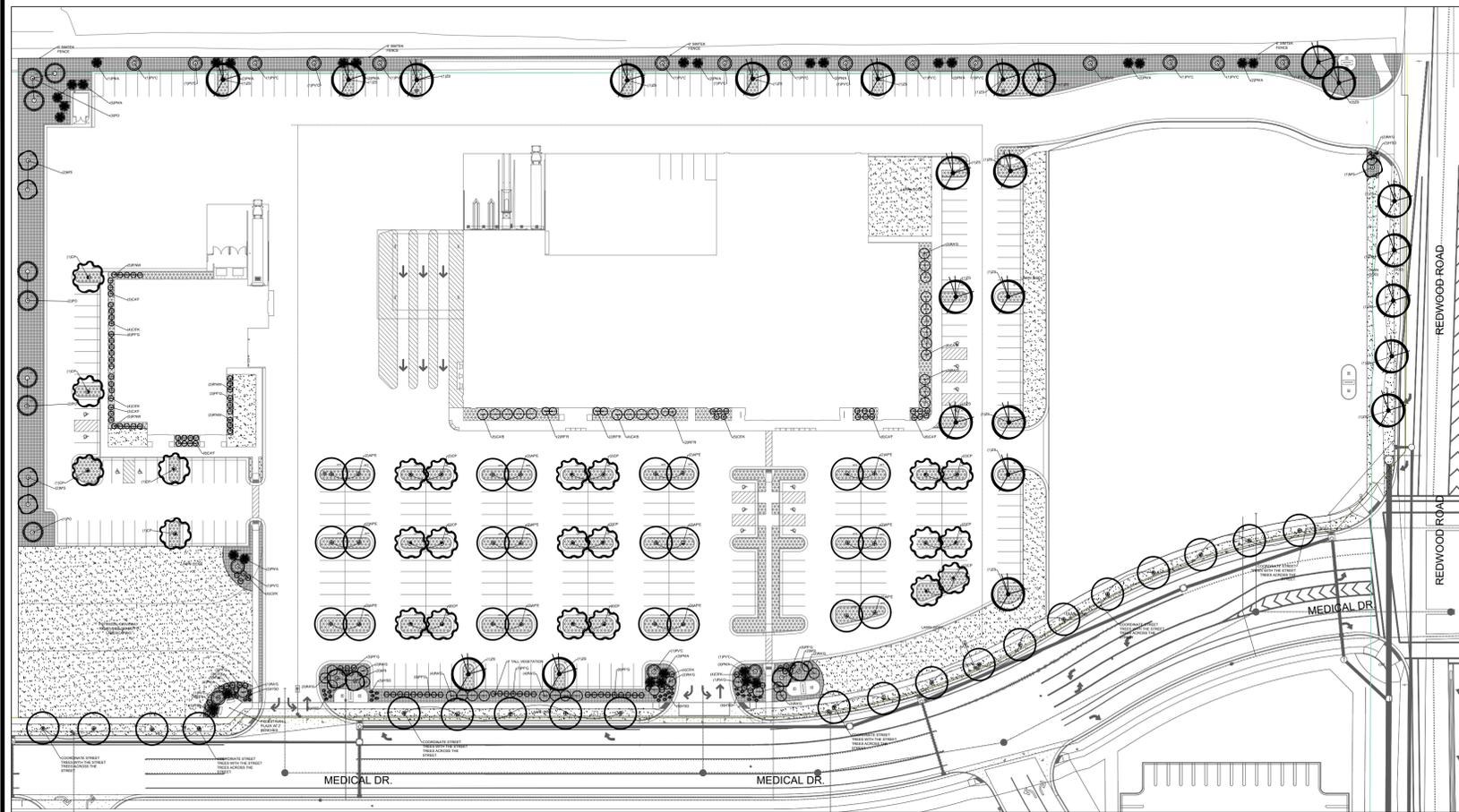
## FINDINGS

The proposed Saratoga Springs UT Welfare Complex is consistent with the goals, objectives and policies outlined within the District Area Plan (DAP) for Saratoga Springs. The project will provide irreplaceable value and honor to the surrounding area with the services provided to the local community. The Church of Jesus Christ of Latter-day Saints will do all they can to provide the civic service to the region and see this proposed Welfare Complex as a worthy extension and symbol for those values within the City of Saratoga Springs.

## APPENDIX A - ALTA SURVEY



## APPENDIX B - LANDSCAPE PLANS



### SITE CALCULATIONS

TOTAL SITE W/ FUTURE RETAIL LOT: 529,303 SQ FT  
 TOTAL SITE WITHOUT FUTURE RETAIL LOT: 446,860 SQ FT  
 TOTAL LANDSCAPE AREA: 98,643 SQ FT (22%)  
 WITHOUT DRIVE AISLE ON THE SOUTHWEST: 90,643 SQ FT. (20%)

SITE TREES:	REQUIRED:	PROVIDED:
DECIDUOUS	39	39
EVERGREEN	37	37
SHRUBS	57	139 - 5 GAL
		PARKING BUFFER 35

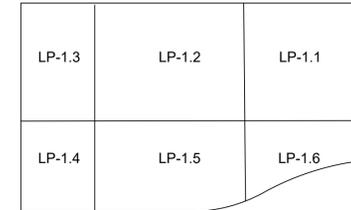
STREET TREES:	REQUIRED:	PROVIDED:
MEDICAL DR.	17	17
REDWOOD RD.	6	6

PARKING ISLAND TREES	REQUIRED:	PROVIDED:
	69	69
		TOTAL 146

3' CIRCLE UNDER TREES  
 50% DROUGHT TOLERANT  
 MINIMUM TWO COLORS OF ROCK

### REFERENCE MAP



### LANDSCAPE PLAN SPECIFICATIONS

**PART I - GENERAL**

**1.1 SUMMARY**

A. This section includes landscape procedures for the Project including all labor, materials, and installation necessary, but not limited to, the following:

- Soil Amendments
- Fine Grading
- Cultivation
- Landscape Edging
- Turf Planting
- Furnish and Installing Plant
- Maintenance
- Mowing
- Weeding

**1.2 SITE CONDITIONS**

A. Examination: Before submitting a Bid, each Contractor shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the Bid the cost of all items required by the Contract Documents are at a variance with the applicable laws, building codes, rules, regulations, or contain obvious erroneous or uncoordinated information, the Contractor shall promptly notify the Project Representative and the necessary changes shall be accomplished by Addendum.

B. Protection: Contractor to conduct the Work in such a manner to protect all existing underground utilities or structures. Contractor to repair or replace any damaged utility or structure using identical materials to match existing at no expense to the Owner.

C. Irrigation System: Do not begin planting until the irrigation system is completely installed, is adjusted for full coverage and is completely operational.

**1.3 PERMITS**

A. Blue Stake/ Dig Line: When digging is required, "Blue Stake" or "Dig Line" the work site and identify the approximate location of all known underground utilities or structures.

**1.4 PLANT DELIVERY, QUALITY, AND AVAILABILITY**

A. Unauthorized substitutions will not be accepted. If proof is submitted that specific plants or plant sizes are unavailable, written substitution requests will be considered for the nearest equivalent plant or size. All substitution requests must be made in writing and preferably before the bid due date.

**1.5 FINAL INSPECTION**

A. All plants will be inspected at the time of Final Inspection prior to receiving a Landscape Substantial Completion for conformance to specified planting

procedures, and for general appearance and vitality. Any plant not approved by the Project Representative will be rejected and replaced immediately.

**1.6 LANDSCAPE SUBSTANTIAL COMPLETION**

A. A Substantial Completion Certificate will only be issued by the Project Representative for "landscape and irrigation" in their entirety. Substantial Completion will not be proportioned to be designated areas of a project.

**1.7 MAINTENANCE**

A. Plant Material: The Contractor is responsible to maintain all planted materials in a healthy and growing condition for 30 days after receiving a Landscape Substantial Completion at which time the Guarantee period commences. This maintenance is to include mowing, weeding, cultivating, fertilizing, monitoring water schedules, controlling insects and diseases, re-guying and staking, and all other operations of care necessary for the promotion of root growth and plant life so that all plants are in a condition satisfactory at the end of the guarantee period. The Contractor shall be held responsible for failure to monitor watering operations and shall replace any and all plant material that is lost due to improper application of water.

**1.8 GUARANTEE**

A. Guarantee: A guarantee period of one year shall begin from end of maintenance period and final acceptance for trees, shrubs, and ground covers. All plants shall grow and be healthy for the guarantee period and trees shall live and grow in acceptable upright position. Any plant not alive, in poor health, or in poor condition at the end of the guarantee period will be replaced immediately. Any plant will only need to be replaced once during the guarantee period. Contractor to provide documentation showing where each plant to be replaced is located. Any outside factors, such as vandalism or lack of maintenance on the part of the Owner, shall not be part of the guarantee

**PART II - PRODUCTS**

**2.1 LANDSCAPE MATERIALS**

A. Tree Staking: All trees shall be staked for one year warranty period. All trees not plumb shall be replaced. Staked trees shall use vinyl tree ties and tree stakes two (2) inch by two (2) by eight (8) foot common pine stakes used as shown on the details.

B. Tree Wrap: Tree wrap is not to be used.

C. Mulch: See Plans. All planter beds to receive a minimum 4" layer for trees, shrubs, and perennials and 1" for groundcovers.

D. Weed Barrier: DeWitt 5 oz. weed barrier fabric. Manufactured by DeWitt Company, dewittcompany.com or approved equal.

E. Tree, Shrub, and Grass Backfill Mixture: Backfill mixture to be 50% native soil and 50% topsoil, thoroughly mixed together prior to placement.

F. Topsoil: Required for turf areas, planter beds and Backfill Mixture. Acceptable topsoil shall meet the following standards:

- PH: 5.5-7.5
- EC (electrical conductivity): < 2.0 mmhos per centimeter
- SAR (sodium absorption ration): < 3.0
- % OM (percent organic matter): >1%
- Texture (particle size per USDA soil classification): Sand <70%; Clay < 30%; Silt < 70%, Stone fragments (gravel or any soil particle greater than two (2) mm in size) < 5% by volume.

G. Turf Sod: All sod shall be 18 month old as specified on plans (or approved equal) that has been cut fresh the morning of installation. Only sod that has been grown on a commercial sod farm shall be used. Only use sod from a single source.

H. Landscape Edging: Headers and Edging six (6) inches by four (4) inches extruded concrete curb made up of the following materials:

- Washed mortar sand free of organic material.
- Portland Cement (see concrete spec. below for type)
- Reinforced fiber - Specifically produced for compatibility with aggressive alkaline environment of Portland cement-based composites.
- Only potable water for mixing.

**3.2 PLANTING OPERATIONS**

A. Review the exact locations of all trees and shrubs with the Project Representative for approval prior to the digging of any holes. Prepare all holes according to the details on the drawings.

B. Water plants immediately upon arrival at the site. Maintain in moist condition until planted.

C. Before planting, locate all underground utilities prior to digging. Do not place plants on or near utility lines.

D. The tree planting hole should be the same depth as the root ball, and three times the diameter of the root ball.

E. Trees must be placed on undisturbed soil at the bottom of the planting hole.

F. The tree hole depth shall be determined so that the tree may be set slightly high of finish grade, 1" to 2" above the base of the trunk flare, using the top of the root ball as a guide.

G. Plant immediately after removal of container for container plants.

H. Set tree on soil and remove all burlap, wire baskets, twine, wrappings, etc. before beginning and backfilling operations. Do not use planting stock if the ball is cracked or broken before or during planting operation.

I. Apply vitamin B-1 root stimulator at the rate of one (1) tablespoon per gallon.

J. Upon completion of backfilling operation, thoroughly water tree to completely settle the soil and fill any voids that may have occurred. Use a watering hose, not the area irrigation system. If additional prepared topsoil mixture needs to be added. It should be a coarser mix as required to establish finish grade as indicated on the drawings.

K. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches. All cuts, scars, and bruises shall be properly treated according to the direction of the Project Representative. Proper pruning techniques shall be used. Do not leave stubs and do not cut the leader branch. Improper pruning shall be cause for rejection of the plant material.

L. Prepare a watering circle of 2' diameter around the trunk. For conifers, extend the watering well to the drip line of the tree canopy. Place mulch around the planted trees.

**3.4 TURF - SOD LAYING**

A. Top Soil Amendments: Prior to laying sod, commercial fertilizer shall be applied and incorporated into the upper four (4) inches of the topsoil at a rate of four pounds of nitrogen per one thousand (1,000) square feet. Adjust fertilization mixture and rate of application as needed to meet recommendations given by topsoil analysis. Include other amendments as required.

B. Fertilization: Three weeks after sod placement fertilize the turf at a rate of ½ pound of nitrogen per 1000 square feet. Use fertilizer specified above. Adjust fertilization mixture and rates to meet recommendations given by topsoil analysis.

C. Sod Availability and Condition: The Contractor shall satisfy himself as to the existing conditions prior to any construction. The Contractor shall be fully responsible for furnishing and lay all sod required on the plans. He shall furnish new sod as specified above and lay it so as to completely satisfy the intent and meaning of the plans and specification at no extra cost to the owner. In the case of plans and specification at no extra cost to the owner. In the case of any discrepancy in the amount of sod to be removed or amount to be used, it shall be the Contractor's responsibility to report such to the Project Representative prior to commencing the work.

D. Sod Laying: The surface upon which the new sod to be laid will be prepared as specified above. Areas where sod is to be laid shall be cut trimmed, or shaped to receive full width sod (minimum twelve (12) inches). No partial strip or pieces will be accepted.

E. Sod shall be tamped lightly as each piece is set to insure that good contact is made between edges and also the ground. Sod laid on any sloped areas shall be anchored with wooden dowels or other materials which are accepted by the grass sod industry.

F. Apply water directly after laying sod. Rainfall is not acceptable.

G. Watering of the sod shall be the complete responsibility of the Contractor by whatever means necessary to establish the sod in an acceptable manner to the end of the Maintenance period. If an irrigation system is in place on the site, but for whatever reason, water is not available in the system. It is the responsibility of the Contractor to water the sod by whatever means, until the sod is accepted by the Project Representative.

H. Protection of the newly laid sod shall be the complete responsibility of the Contractor. The Contractor shall provide acceptable visual barriers, to include barricades set appropriate distances with strings or tapes between barriers, as an indication of new work. The Contractor is to restore any damaged areas caused by others (including vehicular traffic), erosion, etc. until such time as the lawn is accepted by the Owner.

I. All sod that has not been laid within 24 hours shall be deemed unacceptable and will be removed from the site.

**3.5 WEED BARRIER**

A. Cut a slit or x at each plant location no larger than necessary to install plant.

B. Overlap rows of fabric min. 6"

C. Stable fabric edges and overlaps to ground.

END OF SECTION

**GRADING AND DRAINAGE REQUIREMENTS**

- ALL GRADING IS TO SLOPE AWAY FROM THE STRUCTURE PER CODE.
- FINISHED GRADE IS NOT PERMITTED BY CODE TO DRAIN ON NEIGHBORING PROPERTIES
- 6" MIN. FOUNDATION LEFT EXPOSED AT ALL CONDITIONS
- LANDSCAPER TO MAINTAIN OR IMPROVE EXISTING FINAL GRADE AND PROPER DRAINAGE ESTABLISHED BY THE EXCAVATOR'S FINAL GRADE ACTIVITIES INCLUDING ANY MAINTENANCE, PRESERVATION, OR AGGRAVATION OF SLOPES, BERMS, AND SWALES.
- IF ANY SWALE, BERM, OR GRADE HAS BEEN DAMAGED OR IS INCORRECT TO ENSURE CORRECT WATER FLOW THE TRADE CONTRACTOR IS RESPONSIBLE TO FIX STATED ISSUE.
- ROOF RUN-OFF DEVICES SHOULD BE INSTALLED TO COLLECT AND DISCHARGE ALL ROOF RUNOFF A MINIMUM OF 10 FEET FROM FOUNDATION ELEMENTS OR BEYOND THE LIMITS OF BACKFILL AROUND THE FOUNDATION WALLS; WHICHEVER DISTANCE IS GREATER.
- THE GROUND SURFACE WITHIN 10 FEET OF THE FOUNDATIONS SHOULD BE SLOPED TO DRAIN AWAY FROM THE STRUCTURE WITH A MINIMUM FALL OF 6 INCHES.

**LANDSCAPING REQUIREMENTS**

- ALL LANDSCAPING IS TO BE INSTALLED PER ALL GOVERNING JURISDICTIONS I.E. INTERNATIONAL BUILDING CODE, CITY CODES.
- NON-COMPLIANCE TO ALL GOVERNING JURISDICTION REQUIREMENTS AND REGULATION ARE THE RESPONSIBILITY OF THE LANDSCAPING INSTALLER.
- ALL PLANTED LANDSCAPING IS TO BE INSTALLED ACCORDING TO THE NURSERY CARE AND INSTALLATION INSTRUCTIONS WHERE PURCHASED AND BASED ON INDIVIDUAL SOIL CONDITIONS AND SITE CONDITIONS.

**LANDSCAPE NOTES**

- LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR VERIFYING QUANTITIES OF ALL MATERIALS FOR BIDDING AND INSTALLATION PURPOSES. IF DISCREPANCIES EXIST, THE PLAN SHALL DICTATE QUANTITIES TO BE USED.
- PLANT MATERIAL TO BE INSTALLED PER PLANT LEGEND. IF SUBSTITUTIONS ARE WANTED, PROPOSED LANDSCAPE CHANGES MUST BE SUBMITTED TO THE LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO PLANTING.
- NEW LAWN AREAS TO BE SODDED WITH DROUGHT TOLERANT VARIETY. FINE LEVEL ALL AREAS PRIOR TO LAYING SOD.
- SANDY LOAM TOPSOIL TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 6" TOPSOIL (WITH 2" HUMUS MIXED INTO TOPSOIL PRIOR TO SPREADING) IN ALL NEW PLANTER AREAS AND 4" IN ALL NEW LAWN AREAS. PLANTER BEDS TO BE EXCAVATED AS NECESSARY IN ORDER TO ACCOMMODATE NEW TOPSOIL AND/OR PLANTER BED MULCH TO REACH FINISHED GRADE.
- 4"x6" EXTRUDED CONCRETE MOW CURB TO BE INSTALLED BETWEEN ALL LAWN AND PLANTER AREAS PER PLAN. ANY TREES LOCATED IN LAWN MUST HAVE A 4" CONCRETE TREE RING.
- DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS EXCEPT UNDER ANNUAL PLANTING AREAS AS SHOWN ON PLAN.
- ROCK MULCH TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 4" IN ALL TREE, SHRUB, AND PERENNIAL PLANTER AREAS; ANNUAL PLANTING AREAS AS SHOWN ON PLAN TO RECEIVE 4" OF SOIL AID MATERIAL. PULL BARK MULCH MIN. 3" AWAY FROM BASE OF ALL PERENNIALS AND SHRUBS AND MIN. 6" AWAY FROM ALL TREES.
- CONTRACTOR TO PROVIDE NEW AUTOMATIC UNDERGROUND IRRIGATION SYSTEM TO BE INSTALLED IN ALL LANDSCAPE AREAS. ALL LAWN AREA TO RECEIVE 100% HEAD TO HEAD COVERAGE WITH SPRAY AND ROTARY SPRINKLER HEADS. ALL PLANTER AREAS NEED TO RECEIVE A FULL DRIP SYSTEM TO EACH TREE AND SHRUB ON PROJECT. SEE IRRIGATION PLAN.

**DEVELOPER / PROPERTY OWNER / CLIENT**  
 Developer / Property Owner: JRW & ASSOCIATES  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. A  
 REXBURG, ID 83440  
 (208)359-2309

**CLIENT / ENGINEER:**  
 LEI-ENGINEERING  
 3302 N. Main Street  
 Spanish Fork, Ut. 84660  
 801-798-0555 ext. 226  
 www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**  
 PKJ DESIGN GROUP  
 3450 N. TRIUMPH BLVD, SUITE 102  
 LEHI, UTAH 84043 (801) 960-2698  
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**LANDSCAPE PLAN**  
 LP-1.0

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION
06-30-2020	UT19010		

NO.	REVISION	DATE
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GRAPHIC SCALE: 1" = 60'

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
 Developer / Property Owner: JRW & ASSOCIATES  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. A  
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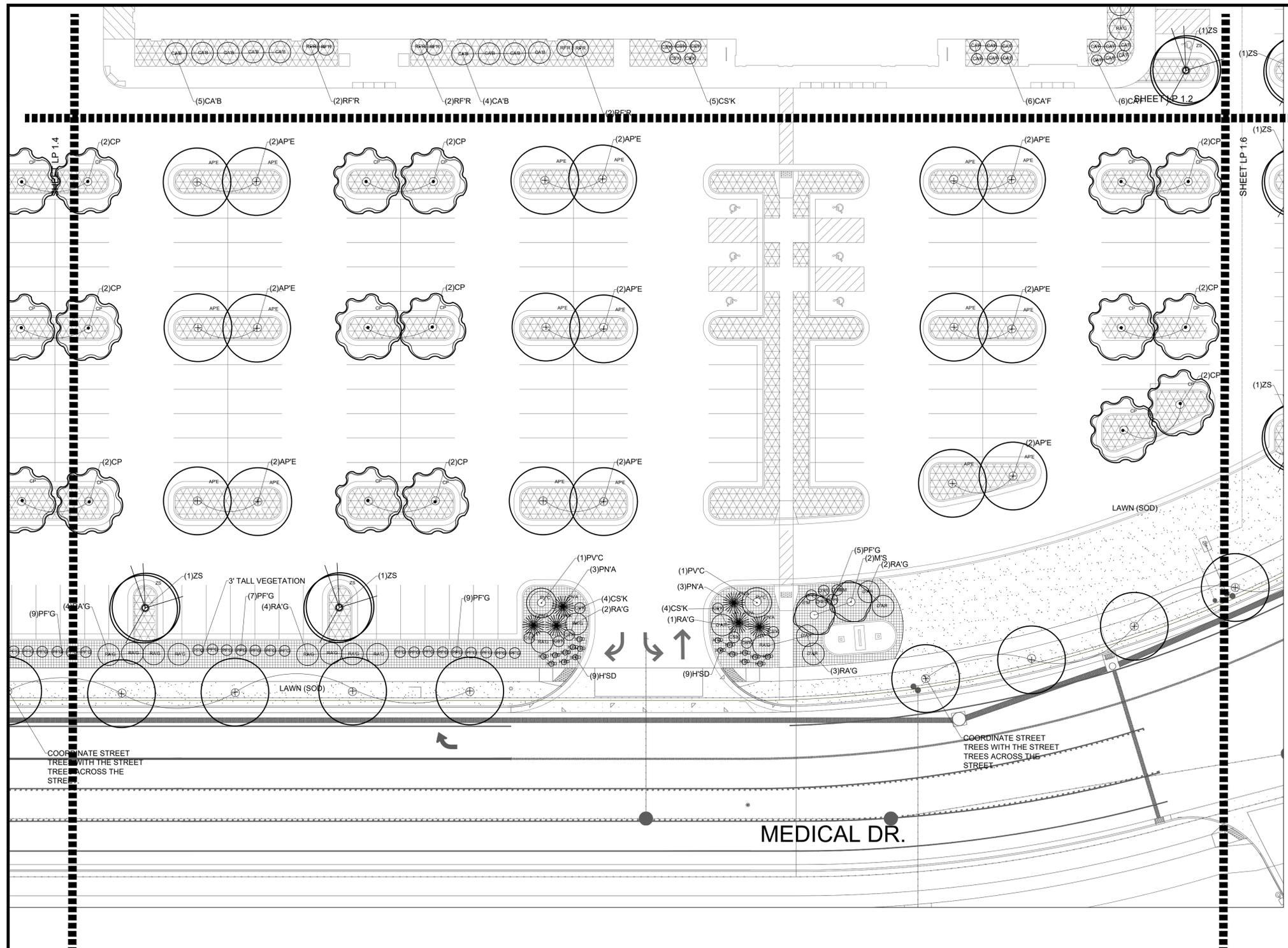
**LANDSCAPE PLAN**  
 LP-1.0











**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APE	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6'-8" TALL	LOW	
PWA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6'-8" TALL	LOW	
M'S	MALUS X 'SPRING SNOW'	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
	STREET TREES MATCHING TREES ACROSS THE STREET		20	2" CAL.	LOW	

**SHRUB LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA	47	5 GAL	LOW	
CS'K	CORNUS SERICEA 'KELSEY'	KELSEY DOGWOOD	31	5 GAL	MODERATE	
RNW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	29	5 GAL	HIGH	

**GRASSES LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CAF	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL	HIGH	

**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
[Pattern]	LAWN (SOD) AREA	50,591 SQ. FT.	DROUGHT TOLERANT VARIETY 'SEE NOTE BELOW'
[Pattern]	1"-2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ. FT. (172.2 CU YD)	LOCATED WHERE SPECIFIED
[Pattern]	1" OQUIRH GRVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ. FT. (259 CU YD)	LOCATED WHERE SPECIFIED

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**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**Client / Engineer:** LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
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**LANDSCAPE ARCHITECT / PLANNER**

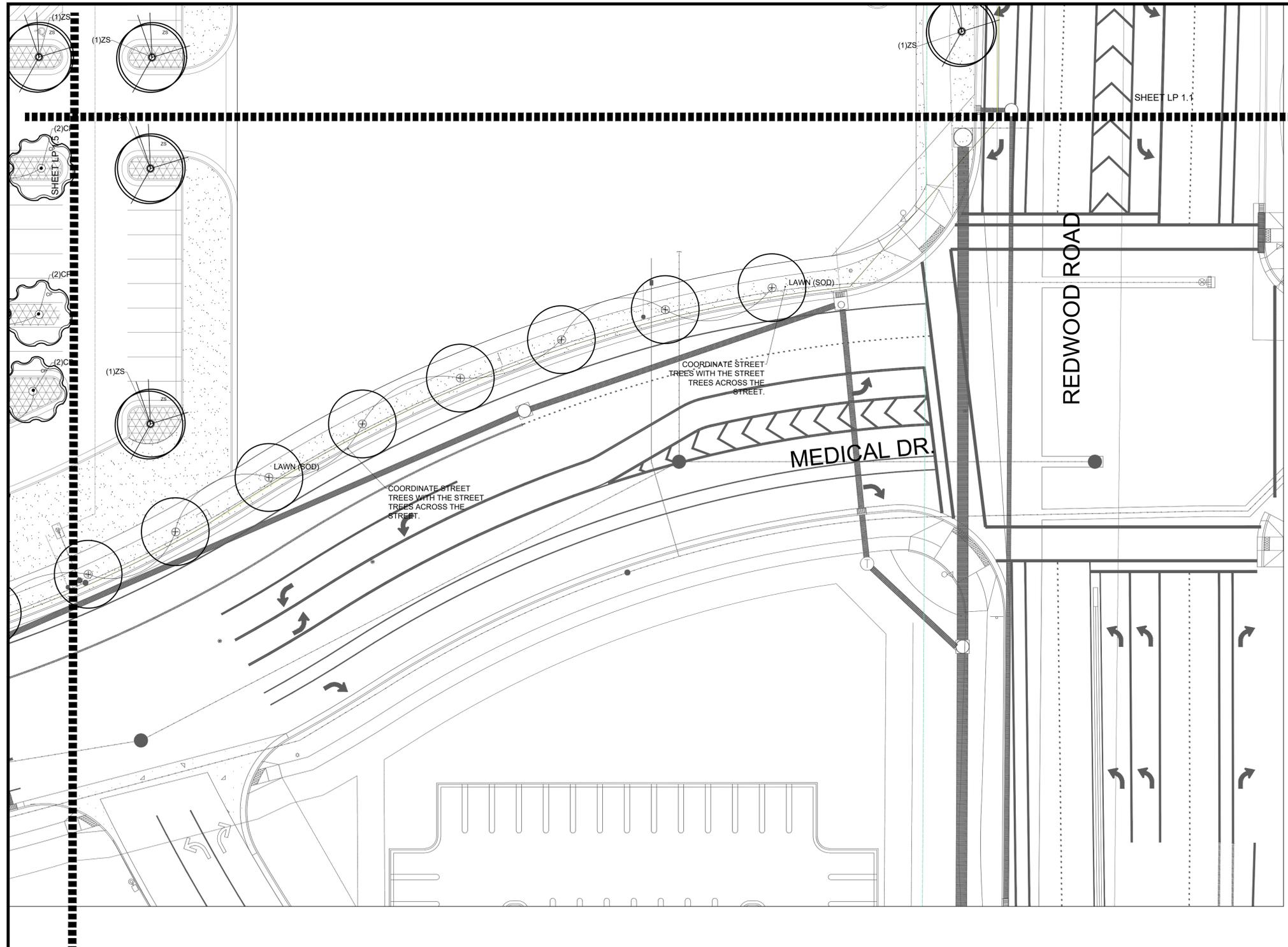
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PLOT DATE: 7/1/2020

**LANDSCAPE PLAN**

**LP-1.5**



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
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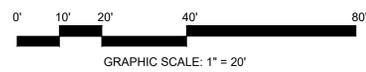
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ISSUE DATE: 06-30-2020  
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**PROJECT INFORMATION**

**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**

Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

Client / Engineer: LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

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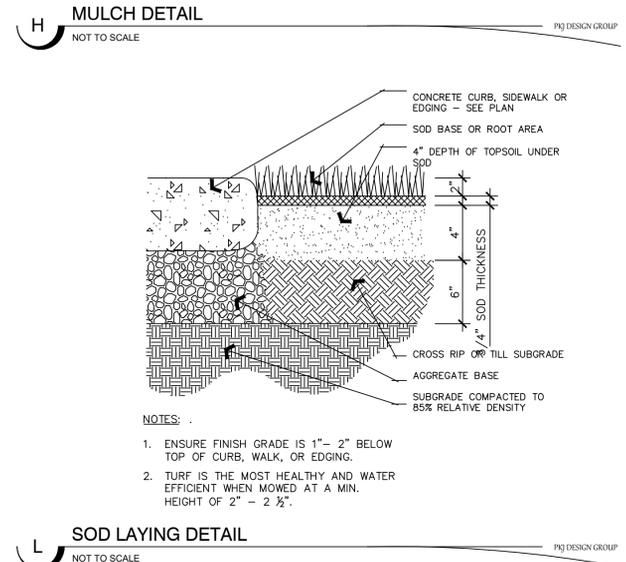
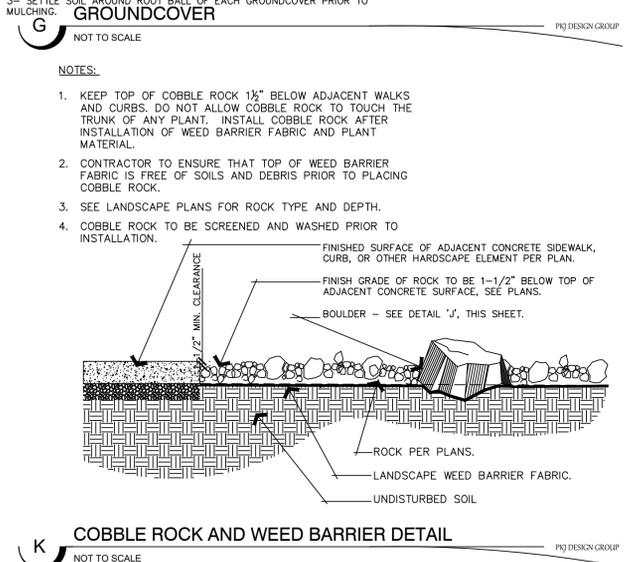
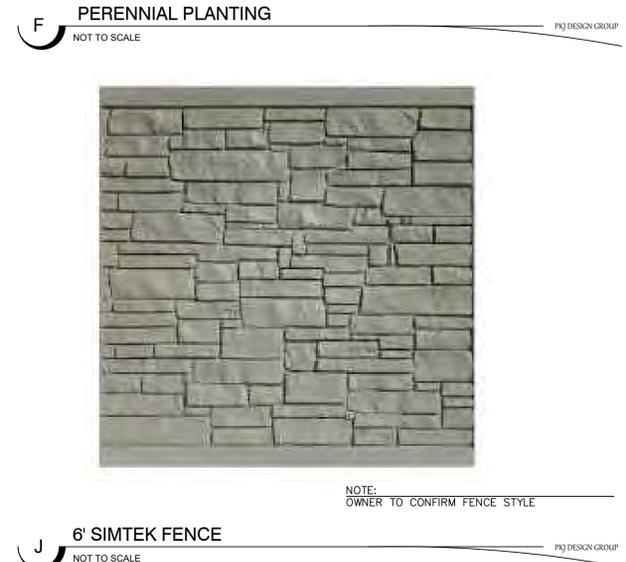
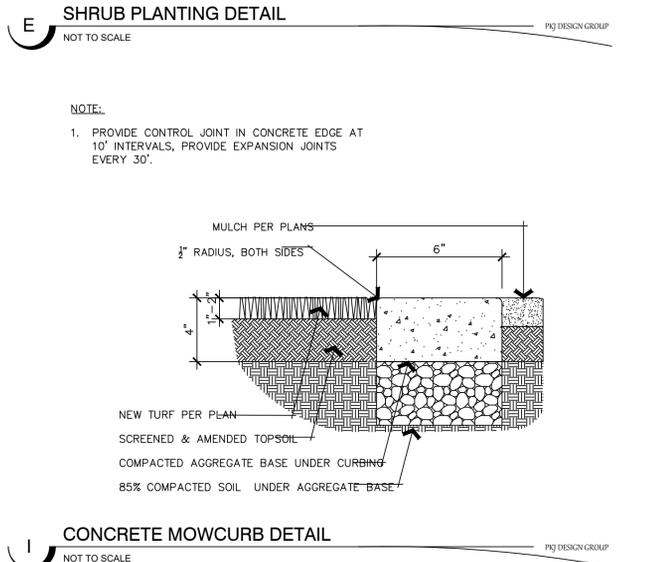
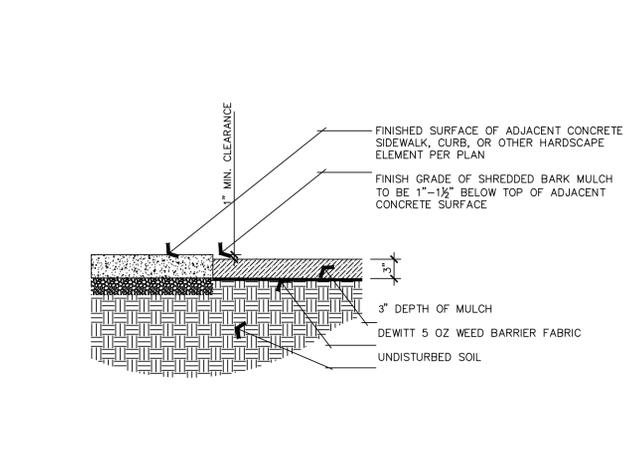
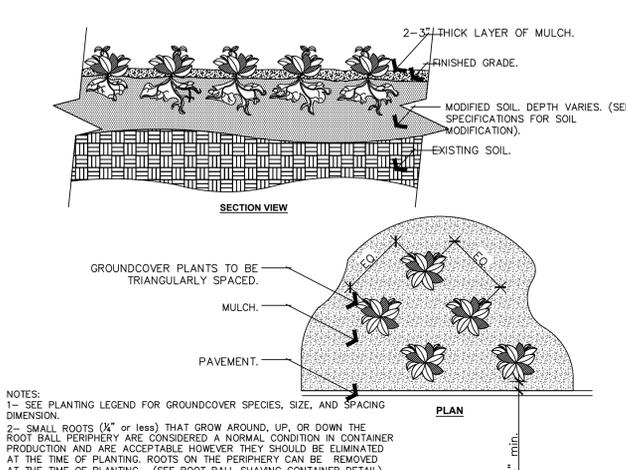
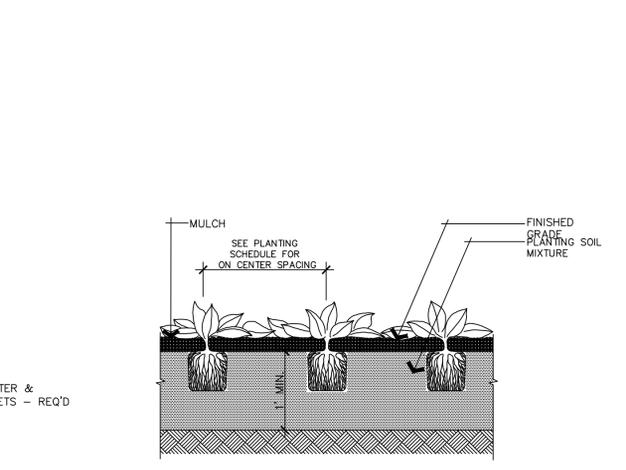
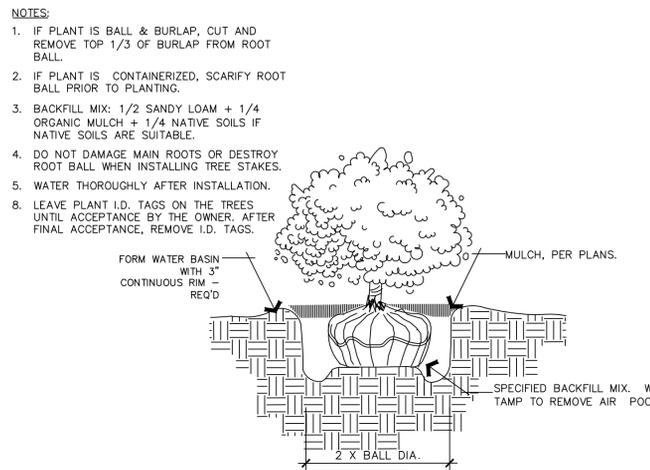
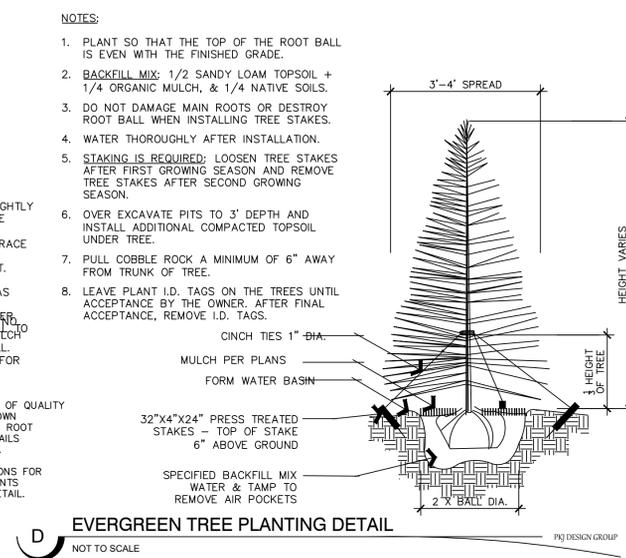
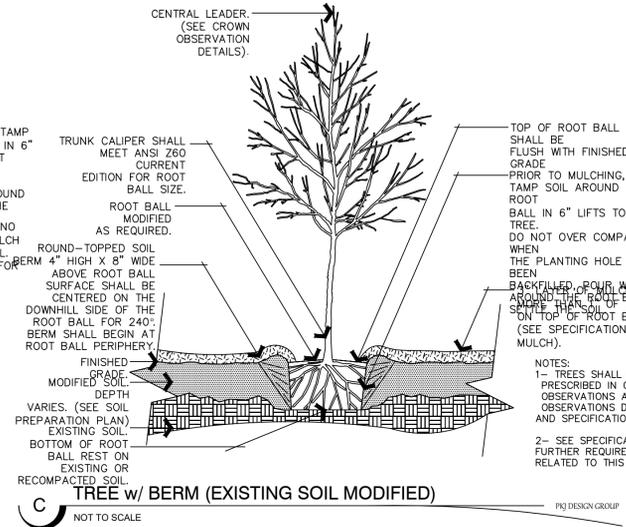
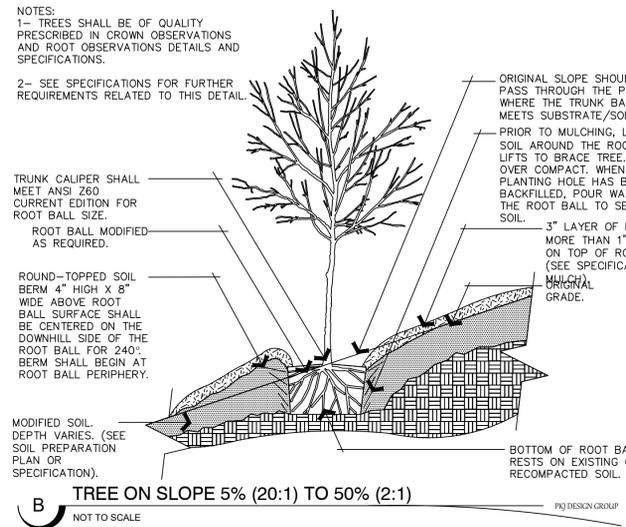
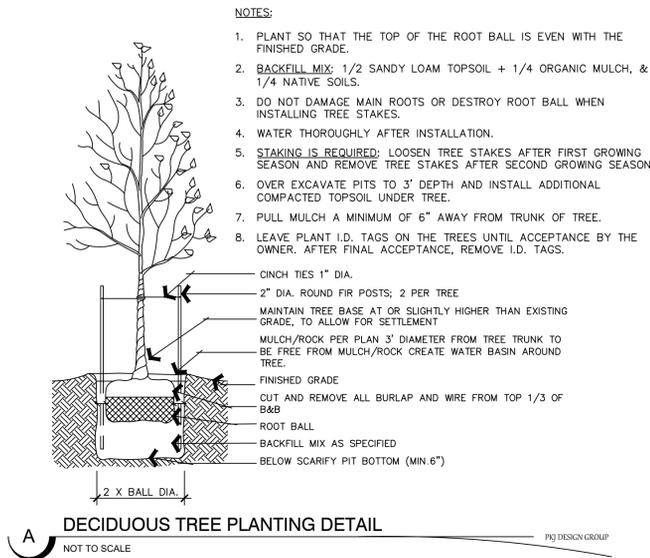
**PKJ DESIGN GROUP**  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
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**LANDSCAPE PLAN**

**LP-1.6**



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP
06-30-2020	UT19010	811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com	
NO.	REVISION	DATE		Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com		
1	XXXX	XX-XX-XX				
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# DI / BISHOP'S STOREHOUSE

## SARATOGA SPRINGS, UTAH

### IRRIGATION SPECIFICATIONS

#### IRRIGATION SPECIFICATIONS

##### PART 1 - GENERAL

###### 1.1 SUMMARY

Work to be done includes all labor, materials, equipment and services required to complete the Project irrigation system as indicated on the Construction Drawings, and as specified herein. Includes but is not limited to: Furnishing and installing underground and above ground sprinkler system complete with any accessories necessary for proper function and operation of the system. All plant material on the Project shall be irrigated. Removal and disposal of any existing sprinkler system components are not to be saved, which are disturbed during the construction process. Restoration of any altered or damaged existing landscape to original state and condition.

###### 1.2 SYSTEM DESCRIPTION

A. Design of irrigation components: Locations of irrigation components on Construction Drawings may be approximate. Piping, sleeving and/or other components shown on Construction Drawings may be shown schematically for graphic clarity and demonstration of component groupings and separations. All irrigation components shall be placed in landscaped areas, with the exception of pipe and wire in sleeving under hardscapes. Actual routing of pipe, wire or other components may be altered due to site conditions not accounted for in the design process.

B. Construction requirements: Actual placement may vary as required to achieve a minimum of 100% coverage without overspray onto hardscape, buildings or other features.

C. Layout of Irrigation Components: During layout and staking, consult with Owner Approved Representative (hereafter referred to as OAR) to verify proper placement of irrigation components and to provide Contractor recommendations for changes, where revisions may be advisable. Small or minor adjustments to system layout are permissible to avoid existing field obstructions such as utility boxes or street light poles. Contractor shall place remote control valves in groups as practical to economize on quantity of manifold isolation valves. Quick coupler valves shall be placed with manifold groups and protected by manifold isolation valves. Quick coupler valves are shown on Construction Documents in approximate locations.

###### 1.3 DEFINITIONS

A. Water Supply: Secondary water piping and components, furnished and installed by others to provide irrigation water to this Project, including but not limited to: fire hydrants, nipples, spools, shut off valves, corporation stop valves, water meters, pressure regulation valves, and piping upstream of (or prior to) the Point of Connection.

B. Point of Connection: Location where the Contractor shall tie into the water supply. May require backflow preventor, saddle, nipples, spools, isolation valves or Stop and Waste valve for landscape irrigation needs and use.

C. Main Line Piping: Pressurized piping downstream of the Point of Connection to provide water to remote control valves and quick couplers. Normally under constant pressure.

D. Lateral Line Piping: Circuit piping downstream of remote control valves to provide water to sprinkler heads, sprinkler heads, drip systems or bubblers.

###### 1.4 REFERENCES

A. The following standards will apply to the work of this Section:

- a. ASTM-American Society for Testing and Materials
- b. IA - The Irrigation Association: Main BMP Document, Landscape Irrigation Scheduling and Water Management Document.

###### 1.5 SUBMITTALS

A. At least thirty (30) days prior to ordering of any materials, the Contractor shall provide manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system. Submittals shall be in three ring binders or other similar bound form. Provide five copies of submittals to OAR for distribution. Place cover or index sheet indicating order in submittal document. No material shall be ordered, delivered or any work preceded in the field until the required submittals have been reviewed in its entirety and stamped approved. Delivered material shall match the approved samples.

B. Operation and Maintenance Manual:

- a. At least thirty (30) days prior to final inspection, the Contractor shall provide Operation and Maintenance manual to OAR, containing:
  - i. Manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system.
  - ii. Parts list for each operating element of the system
  - iii. Manufacturer printed literature on operation and maintenance of operating elements of the system.
- iv. Section listing instructions for overall system operation and maintenance. Include directions for Spring Start-up and Winterization.
- v. Project Record Copy
  - i. Maintain at project site one copy of all project documents clearly marked "Project Record Copy". Mark any deviation in material installation on Construction drawings. Maintain and update drawing at least weekly. Project Record Copy to be available to OAR on demand.
  - ii. Completed Project As-Built Drawings

1. Prior to final inspection, prepare and submit to OAR accurate as-built drawings
2. Show detail and dimension changes made during installation. Show significant details and dimensions that were not shown in original Contract Documents.
3. Field dimension locations of sleeving, points of connection, main line piping, wiring runs not contained in main line pipe trenches, valves and valve boxes, quick coupler valves.
4. Dimensions are to be taken from permanent constructed surfaces, features, or finished edges located at or above finished grade.
5. Contoller Map: upon completion of system, place in each controller a color coded copy of the area that controller services; indicating zone number, type of plant material and location on project that zone services. Laminate map with heat shrink clear plastic.

###### 1.6 QUALITY ASSURANCE

A. Acceptance: Do not install work of this section prior to acceptance by OAR of area to receive such work.

B. Regulatory Requirements: All work and materials shall be according to any and all rules, regulations or codes, whether they are State or Local laws and ordinances. Contract documents, drawings or specifications may not be construed or interpreted to permit work or materials not conforming to the above codes.

C. Adequate Water Supply: Water supply to this Project exists, installed by others. Connections to these supply lines shall be by this Contractor. Verify that proper connection is available to supply line and is of adequate size. Verify that secondary connection components may be installed if necessary. Perform static pressure test prior to commencement of work. Notify OAR in writing of problems encountered prior to proceeding.

D. Workmanship and Materials:

- a. It is the intent of this specification that all material herein specified and shown on the construction documents shall be of the highest quality available and meeting the requirements specified.
- b. All work shall be performed in accordance with the best standards of practice relating to the trade.

E. Contractor Qualifications:

- a. Contractor shall provide document or resume including at least the following items:
  - i. That Contractor has been installing sprinklers on commercial projects for five previous consecutive years.
  - ii. Contractor is licensed to perform Landscape and Irrigation construction in the State of this Project.
  - iii. Contractor is bondable for the work to be performed.
- iv. References of five projects of similar size and scope completed within the last five years. Three of the projects listed shall be local.
- v. Listing of suppliers where materials will be obtained for use on this Project.
- vi. Project site Foreman or Supervisor has at least five consecutive years of commercial irrigation installation experience. This person shall be a current Certified Irrigation Contractor in good standing as set forth by the

Irrigation Association. This person shall be on Project site at least 75% of each working day.

- vii. Evidence that Contractor currently employs workers in sufficient quantities to complete Project within time limits that are established by the Contract.
- viii. All General laborers or workers on the Project shall be previously trained and familiar with sprinkler installation and have a minimum of one-year experience. Those workers performing tasks related to PVC pipe shall have certificates designated below.

###### 1.7 DELIVERY-STORAGE-HANDLING

A. During delivery, installation and storage of materials for Project, all materials shall be protected from contamination, damage, vandalism, and prolonged exposure to sunlight. All material stored at Project site shall be neatly organized in a compact arrangement and storage shall not disrupt Project Owner or other trades on Project site. All material to be installed shall be handled by Contractor with care to avoid breakage or damage. Damaged materials attributed to Contractor shall be replaced with new at Contractor's expense.

###### 1.8 SEQUENCING

A. Perform site survey, research utility records, contact utility location services. The Contractor shall familiarize himself with all hazards and utilities prior to work commencement. Install sleeving prior to installation of concrete, paving or other permanent site elements. Irrigation system Point of Connection components, backflow prevention and pressure regulation devices shall be installed and operational prior to all downstream components. All main lines shall be thoroughly flushed of all debris prior to installation of any sprinkler heads.

###### 1.9 WARRANTY

A. Contractor shall provide one year Warranty. Warranty shall cover all materials, workmanship and labor. Warranty shall include filling and/or repairing depressions or replacing turf or other plantings due to settlement of irrigation trenches or irrigation system elements. Valve boxes, sprinklers or other components settles from original finish grade shall be restored to proper grade. Irrigation system shall have been adjusted to provide proper, adequate coverage of irrigated areas.

###### 1.10 OWNER'S INSTRUCTION

A. After system is installed, inspected, and approved, instruct Owner's Representatives in complete operation and maintenance procedures. Coordinate instruction with references to previously submitted Operation and Maintenance Manual.

###### 1.11 MAINTENANCE

A. Furnish the following items to Owner's Representative:

- a. Two quick coupler keys with hose swivels.
- b. One of each type or size of quick coupler valve and remote control valve. Five percent of total quantities used of each sprinkler and sprinkler nozzle.

B. Provide the following services:

- a. Winterize entire irrigation system installed under this contract. Winterize by 'blow-out' method using compressed air. Compressor shall be capable of minimum of 175 CFM. This operation shall occur at the end of first growing season after need for plant irrigation but prior to freezing. Compressor shall be capable of evacuation system of low water pressure regulation device. Compressor shall be regulated to not more than 60 PSI. Start up system the following spring after danger of freezing has passed. Contractor shall train Owner's Representative in proper start-up and winterization procedure.

##### PART 2 - PRODUCTS

###### 2.1 GENERAL NOTES

A. Contractor shall provide materials to be used on this Project. Contractor shall not remove any material purchased for this Project from the Project Site, nor mix Project materials with other Contractor owned materials. Owner retains right to purchase and provide project material.

###### 2.2 POINT OF CONNECTION

A. The Contractor shall connect onto existing irrigation or water main line as needed for Point(s) of Connection. Contractor shall install new main line as indicated.

###### 2.3 CONNECTION ASSEMBLY

A. Secondary water shall be used on this Project. Install filter and RPZ as needed.

###### 2.4 CONTROL SYSTEM

A. Power supply to the irrigation controller shall be provided for by this Contract.

B. Controller shall be as specified in the drawings. Controller shall be surge protected.

- a. Installation of wall-mount controllers: Irrigation controller shall be responsible for this task. Power configuration for wall-mount controllers shall be 120 VAC unless otherwise noted.
- b. Locate Controller(s) in general location shown on Construction drawings. Coordinate power supply and breaker allocation with electrical contractor. Contractor shall be responsible for all power connections to Controllers, whether they are wall mount or pedestal mount. Contractor shall coordinate with electrical or other Project trades as needed to facilitate installation of power to controllers.

C. Wires connecting the remote control valves to the irrigation controller are single conductors, type PE. Wire construction shall incorporate a solid copper conductor and polyethylene (PE) insulation with a minimum thickness of 0.045 inches. The wires shall be UL listed for direct burial in irrigation systems and be rated at a minimum of 30 VAC. Paige Electric Co., LP specification number P7079D.

- a. A minimum of 24" of additional wire shall be left at each valve, each splice box and at each controller.
- b. Common wire shall be white in color, 12 gauge. Control wire shall be red in color, 14 gauge. Spare wire shall be looped within each valve box of the grouping it is to service.

D. RCV wire splicing connectors shall be 3M brand DBY or DBR. Wire splicing between controller and valves shall be avoided if at all possible. Any wire splices shall be contained within a valve box. Splices within a valve box that contains no control valves shall be stamped "WIRE SPLICED" or "WS" on box lid.

###### 2.5 SLEEVING

A. Contractor shall be responsible to protect existing underground utilities and components. Sleeving minimum size shall be 2". Sleeving 2" through 4" in size shall be S/40 PVC solvent weld. Sleeving 6" and larger shall be CL 200 PVC gasketed. Sleeve diameter shall be at least two times the diameter of the pipe within the sleeve. Sleeves shall be extended 6" minimum beyond burr or edge of pavement. Wire or cable shall not be installed in the same sleeve as piping, but shall be installed in separate sleeves. Sleeve ends on sleeve sizes 4" and larger shall be capped with integral corresponding sized PVC slip cap, pressure fit, until used, to prevent contamination. Sleeves shall be installed at appropriate depths for main line pipe or lateral pipe.

###### 2.6 MAIN LINE PIPE

A. All main line pipe 4" and larger shall be Class 200 gasketed bell end. All main line pipe 3" in size and smaller shall be Schedule 40 PVC solvent weld bell end.

- a. Maximum flows allowed through main line pipe shall be:
  - 3/4" 8 GPM
  - 1" 12 GPM
  - 1-1/2" 30 GPM
  - 2" 53 GPM
  - 2-1/2" 75 GPM
  - 3" 110 GPM
  - 4" 180 GPM
- b. Main line pipe shall be buried with 24" cover

###### 2.7 MAIN LINE FITTINGS

A. All main line fittings 3" and larger shall be gasketed ductile iron material. All ductile iron fittings having change of direction shall have proper concrete thrust block installed. All main line fittings smaller than 3" in size shall be Schedule 80 PVC.

###### 2.8 ISOLATION VALVES

A. Isolation valves 3" and larger shall be Waterous brand model 2500 cast iron gate valve, resilient wedge, push on type, with 2" square operating nut. Place sleeve of 6" or larger pipe over top of valve vertically and then extend to grade. Place 10" round valve box over sleeve at grade.

B. Isolation valves 2-1/2" and smaller shall be Apollo brand 70 series brass ball valves, contained in a Carson Standard size valve box. Valves shall be installed with S/80 PVC TOE Nipples on both sides of the valve. Valve shall be placed so that the handle is vertical toward the top of the valve box in the 'off' position.

###### 2.9 MANIFOLDS

A. Action Manifold fittings shall be used to create unions on both sides of each control valve, allowing the valve to be removed from the box without cutting piping. Valves shall be located in boxes with ample space surrounding them to allow access for maintenance and repair. Where practical, group remote control valves in close proximity, and protect each grouping with a manifold isolation valve as shown in details. Manifold Main Line (or Sub-Main Line) and all manifold components and isolation valves shall be at least as large as the largest diameter lateral served by the respective manifold.

###### 2.10 REMOTE CONTROL VALVES

A. Remote control valves shall be as specified on the drawings. Remote control valves shall be located separately and individually in separate control boxes.

###### 2.11 MANUAL CONTROL VALVES

A. Quick coupler valve shall be attached to the manifold sub-main line using a Lasco G175212 swing joint assembly with snap-lock outlet and brass stabilizer elbow. Quick coupler valve shall be placed within a Carson 10" round valve box. Top of quick coupler valve cover shall allow for complete installation of valve box lid, but also allow for insertion and operation of key. Base of quick coupler valve and top of quick coupler swing joint shall be encased in 3/4" gravel. Contractor shall not place quick coupler valves further than 200 feet apart, to allow for spot watering or supplemental irrigation of new plant material. Quick coupler valve at POC shall not be eliminated or relocated.

###### 2.12 LATERAL LINE PIPE

A. All lateral piping shall be Schedule 40 PVC, solvent weld, and bell end. Lateral pipe shall be buried with 12-18" of cover typically. Lateral pipe shall be 3/4", 1", 1 1/4", 1 1/2" or 2" in size as indicated on Construction Drawings.

###### 2.13 LATERAL LINE FITTINGS

A. All lateral line fittings shall be S/40 PVC

###### 2.14 Spray Sprinklers

A. Spray head sprinklers shall be as specified on the drawings. Nozzles shall be as specified on the drawings.

###### 2.15 VALVE BOXES

A. Carson valve boxes shall be used on this project. Sizes are as directed in these Specifications, detail sheets or plan sheets. Valve boxes shall be centered over the control valve or element they cover. Valve box shall be sized large enough to allow ample room for services access, removal or replacement of valve or element. Valve box shall be set to flush to finish grade of topsoil or parked areas. Contractor shall provide extensions or stack additional valve boxes as necessary to bring valve box pit to above grade.

###### 2.16 IMPORT BACKFILL

A. All main line pipe, lateral line pipe and other irrigation elements shall be bedded and backfilled with clean soil, free of rocks 1" and larger. Contractor shall furnish and install additional backfill material as necessary due to rocky conditions. Trenches and other elements shall be compacted and/or water settled to eliminate settling. Debris from trenching operations unusable for fill shall be removed from project and disposed of properly by Contractor.

###### 2.17 OTHER PRODUCTS

A. Substitution of equivalent products is subject to the OAR's approval and must be designated as accepted in writing.

- a. The Contractor shall provide materials to make the system complete and operational.

##### PART 3 - EXECUTION

###### 3 PREPARATION

A. Contractor shall repair or replace work damaged by irrigation system installation. If damaged work is new, replacement or the original installer of that work shall perform repairs. The existing landscape of this Project shall remain in place. Contractor shall protect and work around existing plant material. Coordination of trench and valve locations shall be laid out the OAR prior to any excavation occurring. Plant material deemed damaged by the OAR shall be replaced with new plant material at Contractor's expense. Contractor shall not cut existing tree roots larger than 2" to install this Project. Route pipe, wire and irrigation elements around tree canopy drip line to minimize damage to tree roots. Contractor shall have no part of existing system used by other portions of site landscape without water for without water for more than 24 hours at a time.

###### 3.2 TRENCHING AND BACKFILLING

A. Pulling of pipe shall not be permitted on this project. Over excavate trenches both in width and depth. Ensure base of trench is rock or debris free to protect pipe and wire. Grade trench base to ensure flat, even support of piping. Backfill with clean soil or import material. Contractor shall backfill no less than 2" around entire pipe with clean, rock free fill. Main line piping and fittings shall not be backfilled until OAR has inspected and pipe has passed pressure testing. Perform balance of backfill operation to eliminate any settling.

###### 3.3 SLEEVING

A. Sleeve all piping and wiring that pass under paving or hardscape features. Wiring shall be placed in separate sleeving from piping. Sleeves shall be positioned relative to structures or obstructions to allow for pipe or wire within to be removed if necessary.

###### 3.4 GRADES AND DRAINAGE

A. Place irrigation pipe and other elements at uniform grades. Winterization shall be by evacuation with compressed air. Automatic drains shall not be installed on this Project. Manual drains shall only be installed at POC where designated on Construction Drawings.

###### 3.5 PVC PIPE

A. Install pipe to allow for expansion and contraction as recommended by pipe manufacturer.

B. Install main line pipes with 18" of cover, lateral line pipes with 12" of cover.

C. Drawings show diagrammatic or conceptual location of piping. Contractor shall install piping to minimize change of direction, avoid placement under large trees or large shrubs, avoid placement under hardscape features.

D. Plastic pipe shall be cut squarely. Burrs shall be removed. Spigot ends of pipes 3" and larger shall be beveled.

E. Pipe shall not be glued unless ambient temperature is at least 50 degrees F. Pipe shall not be glued in rainy conditions unless properly tented. All solvent weld joints shall be assembled using IPS 711 glue and P70 primer according to manufacturer's specification, no exceptions. All workers performing glue operations shall provide evidence of certification. Glued main line pipe shall cure a minimum of 24 hours prior to being energized. Lateral lines shall cure a minimum of 2 hours prior to being energized and shall not remain under constant pressure unless cured for 24 hours.

F. Appropriate thrust blocking shall be performed on fittings 3" and larger. All threaded joints shall be wrapped with Teflon tape or paste unless directed by product manufacturer or sealing by o-ring.

###### 3.6 CONTROLLERS

A. All grounding for pedestal controllers shall be as directed by controller manufacturer and ASIC guidelines, not to exceed a resistance reading of 5 OHMS.

B. Locate controllers in protected, inconspicuous places, when possible. Coordinate location of pedestal controllers with Landscape Architect to minimize visibility.

C. Coordinate location of wall mount controllers with building or electrical Contractor to facilitate electrical service and future maintenance needs. Wall mount shall be securely fastened to surface. If exterior mounted, wall mount controllers shall have electrical service wire and field control wire in separate, appropriate sized weatherproof electrical conduit, PVC pipe shall not be used.

D. Wire under hardscape surfaces shall be placed continuously in conduit. Contractor shall be responsible to coordinate sleeving needs for conduit or sweeps elbows from exterior to interior of building.

E. Pedestal controllers shall be placed upon VIT-Strong Box Quick Pad as per manufacturer's recommendations. Controllers shall be oriented such that Owner's Representative maintenance personnel may access easily and perform field system tests efficiently.

F. Place Standard valve box at base of controller or nearby to allow for three to five feet of slack field control wire to be placed at each controller. This Contractor shall provide conduit access if needed for Electrical Contractor. Electrical supply and installation, as well as hook-up to controller shall be by this Contractor.

###### 3.7 VALVES

A. Isolation valves, remote control valves, and quick coupler valves shall be installed according to manufacturer recommendation and Contract Specifications and Details.

B. Valve boxes shall be set over valves so that all parts of the valve can be reached for service.

C. Valve box and lid shall be set to be flush with finished grade. Only one remote control valve may be installed in a Carson 1419124 box. Place a minimum of 4" of 3/4" washed gravel beneath valve box for drainage. Bottom of remote control valve shall be a minimum of 2" above gravel.

###### 3.8 SPRINKLER HEADS

A. No sprinkler shall be located closer than 6" to walls, fences, or buildings.

B. Heads adjacent to walks, curbs. Or paths shall be located at grade and 2" away from hardscape.

C. Control valves shall be opened and fully flush lateral line pipe and swing joints prior to installation of sprinklers.

D. Spray heads shall be installed and flushed again prior to installation of nozzles.

E. Contractor shall be responsible for adjustment if necessary due to grade changes during landscape construction.

###### 3.9 FIELD QUALITY CONTROL

A. Main line pipes shall not be backfilled or accepted until the system has been tested for 2 hours at 100 psi.

B. Main line pressure test shall include all pipe and components from the point of connection to the upstream side of remote control valves. Test shall include all manifold components under constant pressure. Piping may be tested in sections that can be isolated.

C. Contractor shall provide pressurized water pump to increase or boost pressure where existing static pressure is less than 100 psi.

D. Schedule testing with OAR 48 hours in advance for approval.

E. Leaks or defects shall promptly be repaired or rectified at the Contractors expense and retested until able to pass testing.

F. Grounding resistance at pedestal controller shall also be tested and shall not exceed 5 OHMS.

###### 3.10 ADJUSTMENT

A. Sprinkler heads shall be adjusted to proper height when installed. Changes in grade or adjustment of head height after installation shall be considered a part of the original contract and at Contractor's expense.

B. Adjust all sprinkler heads for arc, radius, proper trim and distribution to cover all landscaped areas that are to be irrigated.

C. Adjust sprinklers so they do not water buildings, structures, or other hardscape features.

D. Adjust run times of station to meet needs of plant material the station services.

###### 3.11 CLEANING

A. Contractor shall be responsible for cleanliness of jobsite. Work areas shall be swept cleanly and picker up daily.

B. Open trenches or hazards shall be protected with yellow caution tape.

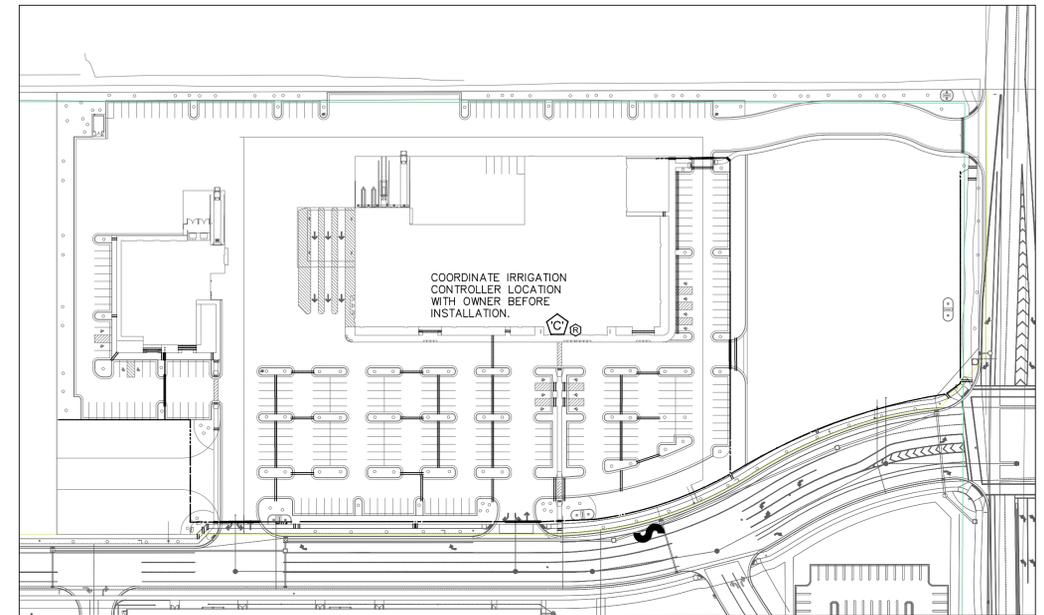
C. Contractor is responsible for removal and disposal offsite of trash and debris generated as a result of this Project.

- a. OAR shall perform periodic as well as a final cleanliness inspection.
- E. Contractor shall leave Project in at least a "broom clean" condition.

END OF SECTION

### REFERENCE MAP

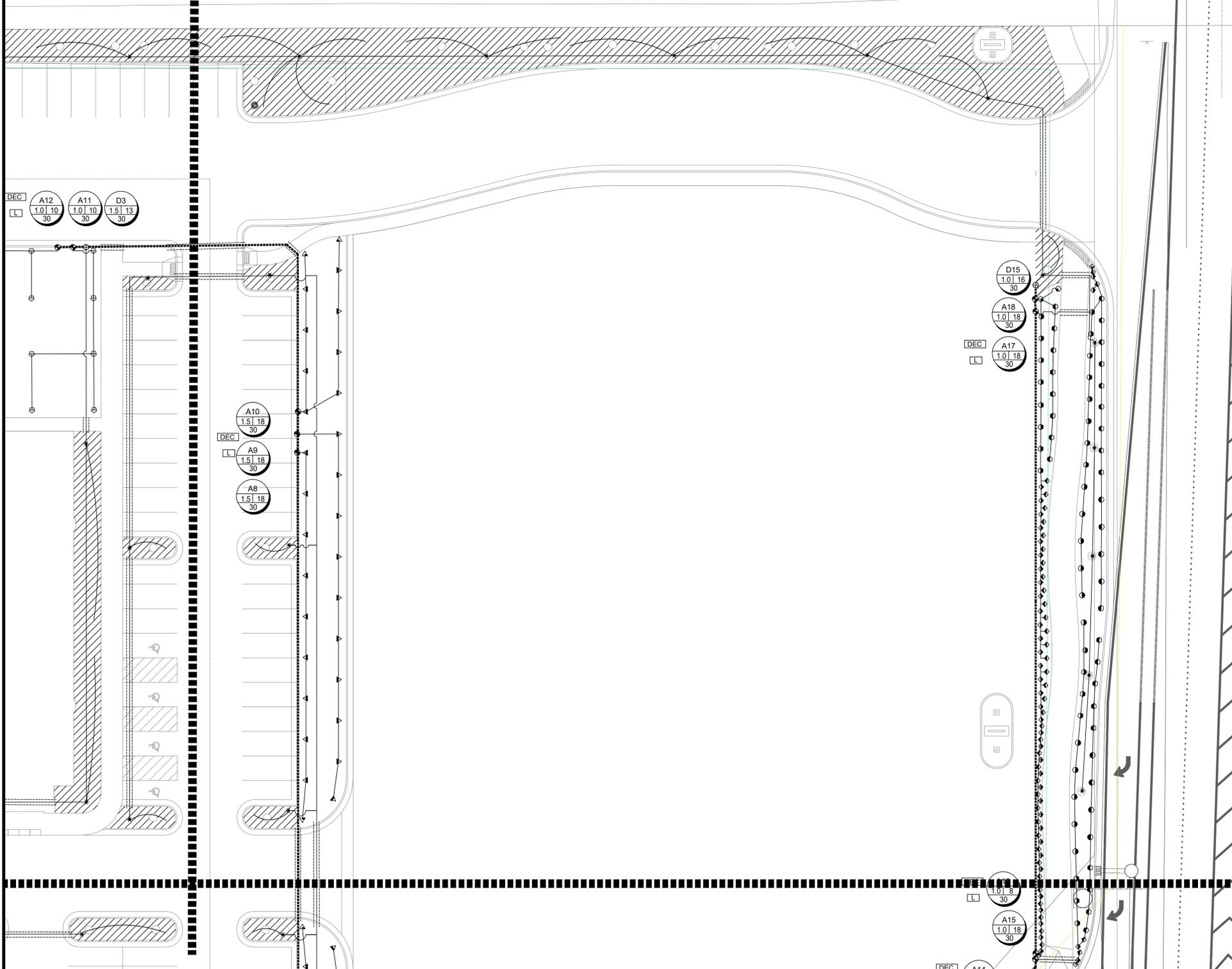
IR-1.3	IR-1.2	IR-1.1
IR-1.4	IR-1.5	IR-1.6



2" MAINLINE ROUTING ,CONTROLLER AND P.O.C. LOCATION OVERVIEW

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP	PM:																								
06-30-2020	UT19010	 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org		Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	 PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com		JTA KBA TM 7/11/2020																								
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7					<p style="text-align: center;"><b>IRRIGATION PLAN</b></p> <p style="text-align: right; font-size: 2em;"><b>IR-1.0</b></p>				
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SHEET IR 1.2



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS	
					Q	T	H	TT	F		
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	8'	30	26	35	52	na	na	1.05	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	10'	30	39	53	79	na	na	1.58	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES MPR NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT, PLACE IN LXMM PEDESTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
○	MASTER VALVE										
○	FLOW SENSOR										
○	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
○	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
○	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
○	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
○	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
○	REMOTE CONTROL VALVE: RAINBIRD PFS-AN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
○	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
*	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
-----	CLASS 200 SLEEVE PER PLAN										
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM			
MAXIMUM LATERAL LENGTH OF TUBING		350 FT			
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)			
APPLICATION RATE		64 INCH PER HOUR			

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

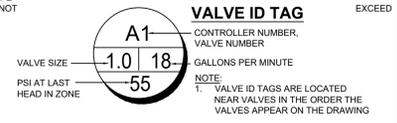
Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25' INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2" AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		

811 BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

DEVELOPER / PROPERTY OWNER / CLIENT  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

Client / Engineer: LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

LANDSCAPE ARCHITECT / PLANNER  
PKJ DESIGN GROUP  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

LICENSE STAMP  
IR-1.1

IRRIGATION PLAN

PLOT DATE: 1/23/2020

JTA  
KBA  
TM

**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM						REMARKS
					Q	T	H	TT	TQ	F	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F.	5'	30	10	15	20	na	na	40	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F.	8'	30	26	35	52	na	na	1.05	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F.	10'	30	39	53	79	na	na	1.58	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES IMPR NOZZLES	Q.T.H.F.	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F.	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTE KIT. PLACE IN LXXM PER DETAIL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
○	MASTER VALVE										
○	FLOW SENSOR										
○	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
○	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
○	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
○	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
○	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
○	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
○	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
*	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
-----	CLASS 200 SLEEVE PER PLAN										
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min		15 min		15 min		30 psi
Shrubs	45 min		45 min		45 min		45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

**IRRIGATION NOTES**

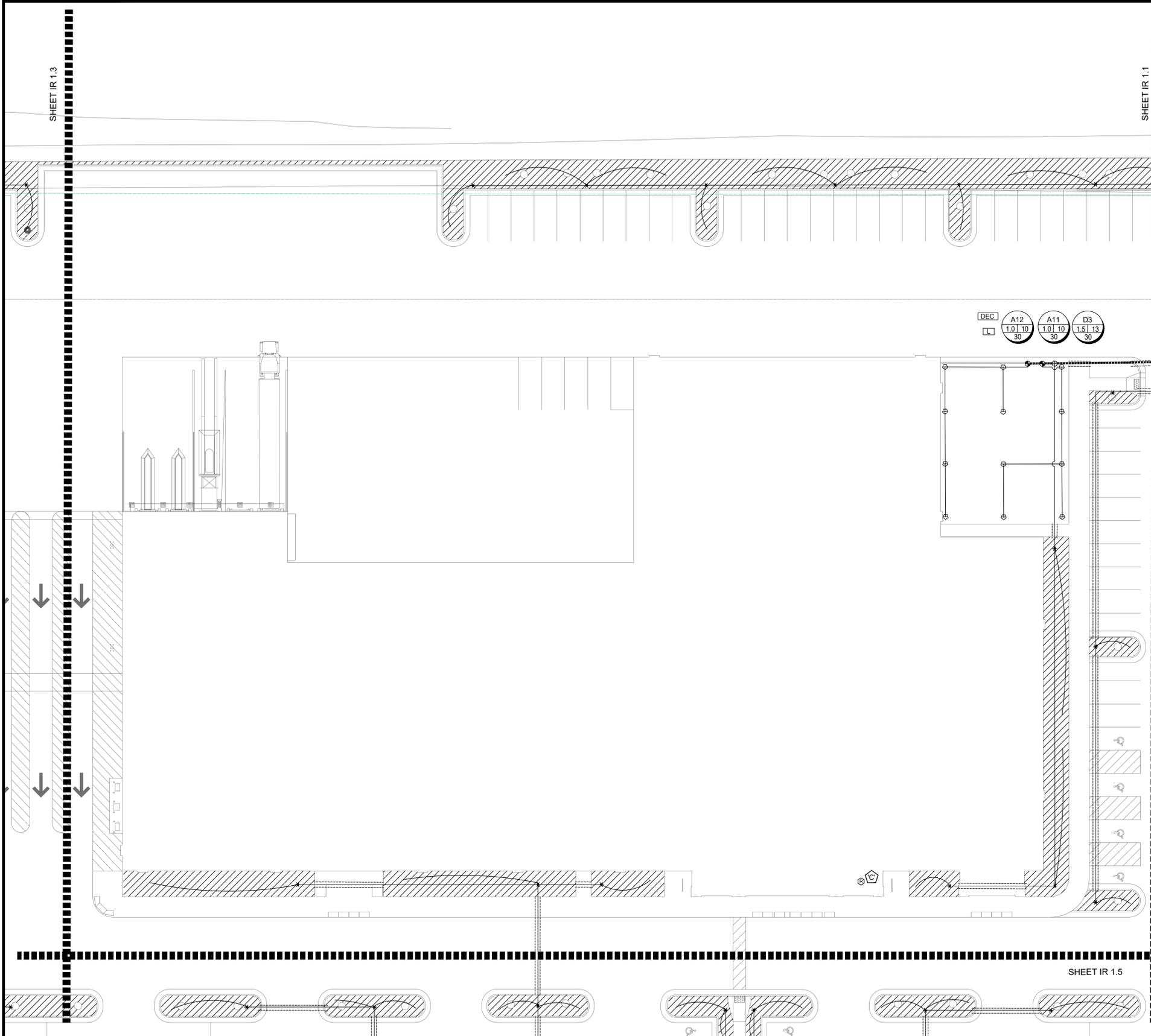
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
- CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
- MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
- CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
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- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
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- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

3/4"	8 GPM	CONTROLLER NUMBER
1"	12 GPM	VALVE NUMBER
1-1/2"	30 GPM	
2"	53 GPM	
2-1/2"	75 GPM	
3"	110 GPM	
4"	180 GPM	

VALVE SIZE: 1.0 18  
PSI AT LAST HEAD IN ZONE: 55

NOTE: 1. VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING



<b>ISSUE DATE</b> 06-30-2020	<b>PROJECT NUMBER</b> UT19010	<b>PLAN INFORMATION</b> 811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>PROJECT INFORMATION</b> <b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	<b>DEVELOPER / PROPERTY OWNER / CLIENT</b> Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	<b>LANDSCAPE ARCHITECT / PLANNER</b> Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com	<b>LICENSE STAMP</b> PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com	<b>IRRIIGATION PLAN</b> PLOT DATE: 1/23/2020 <b>IR-1.2</b>
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**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM						QTY	REMARKS
					Q	T	H	TT	TQ	F		
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						--	
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
⊙	RAINBIRD 5000 SERIES MPX NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
⊙	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
⊙	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTE KIT, PLACE IN LXMM PER INSTALL CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
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⊙	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
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**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min		15 min		15 min		30 psi
Shrubs	45 min		45 min		45 min		45 min	40 psi

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	15 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

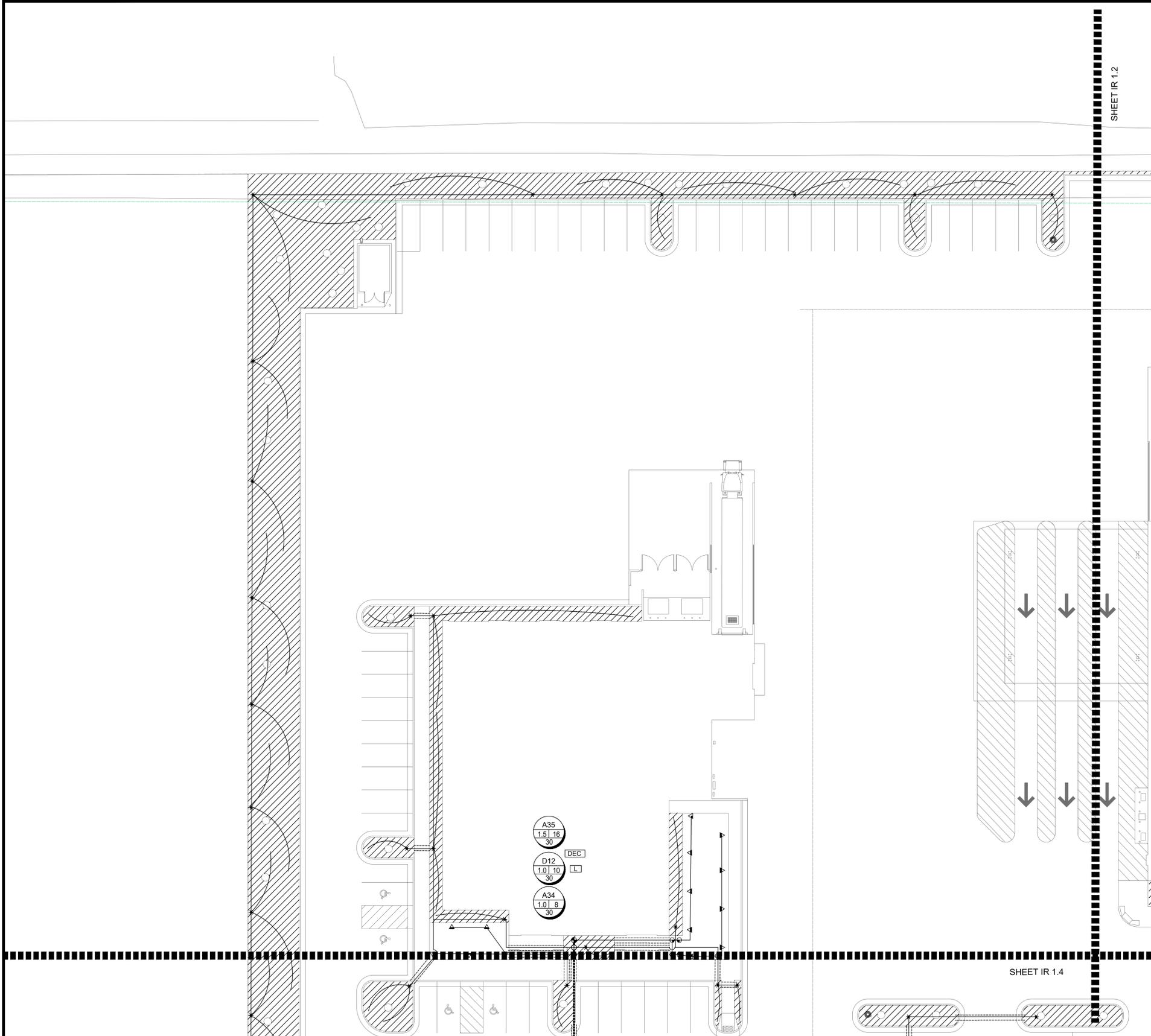
**IRRIGATION NOTES**

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- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
- IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
- ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
- CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

CONTROLLER NUMBER: A1  
VALVE NUMBER: 18  
GALLONS PER MINUTE: 55

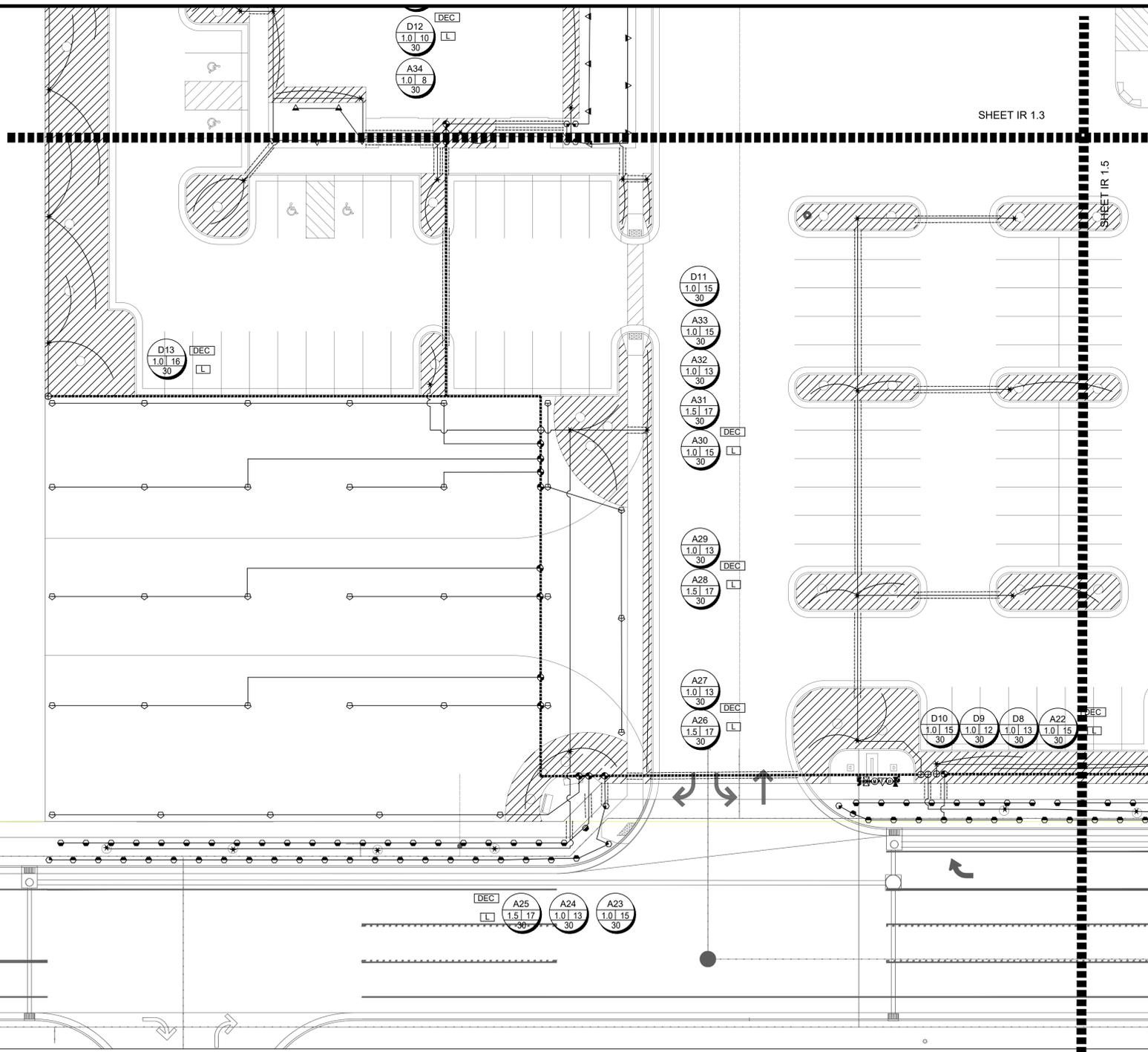
NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING



SHEET IR 1.2

SHEET IR 1.4

<p>ISSUE DATE: 06-30-2020</p> <p>PROJECT NUMBER: UT19010</p>		<p>PLAN INFORMATION</p> <p>811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC 1-800-662-4111 www.bluestakes.org</p>		<p>PROJECT INFORMATION</p> <p><b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH</p>		<p>DEVELOPER / PROPERTY OWNER / CLIENT</p> <p>Developer / Property Owner: JRW &amp; ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020</p>	
<p>NO. REVISION DATE</p> <p>1 XXXX XX-XX-XX</p>		<p>GRAPHIC SCALE: 1" = 20'</p>		<p>Developer / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020</p>		<p>IR-1.3</p>	



**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS	
					Q	T	H	TQ			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	10	15	20	na	40	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	26	35	52	na	1.05	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	10'	30	39	53	79	na	1.58	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES MPR NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT. PLACE IN LXXM PERISTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
□	MASTER VALVE										
□	FLOW SENSOR										
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
□	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
□	CLASS 200 SLEEVE PER PLAN										
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC.										
□	PROVIDE 2 WIRE LOOP SYSTEM.										

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min	45 min	15 min	45 min	15 min	45 min	30 psi
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

**IRRIGATION NOTES**

- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
- CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
- MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
- CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
- INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
- CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
- WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
- ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
- SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
- MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
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- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

3/4"	8 GPM	CONTROLLER NUMBER
1"	12 GPM	VALVE NUMBER
1-1/2"	30 GPM	GALLONS PER MINUTE
2"	53 GPM	
2-1/2"	75 GPM	
3"	110 GPM	
4"	180 GPM	

VALVE SIZE: 1.0 18-55

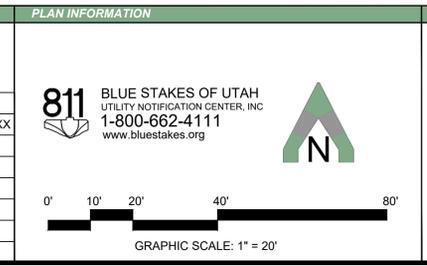
PSI AT LAST HEAD IN ZONE

NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		



**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**  
PKJ DESIGN GROUP  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD. SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

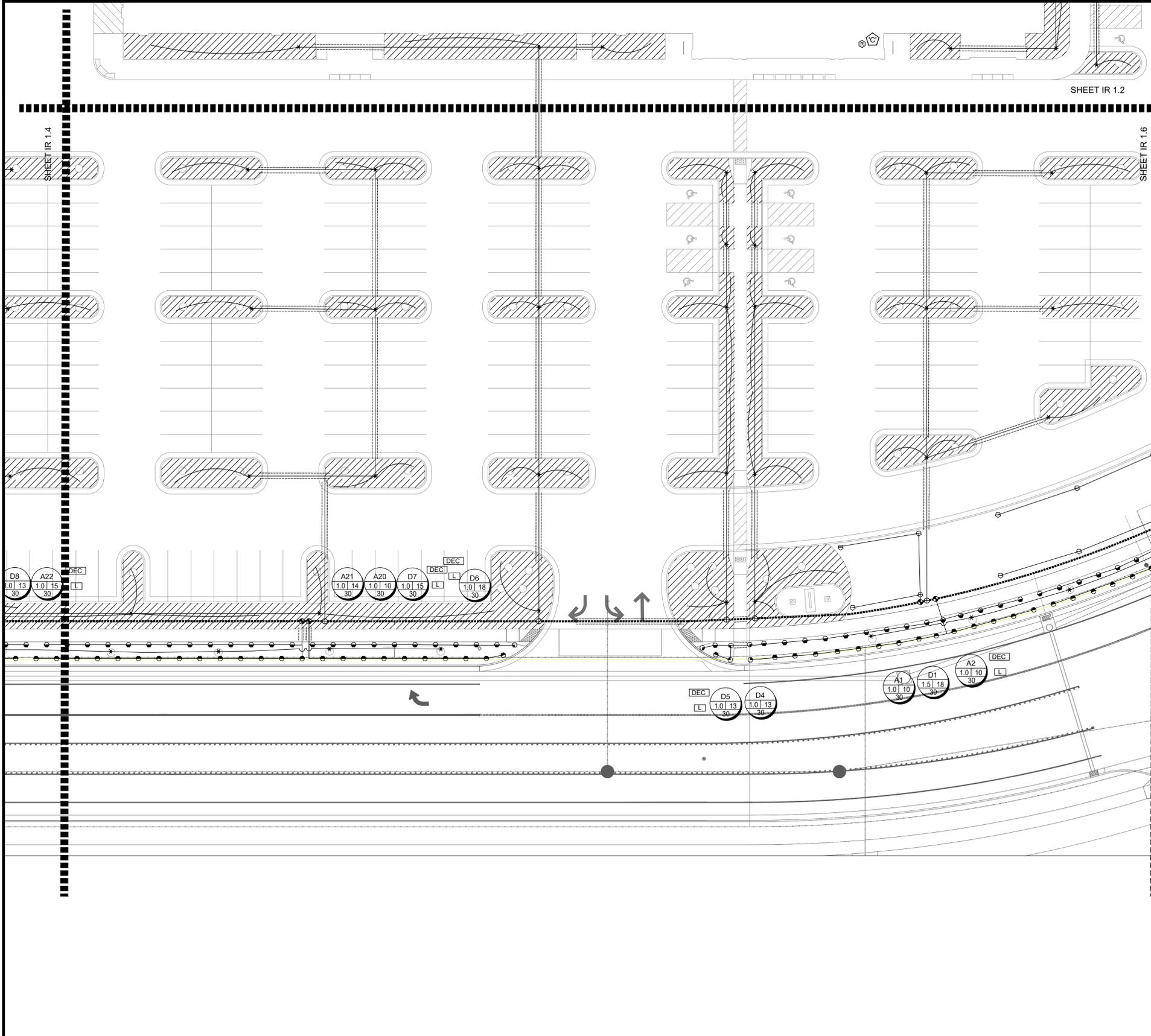
**LICENSE STAMP**

**IRRIGATION PLAN**

IR-1.4

DATE: 1/23/2020

DESIGNED BY: JTA  
DRAWN BY: KBA  
CHECKED BY: TM



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM					REMARKS		
					Q	T	H	TQ	F			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F.	5'	30	10	15	20	na	40	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F.	10'	30	26	35	52	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F.	15'	30	39	53	79	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	Q.T.H.T	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	61						--	
○	RAINBIRD 5000 SERIES MPR NOZZLES	Q.T.H.F.	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F.	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTE KIT, PLACE IN LXMM PEDESTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										--	WALL MOUNT, COORDINATE WITH OWNER FOR EXACT LOCATION
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	MASTER VALVE										--	SEE DETAIL
□	FLOW SENSOR										--	SEE DETAIL
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										--	SEE DETAIL
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										--	SEE DETAIL
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										--	SEE DETAIL
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										--	10" RND. VALVE BOX. SEE DETAIL
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	REMOTE CONTROL VALVE: RAINBIRD PRS-ND AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										--	SEE DETAIL JUMBO BOX-PURPLE LID
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-FRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										--	SEE DETAIL
□	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										--	INSTALL FLUSH CAP. SEE DETAIL
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										--	SEE DETAIL
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										--	SEE DETAIL
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										--	SEE DETAIL
□	CLASS 200 SLEEVE PER PLAN										--	SEE DETAIL
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										--	SEE DETAIL
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										--	SEE DETAIL

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

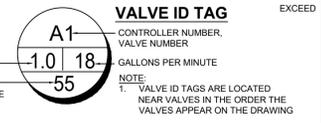
Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	15 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
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  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
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811 BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

Developer / Property Owner:  
**JRW & ASSOCIATES**  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. A  
 REXBURG, ID 83440  
 (208)359-2309

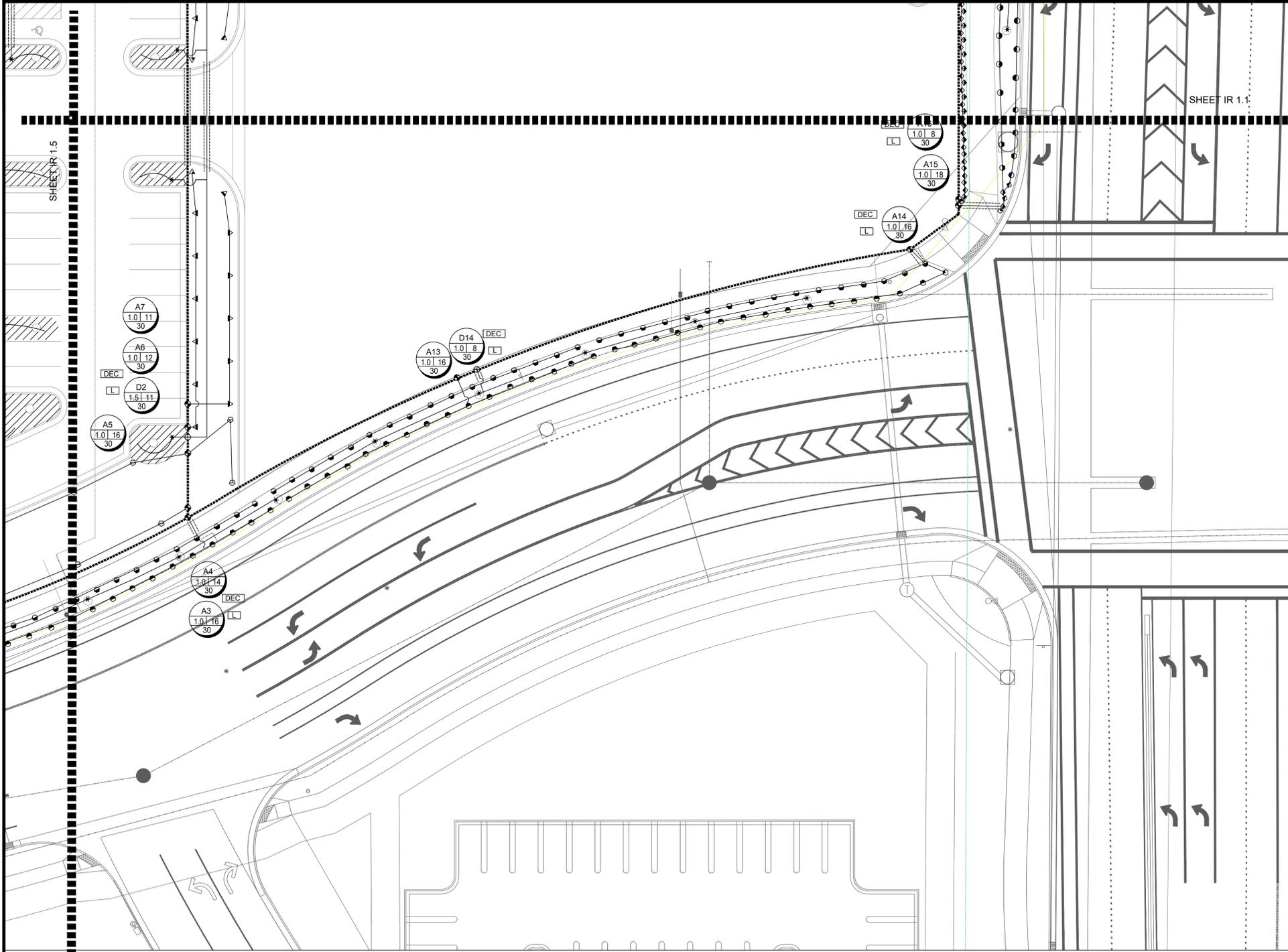
Client / Engineer:  
**LEI-ENGINEERING**  
 3302 N. Main Street  
 Spanish Fork, Ut. 84660  
 801-798-0555 ext. 226  
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LANDSCAPE ARCHITECT / PLANNER  
**PKJ DESIGN GROUP L.L.C.**  
 3450 N. TRIUMPH BLVD, SUITE 102  
 LEHI, UTAH 84043 (801) 960-2698  
 www.pkjdesigngroup.com

LICENSE STAMP

IRRIGATION PLAN  
**IR-1.5**

DATE: 1/23/2020  
 DRAWN: KBA  
 CHECKED: TM  
 PLOT DATE: 1/23/2020



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM					QTY	REMARKS	
					Q	T	H	TT	F			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						--	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
○	RAINBIRD 5000 SERIES IMPR NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTEKIT. PLACE IN LXMM PEDESTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	MASTER VALVE											
□	FLOW SENSOR											
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE											
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)											
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.											
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.											
□	REMOTE CONTROL VALVE: RAINBIRD PFS-AN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)											
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)											
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.											
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER											
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER											
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART											
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT											
□	CLASS 200 SLEEVE PER PLAN											
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN. 1 1/4" DIAMETER MINIMUM											
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC.											
□	PROVIDE 2 WIRE LOOP SYSTEM.											

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25' INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
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**VALVE ID TAG**

CONTROLLER NUMBER: A1

VALVE NUMBER: 1.0 18

GALLONS PER MINUTE: 55

NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

**LICENSE STAMP**

PKJ DESIGN GROUP

3450 N. TRIUMPH BLVD, SUITE 102

LEHI, UTAH 84043 (801) 960-2698

www.pkjdesigngroup.com

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
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# DI STOREHOUSE

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**DEVELOPER / PROPERTY OWNER / CLIENT**

Developer / Property Owner: JRW & ASSOCIATES  
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REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**

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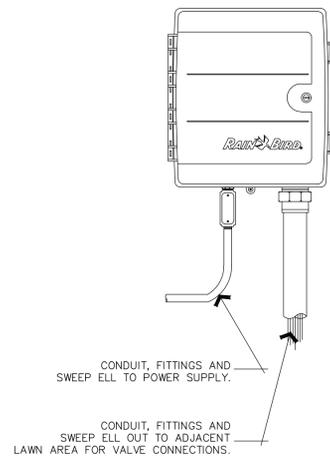
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**IRRIGATION PLAN**

IR-1.6

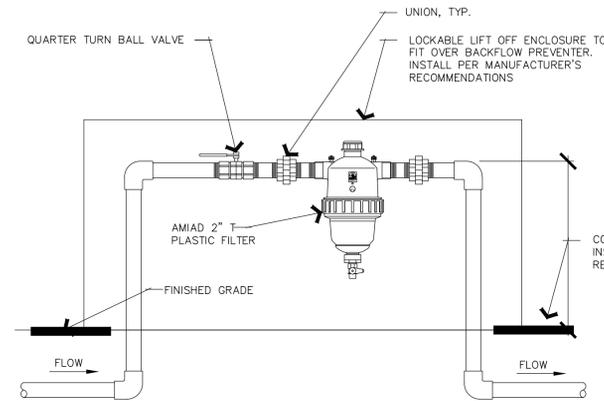
PLOT DATE: 1/23/2020

NAME: JTA  
DRAWN: KBA  
CHECKED: TM

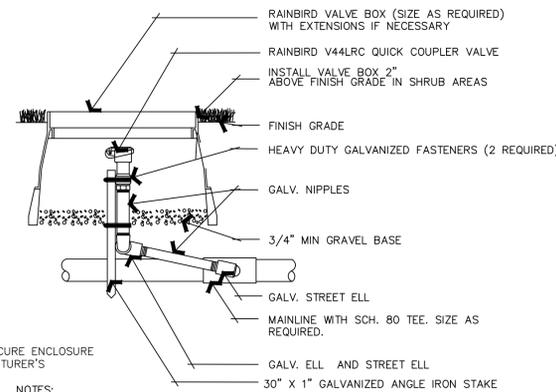


- NOTES:**
1. MOUNT CONTROLLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS AND IN ACCORDANCE WITH ALL LOCAL CODES. EXACT LOCATION TO BE APPROVED BY OWNER. GROUND CONTROLLER PER MANUFACTURER'S RECOMMENDATION AND SPECIFICATIONS. ELECTRICAL CONTRACTOR SHALL GROUND CONTROLLER AND PROVIDE SLEEVING FROM ADJACENT LAWN AREA TO CONTROLLER LOCATION.
  2. CONNECT CONTROLLER TO POWER AND VALVES.
  3. LANDSCAPE CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR TO ENSURE PROPER GROUNDING OF CONTROLLER TO BUILDING GROUNDING GRID.

**A RAINBIRD CONTROLLER DETAIL**  
NOT TO SCALE

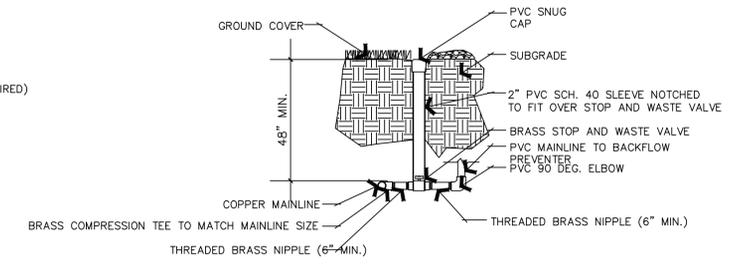


**B 2" PLASTIC FILTER DETAIL**  
NOT TO SCALE



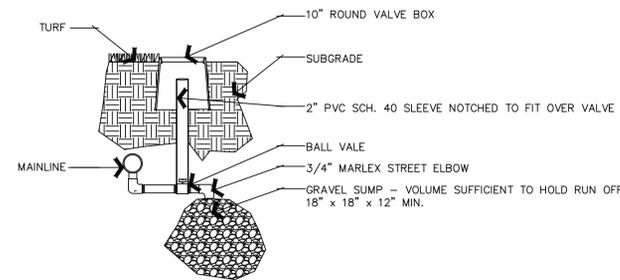
- NOTES:**
1. FLUSH ALL PIPING PRIOR TO INSTALLING VALVE.
  2. WRAP ALL THREADS WITH TEFLON TAPE. 1 1/2 TO 2 WRAPS MAXIMUM.
  3. COMPACT SOILS AROUND VALVE BOX TO 80% OF ORIGINAL DRY DENSITY.
  4. INSTALL GEOFABRIC UNDER VALVE BOXES AND TAPE TO PIPE NIPPLES AND VALVE BOX.
  5. BOX COLOR - GREEN IN TURF AND TAN IN PLANTER AREAS.
  6. IRRIGATION SYSTEM TO BE BLOWN OUT WITH AIR COMPRESSOR THROUGH QUICK COUPLERS BEFORE FREEZING TEMPERATURES OCCUR, TYP.

**C RAINBIRD QUICK COUPLER**  
NOT TO SCALE



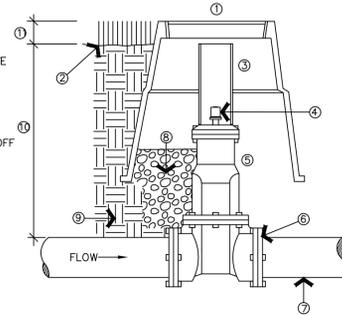
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 40 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**D STOP AND WASTE VALVE ASSEMBLY**  
NOT TO SCALE



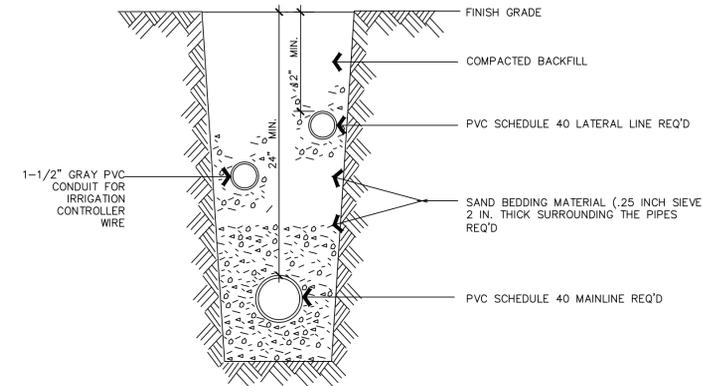
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 80 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**E MANUAL DRAIN ASSEMBLY**  
NOT TO SCALE

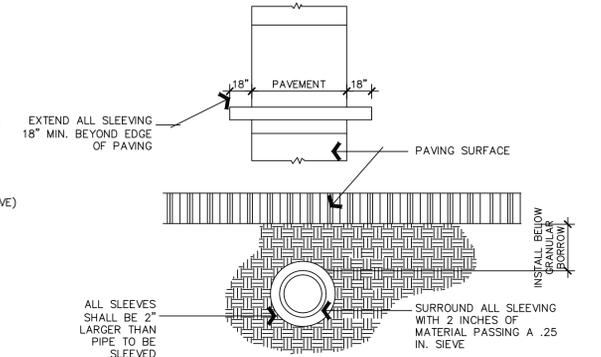


- 1 10" ROUND GREEN PLASTIC VALVE BOX W/ BOLT LOCK, CARSON - BROOKS
- 2 FINISH GRADE
- 3 6" PVC SCH. 40 PIPE SLEEVE, 4" - 6" BELOW GRADE
- 4 2" SQUARE OPERATING NUT
- 5 FLANGE X FLANGE GATE VALVE SEE EQUIPMENT SCHEDULE
- 6 SCH. 80 FLANGE ADAPTER
- 7 MAIN WATER SUPPLY LINE
- 8 6" MIN. GRAVEL
- 9 SUBGRADE COMPACTED TO 95%
- 10 DEPTH: 18" - 30"
- 11 SHRUBS - 2": SOD-1 1/2"; SEED 1"

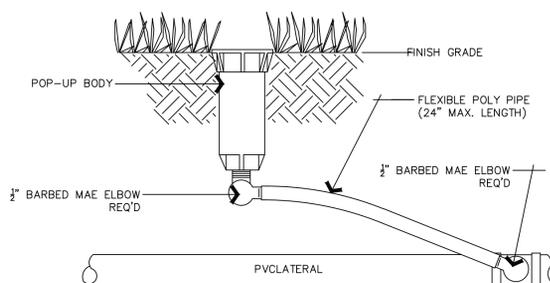
**F GATE VALVE ASSEMBLY**  
NOT TO SCALE



**G TRENCHING DETAIL**  
NOT TO SCALE

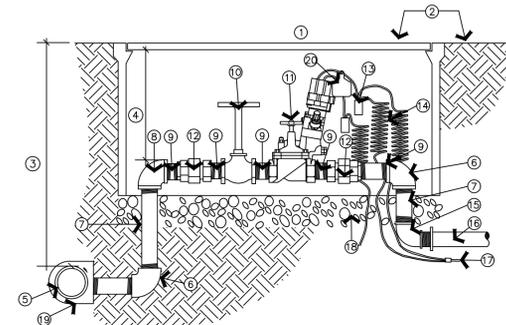


**H TYPICAL SLEEVING**  
NOT TO SCALE



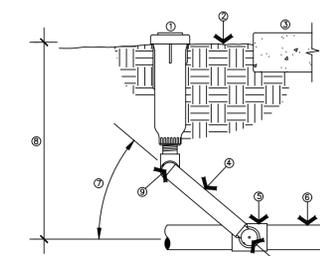
- NOTES:**
1. INSTALL SPRAY AND ROTARY HEADS PER THIS DETAIL.
  2. INSTALL 2" AWAY FROM HARDSCAPES.

**I SPRAY HEAD DETAIL**  
NOT TO SCALE



- NOTES:**
1. ONE REMOTE CONTROL VALVE PER BOX .
  2. ALL FITTINGS AND PIPE IN MANIFOLD SHALL BE THREADED SCH. 80 PVC USING TEFLON TAPE AND #5 RECTOR SEAL.

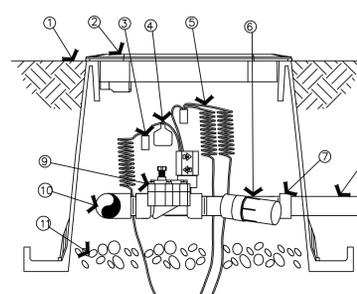
**J CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- 1 POP-UP ROTOR SPRINKLER - SEE LEGEND
- 2 FINISH GRADE
- 3 NOTE: ALL ROTOR HEADS TO BE PLACED 2" CLEAR OF ALL HARDSCAPE SURFACES
- 4 SCH. 80 THREADED NIPPLE
- 5 PVC SCH. 40 SxSxT TEE (OR ELL)
- 6 PVC LATERAL LINE, SIZE AS NOTED ON PLAN
- 7 SWING JOINT ARM INSTALLED AT ANGLE BETWEEN 30 AND 45 DRG. OF LATERAL PIPE. USE MALE THREAD MODEL
- 8 DEPTH - SEE NOTES & TRENCH DETAIL
- 9 MARLEX STREET ELL'S (3)

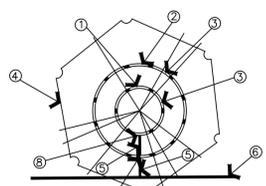
**K POP UP ROTOR DETAIL**  
NOT TO SCALE

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06-30-2020	UT19010	811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com																																	
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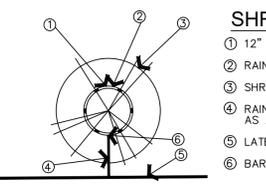


- 1 FINISH GRADE
- 2 STANDARD VALVE BOX WITH COVER: RAIN BIRD VB-STD
- 3 WATERPROOF CONNECTION: RAIN BIRD DB SERIES
- 4 VALVE ID TAG
- 5 30-INCH LINEAR LENGTH OF WIRE, COILED
- 6 PRESSURE REGULATING FILTER: RAIN BIRD PRF-100-RBY (INCLUDED IN XCZ-100-PRF KIT)
- 7 PVC SCH 40 FEMALE ADAPTOR
- 8 LATERAL PIPE
- 9 REMOTE CONTROL VALVE: RAIN BIRD 100-DV (INCLUDED IN XCZ-100-PRF KIT)
- 10 PVC SCH 40 TEE OR ELL TO MANIFOLD
- 11 3-INCH MINIMUM DEPTH OF 3/4-INCH WASHED GRAVEL

**L DRIP CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- NOTES:**
- LAYOUT DRIPLINE SO EMITTERS ARE IN TRIANGULAR PATTERN AS SHOWN
  - APPROXIMATELY 16.2 GPH PER TREE

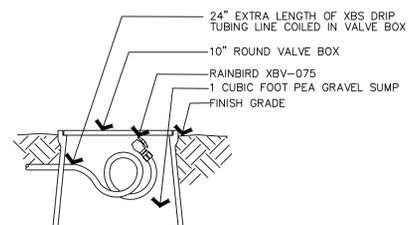


- NOTE:**
- APPROXIMATELY 5.4 GPH PER SHRUB

**M DRIP IRRIGATION - IN LINE EMITTERS**  
NOT TO SCALE

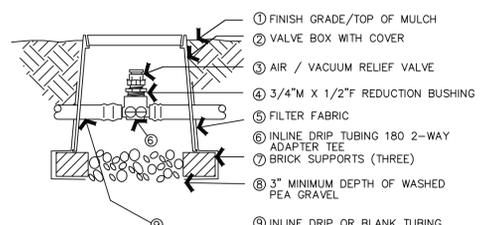
- TREE**
- 1 8' RADIUS
  - 2 16' RADIUS
  - 3 RAIN BIRD XFS-09-18-100 OR EQUIVALENT
  - 4 TREE (DECIDUOUS OR EVERGREEN)
  - 5 RAIN BIRD XT-700 TUBING OR EQUIVALENT AS APPROVED BY ARCHITECT
  - 6 LATERAL LINE
  - 7 4-WAY BARBED TEE
  - 8 BARBED TEE

- SHRUB**
- 1 12" RADIUS
  - 2 RAIN BIRD XFS-09-18-100 OR EQUIVALENT
  - 3 SHRUB
  - 4 RAIN BIRD XT-700 TUBING OR EQUIVALENT AS APPROVED BY ARCHITECT
  - 5 LATERAL LINE
  - 6 BARBED TEE



- NOTE:**
- INSTALL AT END OF DRIP LINE RUNS FOR WINTERIZATION IN THE FALL.

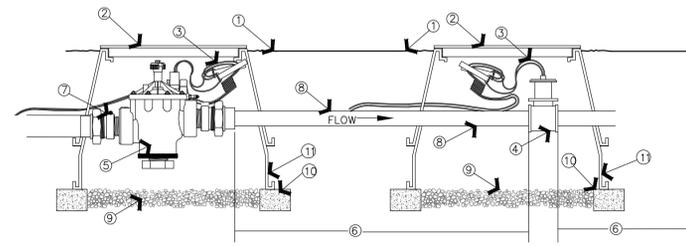
**N FLUSH CAP BOX**  
NOT TO SCALE



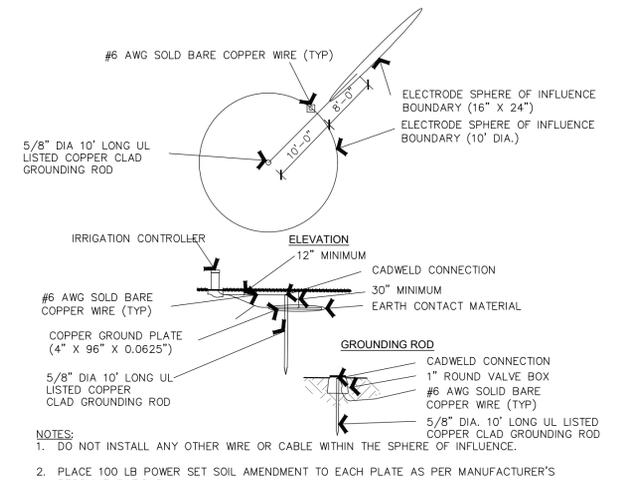
- NOTES:**
- SECURE ALL BARB FITTINGS WITH A STAINLESS STEEL PINCH CLAMP.
  - INSTALL AN AIR/VACUUM RELIEF VALVE AT HIGH POINTS WITHIN DRIP ZONE.
  - INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.

**O DRIP AIR/VACUUM RELIEF VALVE ASSEMBLY**  
NOT TO SCALE

- 1 FINISH GRADE
- 2 GREEN VALVE BOX AND COVER
- 3 CONTROL WIRES WITH 12" MIN. SERVICE COIL AND WATERPROOF WIRE SPLICE CONNECTORS -
- 4 FLOW SENSOR PER IRRIGATION LEGEND
- 5 RAIN BIRD PESB SERIES MASTER VALVE
- 6 STRAIGHT PIPE REQUIRED: MINIMUM 10x PIPE DIAMETER UPSTREAM & MINIMUM 5x PIPE DIAMETER DOWNSTREAM
- 7 UNIONS
- 8 PVC MAINLINE - LENGTH AS REQUIRED
- 9 6" DEPTH OF WASHED 3/4" GRAVEL
- 10 CONTINUOUS BRICK SUPPORTS
- 11 VALVE BOX EXTENSIONS REQUIRED

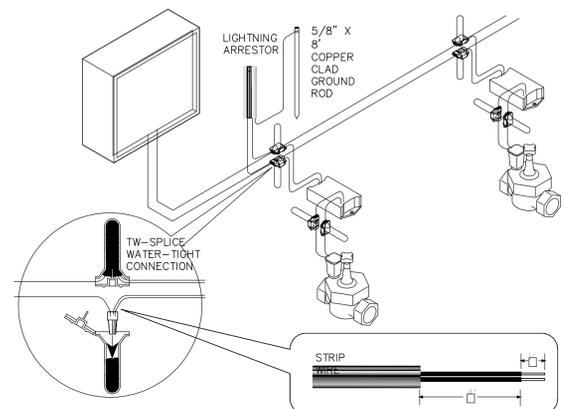


**P MASTER VALVE & FLOW SENSOR**  
NOT TO SCALE

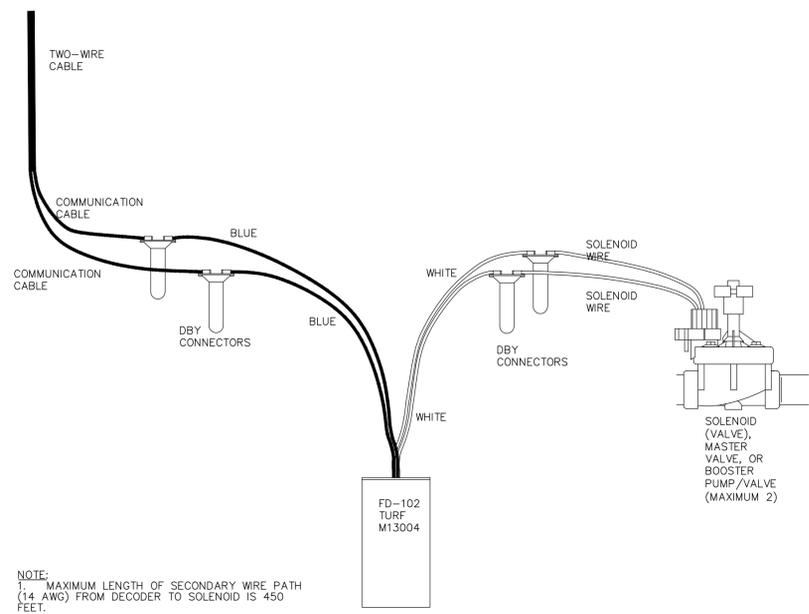


- NOTES:**
- DO NOT INSTALL ANY OTHER WIRE OR CABLE WITHIN THE SPHERE OF INFLUENCE.
  - PLACE 100 LB POWER SET SOIL AMENDMENT TO EACH PLATE AS PER MANUFACTURER'S RECOMMENDATIONS.

**Q GROUNDING DETAIL**  
NOT TO SCALE



**R 2-WIRE CONNECTION**  
NOT TO SCALE



- NOTE:**
- MAXIMUM LENGTH OF SECONDARY WIRE PATH (14 AWG) FROM DECODER TO SOLENOID IS 450 FEET.

**S DECODER WIRING**  
NOT TO SCALE

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP																								
06-30-2020	UT19010	<p>BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org</p>	<p align="center"><b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH</p>	<p>Developer / Property Owner: JRW &amp; ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309</p>	<p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>																									
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7						<p>Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com</p>	<p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>	<p>PM: JTA DRAWN: KBA CHECKED: TM PLOT DATE: 7/1/2020</p>
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## APPENDIX C - PRELIMINARY STORM DRAIN ANALYSIS

# Deseret Industries and Bishop Storehouse

## PRELIMINARY DRAINAGE REPORT

November 25, 2019

Prepared By:



ENGINEERS

SURVEYORS

PLANNERS

3302 N Main Street  
Spanish Fork, UT 84660  
(801) 798-0555

## **DESCRIPTION OF DEVELOPMENT**

The Deseret Industries and Bishop Storehouse site is located within the city of Saratoga Springs, on the west side of Redwood Road and north of Medical Drive. The development area will be divided into two lots. Lot 1 will remain vacant until future development. Lot 2 will consist of the Deseret Industries and Bishop Storehouse site. There is approximately 10.15 acres in the development associated with Lot 2. It currently consists of a vacant field with natural vegetation.

## **OFF-SITE DRAINAGE FEATURES**

There are no offsite drainage features discharging to the site.

## **EXISTING STORM DRAINAGE FEATURES**

The site is currently vacant and is covered with native vegetation. There will be storm drain pipes installed in Medical Drive on the south side of the site with improvements to the Costco site to the south. These downstream pipes will be installed prior to the construction of the Deseret Industries and Bishops Storehouse Site. See the construction drawings for details on the location and sizing of these structures.

## **PROPOSED STORM DRAINAGE FACILITIES**

The proposed storm drain system within the site will consist of inlets and pipes that will be used to route runoff to a series of underground storm chambers before discharging the storm water into the existing downstream system. All pipe sizing and underground detention will be designed according standards set by Saratoga Springs City. The actual storm drain layout and design will be finalized as the site plan design progresses.

## **DRAINAGE CALCULATIONS**

See Appendix A for a complete summary of the calculations including the storage requirements for the underground detention chambers. Due to the size of the site, the rational method was used for the storm drain calculations. The runoff coefficient (c-value) was calculated taking a weighted average of the c-value of all types of proposed ground cover. The rainfall intensities used were taken from data provided in the City Standards. The storm chambers were sized to accommodate the runoff from a 100-year 24-hour storm. The release rate of 0.12 cfs/acre is based on the latest Market Street Storm Drain Capacity Analysis. Refer to Appendix A for the chamber sizing and c-value calculations.

## **STORM DRAIN DRAWINGS**

The exact layout and design of the on-site storm drain inlets, pipes, and underground detention system will be provided with final site plan drawings.

## **CONCLUSION**

Storm water runoff will be collected and detained before being discharged to the downstream system. See the storm drain report submitted for the Costco improvements as well as the Market Street Storm Drain Capacity Analysis for details on the downstream storm drain infrastructure.

## **APPENDIX A: STORM DRAIN CALCULATIONS**



Consulting Engineers and Surveyors, Inc.  
3302 N. Main, Spanish Fork, UT 84660 (801)798-0555

## Storm Drainage Calculations

**Deseret Industries and Bishop's Storehouse  
Saratoga Springs, UT**

Date: September 3, 2019  
Project #: 2019-0012  
Prepared By: EKB  
Revisions:

### Design Criteria

Intensity Table: **Saratoga Springs City Standards**  
Return Period: 100 year  
Allowable Discharge: 0.12 cfs/Ac

### Allowable Discharges

Orifice Discharge: 1.22 cfs  
Total Discharge: 1.22 cfs

### Weighted "C" Value

Surface Type	Area (ac)	C-Value	C*A
Roof	1.60	0.84	1.34
Pavement	6.51	0.89	5.79
Landscape/Open Space	2.04	0.44	0.90
<b>Totals</b>	<b>10.15</b>		<b>8.0</b>
<b>Weighted "C" Value</b>		<b>0.79</b>	

### Drainage Calculations

Duration	Intensity		Area	Rainfall	Accumulated		Discharge	Required
<i>min</i>	<i>in/hr</i>		<i>Ac</i>	<i>cfs</i>	<i>cf</i>		<i>cf</i>	<i>cf</i>
5.0	6.12	0.79	10.15	49.18	14,753	1.22	365	14,388
10.0	4.68	0.79	10.15	37.61	22,564	1.22	731	21,833
15.0	3.84	0.79	10.15	30.86	27,771	1.22	1,096	26,674
30.0	2.58	0.79	10.15	20.73	37,317	1.22	2,192	35,124
60.0	1.60	0.79	10.15	12.86	46,284	1.22	4,385	41,900
120.0	0.87	0.79	10.15	6.95	50,045	1.22	8,770	41,275
180.0	0.58	0.79	10.15	4.66	50,334	1.22	13,154	37,180
360.0	0.31	0.79	10.15	2.46	53,227	1.22	26,309	26,918
720.0	0.17	0.79	10.15	1.38	59,591	1.22	52,618	6,974
1440.0	0.09	0.79	10.15	0.71	61,038	1.22	105,235	-44,198

Maximum Storage Requirement: 41,900

### Detention Pond

Required Detention Volume: 41,900 cf  
Provided Detention Volume: 42,824 cf

### Notes / Details

Storm Tech MC-4500 Chamber and End Cap  
Number of Rows 10  
Number of End Caps 20  
Storage per End Cap 108.70 ft<sup>3</sup>  
Number of Chamber 250  
Storage per Chamber 162.60 ft<sup>3</sup>

Actual underground detention system to be designed with final site plan drawings.

## APPENDIX D - GEOTECHNICAL INVESTIGATION REPORT



**IGES**<sup>®</sup>

Intermountain GeoEnvironmental Services, Inc.  
12429 South 300 East, Suite 100, Draper, Utah, 84020  
Phone (801) 748-4044 | Fax (801) 748-4045  
www.igesinc.com

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Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah  
IGES Project No. 03019-001  
June 7, 2019

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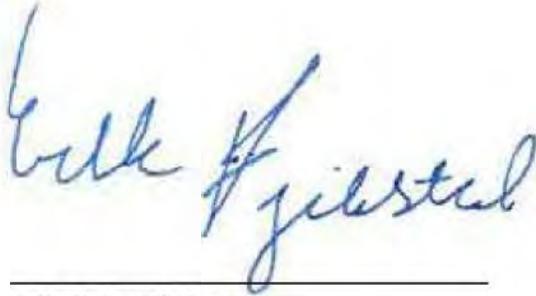
Prepared for  
**JRW & Associates**  
**1152 Bond Avenue, Suite A**  
**Rexburg, Idaho 83440**  
**Attn: Johnny Watson**

**Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah**

IGES Job No. 03019-001

June 7, 2019

Prepared by:

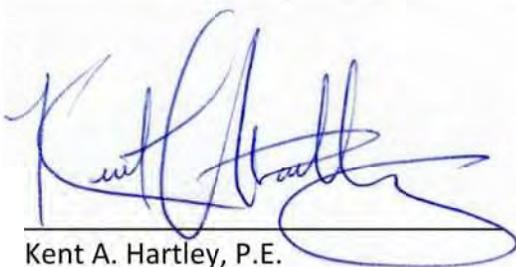


Erik Fjelsted, P.E.  
Staff Engineer



David A. Petersen, P.E.  
Project Engineer

Reviewed by



Kent A. Hartley, P.E.  
Principal

Ideas for a changing world

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C		Laboratory Test Results
D		MCE-PGA Design Response Spectra
E		Liquefaction Analysis Results

## 1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North and Redwood Road in Saratoga Springs, Utah. Based on the subsurface conditions encountered, the subject site is suitable for development provided that the recommendations presented in this report are incorporated into the design and construction of the project. A summary of the critical observations and recommendations are included below:

- Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
- The site is covered by approximately 12 to 24 inches of topsoil, which will need to be removed before constructing footings.
- Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
- Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
- Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
- Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
- Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.
- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least

12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction. IGES staff should be on site to verify compliance with these recommendations.

This executive summary is not intended to replace the complete report and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

## 2.0 INTRODUCTION

### 2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North Redwood Road in Saratoga Springs, Utah as shown on the *Site Vicinity Map* (Figure A-1). The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading and design and construction of foundations, pavements, slabs-on-grade and exterior concrete flatwork.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses and preparation of this report.

The recommendations contained in this report are subject to the limitations presented in Section 7.0 of this report.

### 2.2 PROJECT DESCRIPTION

It is our understanding that the development at the site will include two buildings, roadways, parking lots, landscaping and a detention pond on a 10.5-acre site. The bishop's storehouse is currently planned as a single-story, at-grade structure with a foot print of approximately 23,000 square feet. The Deseret Industries Retail store is currently planned as a single-story, at-grade structure with a foot print of approximately 60,000 square feet. It is anticipated that the parking lots, roadways and loading areas will be paved with either asphalt or concrete. It is anticipated that the proposed structures will be lightly loaded and will be constructed on conventional strip and spread footings.

### 3.0 METHOD OF STUDY

#### 3.1 FIELD INVESTIGATION

As part of this investigation, near-surface soil conditions were explored by completing 8 test pits to a maximum of 14 feet below existing grade and advancing two Cone Penetration Test (CPT) soundings to 50 feet below existing grade. A member of our technical staff visually logged soils at the time of exploration in general accordance with the *Unified Soil Classification System (USCS)*. The approximate locations of the test pits, CPTs, and infiltration test are shown on the *Site Map* (Figure A-2). The geologic conditions are discussed in greater detail in Section 5 of this report. The *Test Pit Logs* are included at the end of this report (Figures A-3 through A-11); a *Key to Soil Symbols and Terminology* is provided as Figure A-12. The CPT Logs are included as part of Appendix B. A discussion of the subsurface conditions encountered is provided in Section 4.0 of this report.

The test pits were completed using a JCB-4CX rubber-tired backhoe. Soil sampling was completed to collect representative samples of the various layers observed at the site. Disturbed samples were placed in plastic baggies and relatively undisturbed soil samples were collected with the use of a 6-inch long brass tube attached to a hand sampler driven with a 2-lb sledge hammer. All samples were transported to our laboratory to evaluate the engineering properties of the various earth materials observed. The soils were classified in accordance with the *Unified Soil Classification System (USCS)* by our field personnel. Classifications for the individual soil units are shown on the attached test pit logs (Figures A-3 through A-11).

The CPT was completed using a 25-ton box-truck. Additional calculations and analysis included as part of the CPT exploration completed at the site are included in Appendix B. These calculations include pore pressure dissipation (PPD) tests to assess groundwater levels and artesian conditions along with seismic tests to assess the representative shear wave velocity of site soils.

##### 3.1.1 Infiltration Testing

Infiltration tests were completed for the project in TP-1 at approximately 4 feet below existing site grade.

The test was performed as follows: a hole approximately 6 inches in diameter and 13 inches in depth was hand-excavated at the bottom of the test pit, and then filled with water. The soil was presoaked for approximately 30 minutes, after which periodic readings were made and recorded to measure the water level at time increments of approximately 10 minutes.

The test was continued until a steady-state infiltration rate could be identified in the records – testing continued for about 90 minutes after pre-soak.

Our test results indicated that the native Lean CLAY (CL) soils were moderately permeable, with measured infiltration measurements given in tables 3.3.1.

**Table 3.3.1 - Infiltration Test Summary – TP-1**

Diameter ~ 6 inches				
Time Elapsed (minutes)	Change in Depth (inch)	Infiltration Rate (min/in)	Infiltration Rate (in/hr)	Comments
0	0	0	0	Intermediate Reading
11	2.0	5.5	10.9	Intermediate Reading
20	1.0	9.0	6.7	Intermediate Reading
30	1.0	10.0	6.0	Intermediate Reading
41	0.88	12.6	4.8	Intermediate Reading
50	0.50	18.0	3.3	Intermediate Reading
60	0.63	16.0	3.8	Intermediate Reading
70	0.50	20.0	3.0	Intermediate Reading
81	0.50	22.0	2.7	Intermediate Reading
90	0.50	<b>18.0</b>	<b>3.3</b>	<b>Final Reading</b>

### 3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on representative relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Laboratory Compaction Characteristics of Soil (Standard Proctor - ASTM D698/D1557)
- California Bearing Ratio (CBR) (ASTM D1883)
- Collapse/Swell Potential (ASTM D4546)

The results of laboratory tests are presented on the Boring Logs in Appendix A (Figures A-3 through A-11) and in Appendix C.

### 3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Analyses were performed using formulas, calculations and software that represent current methods accepted by the geotechnical industry. These methods include settlement, bearing capacity, lateral earth pressures, trench stability and pavement design. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care. The results of our engineering analysis are presented in the recommendations section of this report.

## 4.0 GENERALIZED SITE CONDITIONS

### 4.1 SURFACE CONDITIONS

At the time of our subsurface investigation, the site was vacant and appeared to be used for farming. The surficial soils appeared to be comprised of topsoil consisting of lean clay. The site is relatively flat sloping very gradually down to the east between an elevation of approximately 4,540 feet above mean sea level.

### 4.2 SUBSURFACE CONDITIONS

#### 4.2.1 Soils

Based on our observations the site is overlain by 12 to 24 inches of topsoil comprised of Lean CLAY (CL). Based on our observations, native soils consisted primarily of Lean CLAY (CL) with some isolated layers of Silty SAND (SM) and Poorly Graded GRAVEL with silt (GP-GM).

##### Lean CLAY (CL)

The Lean CLAY (CL) was observed below the topsoil in each test pit. The clay extended to a depth of 10.5 to 14 feet below existing grade. It was generally medium stiff, slightly moist to moist, and moderate brown. Pinholes were observed primarily within the upper 6 feet.

##### Silty SAND (SM)

The Silty SAND was observed in TP-3, TP-5, TP-6 and TP-7. The silty sand was generally medium dense, moist and tan.

##### Poorly Graded GRAVEL with silt (GP-GM)

The Poorly Graded GRAVEL with silt (GP-GM) was observed in TP-5. The gravel was generally medium dense to dense and slightly moist to dry. These gravels have 5 to 12 percent fines. The typical gravel size is 1 inch with 3 inches being the maximum size.

Refer to the boring logs for a more detailed description of the soils encountered (Appendix A).

#### 4.2.2 Groundwater

Groundwater was not encountered in any test pits, however based on the CPT data groundwater was encountered at 29 and 43 feet below grade in CPT-01 and CPT-02, respectively. Seasonal fluctuations in precipitation, snowmelt, surface runoff from

adjacent properties, or other on or offsite sources including irrigation or other sources may increase moisture conditions; groundwater conditions can be expected to fluctuate several feet seasonally depending on the time of year. Groundwater is not anticipated to impact the planned construction.

### 4.2.3 Collapsible Soils

Collapse is a phenomenon where undisturbed native soils under increased loading can exhibit volumetric strain and consolidation upon wetting. Collapsible soils can cause differential settling of structures and roadways. Collapsible soils do not necessarily preclude development and can be mitigated by over-excavating porous, potentially collapsible soils and replacing with engineered fill and by controlling surface drainage and runoff. Collapsible soils are typically characterized by a pinhole structure and relatively light in-situ density. Pinholes were observed in the native clay soil mainly in the upper 6 feet. IGES completed four collapse tests on representative soil samples; test results are summarized below in Table 4.2.3 . The complete results of the one-dimensional collapse tests can be seen in Appendix C.

**Table 4.2.3 - Summary Collapse Test Results**

Location	Depth	Collapse Load	Percent Collapse
TP-2	4.5	2000	5.1%
TP-3	6.0	2000	0.5%
TP-5	4.5	2000	2.6%
TP-7	3.5	2000	3.5%

## 5.0 GEOLOGIC CONDITIONS

### 5.1 GEOLOGIC SETTING

The site is located at an elevation between approximately 4,540 feet in the northwestern portion of Utah Valley. Utah Valley represents a deep, sediment-filled structural basin of Cenozoic-age flanked by uplifted blocks; the Wasatch Range on the east, and the Lake and East Tintic Mountains to the west (Hintze, 1980). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott et al., 1983; Hintze, 1993; Machette, 1992). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover.

Surface sediments at the subject site are mapped as Upper Pleistocene lacustrine silt and clay (QImp) (Biek, 2004). QImp is described as calcareous silt with minor clay and laminated fine-grained sand that was deposited below the Provo shoreline of Lake Bonneville.

### 5.2 FAULTING AND SEISMICITY

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is generally defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black et al., 2003). The site is located approximately 9.2 miles west of the main trace of the Provo segment of the Wasatch Fault Zone, the closest mapped active fault. Smaller detached splays of the Provo segment are located approximately 3.8 miles northeast and 7.8 miles east-northeast of the project site respectively. The Provo segment is one of the longest sections of the Wasatch Fault Zone (Hecker, 1993) and is estimated to be approximately 43 miles long with a reported rupture length of 37 miles and a maximum potential to produce earthquakes up to magnitude ( $M_s$ ) 7.5 to 7.7 (Black et al., 2003). The site is also located approximately 2.1 miles northwest of the Utah Lake Faults and Folds (ULFF). The ULFF consists of several northeast to northwest trending faults and folds located beneath Utah Lake and are reported to

have been active in the past 15 ka (Black et al., 2003). However, since the ULFF is at the bottom of a large lake these faults are poorly understood – as such, the USGS does not include ULFF in their fault database for seismic hazard analysis. Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Salt Lake City region.

Following the criteria outlined in the 2015 International Building Code (IBC, 2015), spectral response at the site was evaluated for the Maximum Considered Earthquake (MCE) which equates to a probabilistic seismic event having a two percent probability of exceedance in 50 years (2PE50). Spectral accelerations were determined based on the location of the site using the *U.S. Seismic Design Maps* USGS website. This tool incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and *the International Building Code* (IBC) (International Code Council, 2015).

Based on our understanding of the proposed project, it is recommended the building be designed with a structural *Building Risk Category* of *II*. To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and *Site Class* are used. Site classification is based on the upper 100 feet of the site soil profile; based on our field exploration and understanding of the geology in this area, the subject site is best classified as Site Class D (*Stiff Soil*). Based on IBC criteria, the short-period ( $F_a$ ) and long-period ( $F_v$ ) site coefficients are 1.109 and 1.740, respectively. The Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) *Spectral Response Accelerations* are presented in Table 3.3.1; a summary of the *Design Maps* data is presented in Appendix C. The *peak ground acceleration* (PGA) may be taken as 0.395g (see Appendix C). It should be noted that to more accurately determine the site classification and site-specific seismic design parameters a geotechnical investigation to a minimum depth of 100 feet is needed. The seismic design category for this site is D.

**Table 5.2.1 - Short- and Long-Period Spectral Accelerations for MCE**

Parameter	Short Period (0.2 sec)	Long Period (1.0 sec)
MCE Spectral Response Acceleration (g)	$S_S = 0.977$	$S_1 = 0.330$
MCE Spectral Response Acceleration Modified for Site Class D (g)	$S_{MS} = S_S F_a = 1.083$	$S_{M1} = S_1 F_v = 0.574$
Design Spectral Response Acceleration (g)	$S_{DS} = S_{MS}^2 / 3 = 0.722$	$S_{D1} = S_{M1}^2 / 3 = 0.383$

### 5.3 OTHER GEOLOGIC HAZARDS AND CONDITIONS

Geologic hazards and conditions can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property or result in impacts to conventional construction procedures. These hazards and conditions must be considered before development of the site. There are several hazards and conditions in addition to seismicity and faulting which, if present at a site, should be considered in the design of the site facilities. Liquefaction is the only other geologic hazard considered for this site.

#### 5.3.1 Liquefaction

Certain areas within the Intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Referring to the *Liquefaction-Potential Map for Utah County, Utah* published by the Utah Geological Survey, the site is located within an area currently designated as "moderate" for liquefaction potential. Therefore, IGES completed two CPT explorations to depths of approximately 50 feet to evaluate the liquefaction potential at this site.

We have evaluated the liquefaction potential of the soil profile encountered in the CPT completed for this site in accordance with procedures detailed by Youd et al. (2001), and

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*Recommended Procedures for Implementation of CDMG Special Publication 117* (Martin and Lew, 1999). Our analysis considered groundwater levels directly observed with the CPT explorations and PPD tests; however, the groundwater level modeled for our liquefaction analysis was conservatively assumed to be about 4 feet higher than the groundwater level observed in the subsurface explorations to account for possible future groundwater level increases.

Our liquefaction model incorporates the PGA corresponding to the 2PE50 ground motion (see Section 5.2). The PGA is estimated to be 0.4g.

Liquefaction analysis also considers the *deaggregated* moment magnitude for a site (the moment magnitude that has the highest contribution to the hazard for the ground motion under consideration). Based on our experience in this area, IGES has used a deaggregated moment magnitude of 7.4 Mw.

For the purpose of our analysis, we have used a factor-of-safety against liquefaction of 1.4 to differentiate between potentially liquefiable and non-liquefiable soils (a factor-of-safety below 1.1 is considered liquefiable, between 1.1 and 1.4 *may* liquefy, and greater than 1.4 is considered to not liquefy). Potential dynamic settlement was evaluated using the methods developed by Tokimatsu and Seed (1987). A summary of the calculations is presented in Appendix E. No liquefaction induced settlement was calculated in CPT-02 and ¼-inch of settlement was calculated for CPT-01. This value is the cumulative sum of multiple small layers, most of which are isolated to 4 to 6 inches or less. These layers are also observed at depths of approximately 30 feet or greater. Based on a boundary curve chart used to predict liquefaction-induced ground damage (Ishihara, 1985), the potential for these discrete layers to manifest liquefaction-induced phenomena at the surface is low (e.g., settlement, sand boils, loss of bearing capacity, etc.).

## 6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

### 6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for development provided that the recommendations included in this report are incorporated into the design and construction of the project. If development at the site does take place, IGES should be notified and allowed to review the proposed development in order to assess the suitability of this report in regard to the planned improvements and to recommend additional explorations, analysis and recommendations.

In general, 12 to 18 inches of topsoil was identified on site. Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. The following sub-sections present our recommendations for general site grading, design of foundations, slabs-on-grade, pavements, moisture protection and soil corrosivity that should be considered prior to developing this site.

### 6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

#### 6.2.1 General Site Preparation and Grading

Within the areas to be graded (below proposed structures, fill sections, concrete flatwork, and pavement sections) any existing surface vegetation, debris, undocumented fill, asphalt, concrete or other miscellaneous debris should be removed. All topsoil should be removed from below footings. Over-excavated soils can be used as structural fill if relatively free of deleterious material and organics and compacted in accordance with the recommendations presented in this report (Section 6.2.4). Topsoil shall be segregated from other soil and not be permitted to be used as structural fill.

An IGES representative should be on site at key points in construction to observe the site preparation and grading operations to assess whether the recommendations presented in this report have been complied with.

### 6.2.2 Trench Excavations

Based on our soil observations, fine-grained soils are prevalent at the site and are considered to be Type A soils (OSHA). Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. When the trench is deeper than 5 feet we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Alternatively, excavations deeper than 5 feet (up to 20 feet) may be constructed with side slopes no steeper than one and three quarters horizontal to one vertical ( $1\frac{3}{4}H:1V$ ). When undocumented fill soils, saturated soils or wet conditions are encountered, side slopes may need to be further flattened to maintain stability. If excavations greater than 20 feet in depth are anticipated a registered professional engineer must design the protective system.

The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, IGES can respond and provide recommendations as needed.

We recommend that IGES observe all excavations to assess the exposed foundation soils. We also recommend that the geotechnical engineer be allowed to review the grading plans when they are prepared in order to evaluate their compatibility with these recommendations.

### 6.2.3 Excavations

Excavations should extend laterally at least two feet beyond slabs-on-grade, footings and pavements. Structural fill should be placed and compacted in accordance with and meet the recommendations included in this report.

Prior to placing structural fill, utilities or constructing footings any loose soils observed in excavation bottoms should be removed or moisture conditioned to within 2 percent of the optimum moisture content (OMC) and compacted to at least 95 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (modified Proctor). If over-excavation is required, it should extend a minimum of 1 foot laterally for every foot of depth of over-excavation.

### 6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill may consist of excavated onsite native fine-grained soils or an

approved imported granular soil. The native fine-grained soils may be challenging to work with to obtain the desired level of compaction. If native fine-grained soils are used as structural fill, they should be pulverized and moisture conditioned beyond the optimum moisture content (OMC) before being placed as structural fill. If import structural fill is used, it should be relatively well graded and have a minimum fines (material passing the No. 200 sieve) of 30 percent. A less permeable fill is desired due to the collapsible soils, hence the reason for requiring a “minimum” of 30% fines. In all cases, structural fill should be free of vegetation and debris, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension).

Soil not meeting the aforementioned criteria may be suitable for use as structural fill; alternate borrow sources may be considered but should be reviewed and approved by IGES prior to use. All structural fill soils should be approved by the Geotechnical Engineer prior to placement.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 12-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. These lift thicknesses are *maximums*; the contractor should understand that thinner lifts may be necessary to achieve the required compaction. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. The moisture content should be at or above the OMC based on the modified proctor (ASTM D1557) for all structural fill. Prior to placing any fill, the excavations should be observed by IGES to assess compliance with our recommendations. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report. All structural fill below footings, pavement, sidewalks and curb and gutter and other concrete slab on grade construction should be compacted to a minimum of 95 percent of the maximum dry density (MDD) based on the modified proctor (ASTMD 1557).

Specifications from governing authorities such as cities and special service districts having their own precedence for backfill and compaction should be followed where applicable. Structural fill as defined above or native soils may be used to backfill around the foundation walls and that it be placed in lifts not exceeding 12 inches prior to compaction, compacted to approximately 90 percent of the MDD and moisture conditioned to within 2 percent of the OMC.

### 6.2.5 Utility Trench Fill and Compaction

All utility trenches backfilled below footings, pavement sections, concrete flatwork, curb and gutter and/or sidewalks should be backfilled with structural fill that is at or slightly above the OMC when placed and compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches in landscape areas should be backfilled and compacted to a minimum of 90 percent of the MDD and within 2 percent of the OMC as determined by ASTM D-1557.

Utility trenches should be backfilled with structural fill as discussed in Section 6.2.5 of this report. Pipe bedding should *not* be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean  $\frac{3}{4}$ -inch gravel which generally does not require compaction. More stringent specifications from utility companies, cities or other governing authorities having their own precedence for backfill and compaction should be followed where applicable.

### 6.2.6 Soft Soil Stabilization

Due to the presence of fine-grained clayey soils, soft soils may be encountered at the site due to the presence of water following precipitation events; this condition may be exacerbated in cold weather. These soils may cause equipment mobility problems and may make it difficult to place and properly compact structural fill overlying the soft soils. If encountered, we recommend stabilizing these soils prior to placing structural fill, constructing pavement sections or foundation elements such as footings.

Stabilization can be accomplished by placing a woven geotextile over the soft subgrade; seams should be overlapped a minimum of 24 inches or as recommended by the manufacturer. The geotextile should be covered with a minimum of 18 inches of crushed, angular  $\frac{3}{4}$ - to 3-inch diameter drain rock. Structural fill (Section 6.2.4) may then be placed and compacted as recommended in this report. The woven geotextile should consist of TenCate Mirafi HP370 or an approved equivalent. The geotextile should be placed to cover the entire excavation bottom.

Alternatively, stabilization of soft or pumping subgrade can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 3 inches in nominal diameter, but less than 6 inches. The stabilization material should be worked (pushed) into the soft subgrade soils until a relatively firm and unyielding surface is established. Once a relatively firm and unyielding surface is achieved, the area may be brought to final design grade using structural fill. Other earth materials not meeting aforementioned criteria may also be suitable but will likely require a thicker section of aggregate; however, such material should be evaluated on a case-by-case basis and should be approved by IGES prior to use. The area should be

wheel-rolled with heavy equipment to evaluate whether a firm working surface has been achieved and that soft/pumping soils have been “bridged” to the greatest extent reasonably possible based on existing subsurface conditions. An IGES representative should be present during this evaluation.

The area of stabilization should extend a minimum of 3 feet beyond the footings and/or footprint of the structure, whichever is greater.

### 6.3 FOUNDATIONS

Prior to constructing footings, all topsoil and any undocumented fill soils should be removed before constructing footings. Footings should be established entirely on competent native soils or on a zone of structural fill that extends to competent native soils located at a minimum depth of 6 feet below existing side grade. Loose soils remaining in the excavation following excavation should either be removed or compacted in place. To reduce the potential for differential settlement, transition zones between fill and native soil are generally not recommended but can be evaluated on a case by case basis. If structural fill is used it should meet the criteria described in Section 6.2.5 and have a minimum thickness of 12 inches. The structural fill should also extend a minimum of 24 inches beyond the edge of the footings. Strip footings should be a minimum of 24 inches wide and no greater than 48 inches wide; spread footings should be a minimum of 30 inches wide and no greater than 9 feet wide. Exterior footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior footings not exposed to the full effects of frost (i.e., a continuously headed structure) should be embedded at least 18 inches for confinement.

Conventional strip footings founded as described above may be proportioned for a maximum net allowable bearing capacity of **1,500 pounds per square foot (psf)**. The bearing capacity may be increased to 2,000 if placed on a zone of structural fill having a minimum thickness of 24 inches. these values are for dead load plus live load conditions.

Static settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

### 6.4 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 4 inches of gravel overlying a zone of structural fill (reworked native soils) with a minimum thickness of 18 inches due to the collapse potential of native soils. Native soils should be removed to a depth of at least 12 inches, the exposed soils may then be scarified to a minimum depth of 6 inches

and compacted in place and then the removed native soils can be replaced as structural fill in 6 inch lifts). The slab may be designed with a Modulus of Subgrade Reaction of **120 psi/inch**. The gravel should consist of clean drain rock with a  $\frac{3}{4}$ -inch maximum particle size and no more than 5 percent fines passing the No. 200 mesh sieve. The gravel layer should be vibrated in place until tight and relatively unyielding.

The maximum load on the floor slab should not exceed 300 psf; greater loads may be allowed but must be evaluated by IGES or a structural engineer on a case-by-case basis. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fiber mesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of W4.0 x W4.0 welded wire mesh within the middle third of the slab.

Our experience indicates that use of reinforcement in slabs and foundations can generally reduce the potential for drying and shrinkage cracking. However, some cracking can be expected as the concrete cures. Minor cracking is considered normal; however, it is often increased by a high water/cement ratio, high concrete temperature at the time of placement, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking; saw cuts in the concrete at strategic locations can help to control and reduce undesirable shrinkage cracks.

We recommend a **minimum slab thickness of 4 inches**; a thicker slab section may be required if the slab-on-grade is designed to bear a significant structural load (i.e., a structural slab or mat foundation, which is different than slab-on-grade flooring). We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI).

## 6.5 EARTH PRESSURE AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance, a coefficient of friction of 0.43 should be used for concrete in contact with native granular (sandy and gravelly) soils or granular structural fill.

Ultimate lateral earth pressures from backfill acting against retaining walls and buried structures may be computed from lateral pressure coefficients or equivalent fluid

densities. In general, foundation and other walls that are fixed at the top should be designed using at-rest lateral earth pressures. Retaining walls allowed to rotate at the top (unfixed) can be designed for active pressures based on the International Building Code (IBC, 2015). Foundation walls for buried or partially buried structures may also be designed for active pressures if no more than 8 feet of the wall extends below grade and is laterally supported by flexible diaphragms.

Based on an internal angle of friction of 28°, the ultimate lateral earth pressures for native fine-grained soils acting against buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 6.5.1:

**Table 6.5.1 - Lateral Pressure Coefficients and Equivalent Fluid Densities**

Earth Pressure Condition	Lateral Pressure Coefficient (symbol)	Equivalent Fluid Density (pounds per cubic foot)
Active*	0.36 ( $k_A$ )	42
At-rest**	0.53 ( $k_0$ )	60
Passive*	2.77 ( $k_p$ )	310

\* Based on Coulomb's equation

\*\* Based on Jaky

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation the at-rest condition should be used unless the wall has 8 feet or less of depth below grade according to the IBC, as mentioned previously. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

Lateral pressures can increase during a seismic event and should be accounted for in the design of retaining walls. The interaction of dynamic loads from earthquakes and retaining walls is complex; assessing this interaction can require sophisticated analysis. The Mononobe-Okabe (M-O) pseudo-static approach simplifies this analysis and provides reasonable design values. With the M-O approach for seismic analyses, the *active* and *passive* earth pressure coefficients provided in the following table account for the both the dynamic horizontal thrust produced by ground motion and the static lateral earth pressure; therefore, for seismic analysis the static and seismic values reported below do not need to be added together, the seismic value alone can be used.

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**Table 6.5.2 – Recommended Lateral Earth Pressure Coefficients for Dynamic Conditions**

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active (K <sub>ae</sub> )	0.75	90
Passive (K <sub>pe</sub> )	2.10	240

The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients and densities presented in the tables above for static and dynamic conditions assume no buildup of hydrostatic pressures, a vertical wall face and flat back slope. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. Proper grading and other drainage recommendations provided previously in this report will help to reduce the potential for buildup of hydrostatic pressures if implemented.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils with a potential for swelling should not be used as retaining wall backfill. Backfill should consist of soil with an Expansion Index (EI) less than 20.

## 6.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

Moisture should not be allowed to infiltrate the soils near, or upslope from, the structures. Precautions should be taken during and after construction to minimize the potential for saturation of foundation soils beneath footings, exterior slab on grade construction, sidewalks and roadways. We recommend the following be implemented during and/or after construction is complete:

- We recommend rain gutters be installed around the entire perimeter of the buildings to collect and direct all roof runoff a minimum of 10 feet away from structures.
- The grade within 10 feet of the structures should be sloped a minimum of 5% away from the structure (6-inches). Alternatively, if the surface within 10 feet of the structure consists of a hard surface such as concrete or asphalt, the minimum recommended slope would be 2% away from the structure.

- No pressurized irrigation lines should be placed within 5 feet of the structures and we recommend the area within 5 feet of the structure be hardscaped, xeriscaped or planted with drought tolerant plants that do not require irrigation.
- Compact backfill against the foundation walls in maximum 12-inch loose lifts to approximately 90 to 95 percent of the MDD (ASTM D1557); native soils may be used as backfill.

## 6.7 ASPHALT & CONCRETE PAVEMENT DESIGN

IGES completed one CBR lab test (See Appendix C) to assess the suitability of native soils to support a pavement section. The laboratory test indicated a CBR value of 4.1 for near surface soils. For the pavement section designs presented below, IGES has used a CBR of 4.1. IGES has prepared pavement section designs for three different traffic scenarios: parking, drives and a trash enclosure approach slab (high traffic area). The pavement section designs presented below have been prepared for a 40-year design life assuming an annual growth rate of 0%.

IGES has estimated an equivalent single axle load (ESAL) of approximately 200,000 over a 40-year design life for the Parking Lot. IGES recommends that one of the following pavement thicknesses be used for the parking lot:

**Table 6.7.1 - Flexible (Asphalt) Pavement Section – Parking Lot**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Parking Lot 1</b>	<b>4</b>	<b>7</b>	<b>8</b>	<b>18</b>
<b>Parking Lot 2</b>	<b>5</b>	<b>9</b>	<b>-</b>	<b>18</b>

**Table 6.7.2 - Rigid (Concrete) Pavement Section – Parking Lot**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Parking Lot 3</b>	<b>6</b>	<b>8</b>	<b>18</b>

IGES has estimated an equivalent single axle load (ESAL) of approximately 500,000 over a 40-year design life for the Drive areas. IGES recommends that one of the following pavement thicknesses be used for the Drive areas at the site:

**Table 6.7.3 - Flexible (Asphalt) Pavement Section – Drives**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Main Drive 1</b>	<b>4</b>	<b>9</b>	<b>10</b>	<b>18</b>
<b>Main Drive 2</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>18</b>

**Table 6.7.4 - Rigid (Concrete) Pavement Section – Drives**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Main Drive 3</b>	<b>7</b>	<b>10</b>	<b>18</b>

It is our experience that pavement in areas where trucks frequently turn around, backup, or load and unload, including round-a-bouts, docks, trash enclosures, exit and entrances from the main roadways, etc., experience more distress. If the owner wishes to prolong the life of the pavement in these areas consideration should be given to using a Portland cement concrete (rigid) pavement in these areas. The following rigid pavement section is recommended:

**Table 6.7.5 - Rigid Pavement Section – High Traffic Areas**

Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>7</b>	<b>12</b>	<b>18</b>

All undocumented fill soils should have been removed or compacted in place as structural fill in accordance with Section 6.2.5 of this report prior to starting construction on the pavement section. IGES recommends that the upper 18 inches be removed and replaced with structure fill (Section 6.2.4) prior to constructing the pavement sections. This can be accomplished by removing the upper 12 inches and scarifying the exposed subgrade soils to a minimum depth of 6 inches; the scarified soils should moisture conditioned and compacted as structural fill as recommended in Section 6.2.4. Additionally, if the subgrade soils are soft or pumping, they should be stabilized as recommended in section 6.2.6 prior to placing granular borrow or road base.

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Asphalt has been assumed to be a high stability plant mix; base coarse material should be composed of crushed stone with a minimum CBR of 70. Granular borrow has been assumed to be a pit-run type material with a minimum CBR of 30. Asphalt should be compacted to a minimum density of 96% of the Marshall value; base coarse and granular borrow should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

If traffic conditions vary significantly from our stated assumptions, IGES should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to revise the pavement section design as necessary. The pavement section thicknesses above assume that most construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed the owner should anticipate maintenance or a decrease in the design life of the pavement.

The owner should also consider the benefits of maintenance in extending the life of the pavement. Some heavy traffic areas may need to be repaired or replaced. Crack seal should be applied every 2-3 years to new cracks that have developed to help reduce the effects infiltrated water can have on deteriorating the pavement support materials.

The pavement section thicknesses above have been designed with the assumption that there is no mixing over time between the road base and the softer native layers below. In order to prevent mixing or fines migration, and thereby prolong the life of the pavement section, we recommend placing a non-woven filter fabric such as Mirafi TenCate 160N between the native soils and the road base.

## 6.8 SOIL CORROSIVITY

Chemical testing was not completed as a part of this investigation however the soils were predominantly fine-grained. It would be expected to get test results indicating that the corrosion potential of native soils on site can be characterized as **moderate to severe** with respect to steel that is in direct contact with native soils. Consideration should be given to consulting with a corrosion engineer to design appropriate cathodic protection or sacrificial thicknesses for metal that will be in contact with native site soils.

The soluble sulfate content is likely to be in a range that indicates a low to moderate risk of sulfate attack on concrete. Type I/II cement should be used for all concrete at this

project site. The provisions in American Concrete Institute (ACI) 318 Section 4.3 should be reviewed for further clarification.

No chemical testing was completed, however chemical testing can be completed upon request.

## 6.9 OTHER CONSIDERATIONS

Moderate to highly collapsible soils were prevalent in the top 4.5 feet with minor pinholes observed up to 6 feet below existing grade. To reduce the risk associated with collapsible soils, we recommend removing all collapsible soils to a depth of 6 feet below existing grade where footings are planned. For parking lots, roadways or sidewalks, it is recommended to scarify and moisture condition the top 18 inches. Before placing structural fill, an IGES representative should be on site to observe that the exposed soils have been prepared as recommended in this report.

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## 7.0 CLOSURE & LIMITATIONS

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment and experience. As such the solutions and resulting recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and designs, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warranties, guarantees or other representations are made.

The information contained in this report is based on limited field testing and understanding of the project. The subsurface data used in the preparation of this report were obtained largely from the explorations made for this project. It is very likely that variations in the soil, rock, and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs and additional explorations are completed. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for the Welfare Complex. Use of the data, recommendations or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

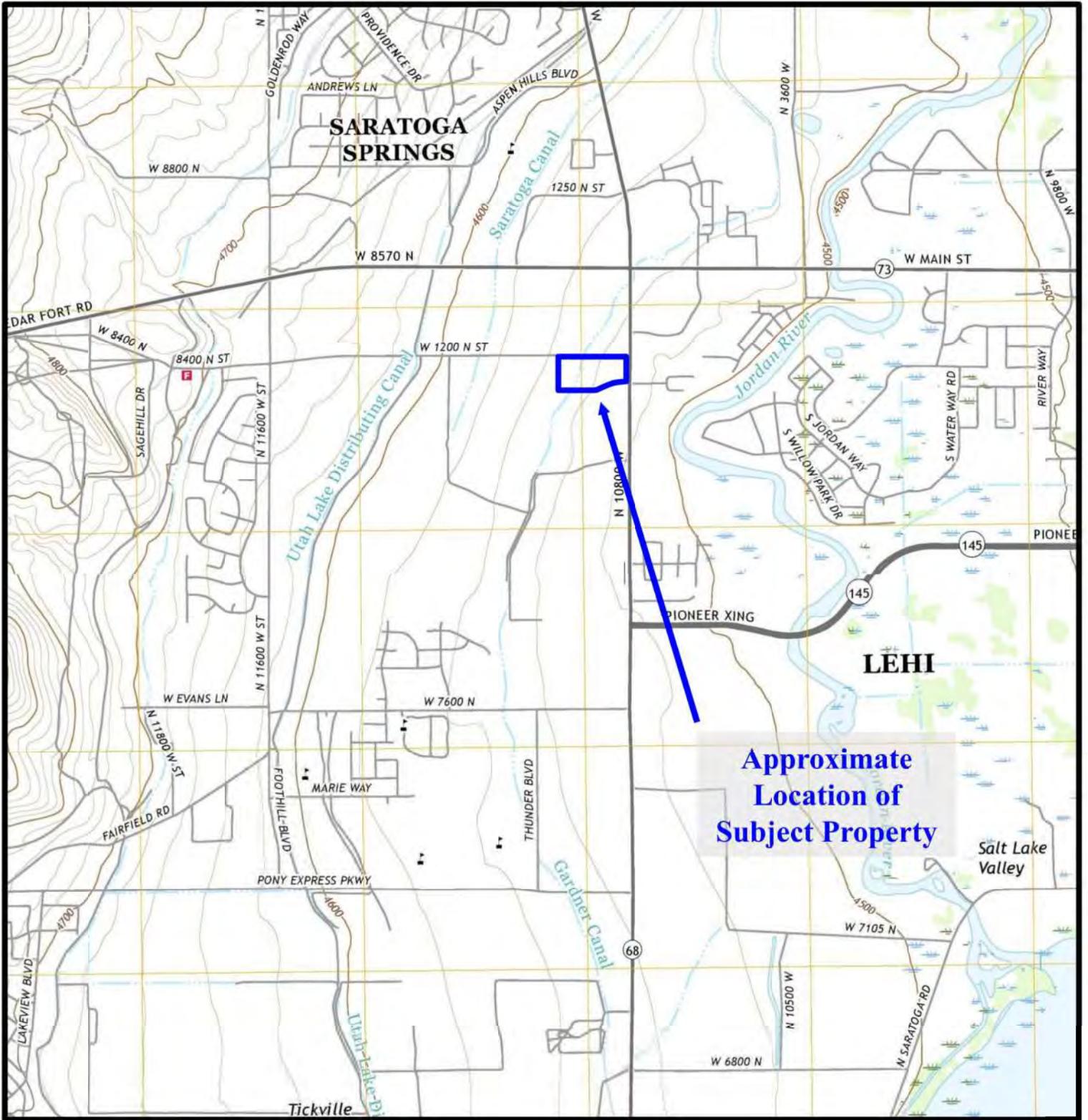
We recommend that IGES be retained to review the final design plans, grading plans and specifications to determine if our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate, construction performance and other geotechnical aspects of the projects as construction initiates and progresses through its completion.

## 8.0 REFERENCES CITED

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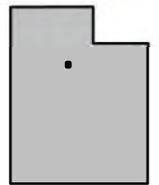
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# **APPENDIX A**



Base Map:  
 USGS Jordan Narrows  
 USGS Saratoga Springs  
 7.5-Minute Quadrangle Topographic Maps (2017)

0' 1000' 2000'  
 SCALE 1:24,000  
 Contour Interval – 20 feet



MAP LOCATION



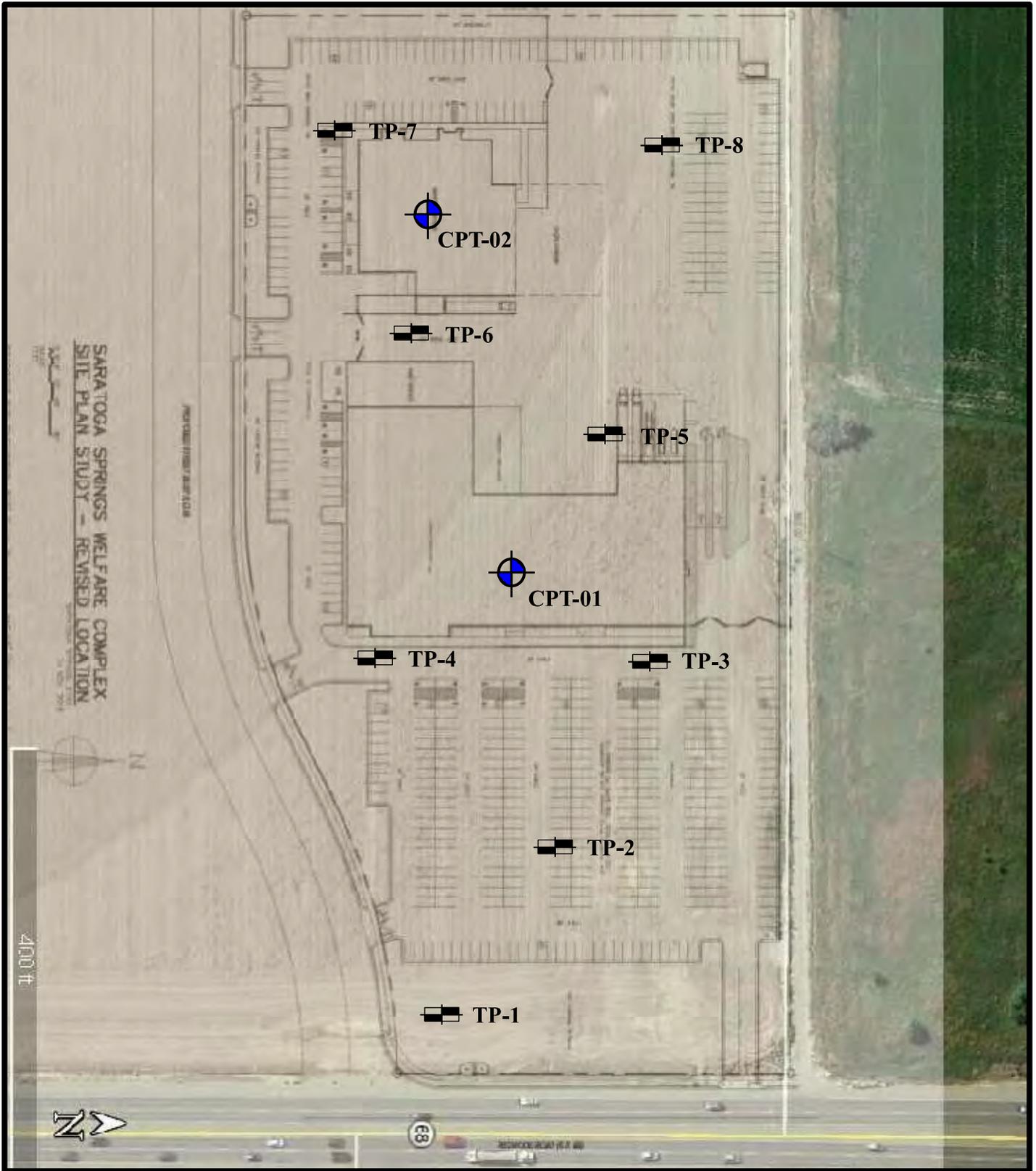
**IGES**<sup>®</sup>

Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE VICINITY MAP**

**Figure  
 A-1**



-  Approximate Test Pit Location
-  Approximate CPT Location



Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE MAP**

**Figure**  
**A-2**

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah			IGES Rep: JGS Rig Type: JCB-4CX		TEST PIT NO: <b>TP-1</b> Sheet 1 of 1								
STARTED: 3/11/19		Project Number 03019-001			Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits					
COMPLETED: 3/11/19										MATERIAL DESCRIPTION			Plastic Limit    Moisture Content    Liquid Limit		
BACKFILLED: 3/11/19													10 20 30 40 50 60 70 80 90		
DEPTH		LOCATION													
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION	LATITUDE	LONGITUDE	ELEVATION (ft)							
0	0			[Topsoil]											
				[Lean Clay]	CL										
				[Light Brown]											
		[X]		[Occasional Pinholes]											
				[Few to no pinholes]											
3	10			[No groundwater]											
4				[Bottom of test pit @ 14 Feet]											



**SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 X - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 3**

LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah			IGES Rep: JGS		TEST PIT NO: <b>TP-2</b>					
STARTED: 3/11/19		Project Number 03019-001			Rig Type: JCB-4CX		Sheet 1 of 1					
COMPLETED: 3/11/19												
DEPTH		LOCATION			Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits		
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)						Plastic Limit	Moisture Content	Liquid Limit
		MATERIAL DESCRIPTION										
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown										
		Lean CLAY - stiff, moist, brown frequent pinholes										
		- light brown										
	5	- occasional to few pinholes			80.1	15.5						
		- no pinholes										
	10	No groundwater was encountered										
	15	Bottom of test pit @ 12.5 Feet										



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- SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER
- WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure**

**A - 4**



LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-4</b>												
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1												
COMPLETED: 3/11/19																				
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits									
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Plastic Limit						Moisture Content	Liquid Limit								
		MATERIAL DESCRIPTION									10	20	30	40	50	60	70	80	90	
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown																		
		Lean CLAY - stiff, moist, brown pinholes present																		
		- occasional pinholes																		
		- no pinholes, white mottling and stringers																		
		- brown to gray, no more white mottling																		
		No groundwater was encountered																		
		Bottom of test pit @ 12.5 Feet																		



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- SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER
- WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 6**

LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-5</b>	
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1	
COMPLETED: 3/11/19									
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Moisture Content and Atterberg Limits	
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Plastic Limit			Moisture Content	Liquid Limit
		MATERIAL DESCRIPTION				Percent minus 200	Liquid Limit	Plasticity Index	
								10 20 30 40 50 60 70 80 90	
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown							
		CL Lean CLAY - stiff, moist, brown pinholes present							
1		- few to no pinholes							
		- gray to brown							
5						89.7	19.5		
3	10	SM Silty SAND with gravel - medium dense, moist, tan with cobbles							
		GP-GM Poorly Graded GRAVEL with silt and sand - dense, moist, tan with cobbles							
4		No groundwater was encountered							
		Bottom of test pit @ 12.5 Feet							
15									



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**SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure**  
**A - 7**



LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-7</b>												
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1												
COMPLETED: 3/11/19																				
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits									
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Plastic Limit						Moisture Content	Liquid Limit								
		MATERIAL DESCRIPTION									10	20	30	40	50	60	70	80	90	
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown																		
		Lean CLAY - stiff, moist, brown to light brown pinholes present				79.1	17.2													
1		- few to no pinholes - brown																		
3	10	Silty SAND - medium dense, moist, tan																		
4		No groundwater was encountered																		
		Bottom of test pit @ 12.5 Feet																		



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- SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER
- WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 9**

LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah			IGES Rep: JGS		TEST PIT NO: <b>TP-8</b>											
STARTED: 3/11/19		Project Number 03019-001			Rig Type: JCB-4CX		Sheet 1 of 1											
COMPLETED: 3/11/19																		
DEPTH		LOCATION			Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits								
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)						Plastic Limit	Moisture Content	Liquid Limit						
		MATERIAL DESCRIPTION																
0	0	Topsoil - stiff, moist, dark brown								10	20	30	40	50	60	70	80	90
		Lean CLAY - stiff, moist, brown trace pinholes																
		- no pinholes																
1																		
	5																	
2																		
	10																	
3																		
	15																	
4		No groundwater was encountered																
		Bottom of test pit @ 12.5 Feet																



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**SAMPLE TYPE**  
 - GRAB SAMPLE  
 - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 - MEASURED  
 - ESTIMATED

**NOTES:**

**Figure  
A - 10**

# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		USCS SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS <small>(More than half of material is larger than the #4 sieve)</small>	GRAVELS <small>(More than half of coarse fraction is larger than the #4 sieve)</small>	Clean gravels with little or no fines	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		Gravels with over 12% fines	GP POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		SANDS <small>(More than half of coarse fraction is smaller than the #4 sieve)</small>	Clean sands with little or no fines	GM SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
	Sands with over 12% fines		GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	
			Clean sands with little or no fines	SW WELL-GRADED SANDS, SAND-GRAVEL MIXTURES WITH LITTLE OR NO FINES
	FINE GRAINED SOILS <small>(More than half of material is smaller than the #200 sieve)</small>	SILTS AND CLAYS <small>(Liquid limit less than 50)</small>	ML	INORGANIC SILTS & VERY FINE SANDS, SILTY OR CLAYEY FINE SANDS, CLAYEY SILTS WITH SLIGHT PLASTICITY
CL			INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL			ORGANIC SILTS & ORGANIC SILTY CLAYS OF LOW PLASTICITY	
MH			INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILT	
CH			INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
SILTS AND CLAYS <small>(Liquid limit greater than 50)</small>		OH	ORGANIC CLAYS & ORGANIC SILTS OF MEDIUM-TO-HIGH PLASTICITY	
		US	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS	
		MS		
HIGHLY ORGANIC SOILS		PT		

## LOG KEY SYMBOLS

	BORING SAMPLE LOCATION		TEST-PIT SAMPLE LOCATION
	WATER LEVEL (level after completion)		WATER LEVEL (level where first encountered)

## CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

## OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

## MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

## MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

## STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

## GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

## APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

## CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE	POCKET PENETROMETER	FIELD TEST
		UNTRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.



Figure  
A-11

# **APPENDIX B**

# PRESENTATION OF SITE INVESTIGATION RESULTS

## JRW

*Prepared for:*

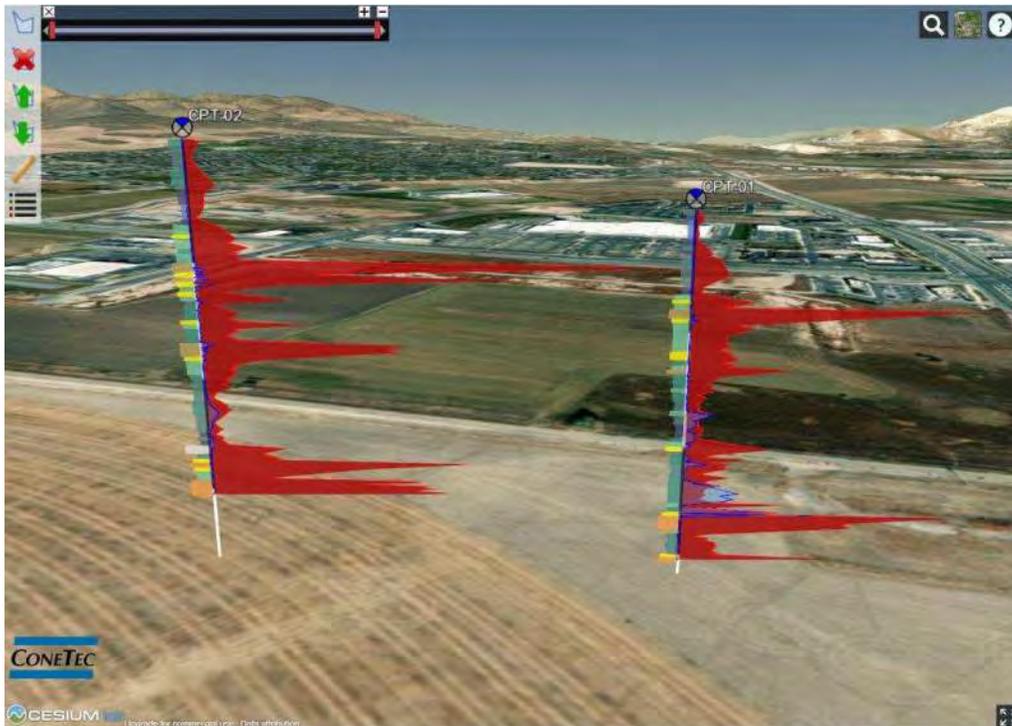
IGES, Inc.

ConeTec Job No: 19-52023

Project Start Date: 16-May-2019

Project End Date: 16-May-2019

Report Date: 24-May-2019



*Prepared by:*

ConeTec Inc.  
3750 West 500 South  
Salt Lake City, UT 84104

Tel: (801) 973-3801

Fax: (801) 973-3802

Email: [saltlakecity@conetec.com](mailto:saltlakecity@conetec.com)

[www.conetec.com](http://www.conetec.com)

[www.conetecdataservices.com](http://www.conetecdataservices.com)



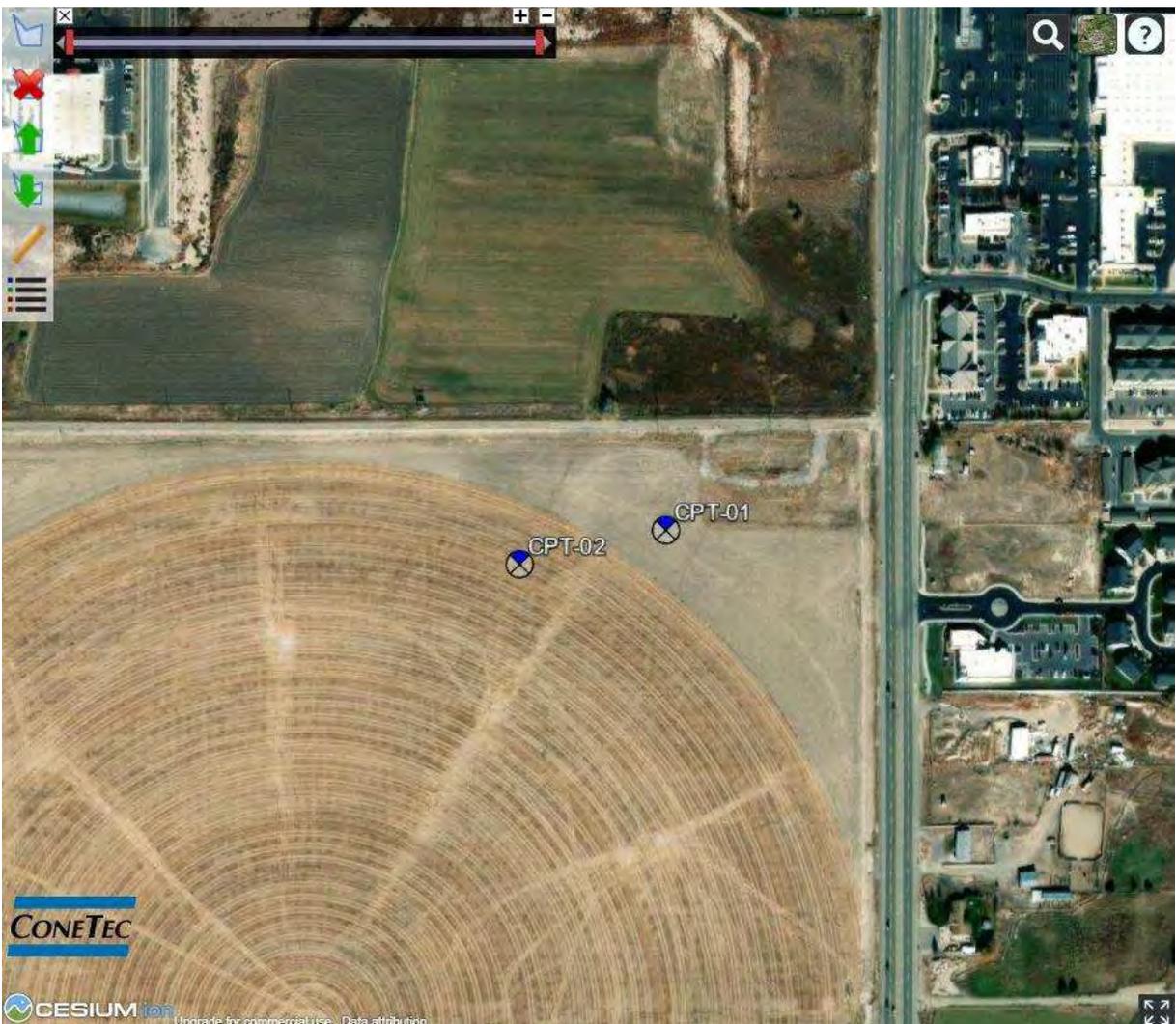
## Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for IGES, Inc. of Draper, Utah. The program consisted of cone penetration testing (CPT) at two (2) locations. Shear wave velocities were recorded in one (1) of the soundings. Pore pressure dissipation testing was performed as directed by IGES, Inc. field personnel. The water table used in the CPT interpretations is based on the results of the pore pressure dissipation tests performed within each sounding.

## Project Information

Project	
Client	IGES, Inc.
Project	JRW
ConeTec Project #	19-52023

A map from Bing maps including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT truck rig	25-ton truck mounted cylinder	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	USB/Serial GPS	4326 (WGS 84 / LatLong)

Cone Penetration Test (CPT)	
Depth reference	Existing ground surface at the time of the investigation
Tip and sleeve data offset	0.1 Meter This has been accounted for in the CPT data files
Additional Comments	None

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm <sup>2</sup> )	Sleeve Area (cm <sup>2</sup> )	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
418:T1500F15U500	418	15	225	1500	15	500
Cone 418 was used in all soundings						

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behavior Type Chart based on Qtn (SBT Qtn) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (qt) sleeve friction (fs), and pore pressure (u2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile.

**Limitations**

This report has been prepared for the exclusive use of IGES, Inc. (Client) for the project titled “JRW”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec, Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.



The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm<sup>2</sup> and 15 cm<sup>2</sup> tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm<sup>2</sup> penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm<sup>2</sup> piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u<sub>2</sub>" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

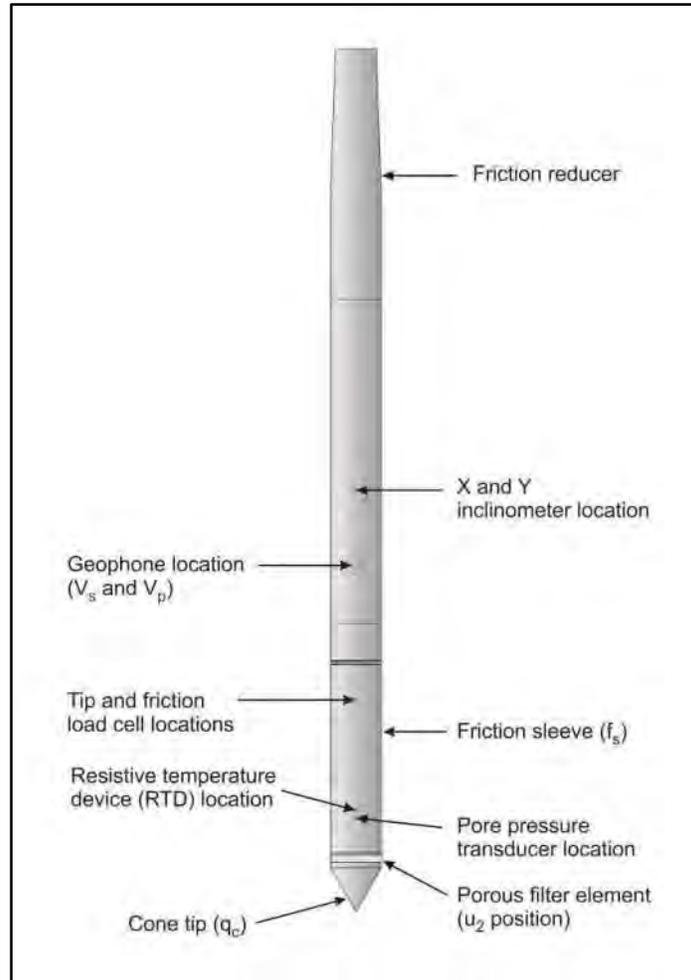


Figure CPTu. Piezocone Penetrometer (15 cm<sup>2</sup>)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ( $q_c$ )
- Sleeve friction ( $f_s$ )
- Dynamic pore pressure ( $u$ )
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ( $q_t$ ), sleeve friction ( $f_s$ ) and pore water pressure ( $u$ ). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance ( $q_c$ ) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ( $q_t$ ) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where:  $q_t$  is the corrected tip resistance

$q_c$  is the recorded tip resistance

$u_2$  is the recorded dynamic pore pressure behind the tip ( $u_2$  position)

$a$  is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ( $f_s$ ) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure ( $u$ ) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio ( $R_f$ ) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave ( $V_p$ ) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

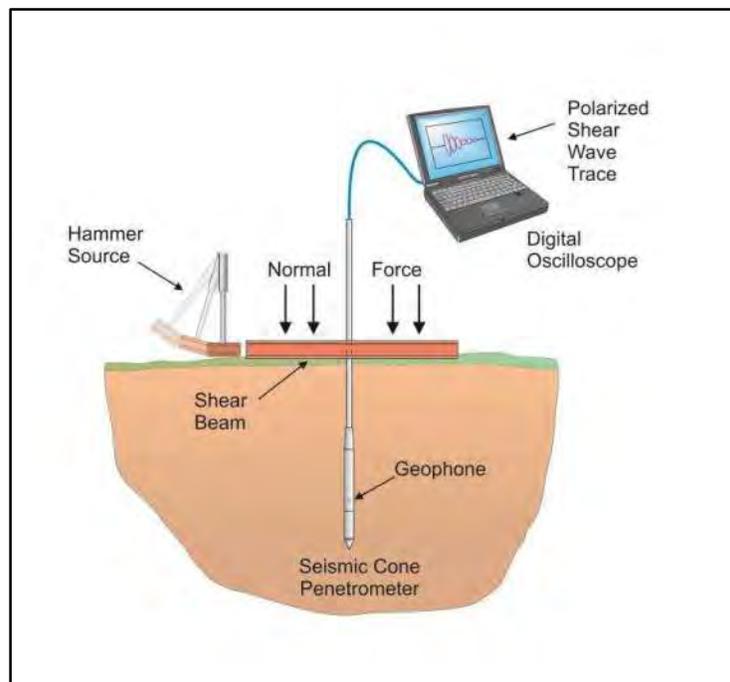


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

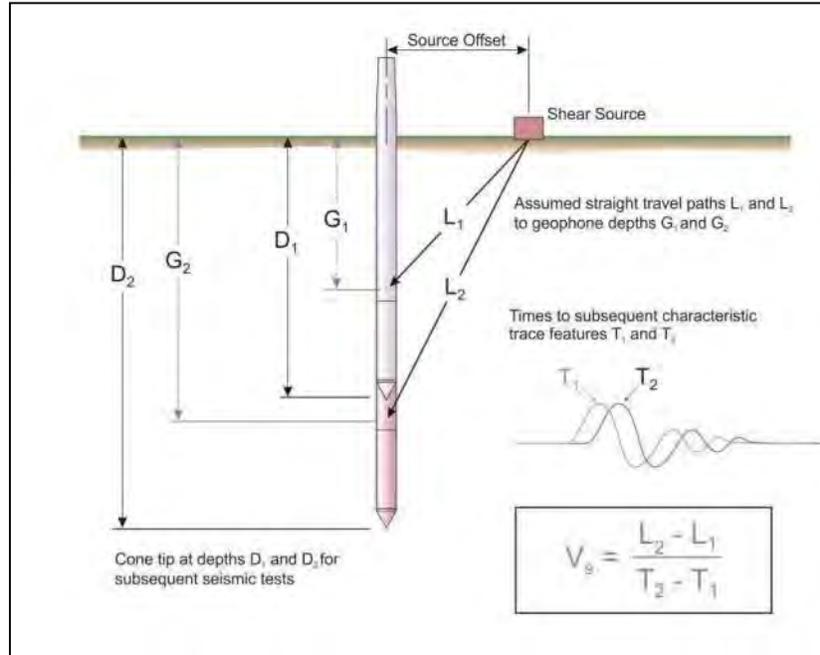


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ( $\bar{v}_s$ ) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}}$$

where:  $\bar{v}_s$  = average shear wave velocity ft/s (m/s)  
 $d_i$  = the thickness of any layer between 0 and 100 ft (30 m)  
 $v_{si}$  = the shear wave velocity in ft/s (m/s)  
 $\sum_{i=1}^n d_i = 100 \text{ ft (30 m)}$

Average shear wave velocity,  $\bar{v}_s$  is also referenced to  $V_{s100}$  or  $V_{s30}$ .

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure ( $u$ ) with time ( $t$ ).

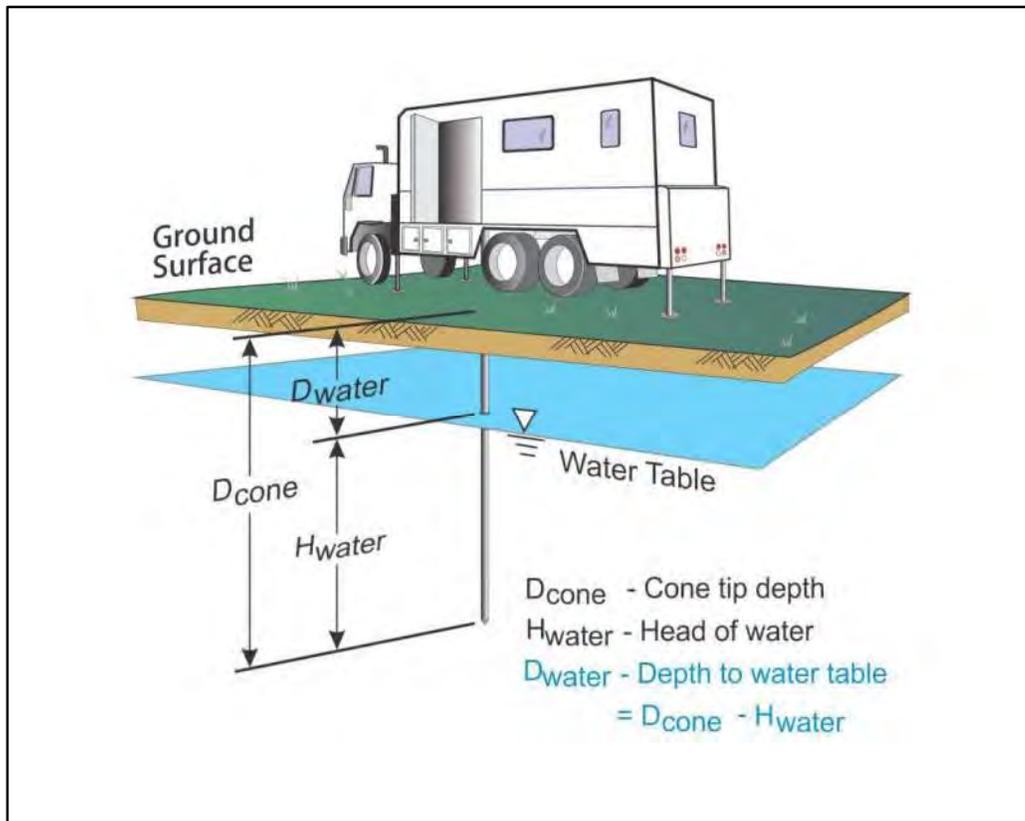


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

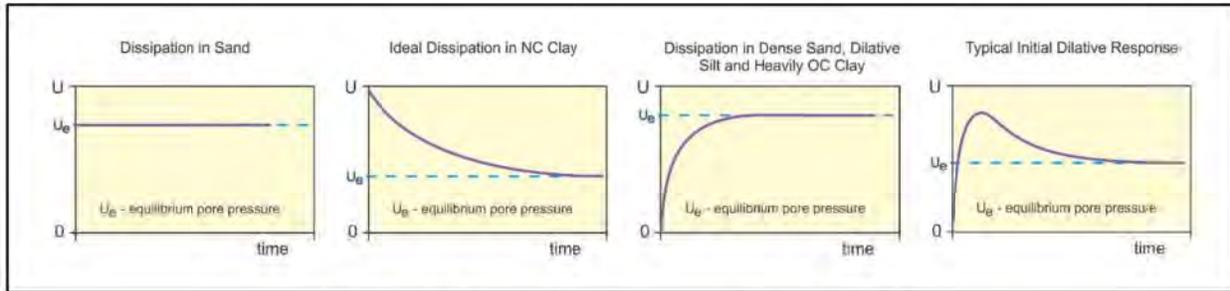


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure ( $u_{eq}$ ) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as  $t_{100}$ . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to  $t_{100}$ . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor ( $T^*$ ) may be used to calculate the coefficient of consolidation ( $c_h$ ) at various degrees of dissipation resulting in the expression for  $c_h$  shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- $T^*$  is the dimensionless time factor (Table Time Factor)
- $a$  is the radius of the cone
- $I_r$  is the rigidity index
- $t$  is the time at the degree of consolidation

Table Time Factor.  $T^*$  versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time ( $t_{50}$ ) corresponding to a degree of dissipation of 50% ( $u_{50}$ ). In order to determine  $t_{50}$ , dissipation tests must be taken to a pressure less than  $u_{50}$ . The  $u_{50}$  value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as  $u_{100}$ . To estimate  $u_{50}$ , both the initial maximum pore pressure and  $u_{100}$  must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure ( $u$  at  $t_{100}$ ) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ( $u_{100}$ ), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of  $c_h$  (Teh and Houlsby, 1991),  $t_{50}$  values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ( $I_r$ ) is assumed. For curves having an initial dilatatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining  $t_{50}$ . In cases where the time to peak is excessive,  $t_{50}$  values are not calculated.

Due to possible inherent uncertainties in estimating  $I_r$ , the equilibrium pore pressure and the effect of an initial dilatatory response on calculating  $t_{50}$ , other methods should be applied to confirm the results for  $c_h$ .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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## REFERENCES

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Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", *Geotechnique*, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Normalized Cone Penetration Test Plots
- SBT Zone Scatter Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Seismic Cone Penetration Wave Traces
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and  
Standard Cone Penetration Test Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

### CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface <sup>1</sup> (ft.)	Final Depth (ft.)	Latitude <sup>2</sup>	Longitude	Elevation <sup>3</sup> (ft.)	Refer to Notation Number
CPT-01	19-52023_SP01	16-May-2019	418:T1500F15U500	29.5	50.03	40.383219	-111.918333	4540	
CPT-02	19-52023_SP02	16-May-2019	418:T1500F15U500	43.4	50.03	40.383012	-111.919514	4549	

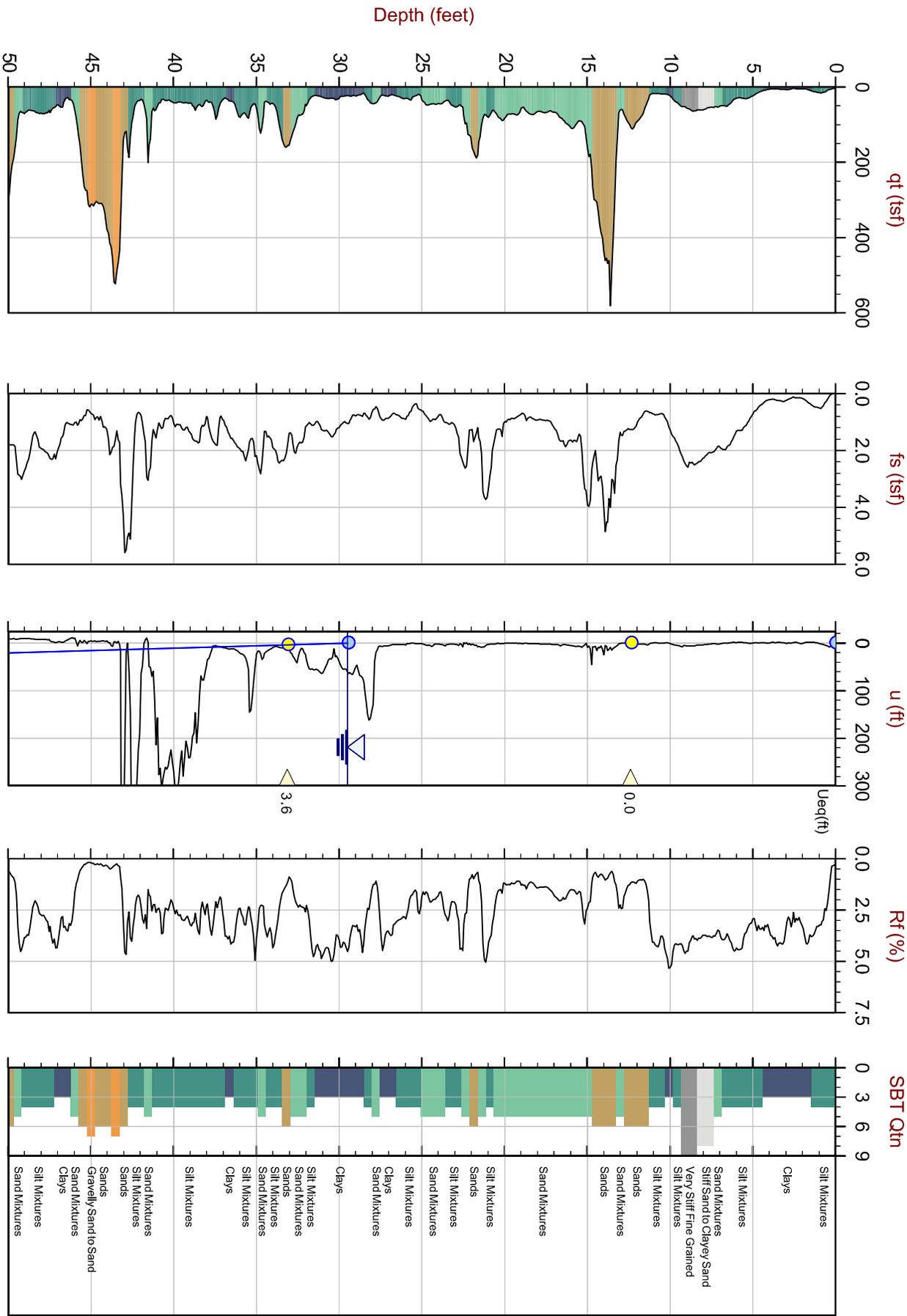
1. The assumed phreatic surface used in the CPT interpretations are based on the pore pressure dissipation tests performed within each sounding.
2. The coordinates are based on the WGS84 Datum and have an accuracy of ±30 feet.
3. Elevations are referenced to the ground surface and are derived from the Google Earth Elevation for the recorded coordinates.



IGES

Job No: 19-52023  
Date: 2019-05-16 09:01  
Site: JRW

Sounding: CPT-01  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m  
 File: 19-52023\_CP01.COR  
 Unit Wt: SBTQtn (PKR2009)  
 SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383220 Long: -111.918330

OverplotItem: ● Ueq    ● Assumed Ueq    ▲ Dissipation, Ueq achieved    ▲ Dissipation, Ueq not achieved    — Hydrostatic Line    — Phreatic Surface

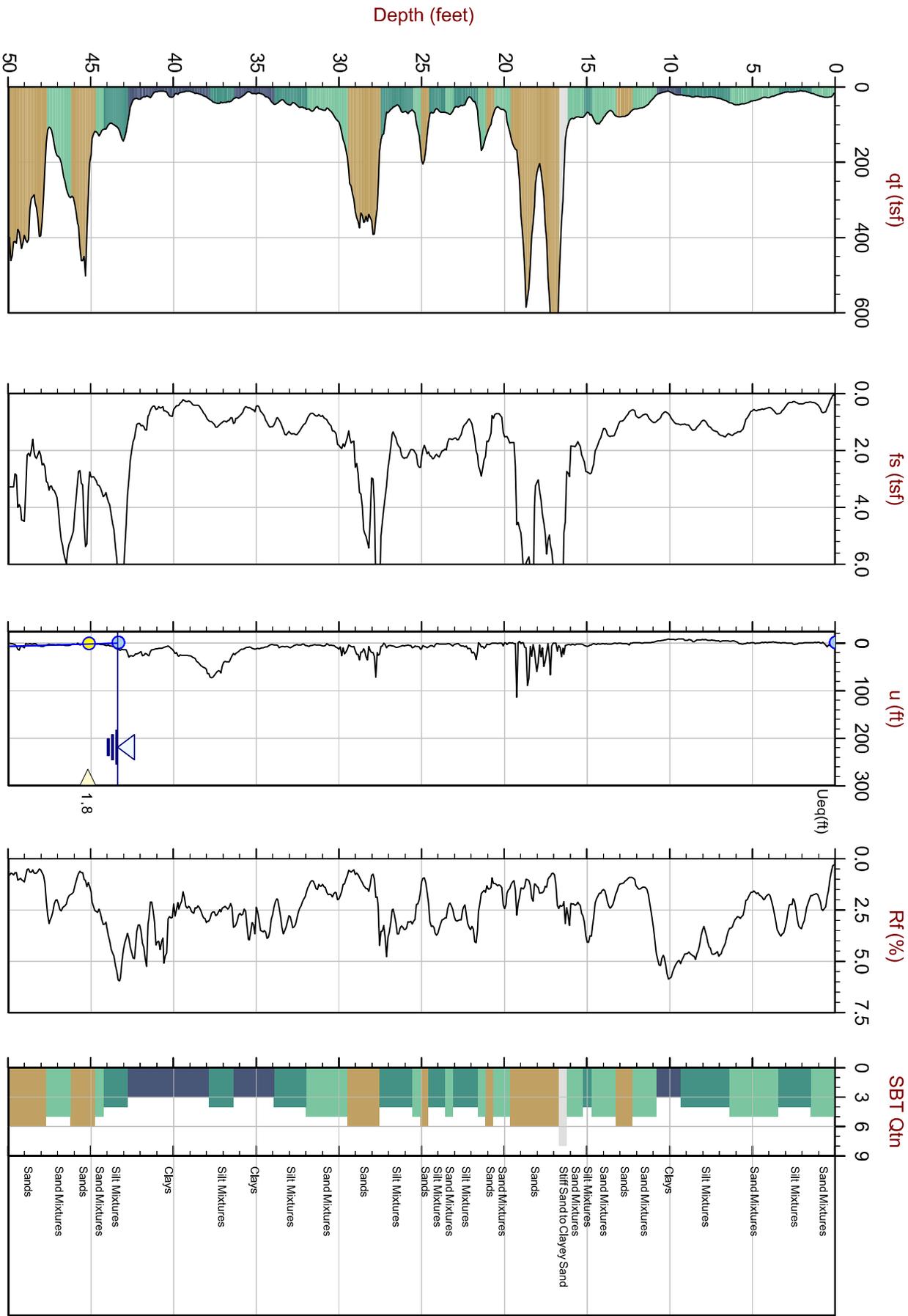
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: 0.150 m

File: 19-52023\_SP02.COR  
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq ● Assumed Ueq ▲ Dissipation, Ueq achieved ▼ Dissipation, Ueq not achieved — Hydrostatic Line — Phreatic Surface

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## Normalized Cone Penetration Test Plots

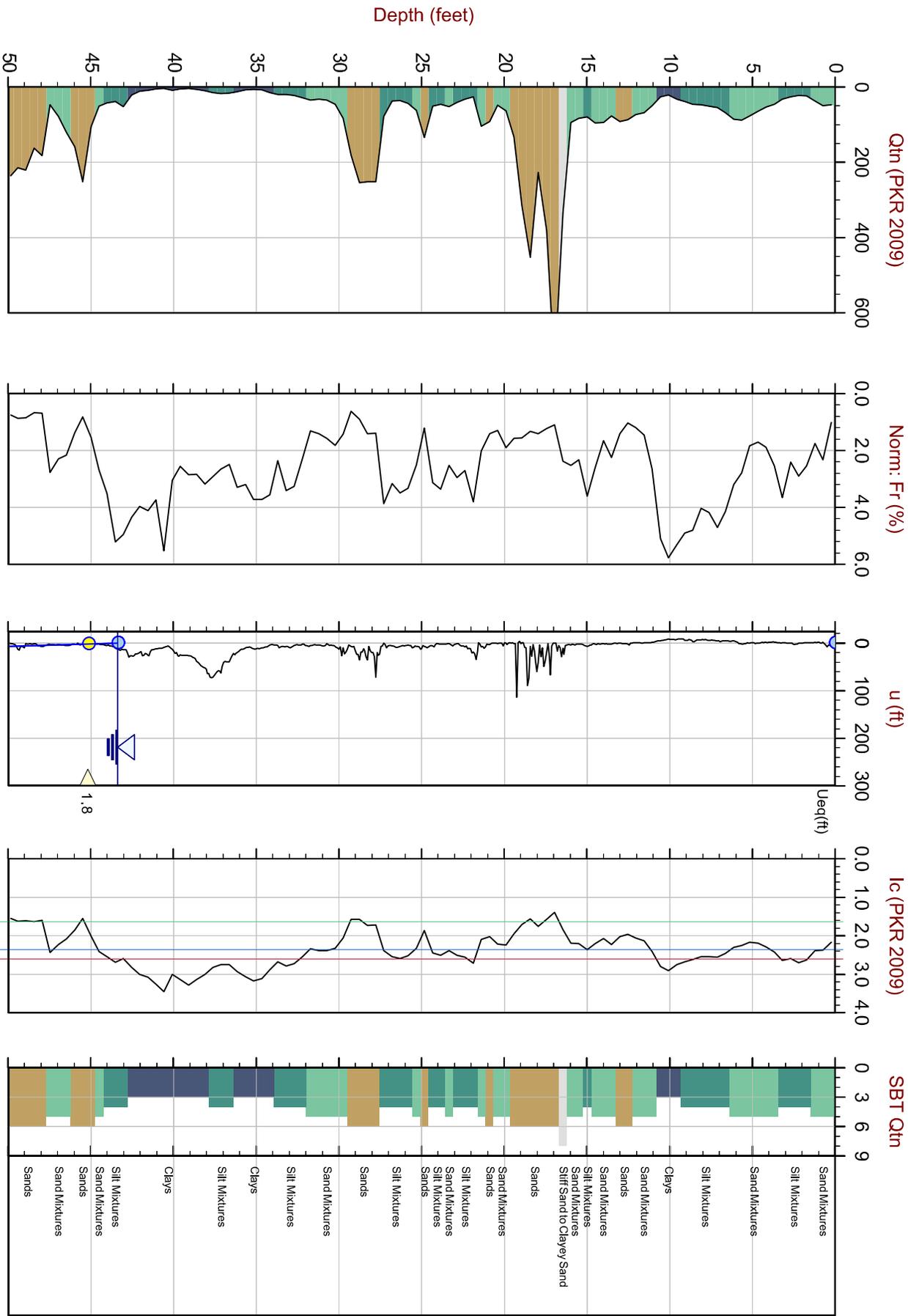




# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m

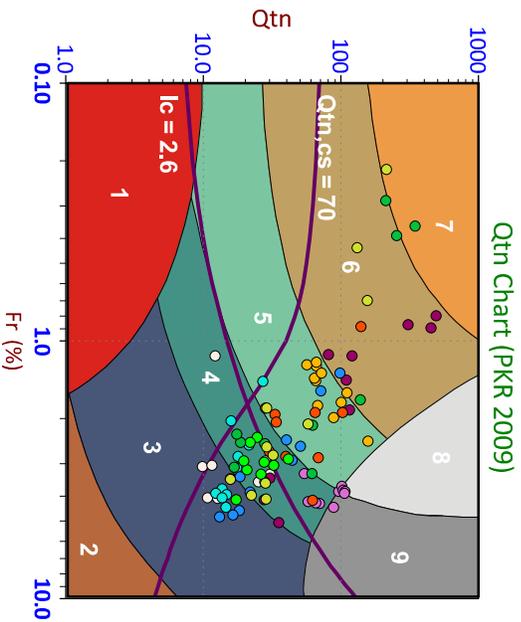
File: 19-52023\_SP02.COR  
 Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq    ● Assumed Ueq    ▲ Dissipation, Ueq achieved    ▲ Dissipation, Ueq not achieved    — Hydrostatic Line    — Phreatic Surface

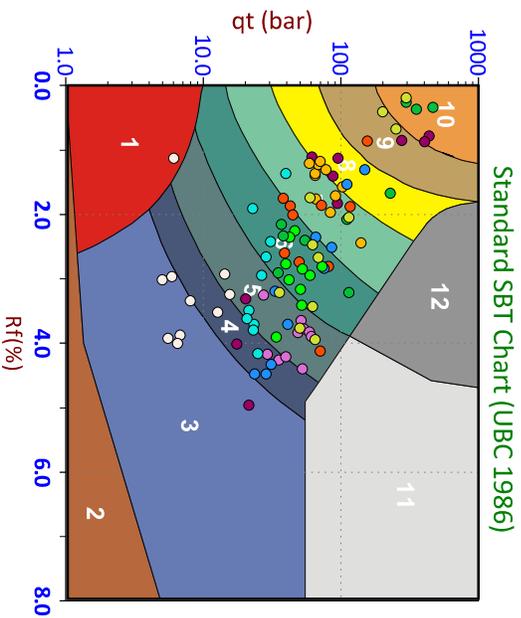
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## SBT Zone Scatter Plots

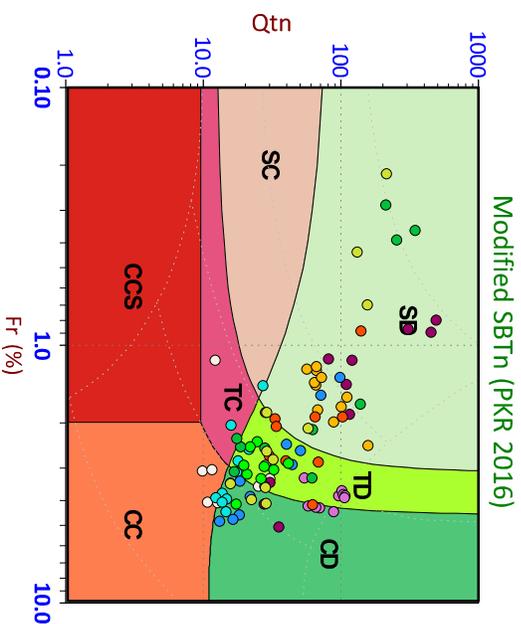


- #### Depth Ranges
- >0.0 to 5.0 ft
  - >5.0 to 10.0 ft
  - >10.0 to 15.0 ft
  - >15.0 to 20.0 ft
  - >20.0 to 25.0 ft
  - >25.0 to 30.0 ft
  - >30.0 to 35.0 ft
  - >35.0 to 40.0 ft
  - >40.0 to 45.0 ft
  - >45.0 to 50.0 ft
  - >50.0 ft

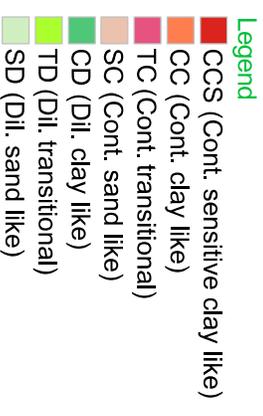
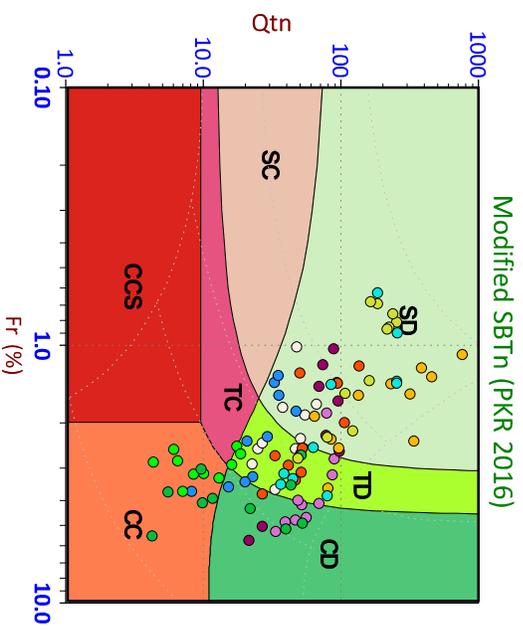
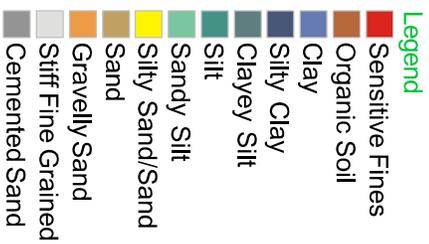
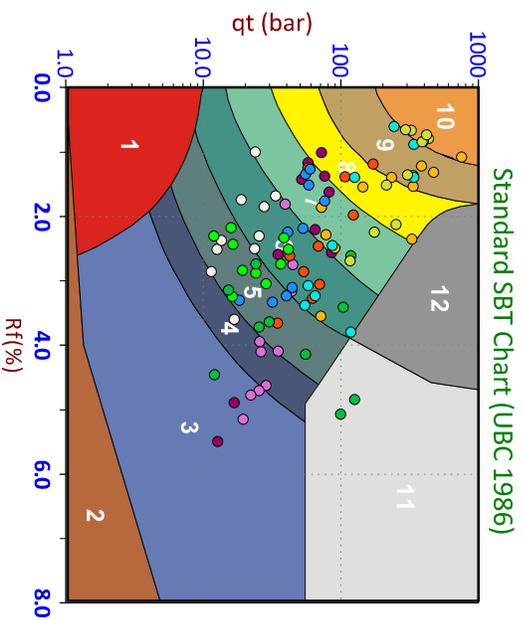
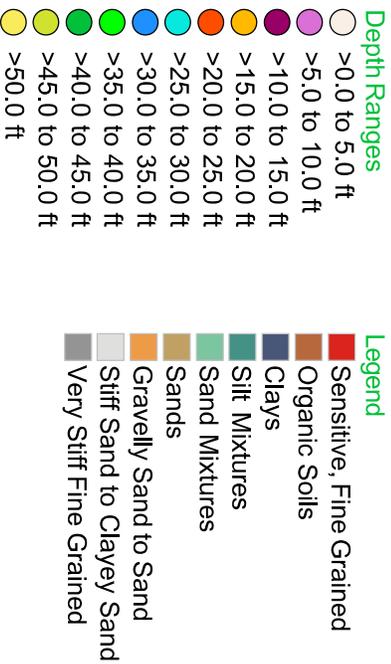
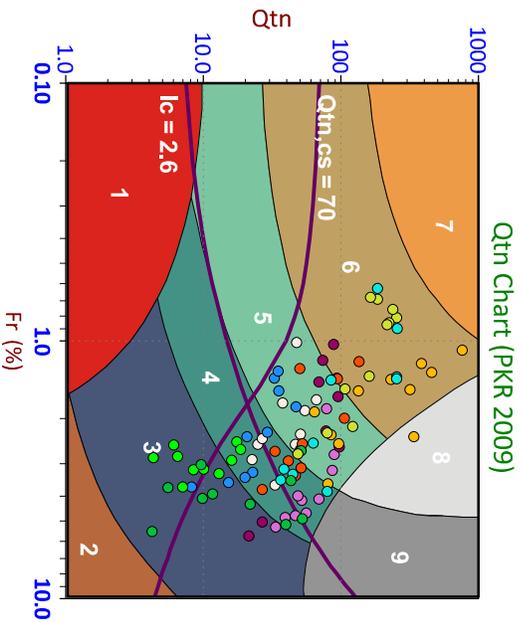
- #### Legend
- Sensitive, Fine Grained
  - Organic Soils
  - Clays
  - Silt Mixtures
  - Sand Mixtures
  - Sands
  - Gravelly Sand to Sand
  - Stiff Sand to Clayey Sand
  - Very Stiff Fine Grained



- #### Legend
- Sensitive Fines
  - Organic Soil
  - Clay
  - Silty Clay
  - Clayey Silt
  - Silt
  - Sandy Silt
  - Silty Sand/Sand
  - Sand
  - Gravelly Sand
  - Stiff Fine Grained
  - Cemented Sand



- #### Legend
- CCS (Cont. sensitive clay like)
  - CC (Cont. clay like)
  - TC (Cont. transitional)
  - SC (Cont. sand like)
  - CD (Dil. clay like)
  - TD (Dil. transitional)
  - SD (Dil. sand like)



Seismic Cone Penetration Test Plots

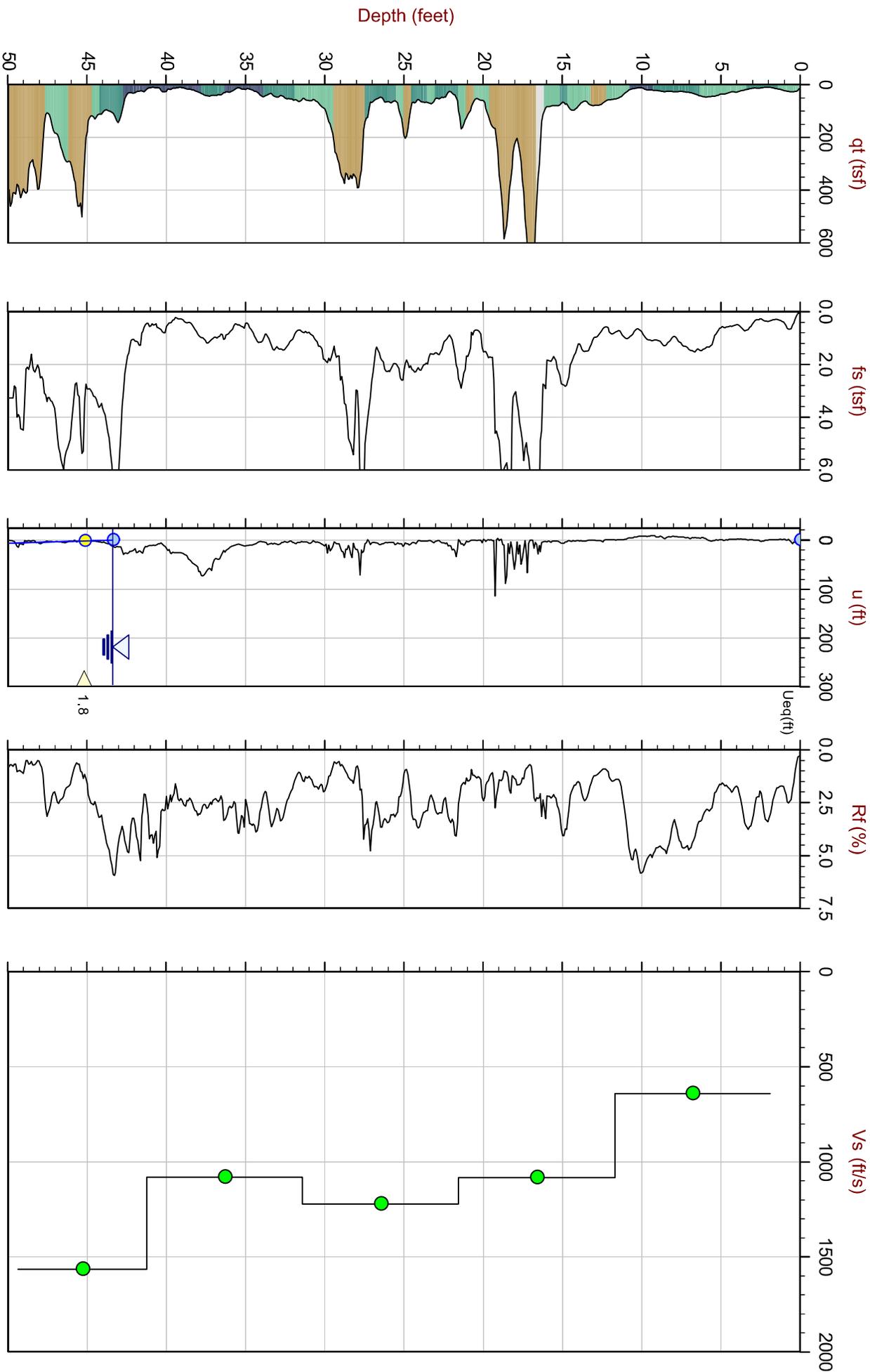




# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m  
 File: 19-52023\_SP02.COR  
 Unit Wt: SBTQIn (PKR2009)

SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

- OverplotItem: ● Ueq    ● Assumed Ueq    ▲ Dissipation, Ueq achieved    ▲ Dissipation, Ueq not achieved
- Hydrostatic Line    — Phreatic Surface
- The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## Seismic Cone Penetration Test Tabular Results



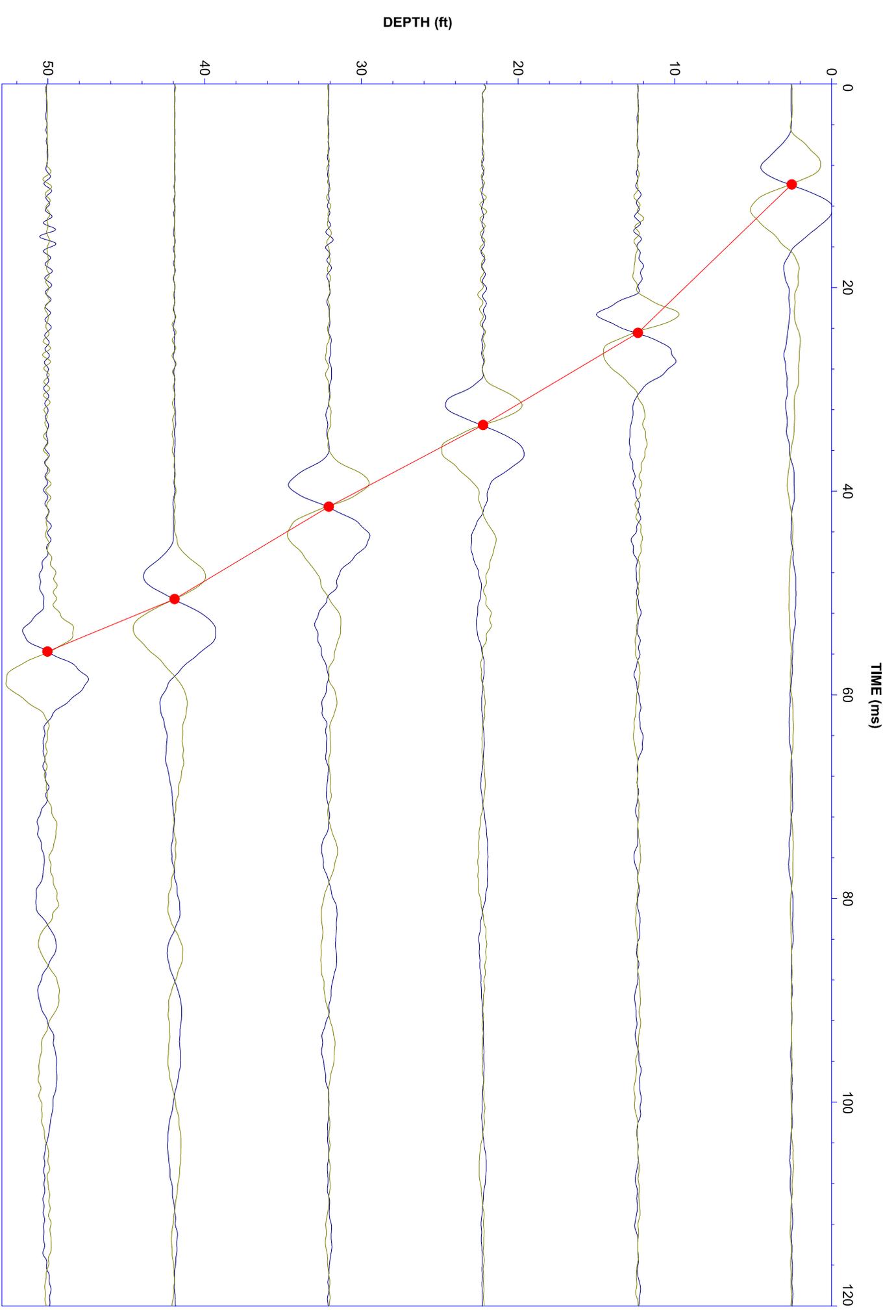
Job No: 19-52023  
Client: IGES  
Project: JRW  
Sounding ID: SCPT-02  
Date: 16-May-2019

Seismic Source: Beam  
Source Offset (ft): 1.50  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

**SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>**

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
2.56	1.90	2.42			
12.37	11.71	11.81	9.39	14.56	644
22.24	21.59	21.64	9.83	9.05	1087
32.09	31.43	31.47	9.83	8.02	1225
41.93	41.27	41.30	9.83	9.07	1084
50.03	49.38	49.40	8.10	5.16	1569

## Seismic Cone Penetration Wave Traces



Pore Pressure Dissipation Summary and  
Pore Pressure Dissipation Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

**CPT<sub>u</sub> PORE PRESSURE DISSIPATION SUMMARY**

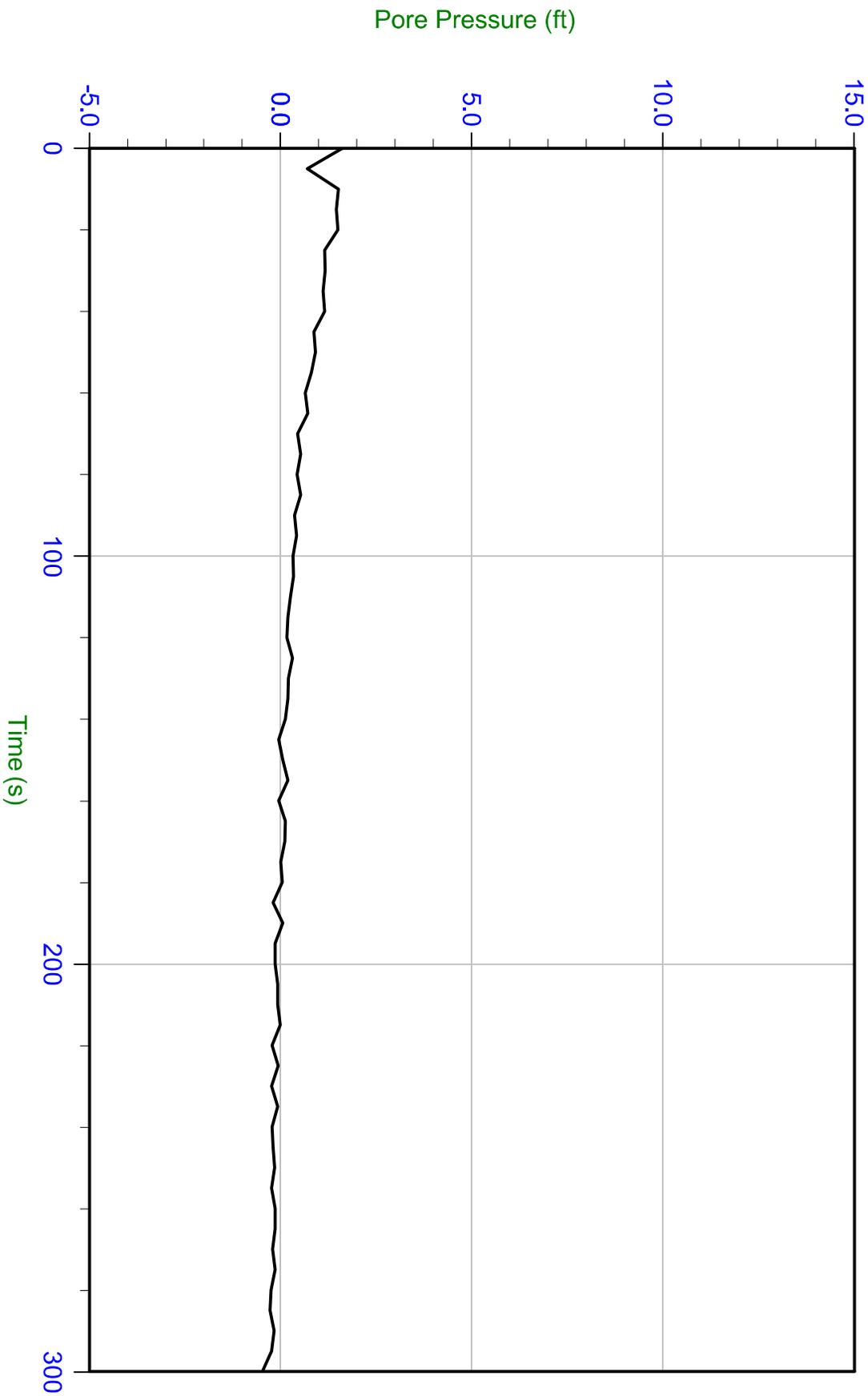
Sounding ID	File Name	Cone Area (cm <sup>2</sup> )	Duration (s)	Test Depth (ft.)	Estimated Equilibrium Pore Pressure U <sub>eq</sub> (ft.)	Calculated Phreatic Surface (ft.)	Refer to Notation Number
CPT-01	19-52023_CP01	15	300	12.39	0.0	12.4	
CPT-01	19-52023_CP01	15	1000	33.14	3.6	29.5	
CPT-02	19-52023_SP02	15	500	45.19	1.8	43.4	



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_CP01.PPD  
Depth: 3.775 m / 12.385 ft  
Duration: 300.0 s

u Min: -0.5 ft  
u Max: 1.6 ft  
u Final: -0.5 ft

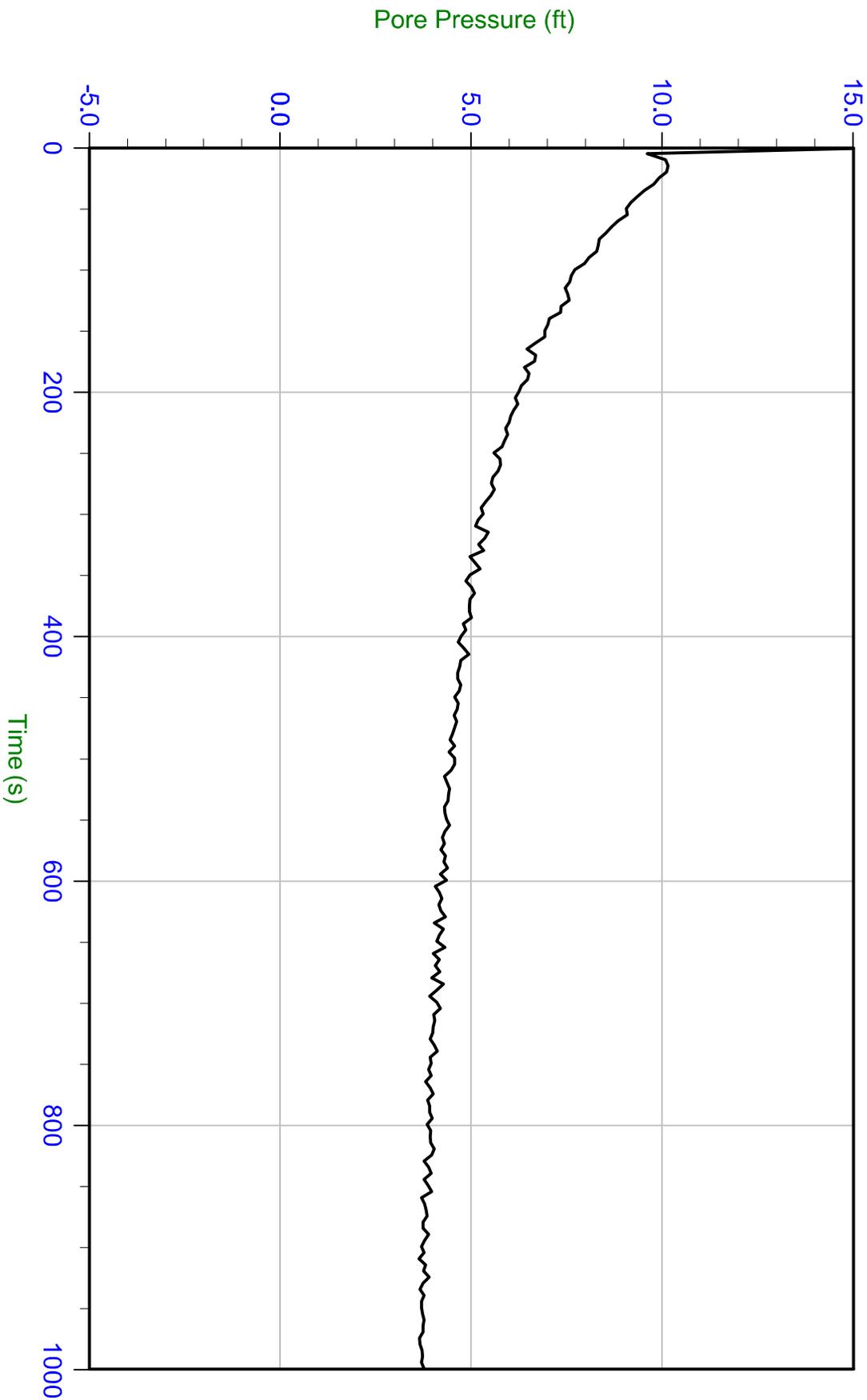
WT: 3.772 m / 12.374 ft  
Ueq: 0.0 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



**Trace Summary:**

Filename: 19-52023\_CP01.PPD  
Depth: 10.100 m / 33.136 ft  
Duration: 1000.0 s

u Min: 3.6 ft  
u Max: 15.5 ft  
u Final: 3.8 ft

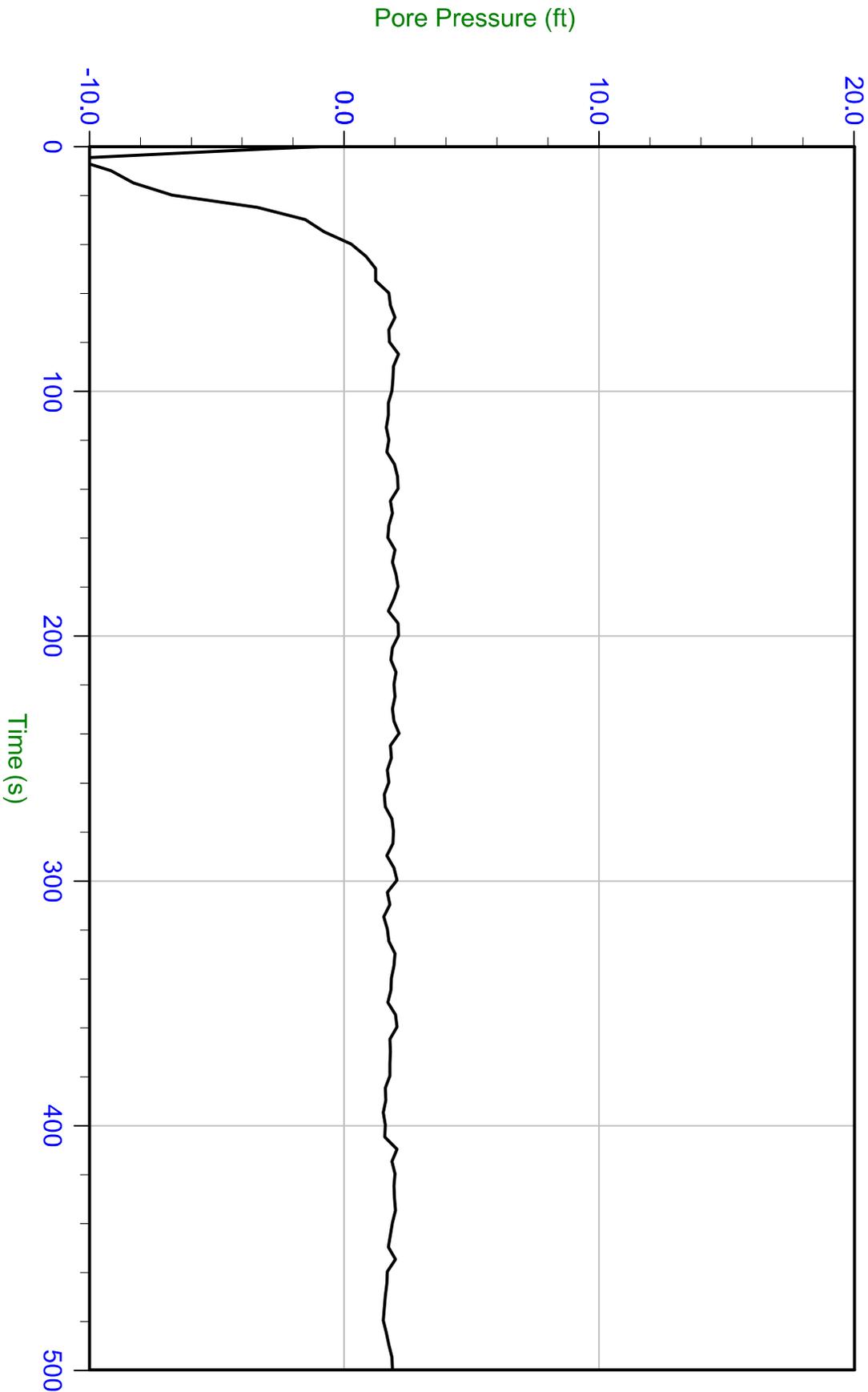
WT: 8.989 m / 29.491 ft  
Ueq: 3.6 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 10:19:35  
Site: JRW

Sounding: CPT-02  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_SP02.PPD  
Depth: 13.775 m / 45.193 ft  
Duration: 500.0 s

u Min: -10.7 ft  
u Max: 2.2 ft  
u Final: 1.9 ft  
WT: 13.233 m / 43.415 ft  
Ueq: 1.8 ft

# **APPENDIX C**

# Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

**Project:** GTI Welfare Complex  
**No:** 03019-001

**Location:** Saratoga Springs

**Date:** 3/18/2019

**By:** JAB

**Method:** ASTM D698 B

**Mold Id.** Inc 1

**Mold volume (ft<sup>3</sup>):** 0.0333

**Boring No.:** TP-2

**Sample:**

**Depth:** 2.0-4.0'

**Sample Description:** Brown clay

**Engineering Classification:** Not requested

**As-received water content (%):** Not requested

**Preparation method:** Moist

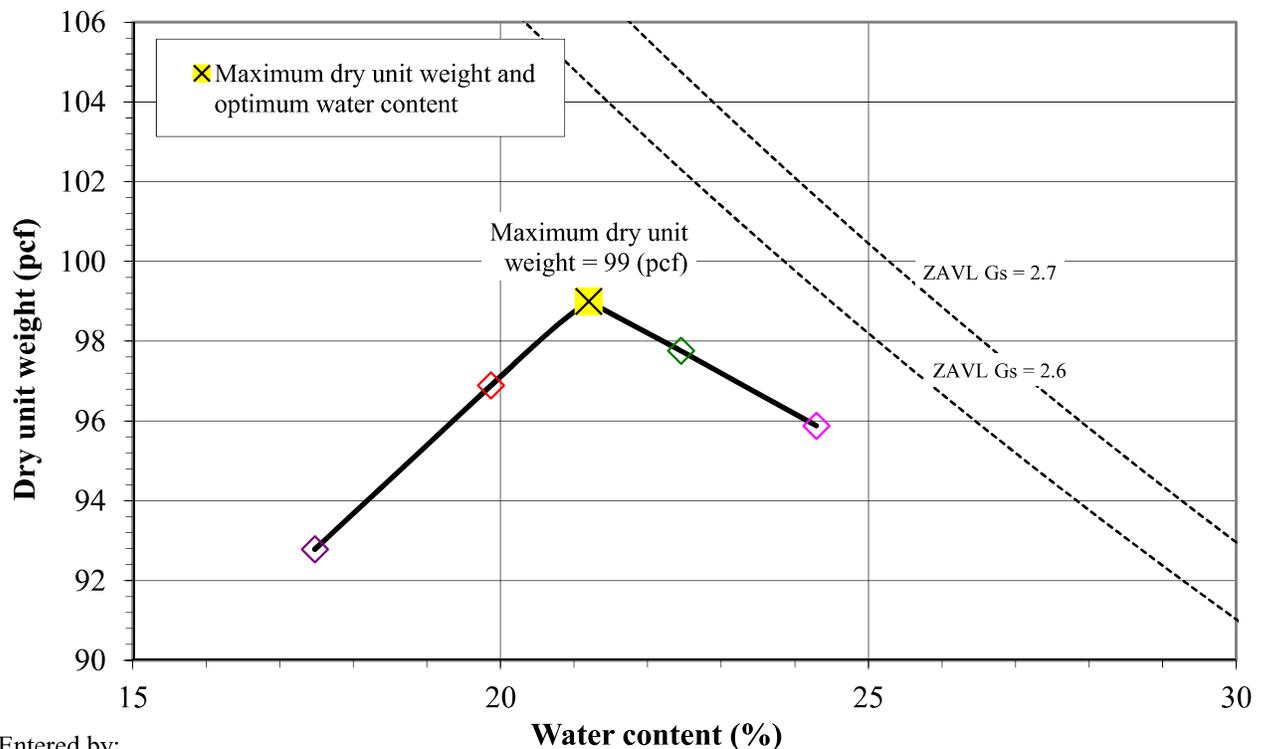
**Rammer:** Mechanical-circular face

**Rock Correction:** No

**Optimum water content (%):** 21.2

**Maximum dry unit weight (pcf):** 99

Point Number	As-Is	+2%	+4%	+6%				
Wt. Sample + Mold (g)	5876.9	5984.7	6038.6	6030.5				
Wt. of Mold (g)	4231.4	4231.4	4231.4	4231.4				
Wet Unit Wt., $\gamma_m$ (pcf)	109.0	116.1	119.7	119.2				
Wet Soil + Tare (g)	1297.47	1411.96	1563.23	1561.59				
Dry Soil + Tare (g)	1153.89	1232.32	1351.73	1317.51				
Tare (g)	332.26	328.19	409.82	312.77				
Water Content, w (%)	17.5	19.9	22.5	24.3				
Dry Unit Wt., $\gamma_d$ (pcf)	92.8	96.9	97.8	95.9				



Entered by: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**California Bearing Ratio**

(ASTM D 1883)



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**Project: GTI Welfare Complex**

**Number: 03019-001**

Location: **Saratoga Springs**

Date: **3/26/2019**

By: **JWB**

Maximum Dry Unit Weight (pcf): **99**  
 Optimum Water Content (%): **21.2**  
 Relative Compaction (%): **101.3**  
**0.1 in. Corrected CBR (%): 4.1**  
**0.2 in. Corrected CBR (%): 5.3**

**Boring No.: TP-2**

**Sample:**

**Depth: 2.0-4.0'**

Original Method: **ASTM D698 B**

Engineering Classification: **Not requested**

Condition of Sample: **Soaked**

Scalp and Replace: **No**

As Compacted Data		Before	After
Mold Id. <b>E</b>	Wet Soil + Tare (g)	1661.81	1919.54
Wt. of Mold + Sample (g) <b>11346.6</b>	Dry Soil + Tare (g)	1430.37	1639.72
Wt. of Mold (g) <b>7224.9</b>	Tare (g)	327.89	315.02
Dry Unit Weight (pcf) <b>100.3</b>	Water Content (%)	21.0	21.1
After Soaking Data		Average	Top 1 in.
Wt. of Mold + Sample (g) <b>11454.3</b>	Wet Soil + Tare (g)	1730.68	483.43
Dry Unit Weight (pcf) <b>98.9</b>	Dry Soil + Tare (g)	1439.57	411.33
	Tare (g)	222.26	122.4
	Water Content (%)	23.9	25.0

**Swell Data**

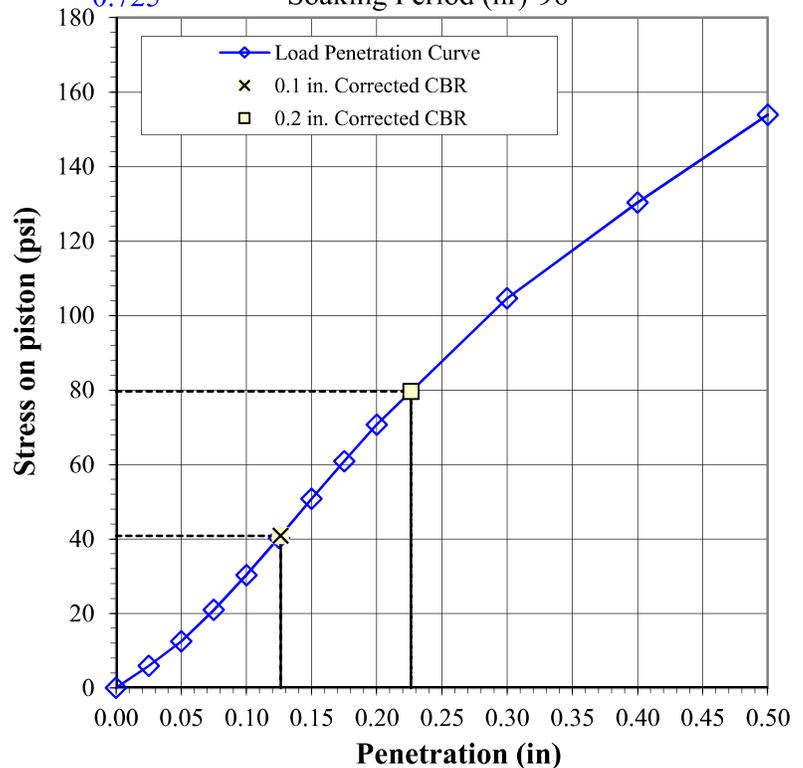
Date: **3/21/2019** Time: **11:15** Dial: **0.661** Surcharge (psf) **50**  
 Date: **3/25/2019** Time: **11:00** Dial: **0.725** Swell (%) **1.40**  
 Soaking Period (hr) **96**

Penetration Data	Piston ID	CBR T1
------------------	-----------	--------

Zero load (lb) = **0**

Area of Piston (in<sup>2</sup>) = **3.0**

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	18	6	
0.050	37	12	
0.075	63	21	
0.100	91	30	1000
0.125	121	40	1125
0.150	152	51	1250
0.175	182	61	1375
0.200	212	71	1500
0.300	314	105	1900
0.400	391	130	2300
0.500	462	154	2600



Entered By: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-2**

Sample:

Depth: **4.5'**

Sample Description: **Brown silt**

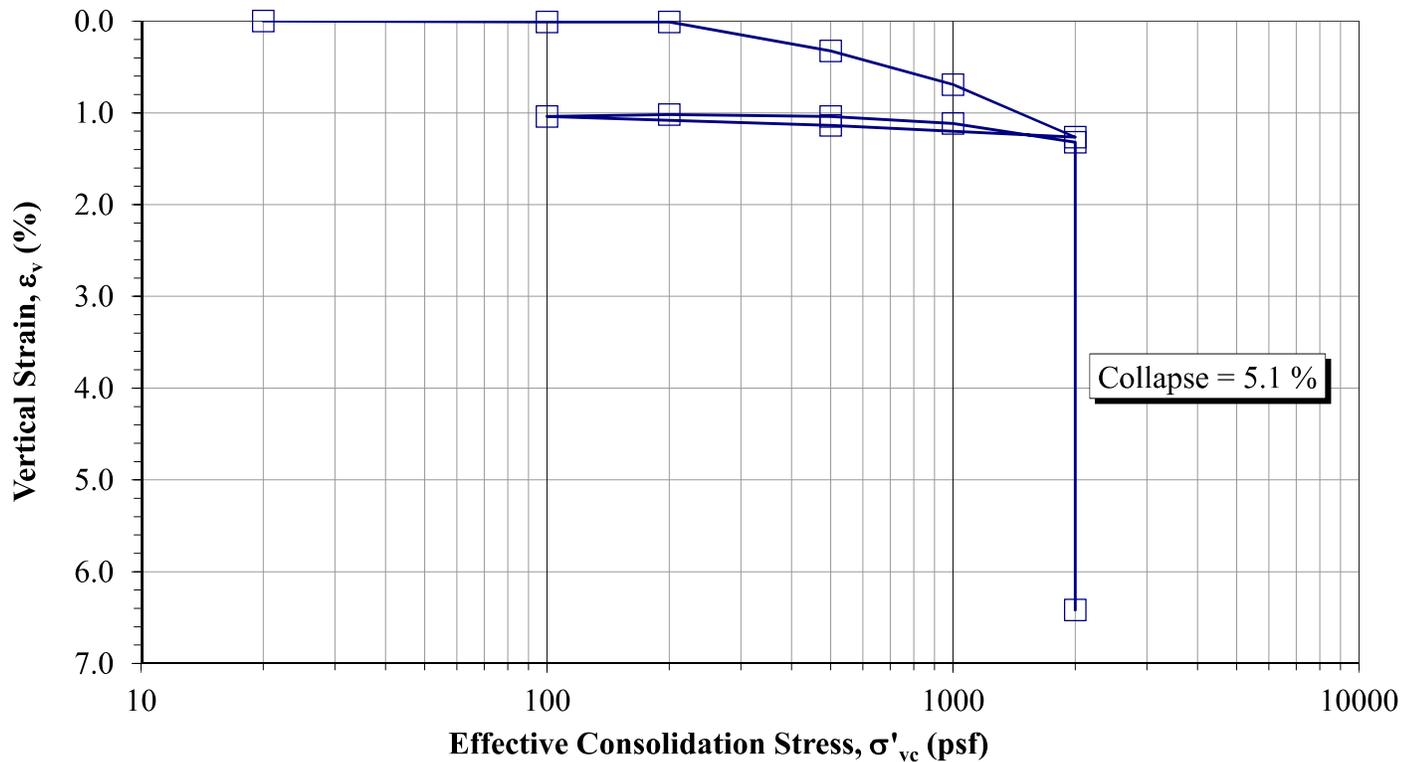
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 4  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 5.1  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.924	0.865
Sample diameter, D (in.)	2.419	2.419
Mass rings + wet soil (g)	149.22	161.41
Mass rings/tare (g)	46.11	46.11
Moist unit wt., $\gamma_m$ (pcf)	92.50	110.53
Wet soil + tare (g)	231.92	236.70
Dry soil + tare (g)	217.75	211.02
Tare (g)	126.53	123.05
Water content, w (%)	15.5	29.2
Dry unit wt., $\gamma_d$ (pcf)	80.06	85.55
Saturation	37.95	81.24

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.0732	0.00	0.9240	1.105
20	0.0732	0.00	0.9240	1.105
100	0.0733	0.01	0.9239	1.105
200	0.0733	0.01	0.9239	1.105
500	0.0762	0.32	0.9210	1.098
1000	0.0796	0.69	0.9176	1.091
2000	0.0849	1.27	0.9123	1.079
500	0.0837	1.14	0.9135	1.081
100	0.0828	1.04	0.9144	1.083
200	0.0826	1.02	0.9146	1.084
500	0.0828	1.04	0.9144	1.083
1000	0.0835	1.11	0.9137	1.082
2000	0.0854	1.32	0.9118	1.077
2000	0.1325	6.42	0.8647	0.970



Comments: **Test specimen contains pinholes.**

Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-3**

Sample:

Depth: **6.0'**

Sample Description: **Brown clay**

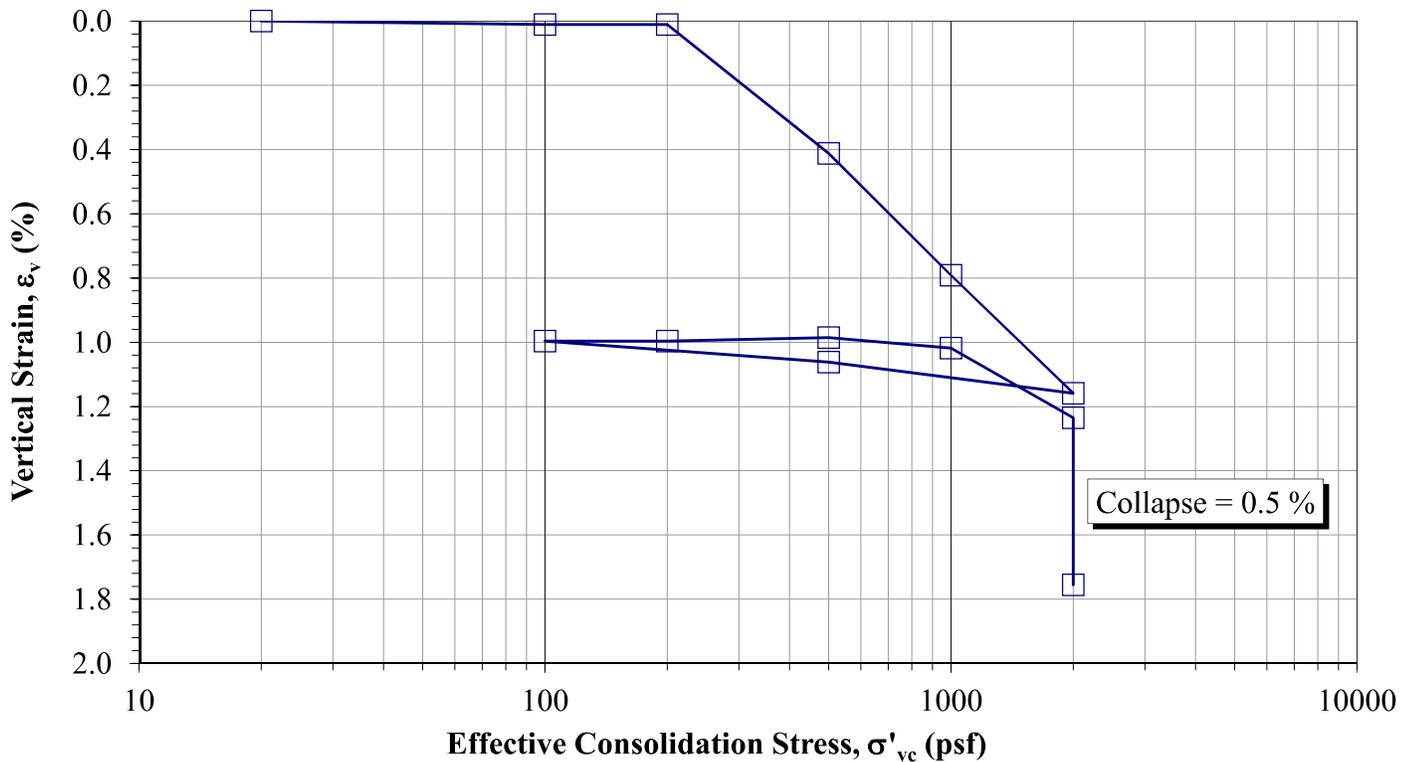
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 7  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 0.5  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.923	0.907
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	163.95	172.94
Mass rings/tare (g)	44.87	44.87
Moist unit wt., $\gamma_m$ (pcf)	107.38	117.56
Wet soil + tare (g)	242.53	247.71
Dry soil + tare (g)	224.50	221.21
Tare (g)	121.61	120.83
Water content, w (%)	17.5	26.4
Dry unit wt., $\gamma_d$ (pcf)	91.37	93.01
Saturation	56.01	87.75

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1466	0.00	0.9230	0.845
20	0.1466	0.00	0.9230	0.845
100	0.1467	0.01	0.9229	0.844
200	0.1467	0.01	0.9229	0.844
500	0.1504	0.41	0.9192	0.837
1000	0.1539	0.79	0.9157	0.830
2000	0.1573	1.16	0.9123	0.823
500	0.1564	1.06	0.9132	0.825
100	0.1558	1.00	0.9138	0.826
200	0.1558	1.00	0.9138	0.826
500	0.1557	0.99	0.9139	0.826
1000	0.1560	1.02	0.9136	0.826
2000	0.1580	1.24	0.9116	0.822
2000	0.1628	1.76	0.9068	0.812



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-5**

Sample:

Depth: **4.5'**

Sample Description: **Brown clay with sand**

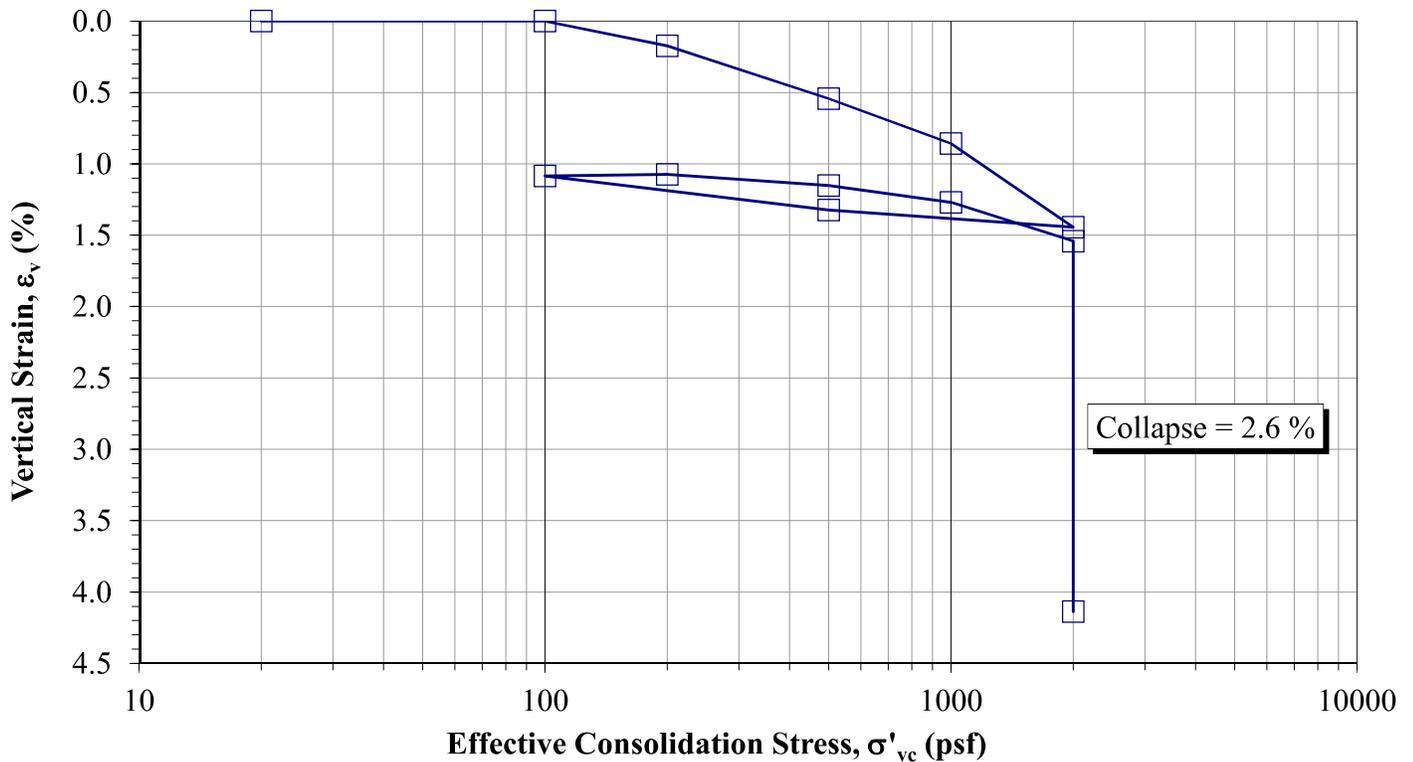
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 8  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 2.6  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.883
Sample diameter, D (in.)	2.415	2.415
Mass rings + wet soil (g)	164.24	171.73
Mass rings/tare (g)	45.55	45.55
Moist unit wt., $\gamma_m$ (pcf)	107.18	118.86
Wet soil + tare (g)	281.26	253.68
Dry soil + tare (g)	256.11	226.92
Tare (g)	127.36	128.09
Water content, w (%)	19.5	27.1
Dry unit wt., $\gamma_d$ (pcf)	89.66	93.53
Saturation	59.94	91.15

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1597	0.00	0.9210	0.880
20	0.1597	0.00	0.9210	0.880
100	0.1597	0.00	0.9210	0.880
200	0.1613	0.17	0.9194	0.877
500	0.1647	0.54	0.9160	0.870
1000	0.1676	0.86	0.9131	0.864
2000	0.1730	1.44	0.9077	0.853
500	0.1719	1.32	0.9088	0.855
100	0.1697	1.09	0.9110	0.859
200	0.1696	1.07	0.9111	0.860
500	0.1703	1.15	0.9104	0.858
1000	0.1714	1.27	0.9093	0.856
2000	0.1739	1.54	0.9068	0.851
2000	0.1978	4.14	0.8829	0.802



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-7**

Sample:

Depth: **3.5'**

Sample Description: **Brown clay**

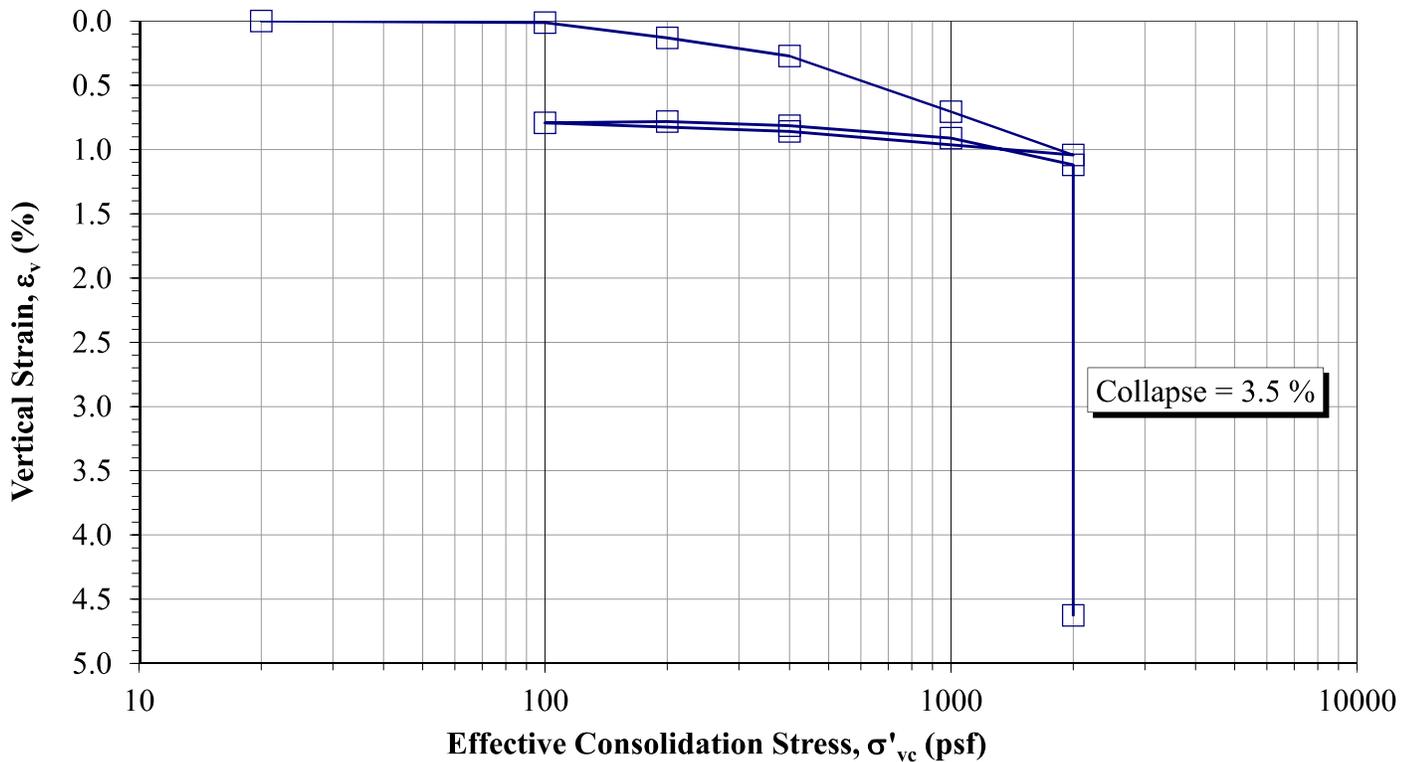
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: **9**  
 Specific gravity,  $G_s$  **2.70** Assumed  
 Collapse (%) **3.5**  
 Collapse stress (psf) **2000**  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.878
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	148.00	161.60
Mass rings/tare (g)	45.46	45.46
Moist unit wt., $\gamma_m$ (pcf)	92.67	110.05
Wet soil + tare (g)	248.57	237.33
Dry soil + tare (g)	229.70	208.72
Tare (g)	120.17	121.44
Water content, w (%)	17.2	32.8
Dry unit wt., $\gamma_d$ (pcf)	79.05	82.88
Saturation	41.08	85.63

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1130	0.00	0.9210	1.132
20	0.1130	0.00	0.9210	1.132
100	0.1131	0.01	0.9209	1.132
200	0.1142	0.13	0.9198	1.129
400	0.1155	0.27	0.9185	1.126
1000	0.1195	0.71	0.9145	1.117
2000	0.1226	1.04	0.9114	1.110
400	0.1209	0.86	0.9131	1.114
100	0.1203	0.79	0.9137	1.115
200	0.1202	0.78	0.9138	1.116
400	0.1205	0.81	0.9135	1.115
1000	0.1214	0.91	0.9126	1.113
2000	0.1233	1.12	0.9107	1.108
2000	0.1556	4.63	0.8784	1.034



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

# **APPENDIX D**



Date: 2019-05-24T19:18:40.163Z

Reference Document: IBC-2015

URL: [https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare Complex](https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare%20Complex)

Parameters: latitude: 40.383064, longitude: -111.918064

Risk Category: II

Site Class: D

Title: Welfare Complex

Response Data:

pgauh: 0.395

pgad: 0.612

pga: 0.395

fpga: 1.105

pgam: 0.437

ssrt: 0.974

crs: 0.855

ssuh: 1.139

ssd: 1.759

ss: 0.974

fa: 1.11

sms: 1.082

sds: 0.721

sdcs: D

s1rt: 0.329

cr1: 0.854

s1uh: 0.385

s1d: 0.658

s1: 0.329

fv: 1.741

sm1: 0.573

sd1: 0.382

sd1: D

sd1: D



Project Number 03019-001

Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah

**MCE-PGA DESIGN RESONSE SPECTRA**

**Figure**

**C-1**

# **APPENDIX E**

















Lamp	Material	In	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG	HH	HI	HJ	HK	HL	HM	HN	HO	HP	HQ	HR	HS	HT	HU	HV	HW	HX	HY	HZ	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	IM	IN	IO	IP	IQ	IR	IS	IT	IU	IV	IW	IX	IY	IZ	JA	JB	JC	JD	JE	JF	JG	JH	JI	JJ	JK	JL	JM	JN	JO	JP	JQ	JR	JS	JT	JU	JV	JW	JX	JY	JZ	KA	KB	KC	KD	KE	KF	KG	KH	KI	KJ	KL	KM	KN	KO	KP	KQ	KR	KS	KT	KU	KV	KW	KX	KY	KZ	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	LS	LT	LU	LV	LW	LX	LY	LZ	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	MP	MQ	MR	MS	MT	MU	MV	MW	MX	MY	MZ	NA	NB	NC	ND	NE	NF	NG	NH	NI	NJ	NK	NL	NM	NO	NP	NQ	NR	NS	NT	NU	NV	NW	NX	NY	NZ	OA	OB	OC	OD	OE	OF	OG	OH	OI	OJ	OK	OL	OM	ON	OO	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PP	PQ	PR	PS	PT	PU	PV	PW	PX	PY	PZ	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST	SU	SV	SW	SX	SY	SZ	TA	TB	TC	TD	TE	TF	TG	TH	TI	TJ	TK	TL	TM	TN	TO	TP	TQ	TR	TS	TT	TU	TV	TW	TX	TY	TZ	UA	UB	UC	UD	UE	UF	UG	UH	UI	UJ	UK	UL	UM	UN	UO	UP	UQ	UR	US	UT	UU	UV	UW	UX	UY	UZ	VA	VB	VC	VD	VE	VF	VG	VH	VI	VJ	VK	VL	VM	VN	VO	VP	VQ	VR	VS	VT	VU	VV	VW	VX	VY	VZ	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	WK	WL	WM	WN	WO	WP	WQ	WR	WS	WT	WU	WV	WW	WX	WY	WZ	XA	XB	XC	XD	XE	XF	XG	XH	XI	XJ	XK	XL	XM	XN	XO	XP	XQ	XR	XS	XT	XU	XV	XW	XX	XY	XZ	YA	YB	YC	YD	YE	YF	YG	YH	YI	YJ	YK	YL	YM	YN	YO	YP	YQ	YR	YS	YT	YU	YV	YW	YX	YZ	ZA	ZB	ZC	ZD	ZE	ZF	ZG	ZH	ZI	ZJ	ZK	ZL	ZM	ZN	ZO	ZP	ZQ	ZR	ZS	ZT	ZU	ZV	ZW	ZX	ZY	ZZ
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																

## APPENDIX E - TRAFFIC STUDY

# Welfare Complex

## Traffic Impact Study



## Saratoga Springs, Utah

July 2, 2020

UT19-1451



## EXECUTIVE SUMMARY

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The Welfare Complex project is located on the west side of Redwood Road (SR-68), just north of 1140 North.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.

The evening peak hour level of service (LOS) was computed for each study intersection. The results of this analysis are shown in Table ES-1. Recommended storage lengths are shown in Table ES-2.

<b>TABLE ES-1</b>				
<b>LOS Analysis - Evening Peak Hour</b>				
<b>Saratoga Springs - Welfare Complex TIS Update</b>				
Intersection	Level of Service (Sec/Veh) <sup>1</sup>			
	Existing (2020)		Future (2025)	
	Background	Plus Project	Background	Plus Project
Medical Drive (1140 North) / Redwood Road (SR-68)	B (11.4)	B (14.8)	B (17.1)	C (27.1)
Market Street / Redwood Road (SR-68)	A (8.0)	A (8.7)	B (10.9)	B (18.7)
Market Street / Pioneer Crossing (SR-145)	B (14.8)	B (14.8)	B (18.5)	B (14.6)
Commerce Drive / Redwood Road (SR-68)	f (>50) / WBL	f (>50) / WBL	B (12.7)	B (11.6)
Medical Drive / Exchange Drive	-	-	a (6.4) / EBT	a (6.5) / EBT
Access 1 / Redwood Road (SR-68) <sup>2</sup>	-	f (>50) / EBL	-	f (>50) / EBL
Access 2 / Medical Drive <sup>2</sup>	-	a (4.6) / SBL	-	a (6.1) / SBL
Access 3 / Medical Drive <sup>2</sup>	-	a (4.0) / SBL	-	a (6.2) / SBL

1. Intersection LOS and delay (seconds/vehicle) values represent the overall intersection average for roundabout, signalized, all-way stop-controlled intersections and the worst movement for all other unsignalized intersections. Uppercase LOS used for signalized, roundabout, and all-way stop-controlled intersections. Lowercase LOS used for one-way & two-way stop-controlled intersections.

2. This intersection is a project access and was only analyzed in "plus project" scenarios.

Source: Hales Engineering, July 2020

**TABLE ES-2**  
**Recommended Storage Lengths**  
**Saratoga Springs - Welfare Complex TIS Update**

Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

## **SUMMARY OF KEY FINDINGS/RECOMMENDATIONS**

The following is a summary of key findings and recommendations:

- The Commerce Drive / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour in existing (2020) background conditions. All other study intersections are currently operating at an acceptable LOS.
  - Commerce Drive / Redwood Road (SR-68) is anticipated to be signalized by the year 2025 with the completion of the Foothill Boulevard project as per UDOT agreement.
- The development will consist of welfare facilities, including a Deseret Industries thrift store and a Bishop's Storehouse/LDS Family Services facility.
- The Access 1 / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour with project traffic added. All other study intersections are anticipated to operate at an acceptable LOS.
  - It is anticipated that traffic will reroute to avoid left-turn movement delays onto Redwood Road. There is excess capacity at the accesses on Medical Drive that will accommodate these volumes. It is recommended that safety and operations be evaluated at this access and left-turn movements restricted if future problems are observed.
- All study intersections are anticipated to operate at an acceptable LOS during the evening peak hour in future (2025) background and plus project conditions.
- While no operational problems were observed between the offset of the western Costco access and the Access 2 / Medical Drive intersection, it is recommended that this access be evaluated for safety and restricted to right-in right-out (RIRO) access only if safety concerns are present.

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## I. INTRODUCTION

### A. Purpose

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The proposed project is located on the west side of Redwood Road (SR-68), just north of 1140 North. Figure 1 shows a vicinity map of the proposed development.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.



Figure 1: Vicinity map showing the project location in Saratoga Springs, Utah

## **B. Scope**

The study area was defined based on conversations with the development team. This study was scoped to evaluate the traffic operational performance impacts of the project on the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)
- Commerce Drive / Redwood Road (SR-68)
- Medical Drive / Exchange Drive (completed by 2025)
- Project Access / Redwood Road (SR-68)
- Project Accesses (2) / Medical Drive

## **C. Analysis Methodology**

Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. Table 1 provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections. Figure 2 provides a visual representation of each LOS letter designation.

The *Highway Capacity Manual* (HCM), 6<sup>th</sup> Edition, 2016 methodology was used in this study to remain consistent with “state-of-the-practice” professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized and all-way stop intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For all other unsignalized intersections, LOS is reported based on the worst movement.

Using Synchro/SimTraffic software, which follow the HCM methodology, the peak hour LOS was computed for each study intersection. Multiple runs of SimTraffic were used to provide a statistical evaluation of the interaction between the intersections. The detailed LOS reports are provided in Appendix B. Hales Engineering also calculated the 95<sup>th</sup> percentile queue lengths for the study intersections using SimTraffic. The detailed queue length reports are provided in Appendix D.

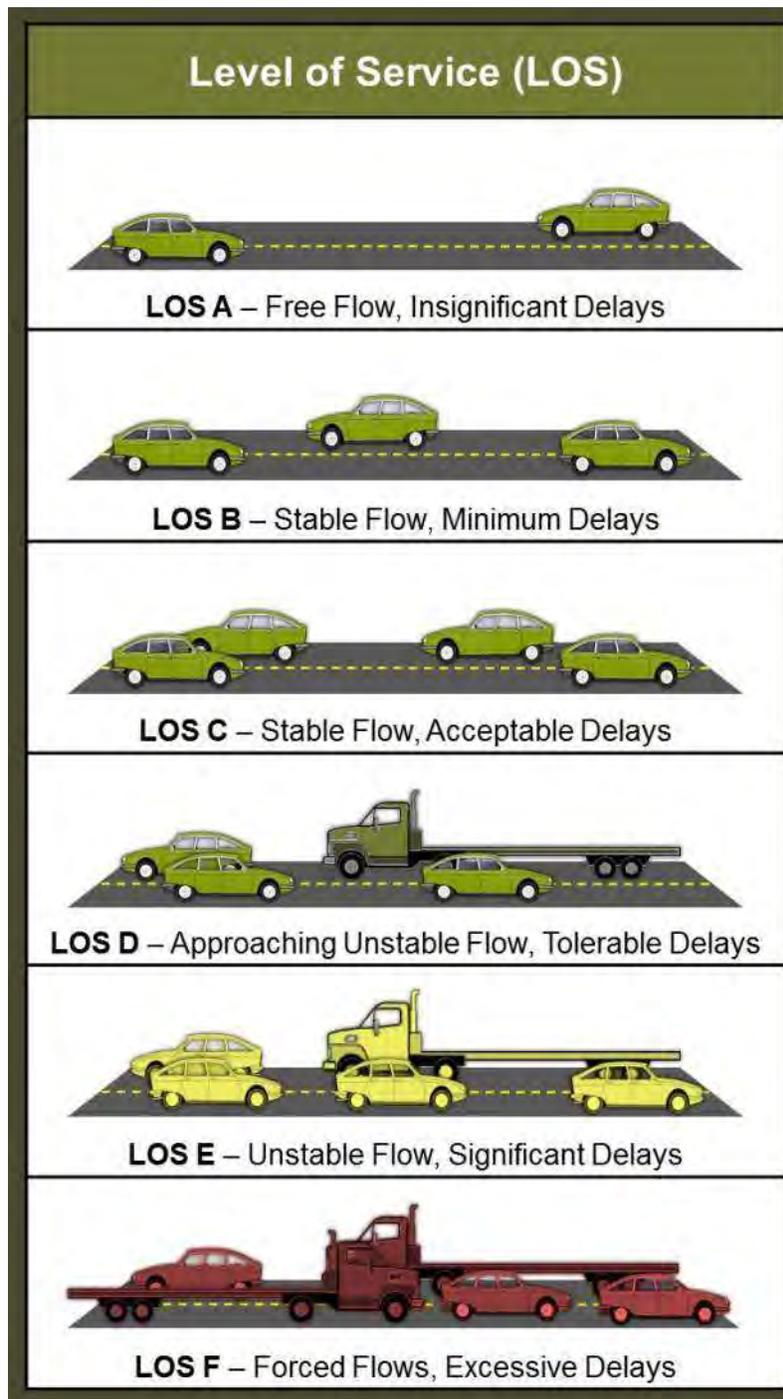
## **D. Level of Service Standards**

For the purposes of this study, a minimum acceptable intersection performance for each of the study intersections was set at LOS D. If levels of service E or F conditions exist, an explanation and/or mitigation measures will be presented. A LOS D threshold is consistent with “state-of-the-practice” traffic engineering principles for urbanized areas.

**Table 1: Level of Service Description**

Level of Service	Description of Traffic Conditions	Average Delay (seconds/vehicle)
		Signalized Intersections
A	Extremely favorable progression and an extremely low level of control delay. Individual users are virtually unaffected by others in the traffic stream.	0 ≤ 10.0
B	Good progression and a low level of control delay. The presence of other users in the traffic stream becomes noticeable.	> 10.0 and ≤ 20.0
C	Fair progression and a moderate level of control delay. The operation of individual users becomes somewhat affected by interactions with others in the traffic stream.	>20.0 and ≤ 35.0
D	Marginal progression with relatively elevated levels of control delay. Operating conditions are noticeably more constrained.	> 35.0 and ≤ 55.0
E	Poor progression with unacceptably elevated levels of control delay. Operating conditions are at or near capacity.	> 55.0 and ≤ 80.0
F	Unacceptable progression with forced or breakdown operating conditions.	> 80.0
Unsignalized Intersections		Worst Approach
A	Free Flow / Insignificant Delay	0 ≤ 10.0
B	Stable Operations / Minimum Delays	>10.0 and ≤ 15.0
C	Stable Operations / Acceptable Delays	>15.0 and ≤ 25.0
D	Approaching Unstable Flows / Tolerable Delays	>25.0 and ≤ 35.0
E	Unstable Operations / Significant Delays Can Occur	>35.0 and ≤ 50.0
F	Forced Flows / Unpredictable Flows / Excessive Delays Occur	> 50.0

Source: Hales Engineering Descriptions, based on the *Highway Capacity Manual (HCM)*, 6<sup>th</sup> Edition, 2016 Methodology (Transportation Research Board)



**Figure 2: Visual representation of the LOS letter designations**

## **II. EXISTING (2020) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the background analysis is to study the intersections and roadways during the peak travel periods of the day with background traffic and geometric conditions. Through this analysis, background traffic operational deficiencies can be identified, and potential mitigation measures recommended. This analysis provides a baseline condition that may be compared to the build conditions to identify the impacts of the development.

### **B. Roadway System**

The primary roadways that will provide access to the project site are described below:

Redwood Road (SR-68) – is a state-maintained roadway (classified by UDOT access management standards as a “Regional – Priority Urban Importance” facility, or access category 5 roadway). Redwood Road (SR-68) has two travel lanes in each direction separated by a two-way left-turn lane (TWLTL). As identified and controlled by UDOT, a “Regional – Priority Urban Importance” access classification identifies minimum signalized intersection spacing of one-half mile (2,640 feet), minimum unsignalized street spacing of 660 feet, and minimum driveway spacing of 350 feet. The posted speed limit on Redwood Road (SR-68) is 45 mph.

Medical Drive – is a future city-maintained roadway which is classified by the Saratoga Springs Transportation Master Plan (January 2019) as a local road. It was assumed that the roadway will have one lane in each direction separated by a TWLTL. The posted speed limit was assumed to be 30 mph in the study area.

### **C. Traffic Volumes**

Weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak period traffic counts were performed at the following intersections:

- Commerce Drive / Redwood Road (SR-68)

The counts were performed on Wednesday, June 24, 2020. The morning peak hour was determined to be between 7:45 and 8:45 a.m., and the evening peak hour was determined to be between 5:00 and 6:00 p.m. The evening peak hour volumes were approximately 70% higher than the morning peak hour volumes. Therefore, the evening peak hour volumes were used in the analysis to represent the worst-case conditions. Detailed count data are included in Appendix A.

*These traffic counts were collected during the COVID-19 pandemic when traffic volumes were slightly reduced due to social distancing measures. According to the UDOT Automatic Traffic Signal Performance Measures (ATSPM) website, the traffic volumes on March 10 (pre-social*

*distancing) were approximately 15% higher than those on June 14. Therefore, the collected data were increased by 15% to represent normal conditions.*

In addition to the counts conducted at the Commerce Drive / Redwood Road (SR-68) intersection, volumes from the previously conducted Kittelson & Associates Saratoga Springs Costco and Hales Engineering Osmond Development traffic impact studies were used for the evening peak hour background volumes at the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)

Figure 3 shows the existing evening peak hour volumes as well as intersection geometry at the study intersections.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement.

In addition to the two planned signals, the previously completed Kittelson & Associates TIS for the Costco development recommends a signal at the Medical Drive (1140 South) / Redwood Road (SR-68) intersection, which is also warranted by the projected volumes. While this signal does not meet current spacing requirements with the planned signal at Commerce Drive, it is anticipated that the necessary administrative decisions will be made to allow a signal at this location. Thus, for the 2020 background conditions analysis, it is assumed that the Market Street / Pioneer Crossing (SR-145), Commercial Drive / Redwood Road (SR-68), and Market Street (1140 North) / Redwood Road (SR-68) signals have been installed with the completion of the Costco development.

#### **D. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) intersection is currently operating at LOS F. All other study intersections are currently operating at acceptable levels of service during the evening peak hour, as shown in Table 2. These results serve as a baseline condition for the impact analysis of the proposed development during existing (2020) conditions.

#### **E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. Queuing of up to 800 feet was present on the westbound leg of the Commerce Drive / Redwood

Road (SR-68) intersection. No other significant queuing was observed during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended. The Commerce Drive / Redwood Road (SR-68) intersection is planned to be signalized with the completion of the Foothill Boulevard project as per UDOT agreement. Until then, traffic will reroute to adjacent signals if heavy delays are present.

Saratoga Springs - Welfare Complex TIS Update  
Existing (2020) Background

Evening Peak Hour  
Figure 3



**Table 2: Existing (2020) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	11.4	B
Market Street / Redwood Road (SR-68)	Signal	-	8.0	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
 2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

### **III. PROJECT CONDITIONS**

#### **A. Purpose**

The project conditions discussion explains the type and intensity of development. This provides the basis for trip generation, distribution, and assignment of project trips to the surrounding study intersections defined in Chapter I.

#### **B. Project Description**

The proposed Welfare Complex development is located on the west side of Redwood Road (SR-68), just north of 1140 North. The development will consist of welfare facilities owned and operated by The Church of Jesus Christ of Latter-day Saints including a Deseret Industries store, a Bishop's Storehouse, and a Family Services office. A concept plan for the proposed development is provided in Appendix C.

The proposed land use for the development has been identified as follows:

- Deseret Industries ~60,000 square feet
- Bishop's Storehouse / Family Services ~20,000 square feet

#### **C. Trip Generation**

Trip generation for the development is normally calculated using trip generation rates published in the Institute of Transportation Engineers (ITE), *Trip Generation*, 10<sup>th</sup> Edition, 2017. However, due to the unique land use of this development, Hales Engineering used trip generation data provided by the developer. Data were collected at the Welfare Complex in Springville, Utah in April 2019 for an entire week. According to the developer, the proposed facility will be practically identical to the Springville facility in size and operations. Detailed trip generation data is provided in Appendix E.

The peak days for trip generation were observed to be Friday and Saturday. However, it is anticipated that the highest combined volumes will be observed on a standard weekday when the background traffic volumes are highest. The Thursday trip generation was observed to be the highest of Tuesday, Wednesday, and Thursday. Therefore, the Thursday trip generation was applied as the proposed project's trip generation.

Trip generation for the proposed project is included in Table 3 and is as follows.

- Daily Trips: 3,014
- Morning Peak Hour Trips: 31
- Evening Peak Hour Trips: 266

**Table 3: Trip Generation**

<b>Saratoga Springs - Welfare Complex TIS Trip Generation</b>					
<b>Weekday Daily</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total Daily Trips
Deseret Industries	60	1,000 sq. ft.	1,356	1,356	2,712
Bishop's Storehouse	20	1,000 sq. ft.	108	108	216
Family Services			43	43	86
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>1,507</b>	<b>1,507</b>	<b>3,014</b>
<b>Morning Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total a.m. Trips
Deseret Industries	60	1,000 sq. ft.	17	9	26
Bishop's Storehouse	20	1,000 sq. ft.	2	0	2
Family Services			3	0	3
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>22</b>	<b>9</b>	<b>31</b>
<b>Evening Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total p.m. Trips
Deseret Industries	60	1,000 sq. ft.	109	119	228
Bishop's Storehouse	20	1,000 sq. ft.	15	15	30
Family Services			3	5	8
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>127</b>	<b>139</b>	<b>266</b>
1. Trip generation based on data collection completed at the Springville Welfare Complex in April 2019.					
SOURCE: Hales Engineering, July 2020					

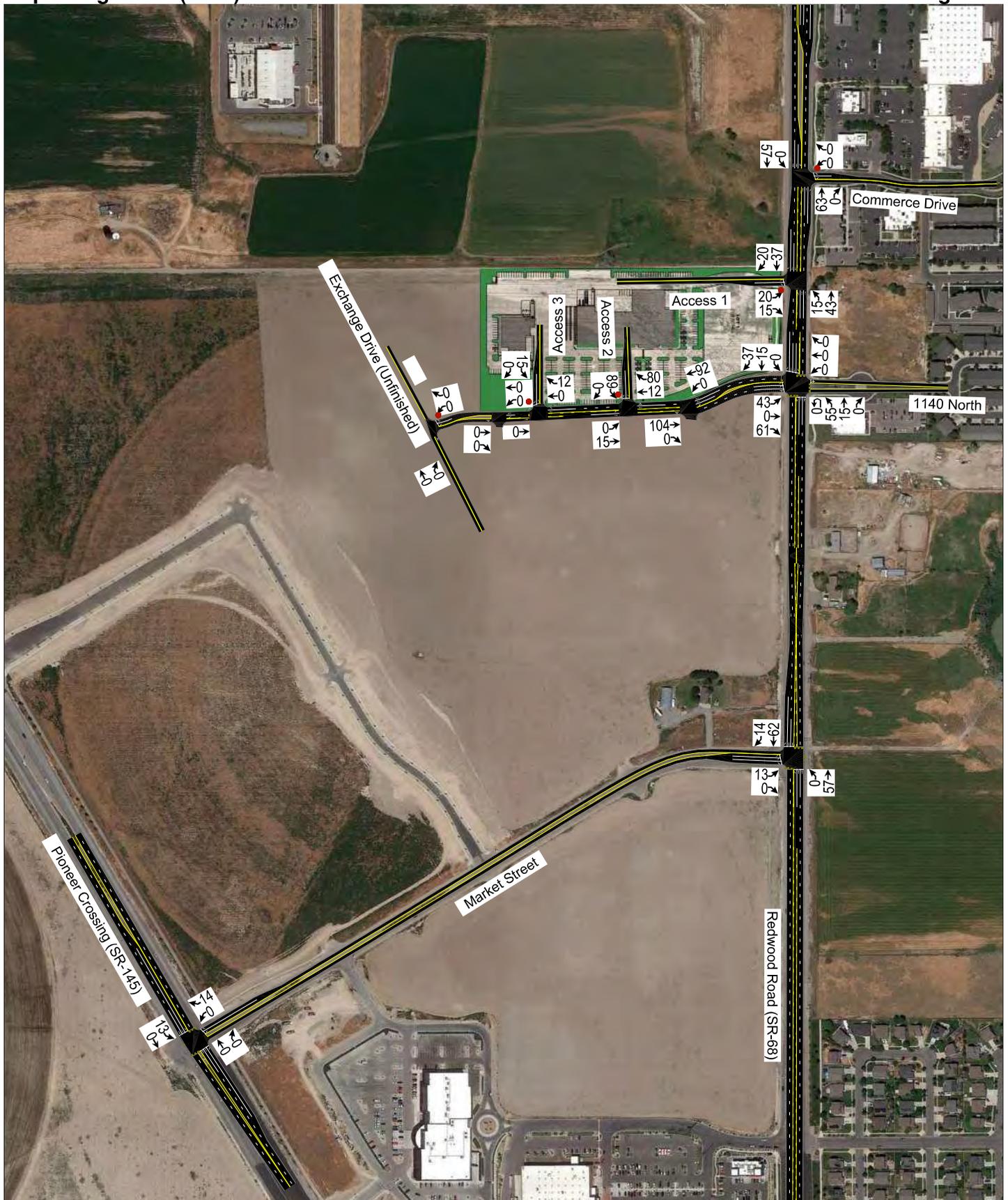
**D. Trip Distribution and Assignment**

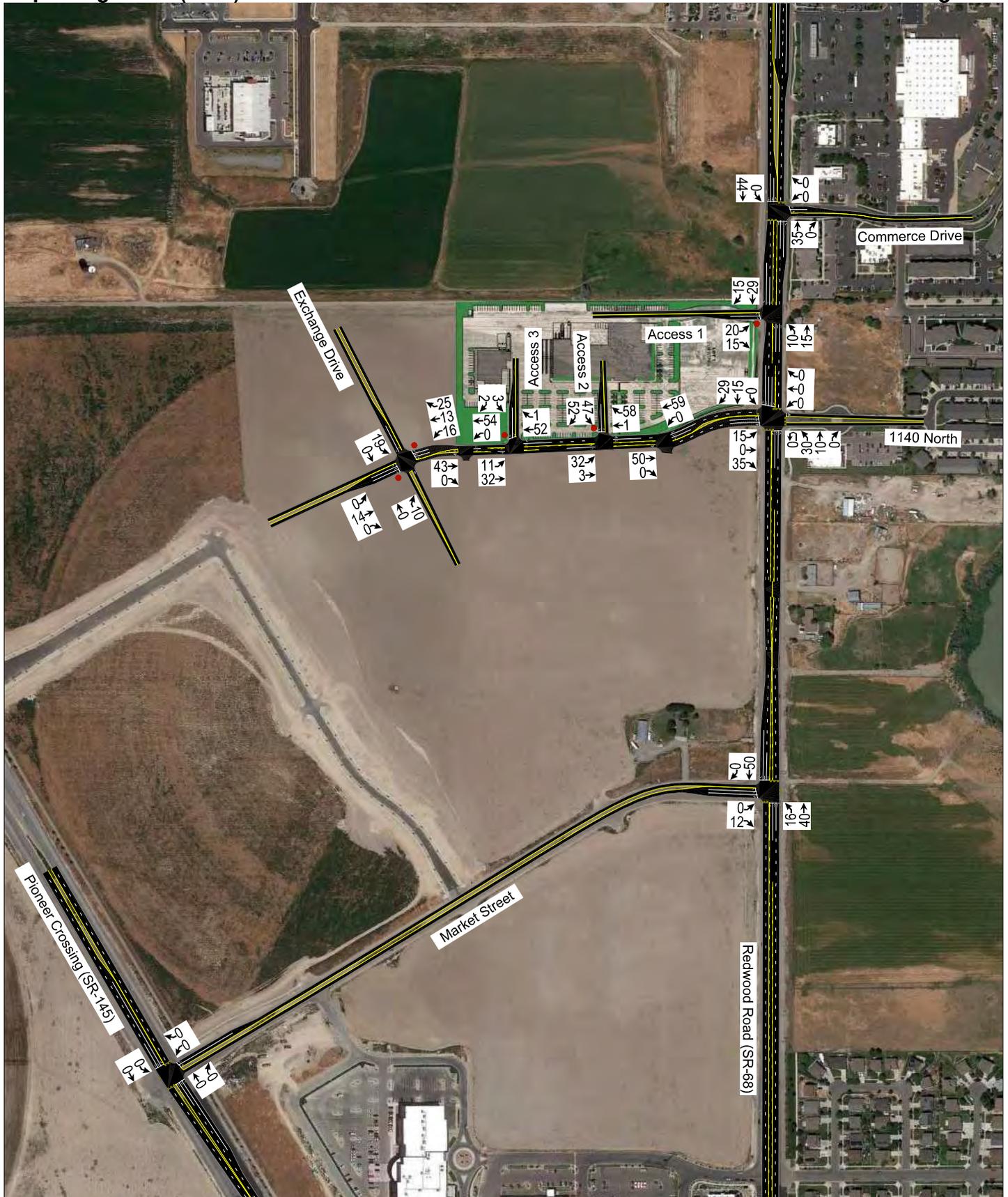
Project traffic is assigned to the roadway network based on the type of trip and the proximity of project access points to major streets, high population densities, and regional trip attractions. Existing travel patterns observed during data collection also provide helpful guidance to establishing these distribution percentages, especially near the site. The resulting distribution of project generated trips during the evening peak hour is as follows:

To/From Project:

- 45% North
- 45% South
- 10% West

These trip distribution assumptions were used to assign the evening peak hour generated traffic at the study intersections to create trip assignment for the proposed development. Trip assignment for the development in 2020 conditions is shown in Figure 4. Considering future roadway connections via Exchange Drive to the north, south, and west, the trip assignment for the development in 2025 conditions is shown in Figure 5.





## **E. Access**

The proposed access for the site will be gained at the following locations (see also concept plan in Appendix C):

### Redwood Road (SR-68):

- Access 1 will be located approximately 320 feet south of the Commerce Drive / Redwood Drive (SR-68) intersection and approximately 350 north of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection. It will access the project on the west side of Redwood Road (SR-68). *It is anticipated that a variance will be needed for this access because it does not meet driveway spacing (350 feet) to the north.* It was assumed that this would be a full-movement access.
- The primary access road to the project will be Medical Drive. Medical Drive will be located on the west side of Redwood Road (SR-68), directly across from the existing 1140 North alignment. Medical Drive will eventually be a through road to Pioneer Crossing with other development in the area.

### Medical Drive:

- Access 2 will be located approximately 675 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.
- Access 3 will be located approximately 925 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.

It is recommended that separate egress left- and right-turn lanes be provided at all project accesses.

## **F. Auxiliary Lane Requirements**

Based on Administrative Rule R930-6, the following auxiliary lanes may be required for the proposed accesses onto Redwood Road (SR-68) (UDOT Access Category 5 roadway):

### Left-turn Deceleration Lane:

*Required when the projected peak hour left-turn ingress volume is greater than 10 vph:*

- With 15 northbound left-turns assumed, a left-turn lane may be required at Access 1. A center TWLTL currently exists and will serve as a left-turn lane for this access.
- With 55 northbound left-turns assumed, a left-turn lane may be required at Medical Drive. A center TWLTL currently exists and will serve as a left-turn lane at Medical Drive.

### Right-turn Deceleration Lane:

*Required when the projected peak hour right-turn ingress volume is greater than 25 vph:*

- With 20 southbound right-turns assumed, a southbound right-turn deceleration lane may not be required at Access 1. Therefore, a right-turn deceleration lane was not assumed for this access.
- With 37 southbound right-turns assumed, a southbound right-turn deceleration lane may be required at Medical Drive. It is recommended that a southbound right-turn lane be installed at this location.

Right-turn Acceleration Lane:

*Required when the projected peak hour right-turn egress volume is greater than 50 vph when the posted speed limit on the highway is greater than 40 mph.*

- With 15 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may not be required at Access 1. Therefore, a right-turn acceleration lane was not assumed for this access.
- With 61 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may be required at Medical Drive. However, a right-turn acceleration lane was not assumed for this access.

Left-turn Acceleration Lane:

*May be required if such a design will be a benefit to the safety and operation of the roadway.*

- A left-turn acceleration lane is not recommended at either access to Redwood Road (SR-68) due to the greater need for left-turn deceleration lane space in the TWLTL.

## **IV. EXISTING (2020) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the existing (2020) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for existing background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the existing (2020) background traffic volumes to predict turning movement volumes for existing (2020) plus project conditions. Existing (2020) plus project evening peak hour turning movement volumes are shown in Figure 6.

### **C. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) and Access 1 / Redwood Road (SR-68) intersections are anticipated to operate at LOS F during the evening peak hour with project traffic added. All other intersections are anticipated to operate at acceptable levels of service, as shown in Table 4.

### **D. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

The delay at the Access 1 / Redwood Road (SR-68) intersection is due to the difficulty in turning left onto Redwood Road during peak hours. Drivers at this access will learn to reroute to the accesses onto Medical Drive to avoid delays. Additional connections in the future with the construction of Exchange Drive and other roadways to the southwest of the development will provide other connection options. Drivers will continue to reroute at the Commerce Drive / Redwood Road (SR-68) intersection to avoid delays.



**Table 4: Existing (2020) Plus Project Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	14.8	B
Market Street / Redwood Road (SR-68)	Signal	-	8.7	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	4.6	a
Access 3 / Medical Drive	SB Stop	SBL	4.0	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **V. FUTURE (2025) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) background analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions. Through this analysis, future background traffic operational deficiencies can be identified, and potential mitigation measures recommended.

### **B. Roadway Network**

According to the Wasatch Front Regional Council (WFRC) Regional Transportation Plan, there are no projects planned before 2025 in the study area. Therefore, no changes were made to the roadway network for the future (2025) analysis.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement; therefore, the signal has been included within this analysis.

### **C. Traffic Volumes**

Hales Engineering obtained future (2025) forecasted volumes from the previously completed Saratoga Springs Costco TIS conducted by Kittelson & Associates in July 2019. This was done to maintain uniformity with other projects in the area and to layer these project volumes with those of previous studies. The Kittelson & Associates study assumed an annual growth rate of 2%, based on historic trends. In addition to the projected future background and Costco traffic, trip assignment from the nearby Osmond Development was also added into the background. Future (2025) evening peak hour turning movement volumes are shown in Figure 7.

### **D. Level of Service Analysis**

Hales Engineering determined that all study intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) background conditions, as shown in Table 5. These results serve as a baseline condition for the impact analysis of the proposed development for future (2025) conditions.

**E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended.

Saratoga Springs - Welfare Complex TIS Update  
 Future (2025) Background

Evening Peak Hour  
 Figure 7



**Table 5: Future (2025) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	17.1	B
Market Street / Redwood Road (SR-68)	Signal	-	10.9	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	18.5	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	12.7	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.4	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **VI. FUTURE (2025) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on future background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the future (2025) background traffic volumes to predict turning movement volumes for future (2025) plus project conditions. Future (2025) plus project evening peak hour turning movement volumes are shown in Figure 8.

### **C. Level of Service Analysis**

Hales Engineering determined that all intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) plus project conditions, as shown in Table 6.

### **D. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

No mitigation measures are recommended.

### **F. Recommended Storage Lengths**

Hales Engineering determined recommended storage lengths based on the 95<sup>th</sup> percentile queue lengths given in the future (2040) plus project scenario. These storage lengths do not include the taper length. Recommended storage lengths for the study intersections are shown in Table 7. Intersections shown in Table 7 include new intersections and existing intersections that have recommended storage length changes.



**Table 6: Future (2025) Plus Project Evening Peak Hour LOS**

Intersection Description	Control	Movement <sup>1</sup>	Level of Service	
			Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	27.1	C
Market Street / Redwood Road (SR-68)	Signal	-	18.7	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.6	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	11.6	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.5	a
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	6.1	a
Access 3 / Medical Drive	SB Stop	SBL	6.2	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

**Table 7: Recommended Storage Lengths**

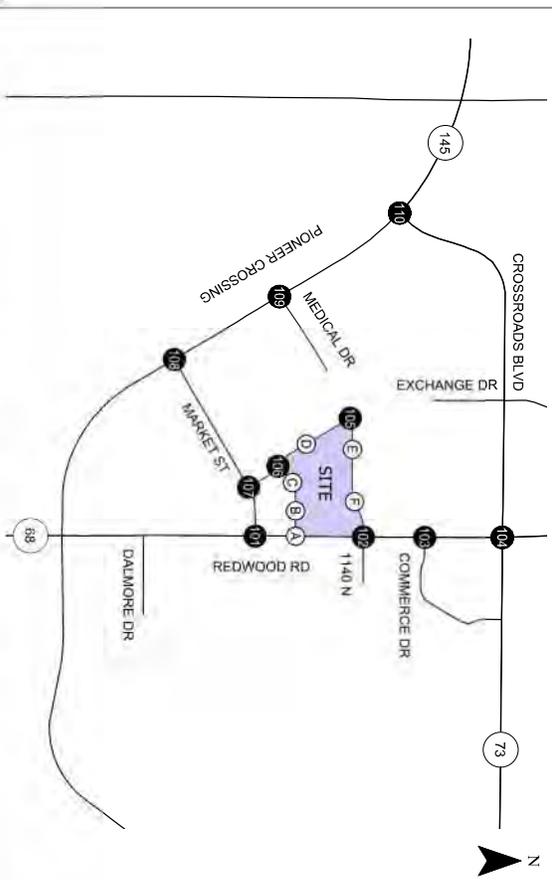
Recommended Storage Lengths Saratoga Springs - Welfare Complex TIS Update								
Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

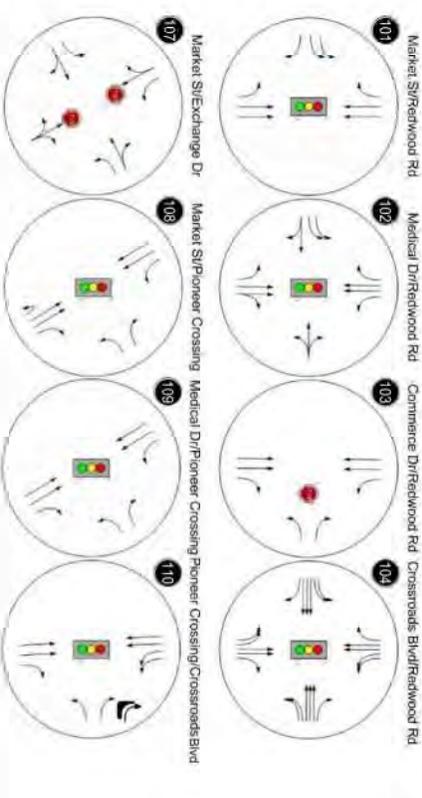
# **APPENDIX A**

## Turning Movement Counts





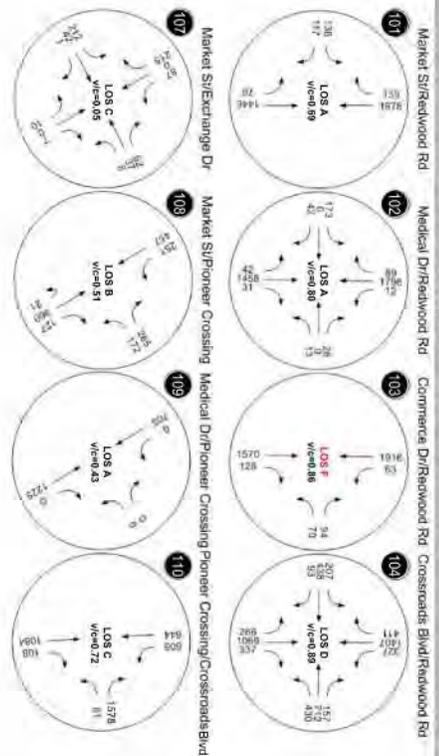
**Lane Configurations**



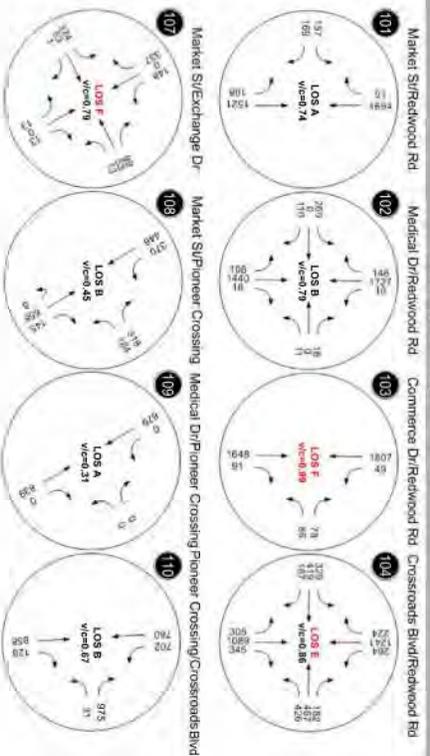
• Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



**Weekday PM Peak Hour**

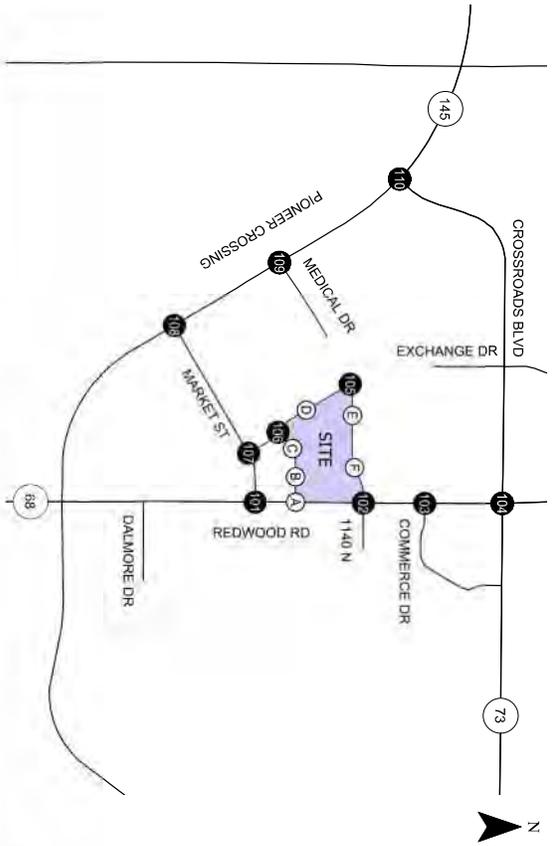


**Saturday Midday Peak Hour**

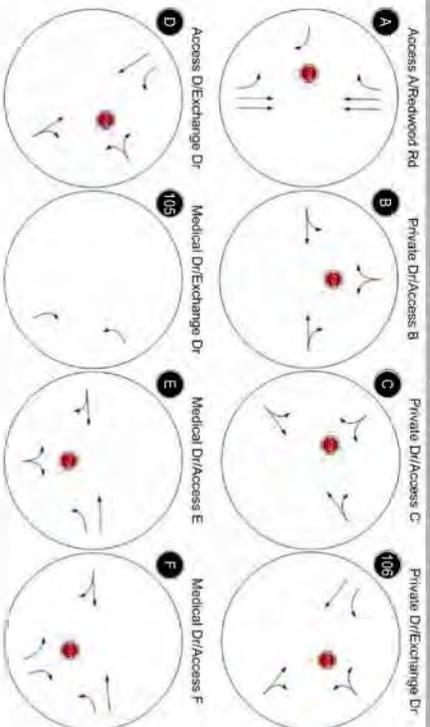


**Year 2020 Total Traffic Conditions (Offsite Intersections) Weekday PM and Saturday Midday Peak Hour Saratoga Springs, Utah**

Figure 9A



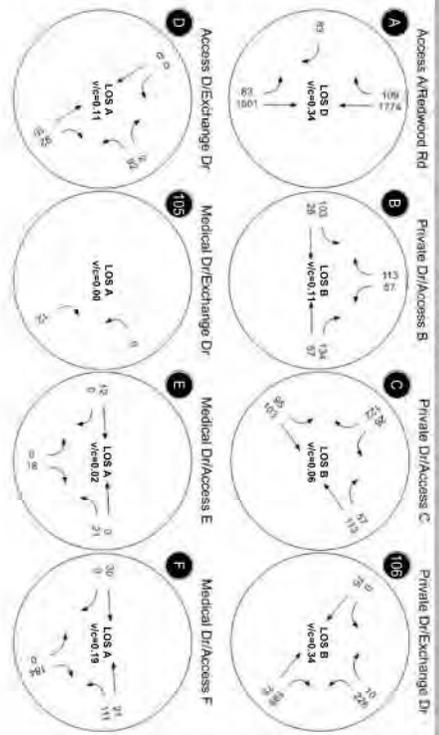
**Lane Configurations**



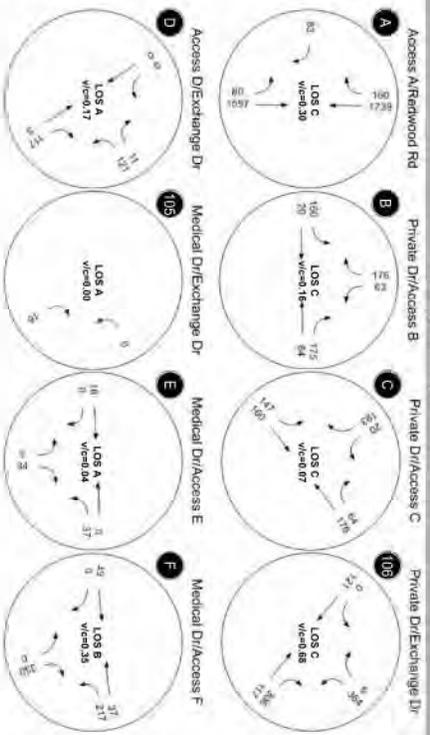
- Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



**Weekday PM Peak Hour**



**Saturday Midday Peak Hour**



**Year 2020 Total Traffic Conditions (Onsite Intersections)**  
**Weekday PM and Saturday Midday Peak Hour**  
**Saratoga Springs, Utah**  
 Figure 9B



# **APPENDIX B**

## **LOS Results**

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## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	42	43	102	56.6	E
	T	1,472	1,476	100	6.2	A
	R	31	33	106	3.7	A
	Subtotal	1,545	1,552	100	7.5	A
SB	L	12	12	100	22.6	C
	T	1,818	1,814	100	7.0	A
	R	89	88	99	3.0	A
	Subtotal	1,919	1,914	100	6.9	A
EB	L	173	172	99	73.2	E
	T	1	1	133	0.4	A
	R	42	44	104	32.8	C
	Subtotal	216	217	100	64.7	E
WB	L	13	12	92	67.9	E
	R	28	30	106	21.2	C
	Subtotal	41	42	102	34.5	C
<b>Total</b>		3,763	3,767	100	11.4	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	45.9	D
	T	1,486	1,502	101	4.8	A
	Subtotal	1,556	1,570	101	6.6	A
SB	T	1,723	1,719	100	2.2	A
	R	166	165	99	1.4	A
	Subtotal	1,889	1,884	100	2.1	A
EB	L	163	156	96	79.9	E
	T	98	103	105	1.9	A
	R	117	116	99	30.1	C
	Subtotal	378	375	99	43.1	D
<b>Total</b>		3,823	3,829	100	8.0	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	971	101	11.4	B
	R	127	129	102	4.6	A
	Subtotal	1,087	1,100	101	10.6	B
SB	L	251	248	99	27.5	C
	T	457	457	100	4.1	A
	Subtotal	708	705	100	12.3	B
WB	L	172	175	102	52.9	D
	R	265	263	99	13.2	B
	Subtotal	437	438	100	29.1	C
<b>Total</b>		2,232	2,243	101	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,576	1,576	100	2.8	A
	R	97	98	101	2.4	A
	Subtotal	1,673	1,674	100	2.8	A
SB	L	66	64	97	31.3	D
	T	1,814	1,825	101	7.8	A
	Subtotal	1,880	1,889	100	8.6	A
WB	<b>L</b>	<b>105</b>	<b>88</b>	<b>84</b>	<b>412.9</b>	<b>F</b>
	R	78	68	87	258.9	F
	Subtotal	183	156	85	345.8	F
<b>Total</b>		3,736	3,719	100	22.2	C

### SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>12</b>	<b>100</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	12	100	0.0	A
<b>Total</b>		12	12	100	0.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	3.6	0.0	0.4	0.2	0.2	0.7	0.7	2.6	0.0	0.1	3.5	0.1
Total Del/Veh (s)	73.2	0.4	32.8	67.9	21.2	56.8	56.6	6.2	3.7	22.6	7.0	3.0
Vehicles Entered	172	1	44	12	30	41	43	1475	33	12	1813	88
Vehicles Exited	172	1	44	12	30	42	43	1476	33	12	1814	88
Hourly Exit Rate	172	1	44	12	30	42	43	1476	33	12	1814	88
Input Volume	173	1	42	13	28	41	42	1472	31	12	1818	89
% of Volume	99	133	104	92	106	102	102	100	106	100	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	12.0
Total Del/Veh (s)	11.4
Vehicles Entered	3764
Vehicles Exited	3767
Hourly Exit Rate	3767
Input Volume	3763
% of Volume	100

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.5	0.1	1.0	0.9	2.0	1.0	0.1	8.6
Total Del/Veh (s)	79.9	1.9	30.1	45.9	4.8	2.2	1.4	8.0
Vehicles Entered	157	104	116	68	1505	1718	164	3832
Vehicles Exited	156	103	116	68	1502	1719	165	3829
Hourly Exit Rate	156	103	116	68	1502	1719	165	3829
Input Volume	163	98	117	70	1486	1723	166	3823
% of Volume	96	105	99	97	101	100	99	100

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.4	1.7	0.3	2.5	3.1	0.2	0.9
Total Delay (hr)	2.6	1.0	3.1	0.2	1.9	0.5	9.3
Total Del/Veh (s)	52.9	13.2	11.4	4.6	27.5	4.1	14.8
Vehicles Entered	174	264	973	129	248	457	2245
Vehicles Exited	175	263	971	129	248	457	2243
Hourly Exit Rate	175	263	971	129	248	457	2243
Input Volume	172	265	960	127	251	457	2232
% of Volume	102	99	101	102	99	100	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	2.0	1.2	0.0	0.0	0.0	0.0	3.2
Denied Del/Veh (s)	68.3	58.3	0.0	0.0	0.0	0.0	3.1
Total Delay (hr)	12.0	5.3	1.2	0.1	0.6	4.0	23.2
Total Del/Veh (s)	412.9	258.9	2.8	2.4	31.3	7.8	22.2
Vehicles Entered	98	74	1580	98	65	1826	3741
Vehicles Exited	88	68	1576	98	64	1825	3719
Hourly Exit Rate	88	68	1576	98	64	1825	3719
Input Volume	105	78	1576	97	66	1814	3736
% of Volume	84	87	100	101	97	101	100

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	12	12
Vehicles Exited	12	12
Hourly Exit Rate	12	12
Input Volume	12	12
% of Volume	100	100

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Total Zone Performance

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Denied Delay (hr)	4.0
Denied Del/Veh (s)	3.7
Total Delay (hr)	58.9
Total Del/Veh (s)	25.1
Vehicles Entered	3813
Vehicles Exited	8271
Hourly Exit Rate	8271
Input Volume	21708
% of Volume	38

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	146	173	77	90	136	243	274	38	284	308	118
Average Queue (ft)	71	97	25	33	67	103	104	10	106	126	17
95th Queue (ft)	130	157	59	74	117	209	218	32	227	257	81
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			180			180
Storage Blk Time (%)	4	14			1	4			2	4	
Queuing Penalty (veh)	3	12			8	3			0	4	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	136	162	150	118	214	197	134	127	59
Average Queue (ft)	71	79	58	50	71	56	35	35	13
95th Queue (ft)	124	136	116	97	172	150	99	95	39
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0	0	1			0	
Queuing Penalty (veh)	0	0	1	2	1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	243	189	360	299	99	236	120	98
Average Queue (ft)	133	72	180	127	36	113	50	36
95th Queue (ft)	213	140	318	264	79	196	105	84
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	4	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	SB	SB	SB
Directions Served	L	R	R	L	T	T
Maximum Queue (ft)	671	150	23	101	122	8
Average Queue (ft)	443	103	2	42	6	0
95th Queue (ft)	785	208	13	84	51	8
Link Distance (ft)	658				865	865
Upstream Blk Time (%)	25					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		50	130	85		
Storage Blk Time (%)	98	11		2	0	
Queuing Penalty (veh)	76	11		15	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 142

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	97	96	99	65.6	E
	T	1,487	1,492	100	7.9	A
	R	31	31	99	5.6	A
	Subtotal	1,615	1,619	100	11.3	B
SB	L	12	12	100	34.0	C
	T	1,833	1,792	98	9.0	A
	R	126	123	98	2.1	A
	Subtotal	1,971	1,927	98	8.7	A
EB	L	216	218	101	69.0	E
	T	1	1	100	0.5	A
	R	103	104	101	38.0	D
	Subtotal	320	323	101	58.8	E
WB	L	13	11	85	72.8	E
	R	28	32	113	25.1	C
	Subtotal	41	43	105	37.3	D
<b>Total</b>		3,988	3,952	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	44.3	D
	T	1,543	1,541	100	5.4	A
	Subtotal	1,613	1,609	100	7.0	A
SB	T	1,784	1,752	98	2.9	A
	R	180	178	99	1.6	A
	Subtotal	1,964	1,930	98	2.8	A
EB	L	176	175	99	76.3	E
	T	98	103	105	2.0	A
	R	117	113	97	30.8	C
	Subtotal	391	391	100	43.6	D
<b>Total</b>		3,968	3,930	99	8.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	942	98	10.8	B
	R	127	132	104	4.5	A
	Subtotal	1,087	1,074	99	10.0	A
SB	L	264	258	98	27.2	C
	T	457	451	99	4.3	A
	Subtotal	721	709	98	12.6	B
WB	L	172	170	99	55.6	E
	R	279	275	99	13.3	B
	Subtotal	451	445	99	29.5	C
<b>Total</b>		2,259	2,228	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,639	1,642	100	1.2	A
	R	97	102	105	0.5	A
	Subtotal	1,736	1,744	100	1.2	A
SB	L	66	70	106	41.0	E
	T	1,872	1,856	99	8.6	A
	Subtotal	1,938	1,926	99	9.8	A
WB	L	<b>105</b>	<b>79</b>	<b>75</b>	<b>535.8</b>	<b>F</b>
	R	78	58	75	339.5	F
	Subtotal	183	137	75	452.7	F
<b>Total</b>		3,856	3,807	99	25.2	D

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>11</b>	<b>92</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	11	92	0.0	A
<b>Total</b>		12	11	92	0.0	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	L	15	15	100	76.3	F
	T	1,716	1,725	101	2.0	A
	Subtotal	1,731	1,740	101	2.6	A
<b>SB</b>	T	1,956	1,914	98	2.0	A
	R	20	20	100	0.4	A
	Subtotal	1,976	1,934	98	2.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>189.8</b>	<b>F</b>
	R	15	16	107	45.2	E
	Subtotal	35	35	100	123.7	F
<b>Total</b>		3,742	3,709	99	3.5	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>89</b>	<b>90</b>	<b>101</b>	<b>4.6</b>	<b>A</b>
	Subtotal	89	90	101	4.6	A
EB	T	45	47	104	0.3	A
	Subtotal	45	47	104	0.3	A
WB	T	34	33	97	0.3	A
	R	80	79	99	0.2	A
	Subtotal	114	112	98	0.2	A
<b>Total</b>		248	249	101	1.8	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>15</b>	<b>17</b>	<b>113</b>	<b>4.0</b>	<b>A</b>
	Subtotal	15	17	113	4.0	A
EB	T	31	31	100	0.2	A
	Subtotal	31	31	100	0.2	A
WB	T	22	20	91	0.1	A
	R	12	12	100	0.2	A
	Subtotal	34	32	94	0.1	A
<b>Total</b>		80	80	100	1.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.1	0.2	0.2	0.8	1.7	3.3	0.0	0.1	4.5	0.1
Total Del/Veh (s)	69.0	0.5	38.0	72.8	25.1	68.1	65.6	7.9	5.6	34.0	9.0	2.1
Vehicles Entered	217	1	104	11	32	40	96	1495	31	12	1795	123
Vehicles Exited	218	1	104	11	32	40	96	1492	31	12	1792	123
Hourly Exit Rate	218	1	104	11	32	40	96	1492	31	12	1792	123
Input Volume	216	1	103	13	28	41	97	1487	31	12	1833	126
% of Volume	101	100	101	85	113	97	99	100	99	100	98	98

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	16.3
Total Del/Veh (s)	14.8
Vehicles Entered	3957
Vehicles Exited	3952
Hourly Exit Rate	3952
Input Volume	3988
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.8	0.1	1.0	0.8	2.3	1.4	0.1	9.5
Total Del/Veh (s)	76.3	2.0	30.8	44.3	5.4	2.9	1.6	8.7
Vehicles Entered	175	103	113	68	1541	1751	178	3929
Vehicles Exited	175	103	113	68	1541	1752	178	3930
Hourly Exit Rate	175	103	113	68	1541	1752	178	3930
Input Volume	176	98	117	70	1543	1784	180	3968
% of Volume	99	105	97	97	100	98	99	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.3	1.6	0.2	2.6	3.0	0.2	0.9
Total Delay (hr)	2.7	1.0	2.9	0.2	2.0	0.5	9.3
Total Del/Veh (s)	55.6	13.3	10.8	4.5	27.2	4.3	14.8
Vehicles Entered	170	274	943	132	259	451	2229
Vehicles Exited	170	275	942	132	258	451	2228
Hourly Exit Rate	170	275	942	132	258	451	2228
Input Volume	172	279	960	127	264	457	2259
% of Volume	99	99	98	104	98	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	6.2	4.5	0.0	0.0	0.0	0.0	10.7
Denied Del/Veh (s)	210.3	211.4	0.0	0.0	0.0	0.0	10.0
Total Delay (hr)	14.7	6.4	0.5	0.0	0.8	4.4	26.9
Total Del/Veh (s)	535.8	339.5	1.2	0.5	41.0	8.6	25.2
Vehicles Entered	90	64	1642	102	69	1858	3825
Vehicles Exited	79	58	1642	102	70	1856	3807
Hourly Exit Rate	79	58	1642	102	70	1856	3807
Input Volume	105	78	1639	97	66	1872	3856
% of Volume	75	75	100	105	106	99	99

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	11	11
Vehicles Exited	11	11
Hourly Exit Rate	11	11
Input Volume	12	12
% of Volume	92	92

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.1	0.2	0.3	1.0	1.0	0.0	3.6
Total Del/Veh (s)	189.8	45.2	76.3	2.0	2.0	0.4	3.5
Vehicles Entered	19	16	15	1727	1916	20	3713
Vehicles Exited	19	16	15	1725	1914	20	3709
Hourly Exit Rate	19	16	15	1725	1914	20	3709
Input Volume	20	15	15	1716	1956	20	3742
% of Volume	95	107	100	101	98	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1
Total Delay (hr)	0.0	0.0	0.0	0.1	0.1
Total Del/Veh (s)	0.3	0.3	0.2	4.6	1.8
Vehicles Entered	47	32	79	90	248
Vehicles Exited	47	33	79	90	249
Hourly Exit Rate	47	33	79	90	249
Input Volume	45	34	80	89	248
% of Volume	104	97	99	101	101

27: Medical Drive & Access 3 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.2	0.1	0.2	4.0	1.0
Vehicles Entered	31	20	12	17	80
Vehicles Exited	31	20	12	17	80
Hourly Exit Rate	31	20	12	17	80
Input Volume	31	22	12	15	80
% of Volume	100	91	100	113	100

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Total Zone Performance

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Denied Delay (hr)	11.5
Denied Del/Veh (s)	10.4
Total Delay (hr)	71.8
Total Del/Veh (s)	29.8
Vehicles Entered	3947
Vehicles Exited	8447
Hourly Exit Rate	8447
Input Volume	26562
% of Volume	32

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	171	195	148	97	220	271	268	67	272	294	130
Average Queue (ft)	88	114	63	34	111	132	133	9	142	154	22
95th Queue (ft)	153	175	124	75	193	242	239	37	257	277	77
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)									0	1	0
Queuing Penalty (veh)									4	5	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	21			11	6			15	11	
Queuing Penalty (veh)	8	22			85	8			2	14	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	165	169	145	104	207	193	166	167	61
Average Queue (ft)	82	90	56	49	77	64	57	63	18
95th Queue (ft)	137	147	116	90	184	164	137	146	48
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0		2			0	
Queuing Penalty (veh)	0	1	0		1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	238	171	335	306	89	227	115	94
Average Queue (ft)	131	73	168	121	37	118	51	35
95th Queue (ft)	211	137	297	261	72	199	107	81
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	5	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	R	L	T	T
Maximum Queue (ft)	679	150	4	32	114	122	47
Average Queue (ft)	506	92	0	3	49	11	2
95th Queue (ft)	844	203	4	19	97	67	25
Link Distance (ft)	658		303			865	865
Upstream Blk Time (%)	44						
Queuing Penalty (veh)	0						
Storage Bay Dist (ft)		50		130	85		
Storage Blk Time (%)	97	8			3	0	
Queuing Penalty (veh)	75	8			32	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	96	48	63	40	55	2
Average Queue (ft)	31	12	17	3	4	0
95th Queue (ft)	84	35	50	29	35	2
Link Distance (ft)	595			303	303	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		100	100			150
Storage Blk Time (%)	3		1		0	
Queuing Penalty (veh)	0		5		0	

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Intersection: 24: Medical Drive & Access 2

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Movement	SB
Directions Served	L
Maximum Queue (ft)	67
Average Queue (ft)	35
95th Queue (ft)	56
Link Distance (ft)	256
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

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Intersection: 27: Medical Drive & Access 3

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Movement	SB
Directions Served	L
Maximum Queue (ft)	28
Average Queue (ft)	10
95th Queue (ft)	29
Link Distance (ft)	278
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

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Zone Summary

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Zone wide Queuing Penalty: 278

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	75	75	100	79.2	E
	T	1,732	1,728	100	9.6	A
	R	34	34	99	7.4	A
	Subtotal	1,841	1,837	100	12.4	B
SB	L	14	14	100	54.7	D
	T	2,134	2,079	97	13.3	B
	R	106	102	96	6.7	A
	Subtotal	2,254	2,195	97	13.3	B
EB	L	208	209	100	71.3	E
	R	81	79	98	40.6	D
	Subtotal	289	288	100	62.9	E
WB	L	15	14	93	71.4	E
	R	31	36	115	31.9	C
	Subtotal	46	50	109	43.0	D
<b>Total</b>		4,472	4,407	99	17.1	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	74	73	99	57.0	E
	T	1,681	1,670	99	7.6	A
	Subtotal	1,755	1,743	99	9.7	A
SB	T	1,922	1,864	97	3.2	A
	R	208	204	98	1.8	A
	Subtotal	2,130	2,068	97	3.1	A
EB	L	234	239	102	68.5	E
	R	139	141	101	39.0	D
	Subtotal	373	380	102	57.6	E
<b>Total</b>		4,258	4,191	98	10.9	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	822	100	7.2	A
	R	158	159	101	3.8	A
	Subtotal	977	981	100	6.6	A
SB	L	160	165	103	22.5	C
	T	586	578	99	4.5	A
	Subtotal	746	743	100	8.5	A
WB	L	266	256	96	91.1	F
	R	180	177	98	18.8	B
	Subtotal	446	433	97	61.5	E
<b>Total</b>		2,169	2,157	99	18.5	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,866	1,866	100	6.5	A
	R	105	107	102	4.3	A
	Subtotal	1,971	1,973	100	6.4	A
SB	L	75	69	92	61.8	E
	T	2,140	2,083	97	12.4	B
	Subtotal	2,215	2,152	97	14.0	B
WB	L	115	116	101	76.6	E
	R	85	84	99	40.1	D
	Subtotal	200	200	100	61.3	E
<b>Total</b>		4,385	4,325	99	12.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	65	100	1.7	A
	T	27	26	95	0.1	A
	R	2	2	100	0.1	A
	Subtotal	94	93	99	1.2	A
SB	T	39	37	94	0.1	A
	Subtotal	39	37	95	0.1	A
<b>EB</b>	<b>T</b>	<b>126</b>	<b>126</b>	<b>100</b>	<b>6.4</b>	<b>A</b>
	R	65	65	100	3.1	A
	Subtotal	191	191	100	5.3	A
WB	T	90	86	95	5.2	A
	Subtotal	90	86	96	5.2	A
<b>Total</b>		416	407	98	3.9	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.9	0.3	0.3	0.8	1.7	4.7	0.1	0.2	7.8	0.2	21.1
Total Del/Veh (s)	71.3	40.6	71.4	31.9	76.9	79.2	9.6	7.4	54.7	13.3	6.7	17.1
Vehicles Entered	208	79	13	36	37	76	1726	33	14	2082	102	4406
Vehicles Exited	209	79	14	36	37	75	1728	34	14	2079	102	4407
Hourly Exit Rate	209	79	14	36	37	75	1728	34	14	2079	102	4407
Input Volume	208	81	15	31	41	75	1732	34	14	2134	106	4472
% of Volume	100	98	93	115	90	100	100	99	100	97	96	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.0	0.3
Denied Del/Veh (s)	0.2	0.5	1.9	0.4	0.0	0.0	0.2
Total Delay (hr)	4.6	1.6	1.2	3.6	1.7	0.1	12.8
Total Del/Veh (s)	68.5	39.0	57.0	7.6	3.2	1.8	10.9
Vehicles Entered	238	141	73	1673	1864	204	4193
Vehicles Exited	239	141	73	1670	1864	204	4191
Hourly Exit Rate	239	141	73	1670	1864	204	4191
Input Volume	234	139	74	1681	1922	208	4258
% of Volume	102	101	99	99	97	98	98

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.4	0.2	2.7	3.0	0.2	0.7
Total Delay (hr)	6.7	0.9	1.7	0.2	1.0	0.7	11.2
Total Del/Veh (s)	91.1	18.8	7.2	3.8	22.5	4.5	18.5
Vehicles Entered	257	178	822	159	165	579	2160
Vehicles Exited	256	177	822	159	165	578	2157
Hourly Exit Rate	256	177	822	159	165	578	2157
Input Volume	266	180	819	158	160	586	2169
% of Volume	96	98	100	101	103	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.9	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	0.9	3.4	0.1	1.2	7.2	15.4
Total Del/Veh (s)	76.6	40.1	6.5	4.3	61.8	12.4	12.7
Vehicles Entered	117	84	1865	107	69	2082	4324
Vehicles Exited	116	84	1866	107	69	2083	4325
Hourly Exit Rate	116	84	1866	107	69	2083	4325
Input Volume	115	85	1866	105	75	2140	4385
% of Volume	101	99	100	102	92	97	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBT	NBL	NBT	NBR	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.4	3.8	0.0	4.0	0.3	0.2	0.1	1.4
Total Delay (hr)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	6.4	3.1	5.2	1.7	0.1	0.1	0.1	3.9
Vehicles Entered	126	65	86	65	26	2	37	407
Vehicles Exited	126	65	86	65	26	2	37	407
Hourly Exit Rate	126	65	86	65	26	2	37	407
Input Volume	126	65	90	65	27	2	39	416
% of Volume	100	100	95	100	95	100	94	98

Total Zone Performance

Denied Delay (hr)	1.0
Denied Del/Veh (s)	0.8
Total Delay (hr)	67.5
Total Del/Veh (s)	26.4
Vehicles Entered	4257
Vehicles Exited	8999
Hourly Exit Rate	8999
Input Volume	24695
% of Volume	36

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	176	200	125	101	236	338	354	81	379	398	248
Average Queue (ft)	86	113	50	40	106	170	169	16	193	212	35
95th Queue (ft)	152	175	103	84	191	306	309	53	335	351	146
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	20			9	9			20	15	
Queuing Penalty (veh)	8	20			77	10			3	16	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	174	238	206	150	282	282	180	188	63
Average Queue (ft)	94	113	83	60	134	112	70	66	20
95th Queue (ft)	150	186	163	115	237	225	140	141	53
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	1	1	4			0	
Queuing Penalty (veh)	2	6	2	6	3			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	495	279	263	216	95	150	147	124
Average Queue (ft)	260	110	139	77	40	76	70	47
95th Queue (ft)	498	292	227	174	78	129	128	102
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	29	0		0				
Queuing Penalty (veh)	53	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	281	150	188	179	74	129	179	202
Average Queue (ft)	119	63	80	83	12	56	78	94
95th Queue (ft)	220	136	162	168	46	108	161	185
Link Distance (ft)	658		675	675			865	865
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	14		2		6	5	
Queuing Penalty (veh)	48	16		2		64	4	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	NB	SB
Directions Served	T	R	T	L	TR
Maximum Queue (ft)	80	45	62	30	2
Average Queue (ft)	38	27	25	3	0
95th Queue (ft)	66	44	46	19	3
Link Distance (ft)	501		151		492
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100		100	
Storage Blk Time (%)	0		0		
Queuing Penalty (veh)	0		0		

Zone Summary

Zone wide Queuing Penalty: 341

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	105	98	94	219.6	F
	T	1,743	1,689	97	20.2	C
	R	34	34	99	13.3	B
	Subtotal	1,882	1,821	97	30.8	C
SB	L	14	13	93	54.4	D
	T	2,034	2,037	100	14.0	B
	R	135	133	99	3.3	A
	Subtotal	2,183	2,183	100	13.6	B
EB	L	223	223	100	67.8	E
	T	1	1	133	0.6	A
	R	116	118	102	48.3	D
	Subtotal	340	342	101	60.9	E
WB	L	15	16	107	73.3	E
	R	31	30	96	39.3	D
	Subtotal	46	46	100	51.1	D
<b>Total</b>		4,492	4,432	99	27.1	C

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	90	91	101	70.3	E
	T	1,721	1,682	98	24.5	C
	Subtotal	1,811	1,773	98	26.9	C
SB	T	1,972	1,967	100	4.6	A
	R	208	214	103	2.6	A
	Subtotal	2,180	2,181	100	4.4	A
EB	L	234	246	105	68.6	E
	R	151	153	101	44.7	D
	Subtotal	385	399	104	59.4	E
<b>Total</b>		4,376	4,353	99	18.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	824	101	10.5	B
	R	158	165	104	3.7	A
	Subtotal	977	989	101	9.4	A
SB	L	160	167	104	23.2	C
	T	586	578	99	6.0	A
	Subtotal	746	745	100	9.9	A
WB	L	266	273	103	48.1	D
	R	180	184	102	10.3	B
	Subtotal	446	457	102	32.9	C
<b>Total</b>		2,169	2,191	101	14.6	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,902	1,844	97	5.2	A
	R	105	106	101	2.0	A
	Subtotal	2,007	1,950	97	5.0	A
SB	L	75	74	99	60.7	E
	T	2,069	2,075	100	11.2	B
	Subtotal	2,144	2,149	100	12.9	B
WB	L	115	113	98	79.8	E
	R	85	82	97	41.8	D
	Subtotal	200	195	98	63.8	E
<b>Total</b>		4,350	4,294	99	11.6	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	61	93	1.6	A
	T	27	26	95	0.2	A
	R	12	12	100	0.2	A
	Subtotal	104	99	95	1.1	A
SB	L	19	19	100	1.6	A
	T	39	38	97	0.1	A
	Subtotal	58	57	98	0.6	A
<b>EB</b>	<b>T</b>	<b>140</b>	<b>136</b>	<b>97</b>	<b>6.5</b>	<b>A</b>
	R	65	68	104	3.3	A
	Subtotal	205	204	100	5.4	A
WB	L	16	15	94	5.1	A
	T	103	101	98	5.7	A
	R	25	28	111	2.4	A
	Subtotal	144	144	100	5.0	A
<b>Total</b>		512	504	98	3.9	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	10	8	80	71.8	F
	T	1,987	1,933	97	3.7	A
	Subtotal	1,997	1,941	97	4.0	A
SB	T	2,168	2,172	100	4.0	A
	R	15	15	100	1.0	A
	Subtotal	2,183	2,187	100	4.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>296.9</b>	<b>F</b>
	R	15	15	100	75.7	F
	Subtotal	35	34	97	199.3	F
<b>Total</b>		4,214	4,162	99	5.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	47	47	99	6.1	A
	R	52	53	101	3.0	A
	Subtotal	99	100	101	4.5	A
EB	L	32	28	87	2.2	A
	T	138	140	102	0.1	A
	Subtotal	170	168	99	0.5	A
WB	T	101	99	98	0.3	A
	R	58	59	101	0.4	A
	Subtotal	159	158	99	0.3	A
<b>Total</b>		428	426	99	1.3	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	3	3	100	6.2	A
	R	2	3	150	2.6	A
	Subtotal	5	6	120	4.4	A
EB	L	11	9	82	2.0	A
	T	166	164	99	0.1	A
	Subtotal	177	173	98	0.2	A
WB	T	152	151	99	0.2	A
	R	1	1	100	0.2	A
	Subtotal	153	152	99	0.2	A
<b>Total</b>		335	331	99	0.3	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.6	0.3	0.3	2.8	6.5	9.6	0.1	0.2	8.0	0.1
Total Del/Veh (s)	67.8	0.6	48.3	73.3	39.3	235.1	219.6	20.2	13.3	54.4	14.0	3.3
Vehicles Entered	223	1	117	16	30	41	103	1696	35	13	2041	133
Vehicles Exited	223	1	118	16	30	40	98	1689	34	13	2037	133
Hourly Exit Rate	223	1	118	16	30	40	98	1689	34	13	2037	133
Input Volume	223	1	116	15	31	41	105	1743	34	14	2034	135
% of Volume	100	133	102	107	96	97	94	97	99	93	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	33.8
Total Del/Veh (s)	27.1
Vehicles Entered	4449
Vehicles Exited	4432
Hourly Exit Rate	4432
Input Volume	4492
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.3	0.0	0.0	0.4
Denied Del/Veh (s)	0.2	0.6	2.0	0.5	0.0	0.0	0.3
Total Delay (hr)	4.8	1.9	1.8	11.7	2.5	0.2	22.9
Total Del/Veh (s)	68.6	44.7	70.3	24.5	4.6	2.6	18.7
Vehicles Entered	244	153	92	1698	1969	214	4370
Vehicles Exited	246	153	91	1682	1967	214	4353
Hourly Exit Rate	246	153	91	1682	1967	214	4353
Input Volume	234	151	90	1721	1972	208	4376
% of Volume	105	101	101	98	100	103	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.3	0.2	2.7	2.9	0.2	0.7
Total Delay (hr)	3.8	0.5	2.4	0.2	1.1	1.0	9.0
Total Del/Veh (s)	48.1	10.3	10.5	3.7	23.2	6.0	14.6
Vehicles Entered	273	186	822	165	167	578	2191
Vehicles Exited	273	184	824	165	167	578	2191
Hourly Exit Rate	273	184	824	165	167	578	2191
Input Volume	266	180	819	158	160	586	2169
% of Volume	103	102	101	104	104	99	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.8	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	1.0	2.7	0.1	1.3	6.5	14.0
Total Del/Veh (s)	79.8	41.8	5.2	2.0	60.7	11.2	11.6
Vehicles Entered	113	83	1845	106	73	2076	4296
Vehicles Exited	113	82	1844	106	74	2075	4294
Hourly Exit Rate	113	82	1844	106	74	2075	4294
Input Volume	115	85	1902	105	75	2069	4350
% of Volume	98	97	97	101	99	100	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.3	3.8	0.0	0.0	0.0	4.0	0.3	0.3	4.2	0.2	1.3
Total Delay (hr)	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Total Del/Veh (s)	6.5	3.3	5.1	5.7	2.4	1.6	0.2	0.2	1.6	0.1	3.9
Vehicles Entered	136	68	15	102	28	61	26	12	19	38	505
Vehicles Exited	136	68	15	101	28	61	26	12	19	38	504
Hourly Exit Rate	136	68	15	101	28	61	26	12	19	38	504
Input Volume	140	65	16	103	25	65	27	12	19	39	512
% of Volume	97	104	94	98	111	93	95	100	100	97	98

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	0.3	0.2	2.0	2.4	0.0	6.6
Total Del/Veh (s)	296.9	75.7	71.8	3.7	4.0	1.0	5.7
Vehicles Entered	20	15	8	1933	2172	15	4163
Vehicles Exited	19	15	8	1933	2172	15	4162
Hourly Exit Rate	19	15	8	1933	2172	15	4162
Input Volume	20	15	10	1987	2168	15	4214
% of Volume	95	100	80	97	100	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	4.0	0.5
Total Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Total Del/Veh (s)	2.2	0.1	0.3	0.4	6.1	3.0	1.3
Vehicles Entered	28	140	99	60	47	53	427
Vehicles Exited	28	140	99	59	47	53	426
Hourly Exit Rate	28	140	99	59	47	53	426
Input Volume	32	138	101	58	47	52	428
% of Volume	87	102	98	101	99	101	99

27: Medical Drive & Access 3 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	3.9	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.0	0.1	0.2	0.2	6.2	2.6	0.3
Vehicles Entered	9	164	151	1	3	3	331
Vehicles Exited	9	164	151	1	3	3	331
Hourly Exit Rate	9	164	151	1	3	3	331
Input Volume	11	166	152	1	3	2	335
% of Volume	82	99	99	100	100	150	99

---

Total Zone Performance

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Denied Delay (hr)	1.2
Denied Del/Veh (s)	0.9
Total Delay (hr)	94.0
Total Del/Veh (s)	35.8
Vehicles Entered	4486
Vehicles Exited	9209
Hourly Exit Rate	9209
Input Volume	30150
% of Volume	31

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	169	200	185	118	284	550	564	107	307	319	265
Average Queue (ft)	88	111	80	41	230	340	315	14	226	243	42
95th Queue (ft)	142	169	155	87	339	619	644	61	339	351	165
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)						9	6		2	4	0
Queuing Penalty (veh)						89	58		23	40	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	18			73	11		0	25	22	
Queuing Penalty (veh)	9	20			639	16		0	4	30	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	209	264	224	187	654	624	205	221	81
Average Queue (ft)	102	118	92	94	255	231	94	94	21
95th Queue (ft)	165	199	170	201	804	776	173	185	59
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)					1	0			
Queuing Penalty (veh)					0	0			
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	2	2	14			1	
Queuing Penalty (veh)	3	6	5	21	13			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	350	258	298	262	87	176	168	154
Average Queue (ft)	193	60	157	107	38	79	77	56
95th Queue (ft)	311	167	270	230	71	136	144	123
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	9			0				
Queuing Penalty (veh)	16			0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	258	150	235	230	110	124	239	143
Average Queue (ft)	117	63	88	91	17	57	36	39
95th Queue (ft)	221	138	208	210	80	104	151	99
Link Distance (ft)	658		303	303			865	865
Upstream Blk Time (%)			1	1			0	
Queuing Penalty (veh)			5	7			0	
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	13		4		6	1	
Queuing Penalty (veh)	48	15		4		58	1	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	R	L	T	R	L	L
Maximum Queue (ft)	84	56	30	59	41	32	19
Average Queue (ft)	40	29	10	26	13	5	1
95th Queue (ft)	67	46	31	45	33	22	9
Link Distance (ft)	501			151			
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		100	50		50	100	100
Storage Blk Time (%)	0		0	0	0		
Queuing Penalty (veh)	0		0	0	0		

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	T	T
Maximum Queue (ft)	140	62	42	80	85	165	179
Average Queue (ft)	48	15	9	8	9	22	34
95th Queue (ft)	128	51	33	85	89	100	126
Link Distance (ft)	595			291	291	303	303
Upstream Blk Time (%)				0	0		0
Queuing Penalty (veh)				1	2		0
Storage Bay Dist (ft)		100	100				
Storage Blk Time (%)	9			1			0
Queuing Penalty (veh)	1			0			0

Intersection: 24: Medical Drive & Access 2

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	34	6	55	54
Average Queue (ft)	5	0	26	26
95th Queue (ft)	23	4	52	49
Link Distance (ft)		150	256	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 27: Medical Drive & Access 3

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	18	24	15
Average Queue (ft)	1	2	2
95th Queue (ft)	11	13	10
Link Distance (ft)		278	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	25		100
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Zone Summary

Zone wide Queuing Penalty: 1137

# **APPENDIX C**

## **Site Plan**





# **APPENDIX D**

## **95<sup>th</sup> Percentile Queue Length Reports**

# SimTraffic Queuing Report



**Project: Saratoga Springs - Welfare Complex TIS Update**

Analysis: Existing (2020) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)

Project #: UT19-1451

Intersection	NB			SB			EB			WB				
	L	R	T	TR	UL	L	R	T	L	R	TR	L	LTR	R
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	209	218	117	32	81	242	144	--	59	--	74	--
02: Redwood Road (SR-68) & Market Street	97	--	161	--	--	--	39	97	130	116	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	79	291	--	--	196	--	95	--	--	--	213	--	140
04: Redwood Road (SR-68) & Commerce Drive	--	13	--	--	--	84	--	30	--	--	--	785	--	208



# SimTraffic Queuing Report

Project: Saratoga Springs - Welfare Complex TIS Update

Analysis: Future (2025) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)



Project #: UT19-1451

Intersection	NB				SB				EB				WB				
	L	R	T	TR	UL	L	R	T	TR	L	R	T	TR	L	LTR	R	T
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	306	309	191	53	146	343	--	164	--	--	103	--	84	--	--
02: Redwood Road (SR-68) & Market Street	115	--	231	--	--	--	53	141	--	168	163	--	--	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	78	201	--	--	129	--	115	--	--	--	--	--	498	--	292	--
04: Redwood Road (SR-68) & Commerce Drive	--	46	165	--	--	108	--	173	--	--	--	--	--	220	--	136	--
05: Exchange Drive & Medical Drive	19	--	--	--	--	--	--	--	3	--	44	66	--	--	--	--	46



# **APPENDIX E**

## Trip Generation Data

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## MEMORANDUM

Date: July 9, 2020

To: Gordon L. Miner, M.E.M., P.E.

From: Hales Engineering

**Subject: Saratoga Springs Welfare Complex Access 3 Analysis**

UT19-1451

This memorandum discusses the study completed for the proposed Welfare Complex in Saratoga Springs. Plans currently exist for a property access onto Medical Drive on the west end of the project, designated as "Access 3" in the TIS report. This proposed access is negatively offset from the existing Costco access (labeled as "Access E" in the Kittelson & Associates Costco TIS) on the south side of Medical Drive, approximately 150 feet to the west of the proposed access.

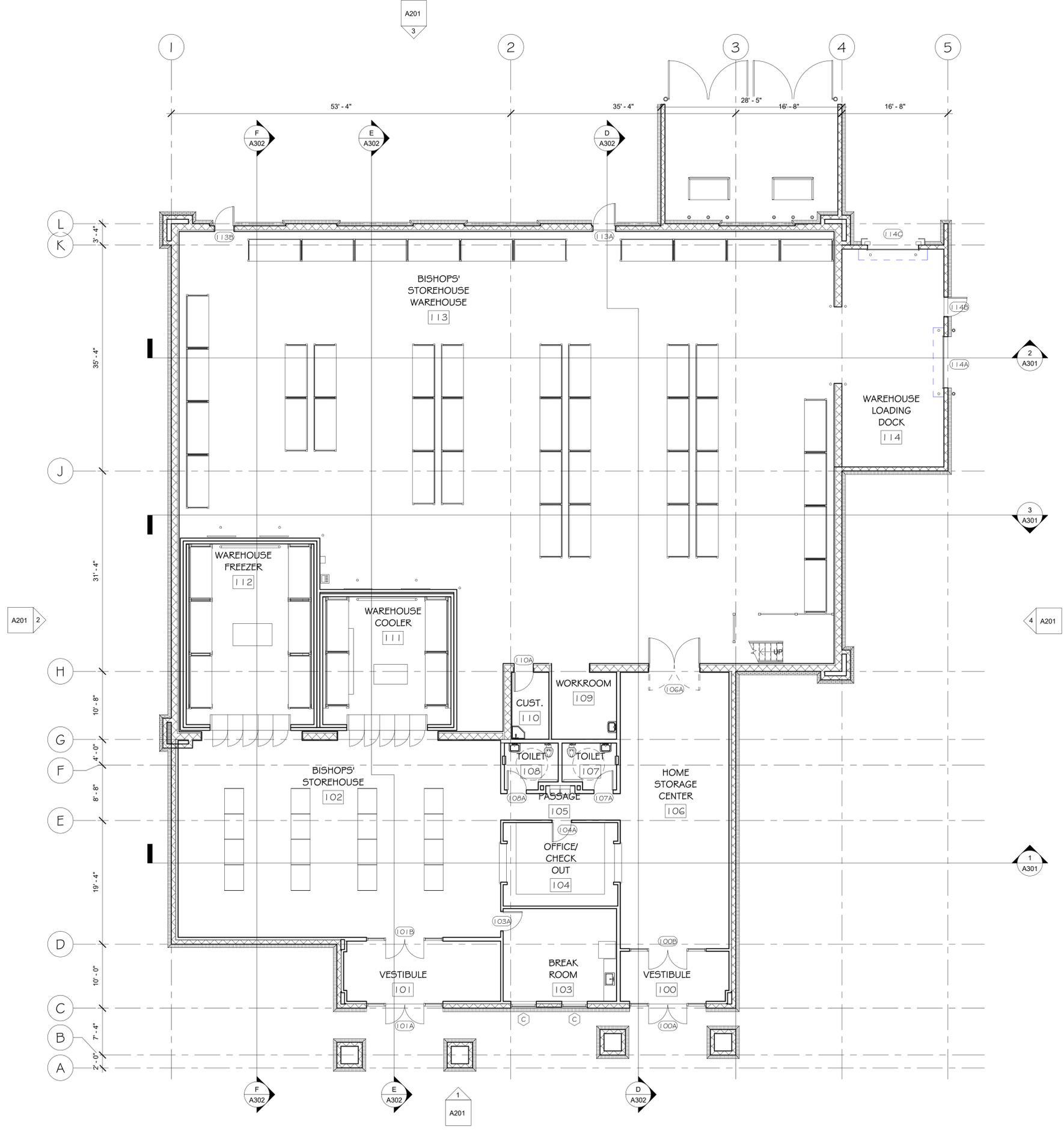
Based on projected 2020 evening peak hour traffic volumes on Medical Drive, as estimated by the Kittelson & Associates Costco TIS as well as additional traffic from the Welfare Complex, no major left-turning movement conflict is expected to exist going into these accesses prior to the completion of Exchange Drive.

In the 2025 plus project evening peak hour traffic condition, only 25 westbound left-turning vehicles are projected with 11 conflicting eastbound left-turning vehicles. Synchro and SimTraffic analysis of these offset accesses yield excellent levels of service in the report and show a 95<sup>th</sup> percentile eastbound left-turn queue of 15 feet at Access 3 and a 95<sup>th</sup> percentile westbound left-turn queue of 25 feet. This indicates that ample storage length would exist for both eastbound left-turn and westbound left-turn movements to queue and make their movements with minimal delay during the evening peak hour in future (2025) conditions.

**Hales Engineering recommends that a center two-way left-turn lane (TWLTL) be utilized for left-turn movements between the Costco Access E and the project Access 3 on Medical Drive.** It is not anticipated that significant queuing will occur by the year 2025 that would create safety concerns at this location. However, it is important to consider that future traffic on Medical Drive may continue to increase beyond the 2025 horizon year and that these offset accesses should be monitored and evaluated if potential left-turn queuing conflicts arise after the year 2025.



## APPENDIX F - ARCHITECTURAL RENDERING AND ELEVATIONS



1 A101/1 - FLOOR PLAN 12,303 sqft. 1/8" = 1'-0" NORTH

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Project For:  
**THE CHURCH OF  
 JESUS CHRIST  
 OF LATTER-DAY SAINTS**

**SARATOGA SPRINGS  
 BISHOPS' STOREHOUSE**  
 PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

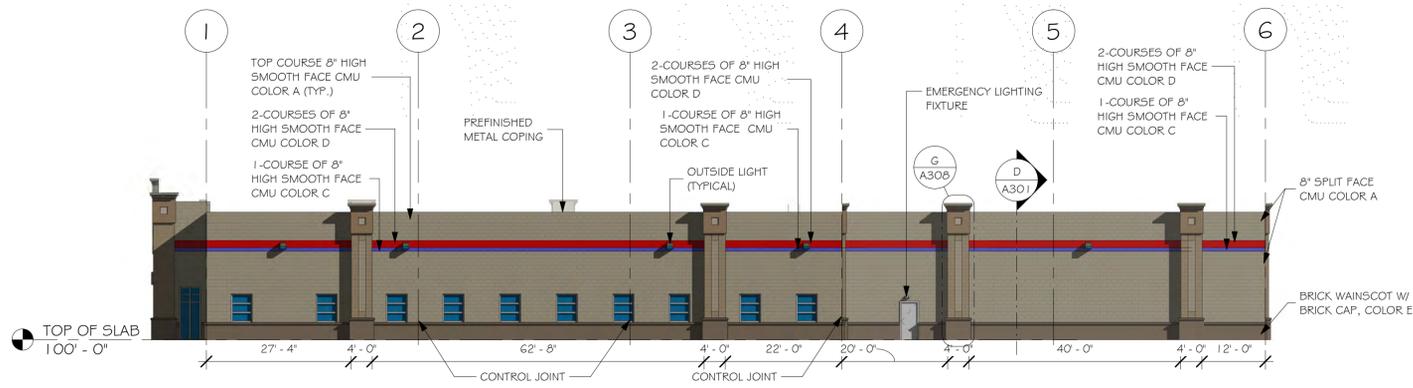
Project Number: 123  
 Plan Series: 123 JRWA Project: 757  
 Property Number: 123

SHEET:  
**FLOOR PLANS**

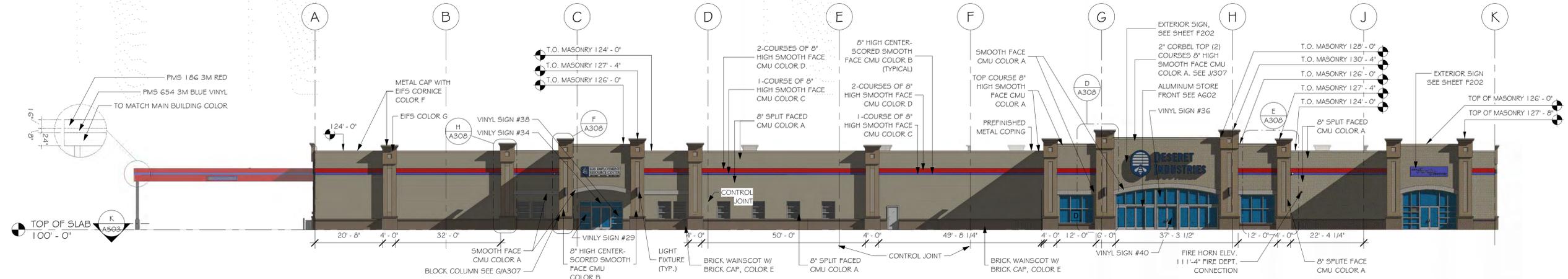
**A101**



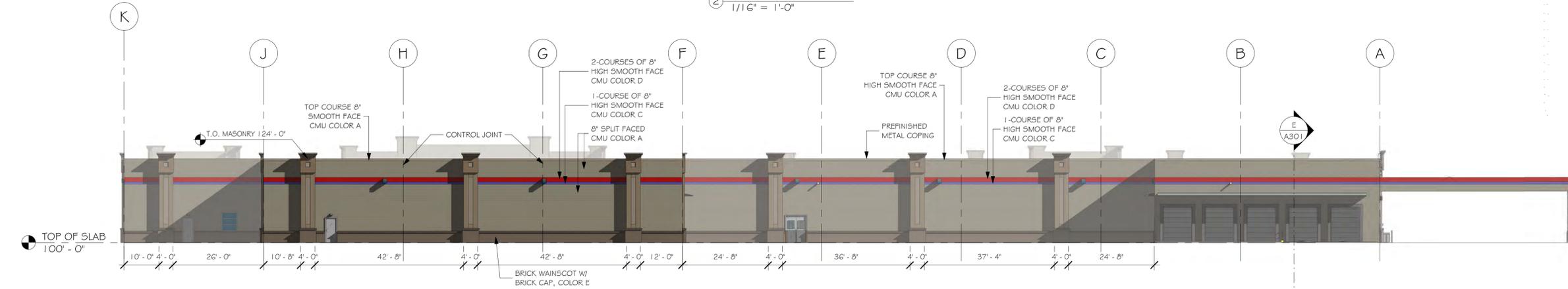




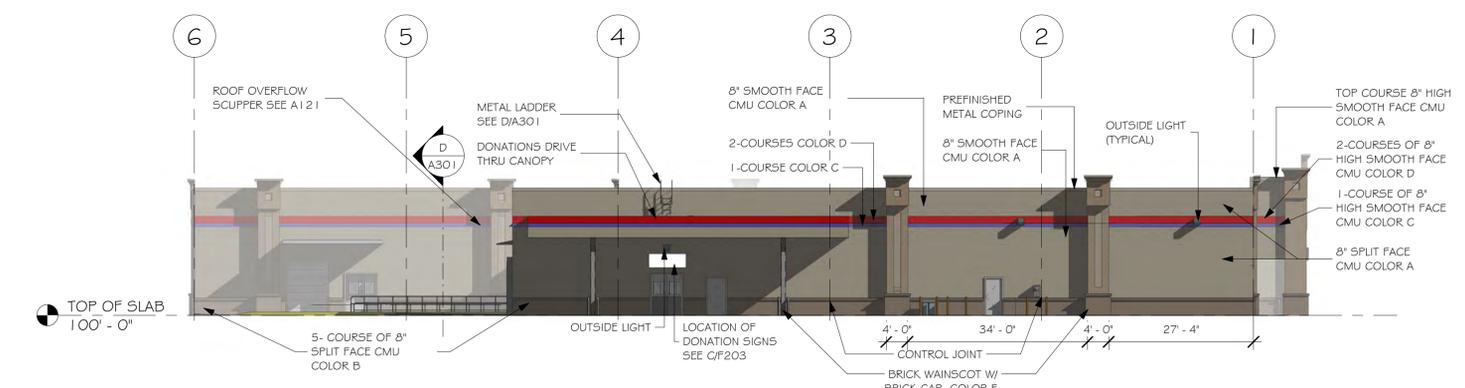
① WEST ELEVATION  
1/16" = 1'-0"



② SOUTH ELEVATION  
1/16" = 1'-0"



③ NORTH ELEVATION  
1/16" = 1'-0"

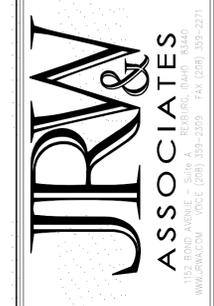


④ EAST ELEVATION  
1/16" = 1'-0"

EXTERIOR CMU COLORS

NOTE: BLOCK COLORS ARE BY AMCOR  
BRICK COLOR IS BY INTERSTATE BRICK  
EIFS COLORS ARE BY GRVIT

COLOR A SPLIT FACE	PEPPERCREAM	COLOR E BRICK VENEER WAINSCOT	WALNUT (INTERSTATE BRICK)
COLOR B SPLIT FACE	INCA TAN	COLOR F MET CAP AND EIFS CORNICE	"TAMALE #382" METAL CAP TO MATCH EIFS COLOR
COLOR C STRIP	D.I. BLUE	COLOR G EIFS COLUMN CAPS	"VAN DYKE#110"
COLOR D STRIP	D.I. RED		



Project For:  
**THE CHURCH OF  
JESUS CHRIST  
OF LATTER-DAY SAINTS**

SARATOGA SPRINGS,  
UTAH  
DESERET INDUSTRIES  
PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123	JRWA Project: 757
Plan Series: 123	Property Number: 123

SHEET:  
**EXTERIOR  
ELEVATIONS**

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COMMUNITY AND  
VILLAGE PLAN

# Saratoga Springs UT Welfare Complex



July, 2020

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## PREFACE

The following Community and Village Plan document addresses the proposed improvements as they pertain to the proposed Deseret Industries and Bishop’s Storehouse located in Saratoga Springs, Utah. The property and the proposed improvements for the development are discussed in detail and follow the requirements set forth within the Community and Village Plan requirements of the City Code of Saratoga Springs. The purpose of the document is to inform the City (Staff, Planning Commission, and City Council) and Public of the proposed general design elements, open space plans, guiding design principles and land uses for the Saratoga Springs Welfare UT Welfare Complex. In addition, utility capacities based on conceptual plans, will outline the methods used to anticipate the demands and service requirements necessary to provide adequate utility service and infrastructure for the proposed improvements.

## EXECUTIVE SUMMARY

The proposed Saratoga Springs UT Welfare Complex is an approximate 11.82-acre parcel located on the northwest corner of State Route 68 (Redwood Road) and Medical Drive in Saratoga Springs. The project is ideally situated to provide connectivity and minimize impact with local and major transportation corridors.

The proposed Community and Village Plan incorporates the following units and approximate acreages:

- *11.82 Total Acres*

## LEGAL DESCRIPTION

The proposed Village Plan contains approximately 11.82-acres of property. Please see Appendix A for a copy of the ALTA survey for the property. The parcel metes and bounds legal description is as follows:

A portion of the Southwest Quarter of Section 14, Township 5 South, Range 1 West, Salt Lake Base and Meridian, located in Saratoga Springs, Utah, more particularly described as follows:

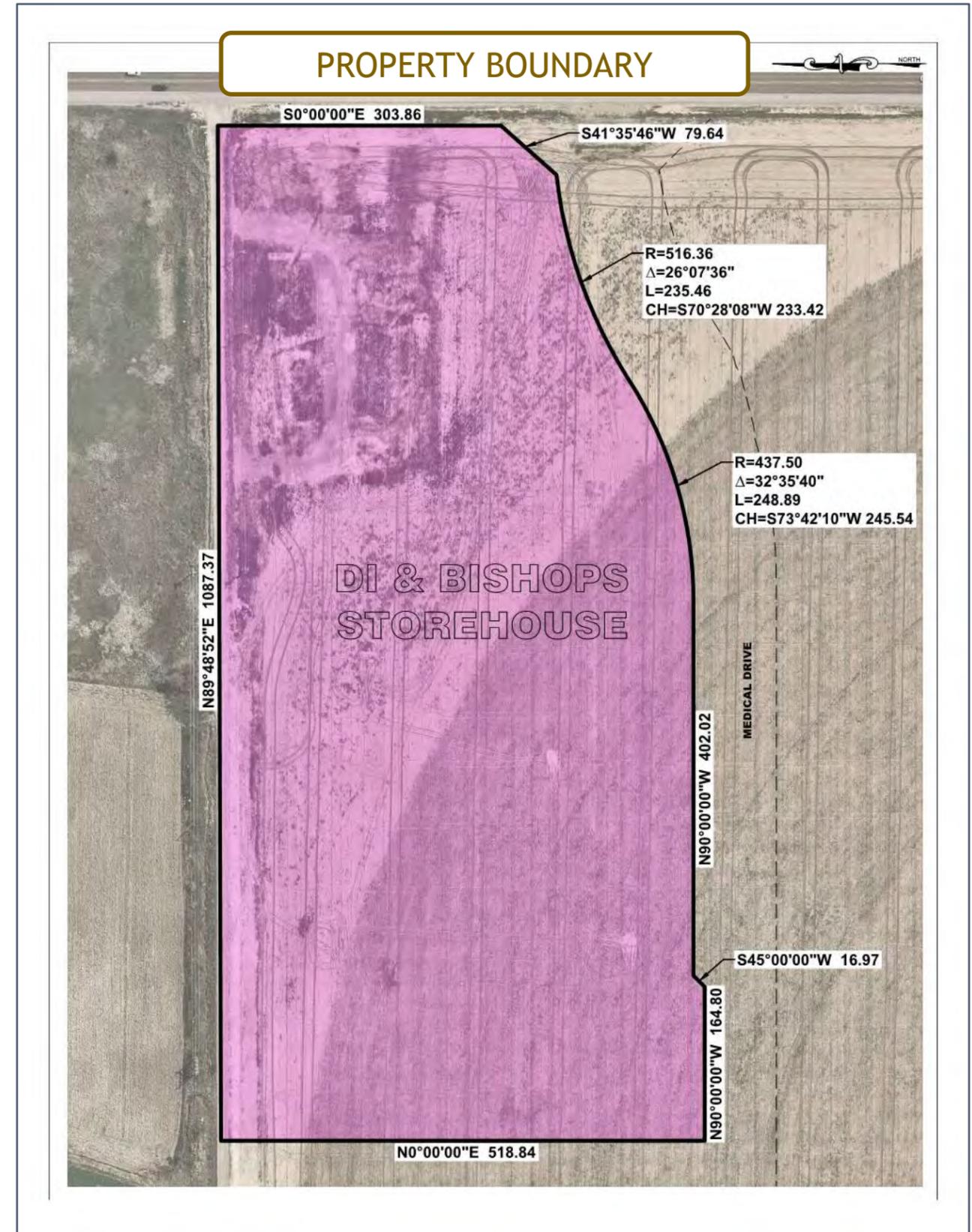
Beginning at a point on the north right-of-way line of Medical Drive, Being located  $N0^{\circ}20'51''E$  along the Section Line 2137.03 feet and east 1512.99 feet from the southwest corner of Section 14, Township 5 South, Range 1 West, Salt Lake Base & Meridian; thence north 518.84 feet to the Quarter Section Line; THENCE  $N89^{\circ}48'52''E$  along the Quarter Section Line 1087.37 feet; thence south 303.86 feet; thence  $S41^{\circ}35'46''W$  79.65 feet; thence southwesterly along the arc of a 516.36 foot radius non-tangent curve to the left (radius bears:  $S6^{\circ}28'05''E$ ) 235.46 feet through a central angle of  $26^{\circ}07'37''$  (chord:  $S70^{\circ}28'09''W$  233.43 feet); thence along the arc of a 437.50 foot radius curve to the right 248.89 feet through a central angle of  $32^{\circ}35'40''$  (chord:  $S73^{\circ}42'10''W$  245.54 feet); thence west 402.02 feet; thence  $S45^{\circ}00'00''W$  16.97 feet to the north right-of-way line of Medical Drive; thence west along said right-of-way line 164.80 feet to the point of beginning

Contains:  $\pm 11.82$  Acres

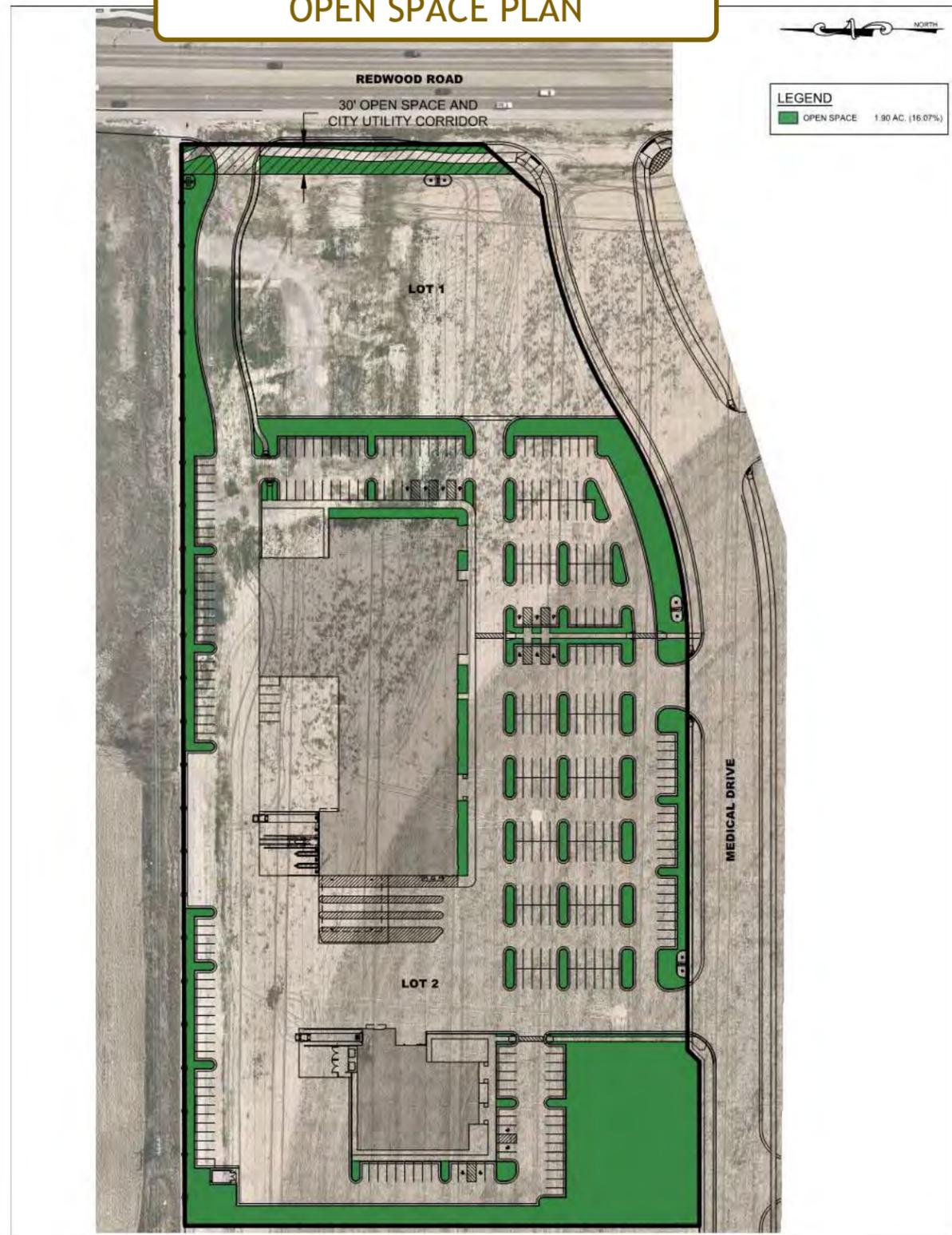
The intersection at Medical Drive and Redwood Road (SR-68) is currently being designed with the proposed development to the south. Depending on the design review and final platting from the Utah Department of Transportation and City staff, the following conditions are proposed related to this Community/Village Plan:

- If the project's acreage increases or decreases from the amount listed above, City Staff can approve the updated acreage by amending the Community/Village Plan as a minor amendment.

The 11.82 acres of land is part of an overall parcel that will require a City approved subdivision exception through a metes and bounds description to be divided from the parent parcel. This will be completed prior or concurrently with the site plan approval.



## OPEN SPACE PLAN



## OPEN SPACE PLAN

Open space for the proposed Saratoga Springs UT Welfare Complex will continue the City's goal for pedestrian wayfinding and safety by incorporating the following key elements that are based on the current City Code requirements:

**Public Sidewalks.** Sidewalks are to be installed along the entire property frontage. Sidewalk connections points will be at Medical Drive and Redwood Road (south). Roadway frontage improvements will adhere to City Roadway Standards. Sidewalk widths and placements will follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.

- **Open Space / Landscaping.** The proposed Saratoga Springs UT Welfare Complex will follow the Regional Retail place type as specified in the DAP. The DAP specifies a landscaping requirement for Regional Retail of approximately 11 to 14-percent which is exceeded for the site at approximately 16-percent. In addition to the sidewalk and pedestrian access throughout the project and along the City ROWs, the project will utilize the Parkway (Boulevard) Open Space Type by placing a pedestrian plaza with benches at the corner of the shared access to the Bishop's Storehouse and Deseret Industries. The backdrop to the pedestrian plaza will feature landscaping that will create a warm and inviting location for those passing by. See the Conceptual Landscaping Plans found in Appendix B for more detail.
- **Public Open Space.** A 30-foot landscape and utility easement/buffer will be provided along Redwood Road that will be owned and maintained by the Church of Jesus Christ of Latter-day Saints. The buffer will include a meandering trail located within a pedestrian access easement and follow the 2019 Saratoga Springs City Standards and Specifications at a minimum.
- **Monumentation and Signage.** Signage will be specific and similar to other uses within the City. Monumentation and signage will meet the regional commercial sign requirements set forth in Title 19.18 of the City Code. See the signage example provided in the following section.



## USE MAP AND BUILDOUT ALLOCATION

The following Use Map depicts the proposed land uses for the Saratoga Springs UT Welfare Project. There will be two lots within the boundary of the Saratoga Springs UT Welfare Project Community/Village Plan. The Village will incorporate the following place type as specified in the District Area Plan:

- Regional Retail.** This area is located just west of State Route 68 and adjacent to Medical Drive in Saratoga Springs. The anticipated land use of Regional Retail coincides with the land uses within the City Center District Area Plan for Saratoga Springs. The DAP place type of Regional Retail will follow the Regional Commercial (RC) zone standards of Title 19 unless expressly identified herein.

Lot 1 will remain vacant until such time a commercial use is determined for the site. Lot 1 will need to follow the appropriate City approval process (Title 19.04 – Regional Commercial [RC]) once a commercial use has been determined. The remaining portion of this document will address the anticipated improvements of Lot 2 which will be completed in a single phase.

Two different methods were requested in determining the land use intensities for Lot 2 within this Village. Both methods illustrate the process used in determining the Equivalent Residential Units (ERUs) for this specific project. They are as follows:

**Method 1 – District Area Plan Guidelines.** The District Area Plan (DAP) states that one ERU is equivalent to 2,165 square feet (sf) of “non-residential area.” The 2,165 sf is generated by dividing 10,000,000 sf commercial area by 4,620 non-residential ERUs as per the DAP. The total proposed building square footage within the boundaries is approximately 69,788 sf. The following yields:

$$(69,788 \text{ sf}) / (2,165 \text{ sf/ERU}) = 32.2 \text{ ERUs}$$

**Method 2 – Water Supply Fixture Unit (wsfu).** A plumbing fixture analysis was completed and based on the anticipated uses for this project. Calculations provided within the utility section of this Community and Village Plan generate approximately **6.5 ERUs** for the two proposed buildings within the project.

The ERU density calculation method (Method 1) identified in the District Area Plan will be used and results in **32.2 ERUs** for the proposed Lot 2 of this Village. Method 2 will be used later within this document for determining the anticipated utility capacities for the project and eventual impacts to the City system.

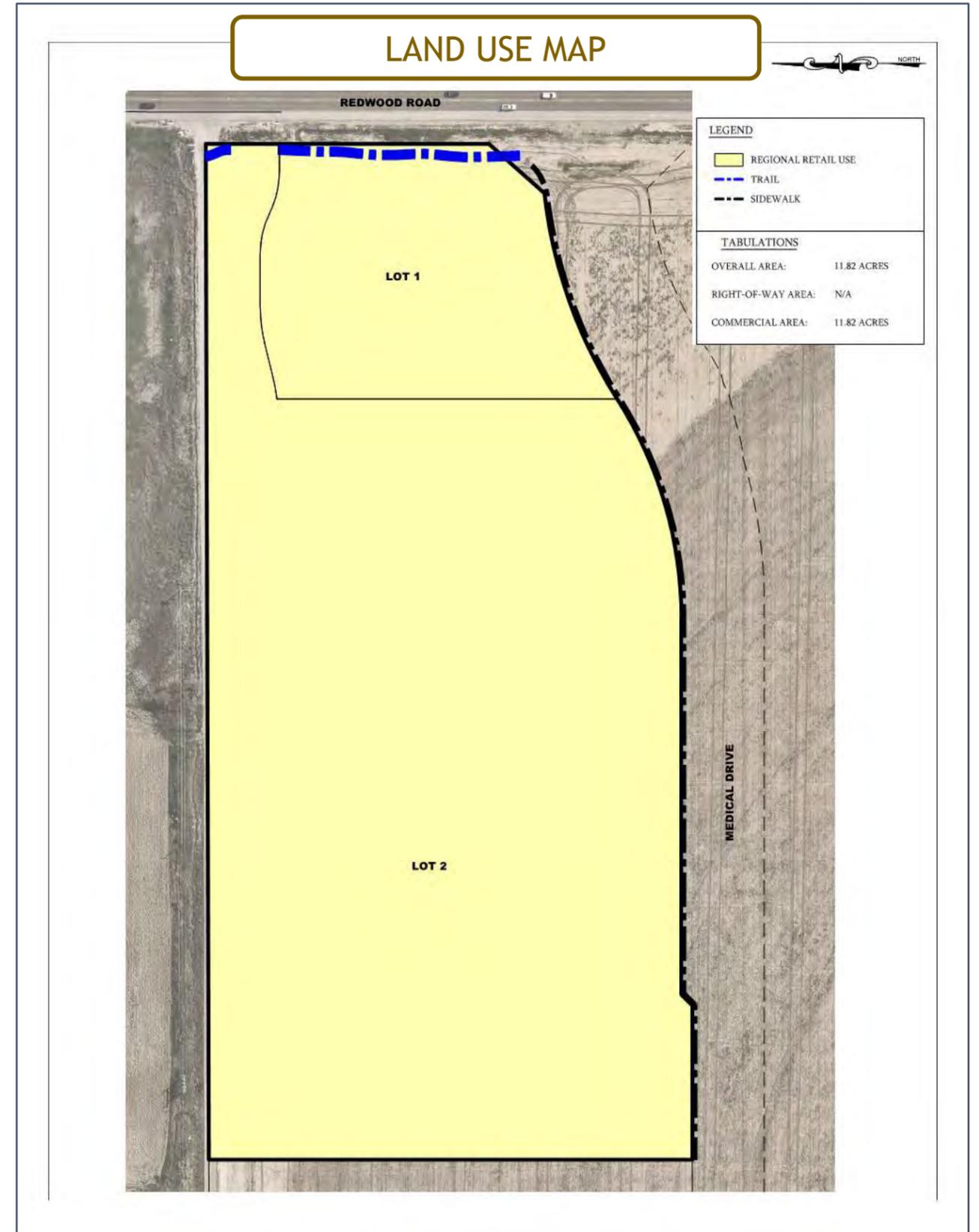
### Village Plan

Lot 2 of this Village will only contain a single use. The Welfare Complex will contain a commodity resource center and a retail thrift store, both of which are a non-profit organization and a division of the Welfare Services of The Church of Jesus Christ of Latter-day Saints.

Overall Village Area (Regional Retail):	11.8 Ac (100%)	32 ERUs based on floor area (100%)
Lot 1 Area:	2.0 Ac (17%)	ERUs to be determined.
Lot 2 Area:	9.8 Ac (83%)	32 ERUs based on floor area (100%)
Projected Population:	0 Persons	
Projected Employment:	255 Equivalent Full Time Jobs	
Deseret Industries:	220 Equivalent Full Time Jobs (includes Employment Center)	
Bishop’s Storehouse:	35 Equivalent Full Time Jobs	

## DEVELOPMENT STANDARDS AND LOTTING MAP

The Saratoga Springs UT Welfare Complex is the only use within this proposed area. Development standards will adhere to the City Code (RC Zone) and the latest approved version of the Standards and Specifications if not specified in the CP/VP.



**Fencing.** There is only one type of fencing anticipated for the site. The fencing type is as follows:

- **6-Foot SimTek Fence.** This fence type will typically follow the rear exterior property lines on the north side of the Village. An authentic stone texture or material pattern is anticipated to contain and restrict access and viewership to the non-public areas and help the anticipated uses for the site to function uninhibited. Pattern and material may vary and to be approved by City Staff during the site plan approval process.
- **Trash Enclosure.** The proposed trash enclosure will follow Title 19 of the City Code.

**Lighting.** Section 19.11 Lighting shall govern with the exception that parking lot light poles may include fixtures of the type and design shown in below. Parking light poles of 36-feet 6-inches in height are permitted provided such lighting poles are bronze in color and designed to blend into existing backgrounds. Additional building accent and security lighting may be provided on the building not to exceed 16-feet in height. Lighting along public roads will be maintained by the City (Redwood Road) and shall be per City standard details and specifications. All exterior lighting shall comply with the City of Saratoga Springs Dark Sky ordinance/requirements.

#### **MAINTENANCE PLAN**

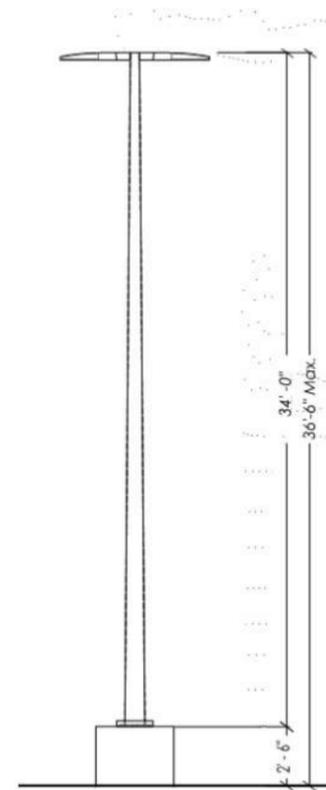
All the proposed open space or landscaping improvements as discussed above will be owned and maintained by The Church of Jesus Christ of Latter-day Saints. The planter strips within a public right-of-way along each property boundary will be owned by the City or UDOT but maintained by The Church of Jesus Christ of Latter-day Saints.

#### **PHASING PLAN**

All improvements for the proposed Village Plan will be completed in a single construction phase.

## **HOMEOWNERS ASSOCIATION**

No homeowners association is anticipated for the project with all open space and amenities in and around the proposed Village Plan to be owned and maintained by The Church of Jesus Christ of Latter-day Saints.



## **GUIDING PRINCIPLES**

The guiding principles for the proposed Saratoga Springs UT Welfare Complex will stay consistent with similar uses provided by the Church of Jesus Christ of Latter-day Saints within Saratoga Springs. It is the Church's goal to integrate with the local surroundings and keep in harmony with the standards set forth by the City of Saratoga Springs. The following provides the guiding principles anticipated for the project:

- **Establishment of Standards.** Architectural design of the building will be similar to what is shown in the rendering shown in Appendix F with final design to be reviewed at site plan approval. No Covenants, Conditions and Restrictions (CC&Rs) are anticipated for the project.
- **United Theme.** It is the desire of the Church of Jesus Christ of Latter-day Saints to keep consistent with similar uses within Saratoga Springs. Any and all street signage and monumentation will keep consistent with similar uses within the City. See the example previously provided. Colors and dimensions may vary with final design.
- **Minimize Impacts.** A variety of techniques have been incorporated within proposed Saratoga Springs UT Welfare Complex to decrease the impacts on the surrounding area and adjacent neighbors to the project. This is accomplished through project orientation and transportation corridors.
  - **Project Orientation.** The front of the Deseret Industries and Bishop's Storehouse are oriented to the south facing Medical Drive. A shared access point will be placed between the two buildings onto Medical Drive.
  - **Transportation Corridors.** Primary access to the Saratoga Springs UT Welfare Complex will be from Medical Drive with a single primary access and two secondary access points. Medical Drive and Redwood Road (State Route 68) is planned to be a controlled access point or traffic light. An additional secondary access point is planned on the northeast end of the project on to Redwood Road (State Route 68).
- **Community Plan Character.** Properly designed and placed landscaping can create a sense of character similar to other uses within the City. The conceptual landscape plan in Appendix B provides an example of the anticipated landscaping for the proposed Saratoga Springs UT Welfare Complex. Landscaping within the planter strips of the City right-of-way will adhere to City Standards and Specifications. Interior landscaping exhibits are conceptual by nature but show the general placement of trees, shrubs and other vegetation.

## UTILITY CAPACITIES

The location of the proposed Village Plan has utilities located within two of the existing rights-of-way: Redwood Road (State Route 68 and Medical Drive. The existing utilities within these two-existing rights-of-way will serve as the backbone infrastructure for the culinary water, secondary water, storm drain and sanitary sewer. Internal line connections from one right-of-ways to the other will provide the necessary looping and sizing required to service the proposed uses within Village Plan. The following addresses each of the different utilities and any specific requirements for each:

### CULINARY WATER

There is an existing 12-inch culinary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. An additional loop will be created by extending an 8-inch culinary water main interior to the project to serve the necessary fire line and fire hydrants required on-site. The interior loop is not anticipated to connect with the existing culinary infrastructure within Redwood Road due to traffic and utility locations in this area.

#### Fire Flow Requirements

A fire flow test has not been conducted in the area but could be completed following the completion of the roadway and utility improvements completed by Costco. The expected fire flow available to the Saratoga Springs UT Welfare Complex is expected to be adequate with the connection and looping to the existing Zone 1 water zone in the area.

There are two proposed buildings within Village Plan which vary in size and use. Building #1 is a single-story, approximately 57,485 square foot, Type II-B structure with a fire flow requirement of 5,000-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 75-percent reduction with the proposed full sprinkler protection. It is anticipated that the 75-percent reduction will be accepted by the State Fire Marshal and local fire authority.

Building #2 is a single story, approximately 12,303 square foot, Type II-B structure with a fire flow requirement of 2,250-gpm as per the International Fire Code (IFC). The IFC allows for reductions to the fire flow requirement up to 75-percent when full sprinkler protection is provided. The Fire Chief for the City of Saratoga Springs requires a minimum 1,250-gpm as per City Code. Based on these criteria, a minimum flow of 1,250-gpm yields a 44-percent reduction with the proposed full sprinkler protection. It is anticipated that the 44-percent reduction will be accepted by the State Fire Marshal and local fire authority.

#### Water Demands

Based on estimations for the proposed uses, the following provides a breakdown of the anticipated plumbing fixtures within the proposed Village Plan. The plumbing fixture requirements were based on the International Building Code (IBC) 2015, Section 2902.1. The following provides a summary of the anticipated uses:

Type	Fixtures Provided	wsfu per Fixture	Total wsfu
Lavatories	15	2.0	30.0
Water Closet	16	10.0	160.0
Urinal	5	5.0	25.0
Drinking Fountains	12	0.25	3.0
Laundry Unit	3	4.0	12.0
Service Sinks	10	3.0	30.0
<b>Total Fixtures</b>	<b>61</b>		<b>260</b>

A total of **260.0 wsfu** is equivalent to **6.5 Equivalent Residential Connections (ERCs)** (260.0/40) as per the Saratoga Springs Drinking Water Impact Fee Plan, Section 2.4, Existing Equivalent Residential Connections.

The anticipated demand for the proposed Village Plan is approximately 61 fixtures. The architectural plans provide more specific detail to the types of fixtures that can be reviewed and compared to the standards set in the International Plumbing Code (IPC).

### SECONDARY WATER

There is an existing 8-inch secondary water main located within Medical Drive that loops from Redwood Road to other adjacent projects in the area. The proposed Village Plan will fall entirely within the Zone 1 water zone. There will be no anticipated water loop planned interior to Village Plan. The landscaping needs for Lot 2 of the project will be served by existing secondary water laterals installed with the Costco roadway and utility improvements.

#### Overall Water Demand

The following design criteria was used in determining the secondary water demand for the project:

- Water Rights (WR) Required: 3.13 ac-ft/Irrigated Acre (IA) per year
- Storage Required: 9,216 gal/IA
- Peak Day Demand: 7.5 gpm/IA

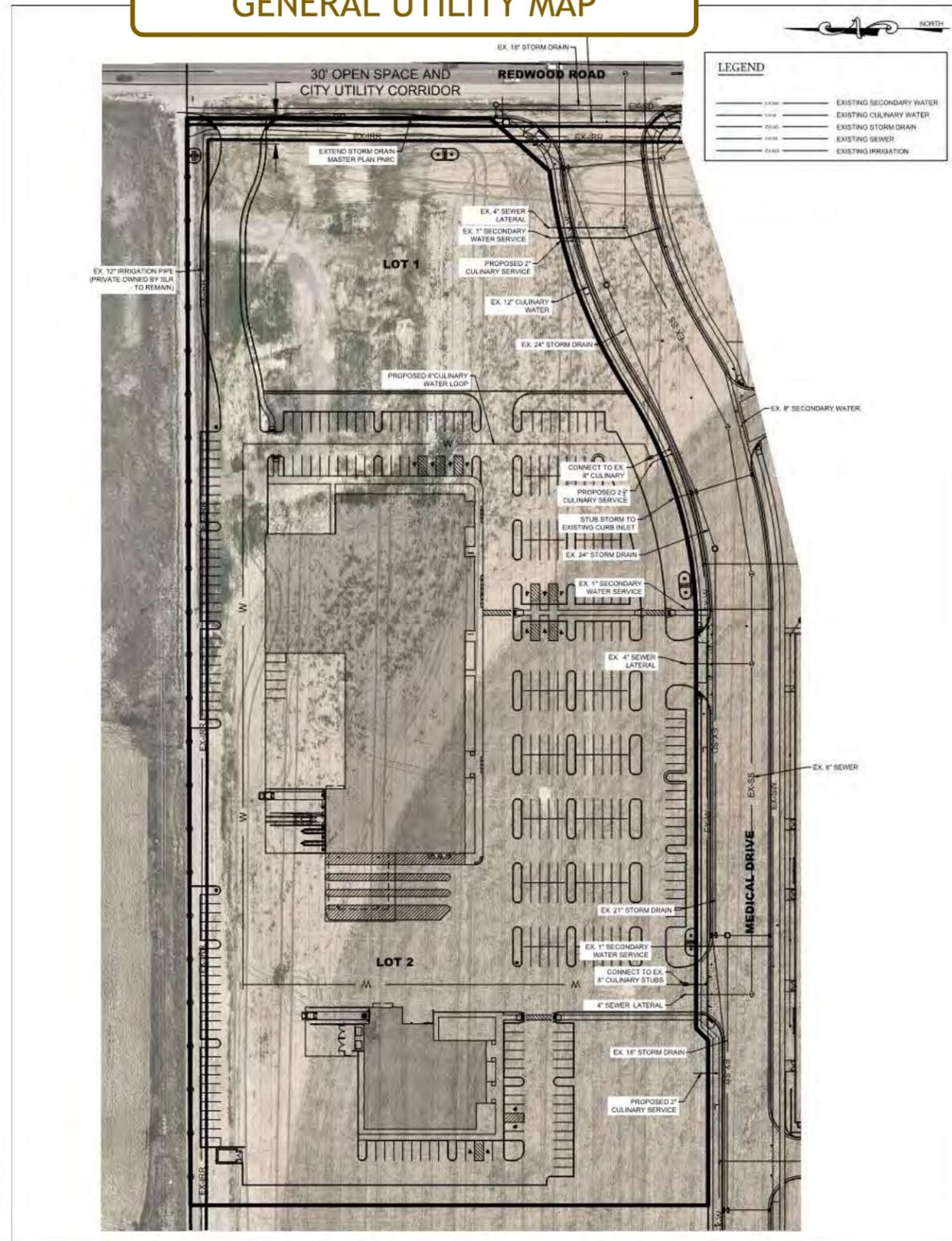
The overall secondary water demand for source and storage is as follows:

Type of Use	Irrigated Area (acres)	Water Right Req'd (ac-ft/IA)	Total Water Right Req'd (ac-ft)	Storage Req'd (gal/IA)	Total Storage (gal)
Regional Retail	1.90	3.13	5.95	9,216	17,510

### SANITARY SEWER

There is an existing 8-inch sanitary sewer main located within Medical Drive that will collect the sanitary sewer waste for Building #1 and Building #2 of the Saratoga Springs UT Welfare Complex. Necessary sanitary sewer infrastructure and service laterals will be installed as per City Standards.

## GENERAL UTILITY MAP



### STORM DRAIN

A preliminary storm drain study in the Appendix C – Storm Drain Analysis was completed for the proposed Saratoga Springs UT Welfare Project and follows the design requirements provided within the Market Street Storm Drain Capacity Analysis dated May 3, 2019. The proposed uses within the site have been evaluated on a preliminary basis to determine the best methodology to discharge from the site with little impact to the downstream system. The following provides a summary of the findings with the full report:

- All storm water runoff from the site will be collected using curb inlets or similar devices at various points within the project. The runoff will then be conveyed using pipes to the southeast corner of the project to a discharge point or pipe installed with Costco roadway and utility improvements.
- A total of 1.30 cfs will be discharged during a 100-year storm event which coincides with the allowed discharge specified in the Market Street Storm Drain Capacity Analysis. All downstream pipes have been sized to accept this stormwater discharge along with runoff from the surrounding area.
- The storm drain design is based on the latest Market Street Storm Drain Capacity Analysis for the overall development area.

### OFFSITE UTILITIES

There are no offsite utilities required with the improvement of the proposed Saratoga Springs UT Welfare Complex. Each of the utilities discussed above are adjacent to the property as depicted in the General Utility Map.

### POWER

All primary power infrastructure improvements within the right-of-way will be installed and buried with the subdivision improvements. All secondary power infrastructure to the site and buildings will be placed underground in conduit or boxes.

## TRANSPORTATION

The following addresses various elements related to the transportation design and service to the proposed Saratoga Springs UT Welfare Complex and is in harmony with the City's Transportation Master Plan. This includes design parameters for proposed roadways and cross sections as it is applicable to the site.

### VEHICULAR AND PEDESTRIAN PLAN

Transportation and pedestrian access in and around Saratoga Springs UT Welfare Complex is a key element for the Church of Jesus Christ of Latter-day Saints and the proposed uses on the site. Transportation access points to the site are planned at three different locations to two different existing right-of-ways adjacent to the site: two on the south and one on the east. These various access points have been strategically placed to spread the flow of traffic rather than concentrating at one or two points of access. The access from Redwood Road (SR-68) will require a Utah Department of Transportation (UDOT) permit and final alignment will be determined during the UDOT approval process. The existing Medical Drive is planned as a 77-foot collector class transportation corridor. Redwood Road will follow the City's standard 180-foot right-of-way with access limited and controlled by the UDOT.

Pedestrian access to the site will be provided with connections to the adjacent City right-of-ways. Each use will connect to the existing five-foot sidewalk installed with Medical Drive and convey foot traffic to the proposed 10-foot trail running parallel to Redwood Road within the City 30-foot pedestrian and utility easement.

### ROADWAY SECTIONS

There are no proposed changes to the existing roadway sections adjacent to the project.

### FIRE DEPARTMENT ACCESS

There are no proposed modifications to the City Standards and Specifications as it relates to the fire department accesses. The internal traffic circulation of the site will be addressed at the time of site plan approval with City Staff.

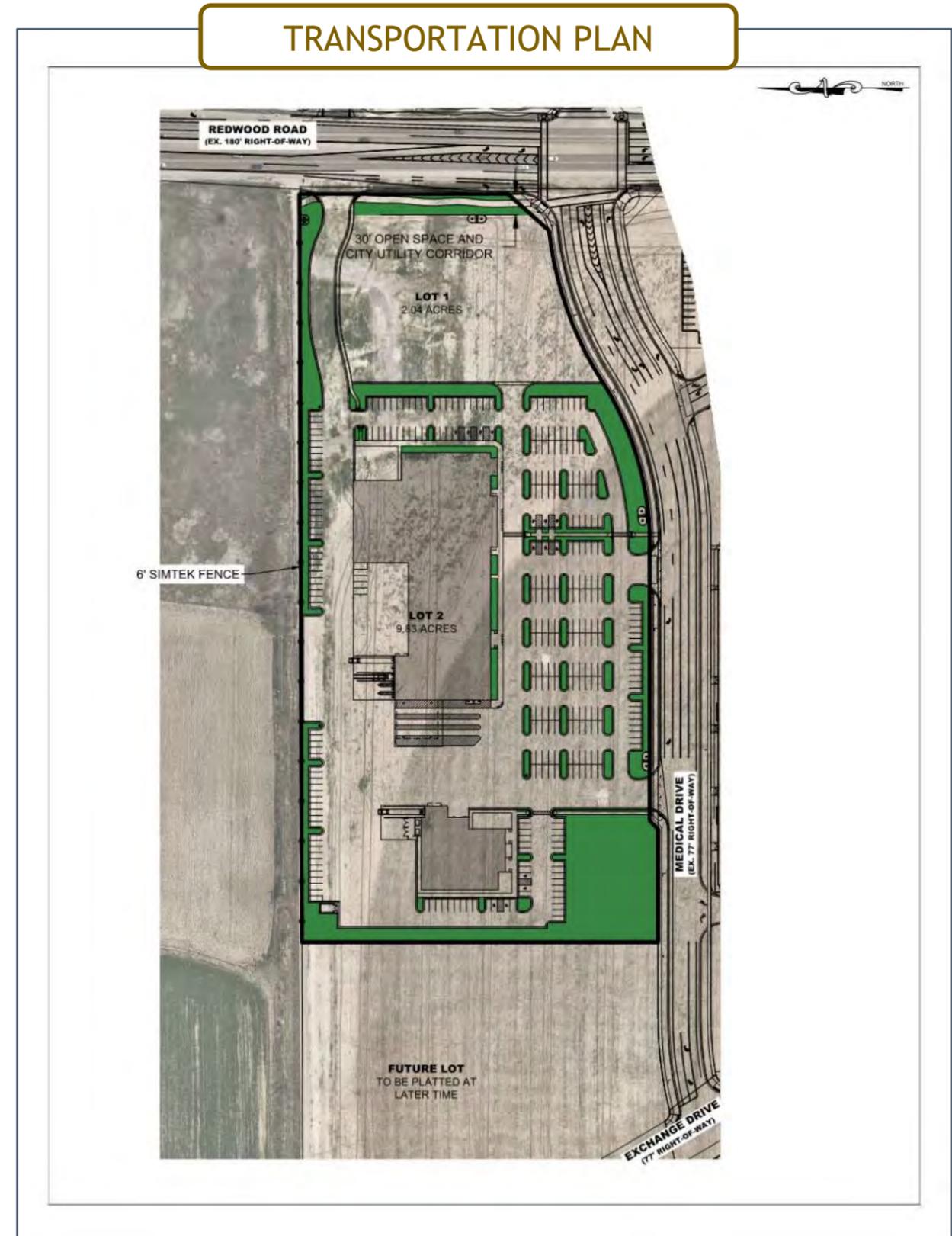
### ROAD NAME AND ADDRESSING

As shown on the exhibit to the right, the main roadways have been named. The existing roadways around Saratoga Springs UT Welfare Complex will remain the same as dedicated with Costco's roadway improvements: Medical Drive (south) and Redwood Road (west). No other additional roadways are planned internally to the property.

### OFF-STREET PARKING

The anticipated parking layout and final quantity will meet the requirements of Title 19 in the City Code. A breakdown of the required parking has been provided below based on the conceptual floor plans provided later in this Village Plan. Although floor plans may vary, approximately 197 parking stalls are required with 334 parking stalls provided. The appropriate number of accessible stalls will be provided as required by the International Building Code (IBC) and the Americans with Disabilities Act (ADA). The final layout, quantity and placement of these stalls will be reviewed at the site plan submittal to the City.

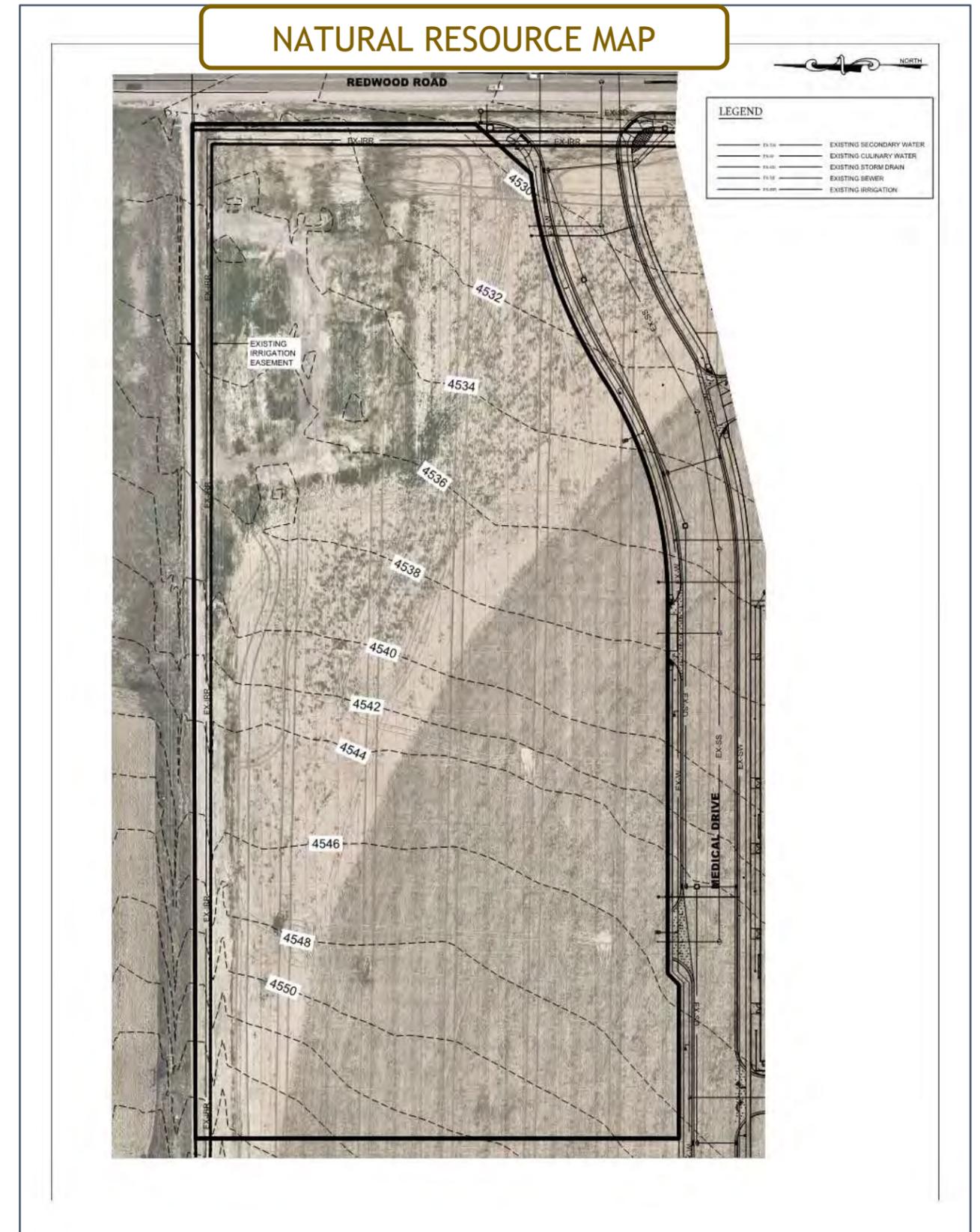
Type	Area (sf)	Parking Requirement	Required Parking
<b>Deseret Industries</b>			
Office	13,200	4 stalls per 1000 sf	53
Retail	24,700	4 stalls per 1000 sf	99
Warehouse	19,900	1 stall per 1000 sf	20
<b>Bishop's Storehouse</b>			
Office	3,800	4 stalls per 1000 sf	16
Warehouse	8,700	1 stall per 1000 sf	9
<b>Total</b>			<b>197</b>



## ADDITIONAL ELEMENTS

The Natural Resource Inventory Map contains information regarding specific site elements such as:

- **Waterways.** There are no existing waterways traversing the site.
- **Geological Information.** Geological information has been obtained from Utah County Hazards Mapping as published by Utah County Public Works Department, in coordination with USGS, MAG and other applicable agencies:
  - This area of the project falls within a low to moderate potential for liquefaction.
  - No flood hazards have been identified. The project area is within flood zone "X" according to FIRM map 4955170115B, dated 17 July, 2002.
  - No landslides hazards have been identified in the project site.
  - No rock fall hazards have been identified in the project site.
  - No wildfire hazards have been identified in the project site.
  - No dam failure risks have been identified in the project site.
  - No avalanche hazards have been identified in the project site.
- **Fault Lines.** According to Utah County Hazards Mapping as published by Utah County Public Works Department, no fault lines or fault ruptures are identified within the project.
- **General Soils Data.** A geotechnical investigation has been conducted on the development. A copy of the investigation results has been included in Appendix D. Excerpts from the investigation include:
  - Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
  - The site is covered by approximately 12 to 24 of inches of topsoil, which will need to be removed before constructing footings.
  - Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
  - Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
  - Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
  - Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
  - Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.



- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least 12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.
- **Slopes.** There are no slopes in the project greater than 30-percent.
- **Statement of Findings.** A statement regarding the findings of this submittal can be found in the Findings section towards the end of the document.
- **Environmental Issues.**
  - **Wetlands.** No wetlands or sources of surface or shallow groundwater have been identified in the project site.
  - **Historical Sites.** No historical sites have been identified in the project site.
  - **Existing Trees.** No existing trees are present on the site.
    - **Traffic Study.** A full traffic study has been included within Appendix E of the Community Plan.
- **Compliance Issues.**
  - **Architectural Standards.** Architectural design of the building will be similar to what is shown in the rendering and typical elevations found in Appendix F.
  - **Common Area Maintenance.** No common area maintenance is anticipated for this project.

## CONCEPTUAL PLANS

- A. **Wildlife Mitigation Plans.** The United States Fish and Wildlife Service has been contacted to determine whether there are any endangered species or wildlife that needs to be mitigated at this time. The Division responded and do not have any concerns due to the current agricultural use of the land.
- B. **Open Space Management Plans.** All the proposed open space as discussed above will be owned and maintained by the Church of Jesus Christ of Latter-day Saints including the 30-foot landscape and utility easement/buffer along Redwood Road. The planter islands within the City right-of-way along each property boundary will be owned by the City but maintained by the Church of Jesus Christ of Latter-day Saints. This includes the frontage along State Route 68 (Redwood Road) outside of the 30-foot landscape and utility easement/buffer.
- C. **Hazardous Material Remediation Plans.** No hazardous materials have been identified within the site. Should any hazardous materials be identified through further geotechnical investigation or site observation, acceptable mitigation must be completed prior to development.

## DESIGN GUIDELINES

The following evaluates various design guideline items as required within the Community and Village Plan requirements:

- **Architectural Standards.** There are a total of two different buildings anticipated within Saratoga Springs UT Welfare Complex. Each of the buildings will be described below with the general architectural standards anticipated with each use. Each building will be constructed of high-quality materials and have high quality architectural design. Final design and materials will be determined at the building permit phase and approved by City Staff. The grounds around these buildings will be beautifully landscaped with trees, shrubs, flowers and grasses.
  - **Building #1.** This building shall be the Bishop's Storehouse for the Church of Jesus Christ of Latter-day Saints and will be comprised of a single floor above grade. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
  - **Building #2.** This building shall be a single-story Deseret Industries for the Church of Jesus Christ of Latter-day Saints. Architectural design of the building will be similar to what is shown in the previous rendering with final design to be reviewed at site plan approval.
- **Floor Area Ratios** – The approximate anticipated building footprints on a 9.83-acre site (Lot 2) produces an FAR of 0.20 maximum.

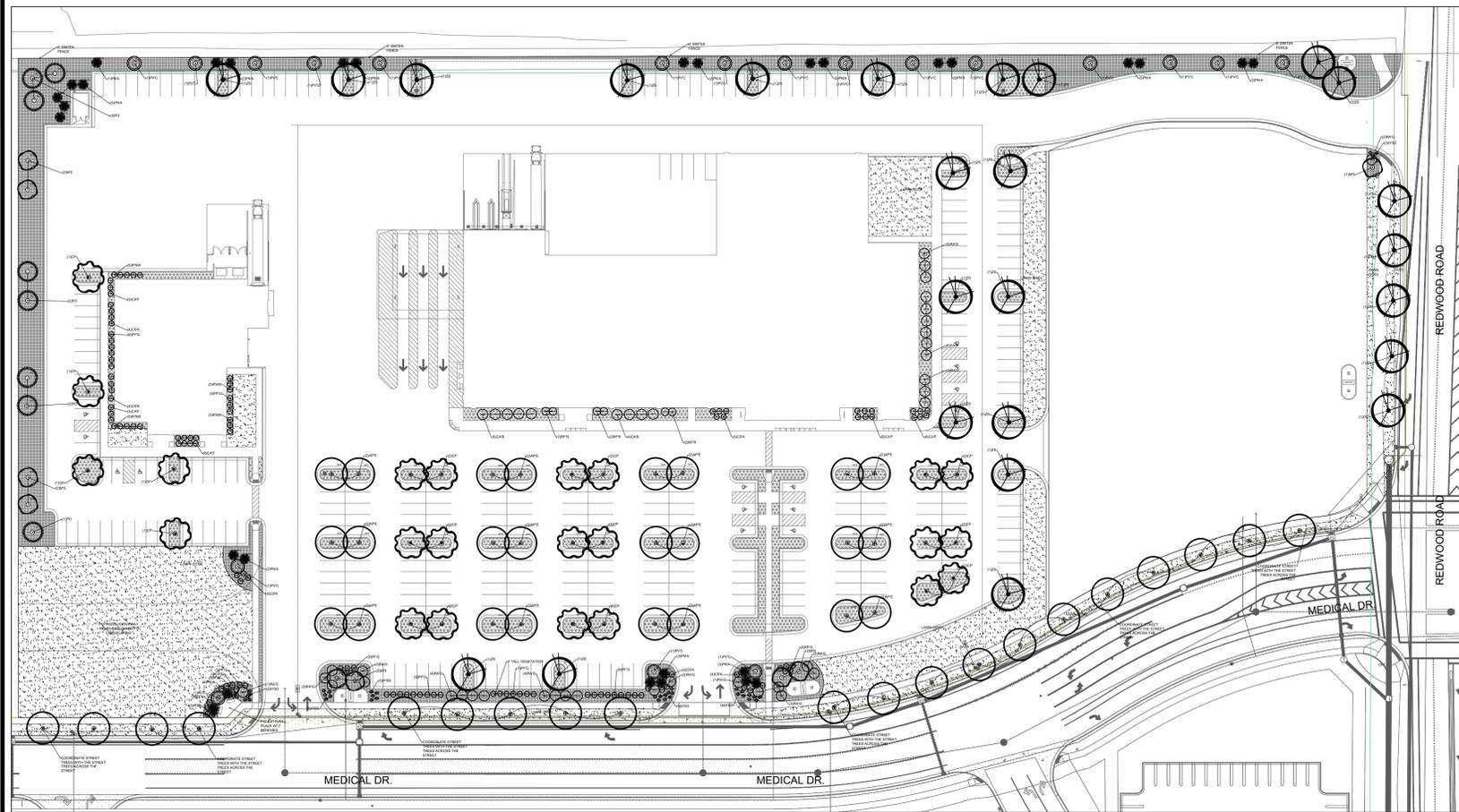
## FINDINGS

The proposed Saratoga Springs UT Welfare Complex is consistent with the goals, objectives and policies outlined within the District Area Plan (DAP) for Saratoga Springs. The project will provide irreplaceable value and honor to the surrounding area with the services provided to the local community. The Church of Jesus Christ of Latter-day Saints will do all they can to provide the civic service to the region and see this proposed Welfare Complex as a worthy extension and symbol for those values within the City of Saratoga Springs.

## APPENDIX A - ALTA SURVEY



## APPENDIX B - LANDSCAPE PLANS



### SITE CALCULATIONS

TOTAL SITE W/ FUTURE RETAIL LOT: 529,303 SQ FT  
 TOTAL SITE WITHOUT FUTURE RETAIL LOT: 446,860 SQ FT  
 TOTAL LANDSCAPE AREA: 98,643 SQ FT (22%)  
 WITHOUT DRIVE AISLE ON THE SOUTHWEST: 90,643 SQ FT. (20%)

SITE TREES:	REQUIRED:	PROVIDED:
DECIDUOUS	39	39
EVERGREEN	37	37
SHRUBS	57	139 - 5 GAL
		PARKING BUFFER 35

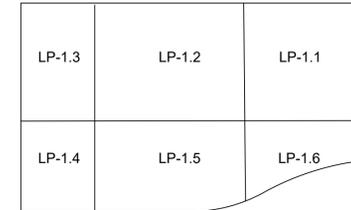
STREET TREES:	REQUIRED:	PROVIDED:
MEDICAL DR.	17	17
REDWOOD RD.	6	6

PARKING ISLAND TREES	REQUIRED:	PROVIDED:
	69	69
		TOTAL 146

3' CIRCLE UNDER TREES  
 50% DROUGHT TOLERANT  
 MINIMUM TWO COLORS OF ROCK

### REFERENCE MAP



### LANDSCAPE PLAN SPECIFICATIONS

**PART I - GENERAL**

**1.1 SUMMARY**

A. This section includes landscape procedures for the Project including all labor, materials, and installation necessary, but not limited to, the following:

- Soil Amendments
- Fine Grading
- Cultivation
- Landscape Edging
- Turf Planting
- Furnish and Installing Plant
- Maintenance
- Mowing
- Weeding

**1.2 SITE CONDITIONS**

A. Examination: Before submitting a Bid, each Contractor shall carefully examine the Contract Documents; shall visit the site of the Work; shall fully inform themselves as to all existing conditions and limitations; and shall include in the Bid the cost of all items required by the Contract Documents are at a variance with the applicable laws, building codes, rules, regulations, or contain obvious erroneous or uncoordinated information, the Contractor shall promptly notify the Project Representative and the necessary changes shall be accomplished by Addendum.

B. Protection: Contractor to conduct the Work in such a manner to protect all existing underground utilities or structures. Contractor to repair or replace any damaged utility or structure using identical materials to match existing at no expense to the Owner.

C. Irrigation System: Do not begin planting until the irrigation system is completely installed, is adjusted for full coverage and is completely operational.

**1.3 PERMITS**

A. Blue Stake/ Dig Line: When digging is required, "Blue Stake" or "Dig Line" the work site and identify the approximate location of all known underground utilities or structures.

**1.4 PLANT DELIVERY, QUALITY, AND AVAILABILITY**

A. Unauthorized substitutions will not be accepted. If proof is submitted that specific plants or plant sizes are unavailable, written substitution requests will be considered for the nearest equivalent plant or size. All substitution requests must be made in writing and preferably before the bid due date.

**1.5 FINAL INSPECTION**

A. All plants will be inspected at the time of Final Inspection prior to receiving a Landscape Substantial Completion for conformance to specified planting

procedures, and for general appearance and vitality. Any plant not approved by the Project Representative will be rejected and replaced immediately.

**1.6 LANDSCAPE SUBSTANTIAL COMPLETION**

A. A Substantial Completion Certificate will only be issued by the Project Representative for "landscape and irrigation" in their entirety. Substantial Completion will not be proportioned to be designated areas of a project.

**1.7 MAINTENANCE**

A. Plant Material: The Contractor is responsible to maintain all planted materials in a healthy and growing condition for 30 days after receiving a Landscape Substantial Completion at which time the Guarantee period commences. This maintenance is to include mowing, weeding, cultivating, fertilizing, monitoring water schedules, controlling insects and diseases, re-guying and staking, and all other operations of care necessary for the promotion of root growth and plant life so that all plants are in a condition satisfactory at the end of the guarantee period. The Contractor shall be held responsible for failure to monitor watering operations and shall replace any and all plant material that is lost due to improper application of water.

**1.8 GUARANTEE**

A. Guarantee: A guarantee period of one year shall begin from end of maintenance period and final acceptance for trees, shrubs, and ground covers. All plants shall grow and be healthy for the guarantee period and trees shall live and grow in acceptable upright position. Any plant not alive, in poor health, or in poor condition at the end of the guarantee period will be replaced immediately. Any plant will only need to be replaced once during the guarantee period. Contractor to provide documentation showing where each plant to be replaced is located. Any outside factors, such as vandalism or lack of maintenance on the part of the Owner, shall not be part of the guarantee

**PART II - PRODUCTS**

**2.1 LANDSCAPE MATERIALS**

A. Tree Staking: All trees shall be staked for one year warranty period. All trees not plumb shall be replaced. Staked trees shall use vinyl tree ties and tree stakes two (2) inch by two (2) by eight (8) foot common pine stakes used as shown on the details.

B. Tree Wrap: Tree wrap is not to be used.

C. Mulch: See Plans. All planter beds to receive a minimum 4" layer for trees, shrubs, and perennials and 1" for groundcovers.

D. Weed Barrier: DeWitt 5 oz. weed barrier fabric. Manufactured by DeWitt Company, dewittcompany.com or approved equal.

E. Tree, Shrub, and Grass Backfill Mixture: Backfill mixture to be 50% native soil and 50% topsoil, thoroughly mixed together prior to placement.

F. Topsoil: Required for turf areas, planter beds and Backfill Mixture. Acceptable topsoil shall meet the following standards:

- PH: 5.5-7.5
- EC (electrical conductivity): < 2.0 mmhos per centimeter
- SAR (sodium absorption ration): < 3.0
- % OM (percent organic matter): >1%
- Texture (particle size per USDA soil classification): Sand <70%; Clay < 30%; Silt < 70%, Stone fragments (gravel or any soil particle greater than two (2) mm in size) < 5% by volume.

G. Turf Sod: All sod shall be 18 month old as specified on plans (or approved equal) that has been cut fresh the morning of installation. Only sod that has been grown on a commercial sod farm shall be used. Only use sod from a single source.

H. Landscape Edging: Headers and Edging six (6) inches by four (4) inches extruded concrete curb made up of the following materials:

- Washed mortar sand free of organic material.
- Portland Cement (see concrete spec. below for type)
- Reinforced fiber - Specifically produced for compatibility with aggressive alkaline environment of Portland cement-based composites.
- Only potable water for mixing.

**3.2 PLANTING OPERATIONS**

A. Review the exact locations of all trees and shrubs with the Project Representative for approval prior to the digging of any holes. Prepare all holes according to the details on the drawings.

B. Water plants immediately upon arrival at the site. Maintain in moist condition until planted.

C. Before planting, locate all underground utilities prior to digging. Do not place plants on or near utility lines.

D. The tree planting hole should be the same depth as the root ball, and three times the diameter of the root ball.

E. Trees must be placed on undisturbed soil at the bottom of the planting hole.

F. The tree hole depth shall be determined so that the tree may be set slightly high of finish grade, 1" to 2" above the base of the trunk flare, using the top of the root ball as a guide.

G. Plant immediately after removal of container for container plants.

H. Set tree on soil and remove all burlap, wire baskets, twine, wrappings, etc. before beginning and backfilling operations. Do not use planting stock if the ball is cracked or broken before or during planting operation.

I. Apply vitamin B-1 root stimulator at the rate of one (1) tablespoon per gallon.

J. Upon completion of backfilling operation, thoroughly water tree to completely settle the soil and fill any voids that may have occurred. Use a watering hose, not the area irrigation system. If additional prepared topsoil mixture needs to be added. It should be a coarser mix as required to establish finish grade as indicated on the drawings.

K. The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches. All cuts, scars, and bruises shall be properly treated according to the direction of the Project Representative. Proper pruning techniques shall be used. Do not leave stubs and do not cut the leader branch. Improper pruning shall be cause for rejection of the plant material.

L. Prepare a watering circle of 2' diameter around the trunk. For conifers, extend the watering well to the drip line of the tree canopy. Place mulch around the planted trees.

**3.4 TURF - SOD LAYING**

A. Top Soil Amendments: Prior to laying sod, commercial fertilizer shall be applied and incorporated into the upper four (4) inches of the topsoil at a rate of four pounds of nitrogen per one thousand (1,000) square feet. Adjust fertilization mixture and rate of application as needed to meet recommendations given by topsoil analysis. Include other amendments as required.

B. Fertilization: Three weeks after sod placement fertilize the turf at a rate of ½ pound of nitrogen per 1000 square feet. Use fertilizer specified above. Adjust fertilization mixture and rates to meet recommendations given by topsoil analysis.

C. Sod Availability and Condition: The Contractor shall satisfy himself as to the existing conditions prior to any construction. The Contractor shall be fully responsible for furnishing and lay all sod required on the plans. He shall furnish new sod as specified above and lay it so as to completely satisfy the intent and meaning of the plans and specification at no extra cost to the owner. In the case of plans and specification at no extra cost to the owner. In the case of any discrepancy in the amount of sod to be removed or amount to be used, it shall be the Contractor's responsibility to report such to the Project Representative prior to commencing the work.

D. Sod Laying: The surface upon which the new sod to be laid will be prepared as specified above. Areas where sod is to be laid shall be cut trimmed, or shaped to receive full width sod (minimum twelve (12) inches). No partial strip or pieces will be accepted.

E. Sod shall be tamped lightly as each piece is set to insure that good contact is made between edges and also the ground. Sod laid on any sloped areas shall be anchored with wooden dowels or other materials which are accepted by the grass sod industry.

F. Apply water directly after laying sod. Rainfall is not acceptable.

G. Watering of the sod shall be the complete responsibility of the Contractor by whatever means necessary to establish the sod in an acceptable manner to the end of the Maintenance period. If an irrigation system is in place on the site, but for whatever reason, water is not available in the system. It is the responsibility of the Contractor to water the sod by whatever means, until the sod is accepted by the Project Representative.

H. Protection of the newly laid sod shall be the complete responsibility of the Contractor. The Contractor shall provide acceptable visual barriers, to include barricades set appropriate distances with strings or tapes between barriers, as an indication of new work. The Contractor is to restore any damaged areas caused by others (including vehicular traffic), erosion, etc. until such time as the lawn is accepted by the Owner.

I. All sod that has not been laid within 24 hours shall be deemed unacceptable and will be removed from the site.

**3.5 WEED BARRIER**

A. Cut a slit or x at each plant location no larger than necessary to install plant.

B. Overlap rows of fabric min. 6"

C. Stable fabric edges and overlaps to ground.

END OF SECTION

**GRADING AND DRAINAGE REQUIREMENTS**

- ALL GRADING IS TO SLOPE AWAY FROM THE STRUCTURE PER CODE.
- FINISHED GRADE IS NOT PERMITTED BY CODE TO DRAIN ON NEIGHBORING PROPERTIES
- 6" MIN. FOUNDATION LEFT EXPOSED AT ALL CONDITIONS
- LANDSCAPER TO MAINTAIN OR IMPROVE EXISTING FINAL GRADE AND PROPER DRAINAGE ESTABLISHED BY THE EXCAVATOR'S FINAL GRADE ACTIVITIES INCLUDING ANY MAINTENANCE, PRESERVATION, OR AGGRAVATION OF SLOPES, BERMS, AND SWALES.
- IF ANY SWALE, BERM, OR GRADE HAS BEEN DAMAGED OR IS INCORRECT TO ENSURE CORRECT WATER FLOW THE TRADE CONTRACTOR IS RESPONSIBLE TO FIX STATED ISSUE.
- ROOF RUN-OFF DEVICES SHOULD BE INSTALLED TO COLLECT AND DISCHARGE ALL ROOF RUNOFF A MINIMUM OF 10 FEET FROM FOUNDATION ELEMENTS OR BEYOND THE LIMITS OF BACKFILL AROUND THE FOUNDATION WALLS; WHICHEVER DISTANCE IS GREATER.
- THE GROUND SURFACE WITHIN 10 FEET OF THE FOUNDATIONS SHOULD BE SLOPED TO DRAIN AWAY FROM THE STRUCTURE WITH A MINIMUM FALL OF 6 INCHES.

**LANDSCAPING REQUIREMENTS**

- ALL LANDSCAPING IS TO BE INSTALLED PER ALL GOVERNING JURISDICTIONS I.E. INTERNATIONAL BUILDING CODE, CITY CODES.
- NON-COMPLIANCE TO ALL GOVERNING JURISDICTION REQUIREMENTS AND REGULATION ARE THE RESPONSIBILITY OF THE LANDSCAPING INSTALLER.
- ALL PLANTED LANDSCAPING IS TO BE INSTALLED ACCORDING TO THE NURSERY CARE AND INSTALLATION INSTRUCTIONS WHERE PURCHASED AND BASED ON INDIVIDUAL SOIL CONDITIONS AND SITE CONDITIONS.

**LANDSCAPE NOTES**

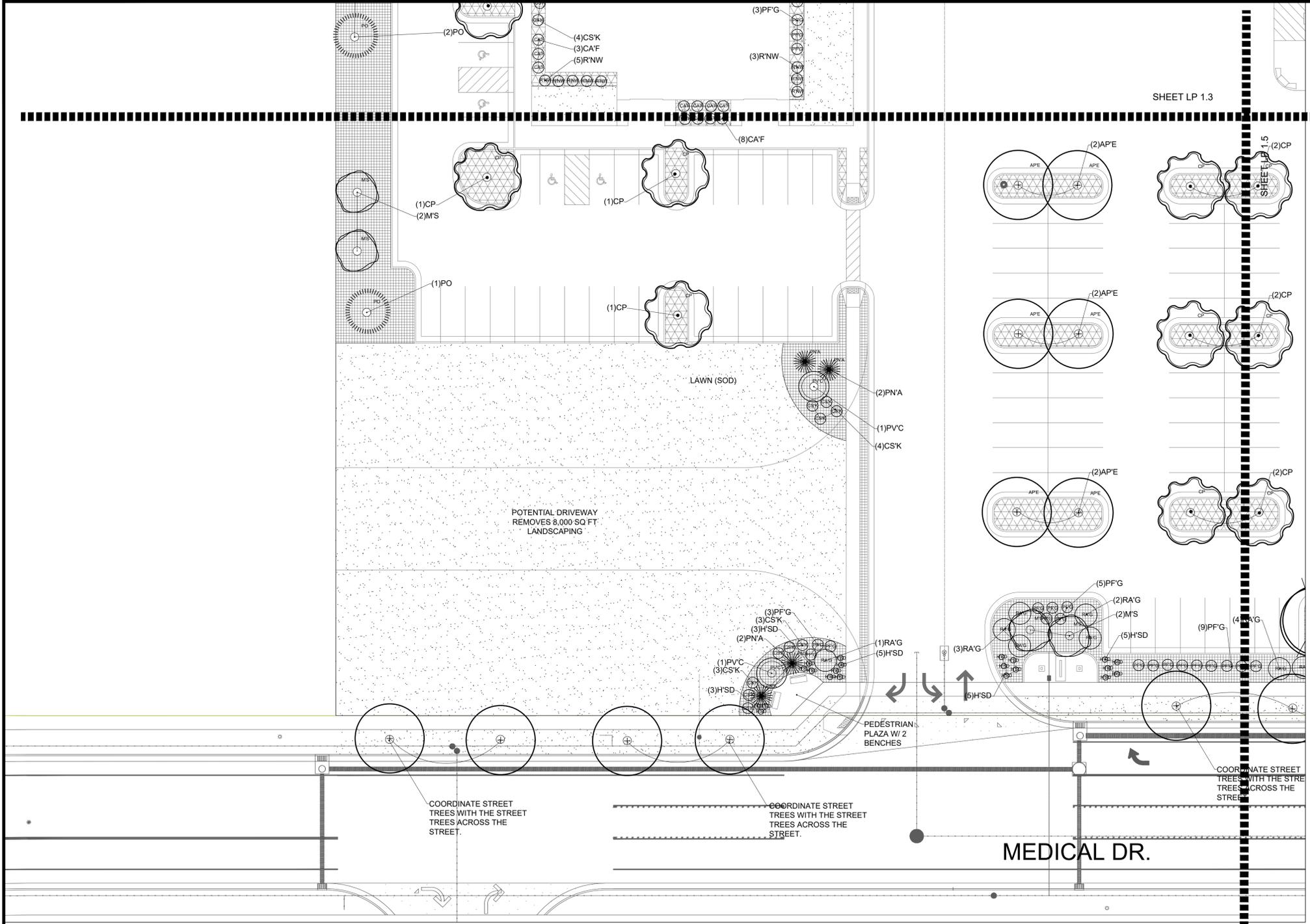
- LANDSCAPE CONTRACTOR IS RESPONSIBLE FOR VERIFYING QUANTITIES OF ALL MATERIALS FOR BIDDING AND INSTALLATION PURPOSES. IF DISCREPANCIES EXIST, THE PLAN SHALL DICTATE QUANTITIES TO BE USED.
- PLANT MATERIAL TO BE INSTALLED PER PLANT LEGEND. IF SUBSTITUTIONS ARE WANTED, PROPOSED LANDSCAPE CHANGES MUST BE SUBMITTED TO THE LANDSCAPE ARCHITECT FOR APPROVAL PRIOR TO PLANTING.
- NEW LAWN AREAS TO BE SODDED WITH DROUGHT TOLERANT VARIETY. FINE LEVEL ALL AREAS PRIOR TO LAYING SOD.
- SANDY LOAM TOPSOIL TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 6" TOPSOIL (WITH 2" HUMUS MIXED INTO TOPSOIL PRIOR TO SPREADING) IN ALL NEW PLANTER AREAS AND 4" IN ALL NEW LAWN AREAS. PLANTER BEDS TO BE EXCAVATED AS NECESSARY IN ORDER TO ACCOMMODATE NEW TOPSOIL AND/OR PLANTER BED MULCH TO REACH FINISHED GRADE.
- 4"x6" EXTRUDED CONCRETE MOW CURB TO BE INSTALLED BETWEEN ALL LAWN AND PLANTER AREAS PER PLAN. ANY TREES LOCATED IN LAWN MUST HAVE A 4" CONCRETE TREE RING.
- DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS EXCEPT UNDER ANNUAL PLANTING AREAS AS SHOWN ON PLAN.
- ROCK MULCH TO BE IMPLEMENTED AT THE FOLLOWING DEPTHS: 4" IN ALL TREE, SHRUB, AND PERENNIAL PLANTER AREAS; ANNUAL PLANTING AREAS AS SHOWN ON PLAN TO RECEIVE 4" OF SOIL AID MATERIAL. PULL BARK MULCH MIN. 3" AWAY FROM BASE OF ALL PERENNIALS AND SHRUBS AND MIN. 6" AWAY FROM ALL TREES.
- CONTRACTOR TO PROVIDE NEW AUTOMATIC UNDERGROUND IRRIGATION SYSTEM TO BE INSTALLED IN ALL LANDSCAPE AREAS. ALL LAWN AREA TO RECEIVE 100% HEAD TO HEAD COVERAGE WITH SPRAY AND ROTARY SPRINKLER HEADS. ALL PLANTER AREAS NEED TO RECEIVE A FULL DRIP SYSTEM TO EACH TREE AND SHRUB ON PROJECT. SEE IRRIGATION PLAN.

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP																							
06-30-2020	UT19010	<p>BLUE STAKES OF UTAH                      UTILITY NOTIFICATION CENTER, INC.                      1-800-662-4111                      www.bluestakes.org</p>	<h1>DI STOREHOUSE</h1> <h2>SARATOGA SPRINGS, UTAH</h2>	Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	<p>PKJ DESIGN GROUP L.L.C.                      3450 N. TRIUMPH BLVD, SUITE 102                      LEHI, UTAH 84043 (801) 960-2698                      www.pkjdesigngroup.com</p>	<p>                         P.M.: JTA                          DRAWN: KBA                          CHECKED: TM                          PLOT DATE: 7/11/2020                     </p>																							
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7			<p>0' 30' 60' 120' 240'</p> <p>GRAPHIC SCALE: 1" = 60'</p>		<p>LANDSCAPE PLAN</p> <h1>LP-1.0</h1>		
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**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
AP'E	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
PO	PICEA OMORIKA	SERBIAN SPRUCE	8	6"-8" TALL	LOW	
PNA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6"-8" TALL	LOW	
M'S	MALUS X 'SPRING SNOW' CRABAPPLE	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
	STREET TREES MATCHING TREES ACROSS THE STREET		20	2" CAL.	LOW	

**SHRUB LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA	47	5 GAL	LOW	
CS'K	CORNUS SERICEA 'KELSEY'	KELSEY DOGWOOD	31	5 GAL	MODERATE	
R'NW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	29	5 GAL	HIGH	

**GRASSES LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CAF	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL	HIGH	

**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
[Pattern]	LAWN (SOD) AREA	50,591 SQ.FT.	DROUGHT TOLERANT VARIETY SEE NOTE BELOW
[Pattern]	1"-2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ.FT. (172.2 CU.YD.)	LOCATED WHERE SPECIFIED
[Pattern]	1" OQUIRRH GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ.FT. (259 CU.YD.)	LOCATED WHERE SPECIFIED

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GRAPHIC SCALE: 1" = 20'

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Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. E  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**

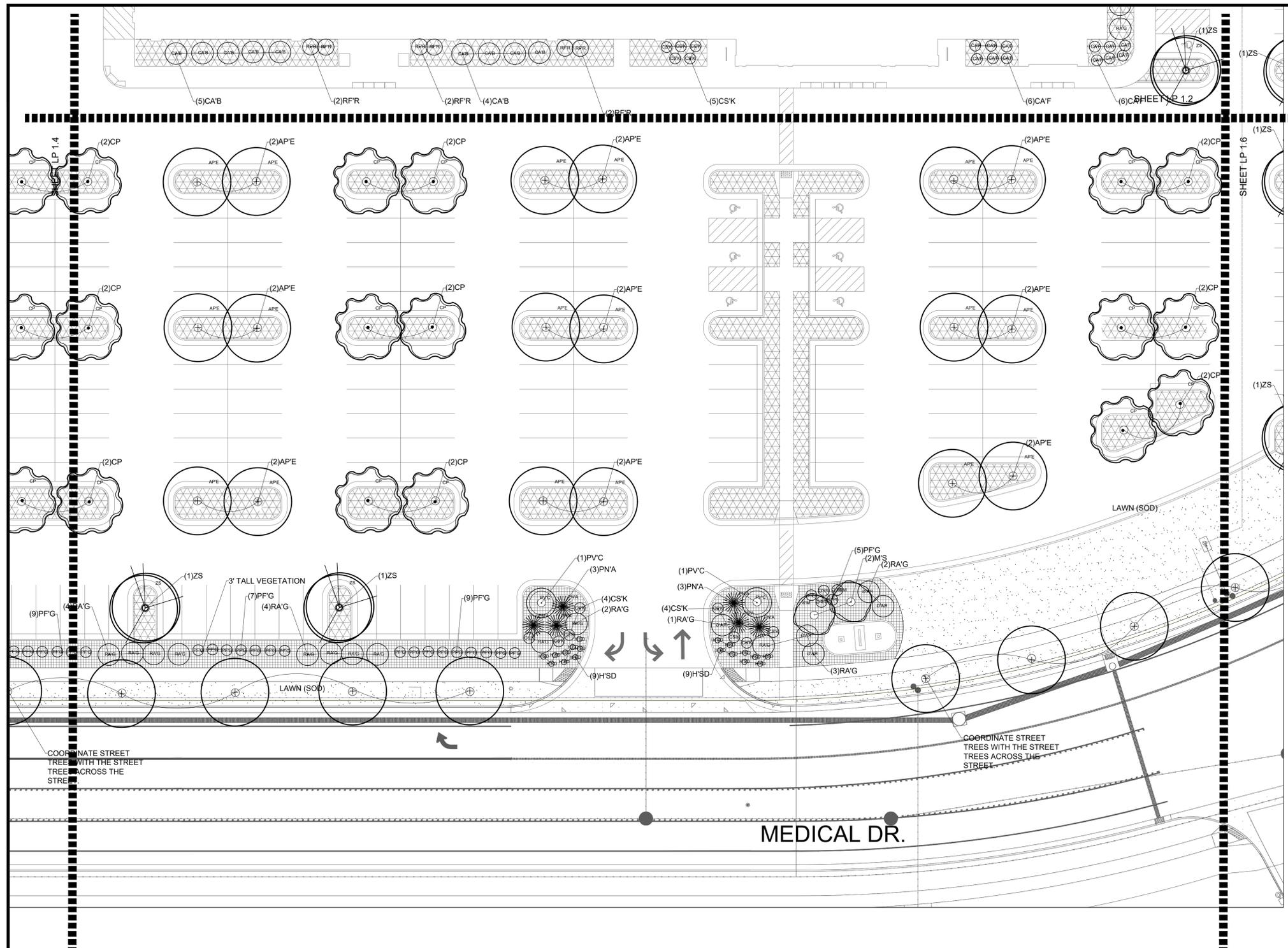
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PLOT DATE: 7/1/2020

**LANDSCAPE PLAN**

**LP-1.4**



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APE	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
CP	CRATAEGUS PHAENOPYRUM	WASHINGTON HAWTHORN	23	2" CAL.	LOW	
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M'S	MALUS X 'SPRING SNOW'	SPRING SNOW CRABAPPLE	9	2" CAL.	LOW	
PVC	PRUNUS VIRGINIANA 'CANADA RED'	CANADA RED CHOKECHERRY	19	2" CAL.	LOW	
ZS	ZELKOVA SERRATA	JAPANESE ZELKOVA	25	2" CAL.	LOW	
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**SHRUB LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'B	BUDDLEIA ALTERNIFOLIA	BUTTERFLY BUSH	15	5 GAL	LOW	
PFG	POTENTILLA FRUITICOSA 'GOLDFINGER'	GOLDFINGER POTENTILLA	47	5 GAL	LOW	
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R'NW	ROSA X 'NEARLY WILD'	NEARLY WILD ROSE	16	5 GAL	HIGH	
RFR	RHAMNUS FRANGULA 'TALL HEDGE'	TALL HEDGE BUCKTHORN	6	5 GAL	HIGH	
RA'G	RHUS AROMATICA 'AUTUMN AMBER'	AUTUMN AMBER SUMAC	29	5 GAL	HIGH	

**GRASSES LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
CA'F	CALAMAGROSTIS A. 'FOERSTER'	FOERSTER FEATHER GRASS	26	2 GAL.	HIGH	

**PERENNIAL LEGEND**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
HSD	HEMEROCALLIS SP. 'STELLA DE ORO'	STELLA DE ORO DAYLILY	42	1 GAL.	MODERATE	

**SITE MATERIALS**

SYMBOL	SITE MATERIAL	QUANTITY	SPECIAL NOTES
[Symbol]	LAWN (SOD) AREA	50,591 SQ. FT.	DROUGHT TOLERANT VARIETY (SEE NOTE BELOW)
[Symbol]	1"-2" OCTOBER SKY GRAVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	18,806 SQ. FT. (172.2 CU YD)	LOCATED WHERE SPECIFIED
[Symbol]	1" OQUIRH GRVEL (DEWITT 5 OZ. WEED BARRIER FABRIC TO BE INSTALLED IN ALL PLANTER AREAS)	27,966 SQ. FT. (259 CU YD)	LOCATED WHERE SPECIFIED

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# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
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3302 N. Main Street  
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**LANDSCAPE ARCHITECT / PLANNER**

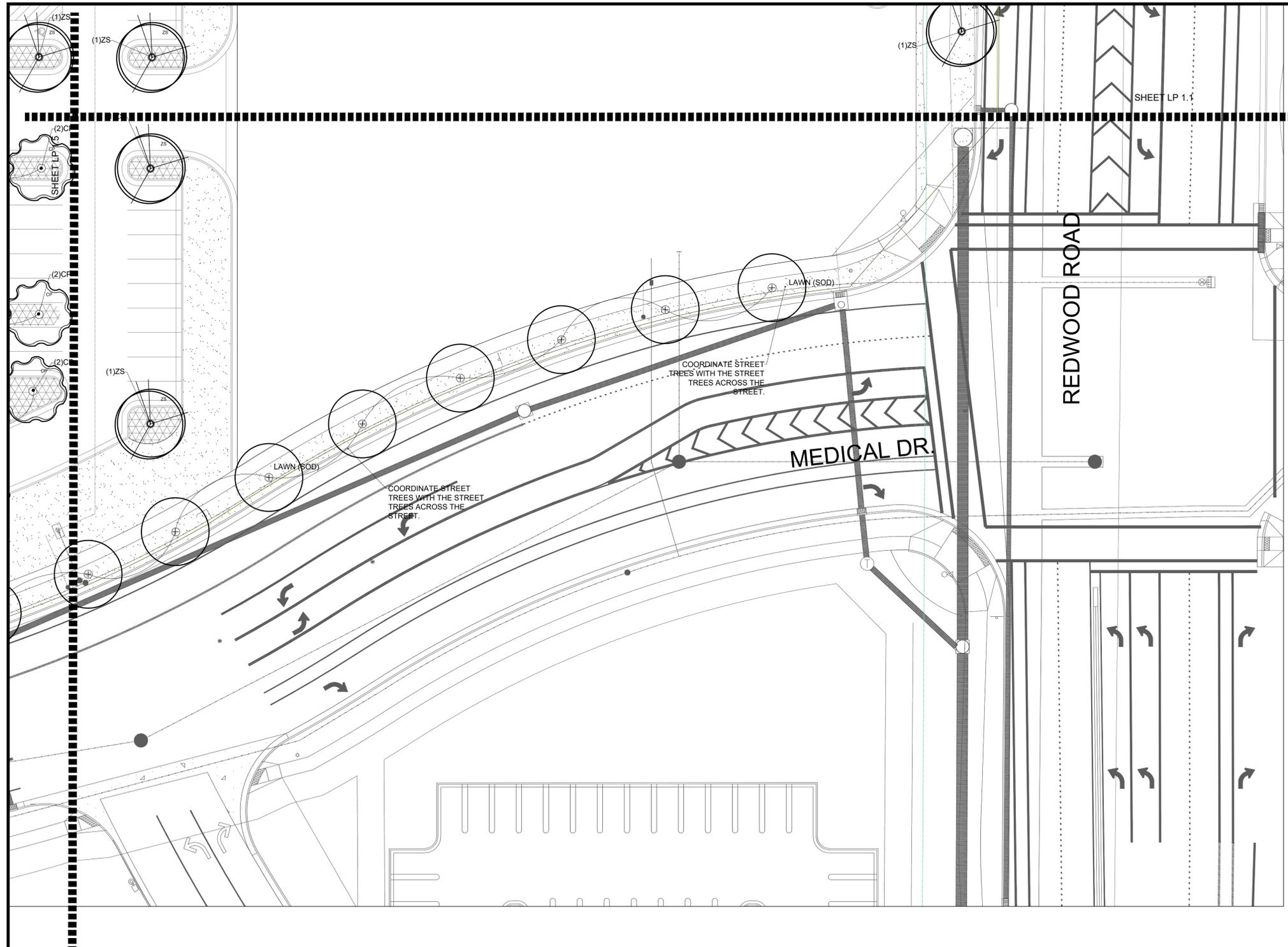
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**LANDSCAPE PLAN**

# LP-1.5



**TREE LEGEND (TOTAL PLANT COUNT)**

SYMBOL	BOTANICAL NAME	COMMON NAME	QTY.	SIZE	HYDROZONE	SPECIAL NOTES
APF	ACER PLATANOIDES 'EMERALD QUEEN'	EMERALD QUEEN MAPLE	24	2" CAL.	MODERATE	
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PWA	PINUS NIGRA 'ARNOLD SENTINEL'	ARNOLD SENTINEL AUSTRIAN BLACK PINE	30	6'-8" TALL	LOW	
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**Client / Engineer:** LEI-ENGINEERING  
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**LANDSCAPE ARCHITECT / PLANNER**

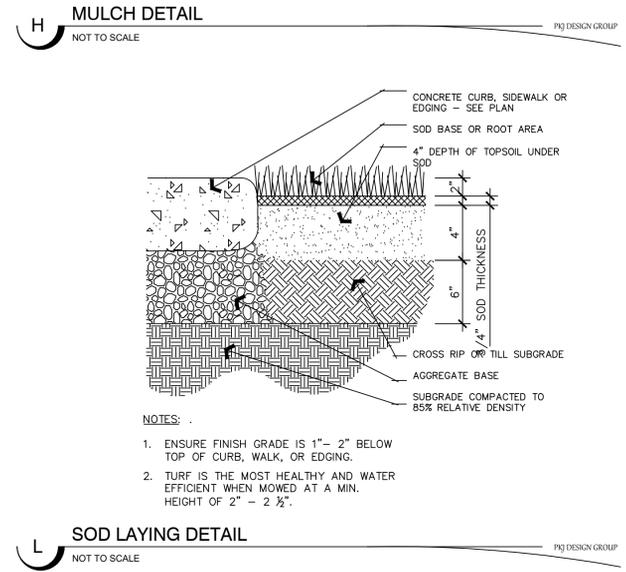
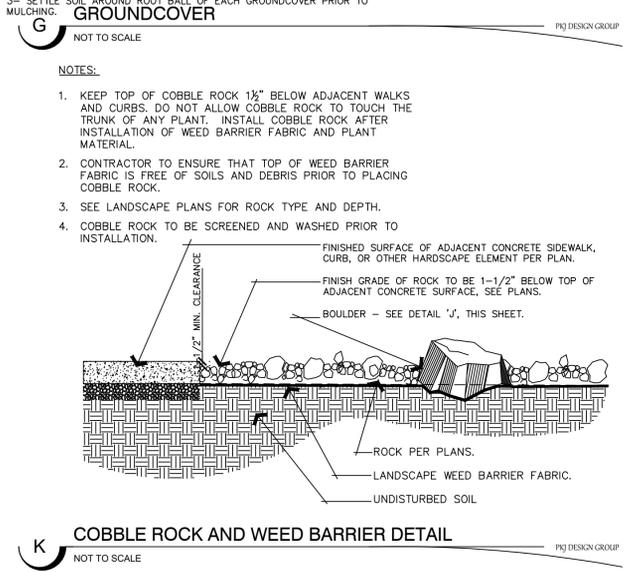
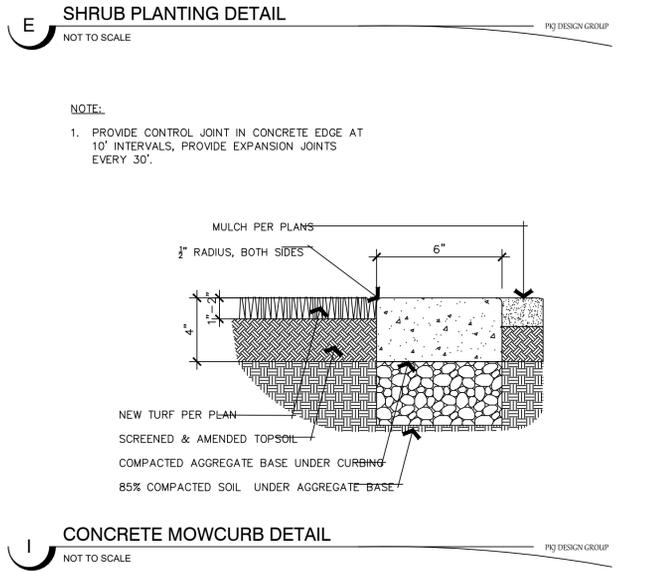
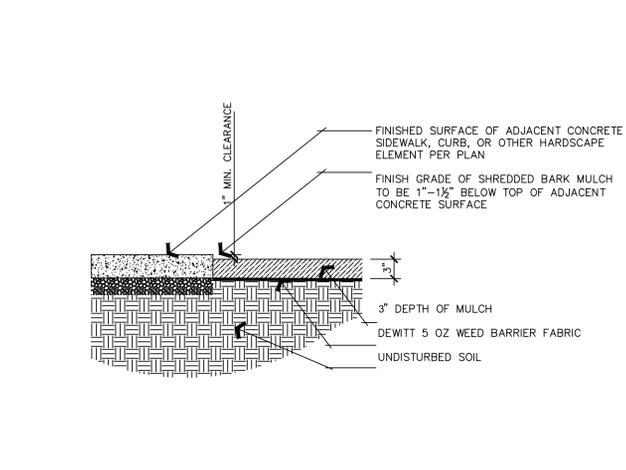
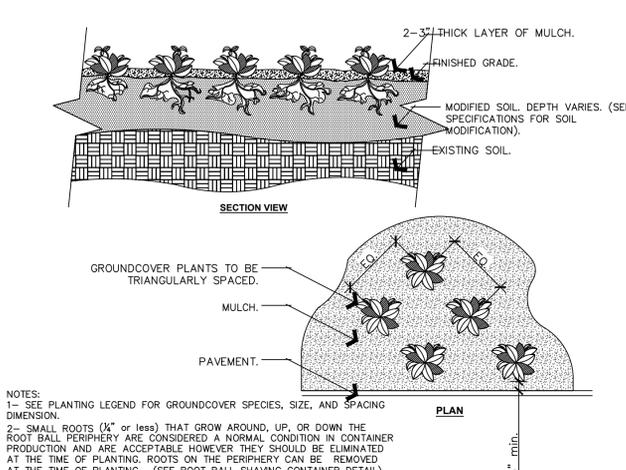
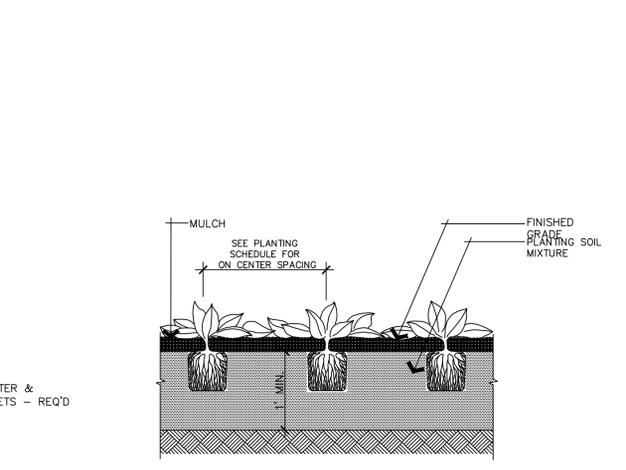
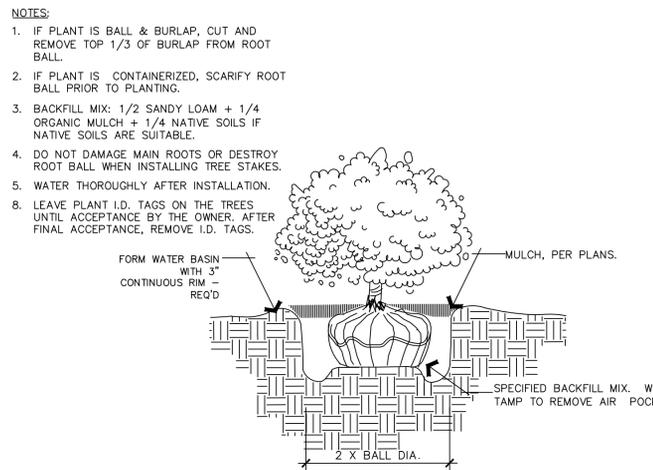
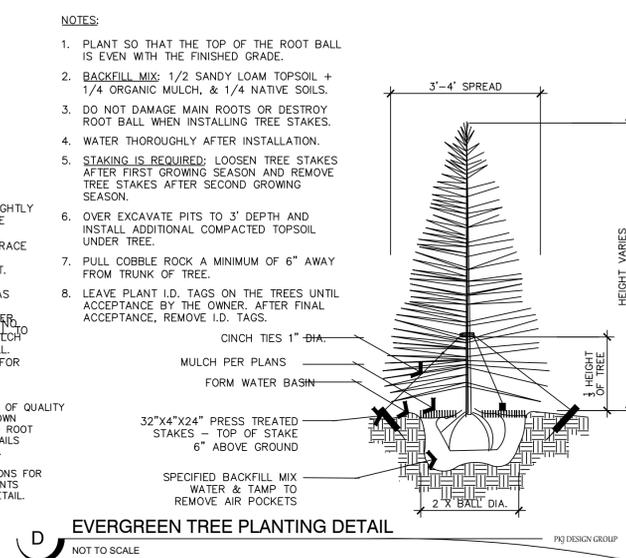
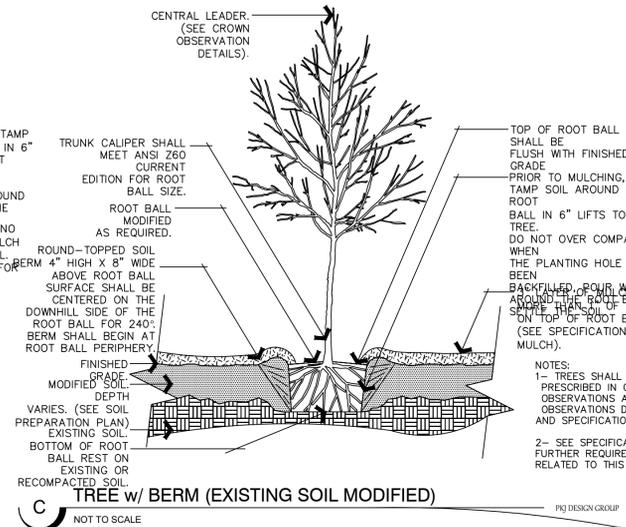
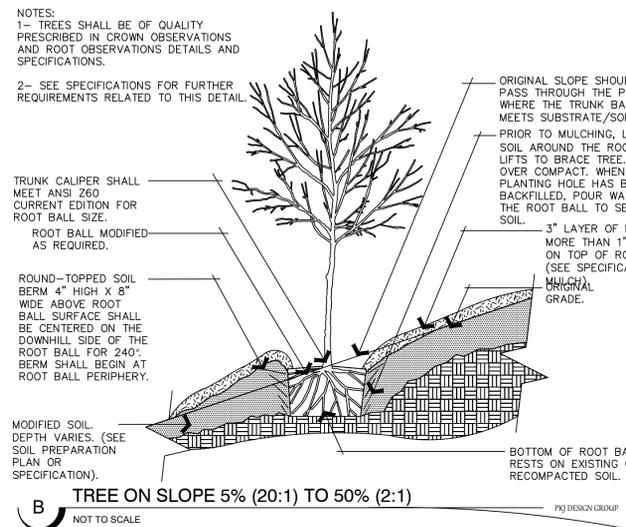
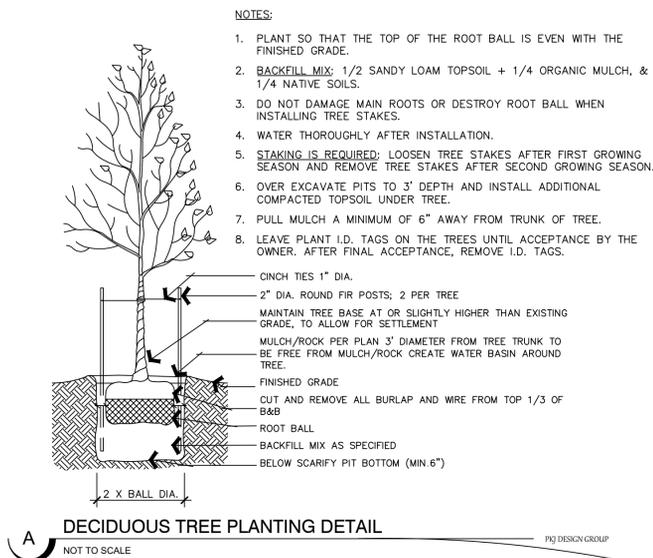
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**LANDSCAPE PLAN**

**LP-1.6**



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP
06-30-2020	UT19010	811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: JRW & ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	<b>PKJ DESIGN GROUP</b> PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com	
NO.	REVISION	DATE		Client / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com		
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PLOT DATE: 7/1/2020

**LANDSCAPE PLAN**

**LP-2.5**

# DI / BISHOP'S STOREHOUSE

## SARATOGA SPRINGS, UTAH

### IRRIGATION SPECIFICATIONS

#### IRRIGATION SPECIFICATIONS

##### PART 1 - GENERAL

###### 1.1 SUMMARY

Work to be done includes all labor, materials, equipment and services required to complete the Project irrigation system as indicated on the Construction Drawings, and as specified herein. Includes but is not limited to: Furnishing and installing underground and above ground sprinkler system complete with any accessories necessary for proper function and operation of the system. All plant material on the Project shall be irrigated. Removal and disposal of any existing sprinkler system components are not to be saved, which are disturbed during the construction process. Restoration of any altered or damaged existing landscape to original state and condition.

###### 1.2 SYSTEM DESCRIPTION

A. Design of irrigation components: Locations of irrigation components on Construction Drawings may be approximate. Piping, sleeving and/or other components shown on Construction Drawings may be shown schematically for graphic clarity and demonstration of component groupings and separations. All irrigation components shall be placed in landscaped areas, with the exception of pipe and wire in sleeving under hardscapes. Actual routing of pipe, wire or other components may be altered due to site conditions not accounted for in the design process.

B. Construction requirements: Actual placement may vary as required to achieve a minimum of 100% coverage without overspray onto hardscape, buildings or other features.

C. Layout of Irrigation Components: During layout and staking, consult with Owner Approved Representative (hereafter referred to as OAR) to verify proper placement of irrigation components and to provide Contractor recommendations for changes, where revisions may be advisable. Small or minor adjustments to system layout are permissible to avoid existing field obstructions such as utility boxes or street light poles. Contractor shall place remote control valves in groups as practical to economize on quantity of manifold isolation valves. Quick coupler valves shall be placed with manifold groups and protected by manifold isolation valves. Quick coupler valves are shown on Construction Documents in approximate locations.

###### 1.3 DEFINITIONS

A. Water Supply: Secondary water piping and components, furnished and installed by others to provide irrigation water to this Project, including but not limited to: fire hydrants, nipples, spools, shut off valves, corporation stop valves, water meters, pressure regulation valves, and piping upstream of (or prior to) the Point of Connection.

B. Point of Connection: Location where the Contractor shall tie into the water supply. May require backflow preventor, saddle, nipples, spools, isolation valves or Stop and Waste valve for landscape irrigation needs and use.

C. Main Line Piping: Pressurized piping downstream of the Point of Connection to provide water to remote control valves and quick couplers. Normally under constant pressure.

D. Lateral Line Piping: Circuit piping downstream of remote control valves to provide water to sprinkler heads, sprinkler heads, drip systems or bubblers.

###### 1.4 REFERENCES

A. The following standards will apply to the work of this Section:

- a. ASTM-American Society for Testing and Materials
- b. IA - The Irrigation Association: Main BMP Document, Landscape Irrigation Scheduling and Water Management Document.

###### 1.5 SUBMITTALS

A. At least thirty (30) days prior to ordering of any materials, the Contractor shall provide manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system. Submittals shall be in three ring binders or other similar bound form. Provide five copies of submittals to OAR for distribution. Place cover or index sheet indicating order in submittal document. No material shall be ordered, delivered or any work preceded in the field until the required submittals have been reviewed in its entirety and stamped approved. Delivered material shall match the approved samples.

B. Operation and Maintenance Manual:

- a. At least thirty (30) days prior to final inspection, the Contractor shall provide Operation and Maintenance manual to OAR, containing:
  - i. Manufacturer catalog cut sheet and current printed specifications for each element or component of the irrigation system.
  - ii. Parts list for each operating element of the system
  - iii. Manufacturer printed literature on operation and maintenance of operating elements of the system.
- iv. Section listing instructions for overall system operation and maintenance. Include directions for Spring Start-up and Winterization.
- v. Project Record Copy
  - i. Maintain at project site one copy of all project documents clearly marked "Project Record Copy". Mark any deviation in material installation on Construction drawings. Maintain and update drawing at least weekly. Project Record Copy to be available to OAR on demand.
  - ii. Completed Project As-Built Drawings

1. Prior to final inspection, prepare and submit to OAR accurate as-built drawings
2. Show detail and dimension changes made during installation. Show significant details and dimensions that were not shown in original Contract Documents.
3. Field dimension locations of sleeving, points of connection, main line piping, wiring runs not contained in main line pipe trenches, valves and valve boxes, quick coupler valves.
4. Dimensions are to be taken from permanent constructed surfaces, features, or finished edges located at or above finished grade.
5. Contoller Map: upon completion of system, place in each controller a color coded copy of the area that controller services; indicating zone number, type of plant material and location on project that zone services. Laminate map with heat shrink clear plastic.

###### 1.6 QUALITY ASSURANCE

A. Acceptance: Do not install work of this section prior to acceptance by OAR of area to receive such work.

B. Regulatory Requirements: All work and materials shall be according to any and all rules, regulations or codes, whether they are State or Local laws and ordinances. Contract documents, drawings or specifications may not be construed or interpreted to permit work or materials not conforming to the above codes.

C. Adequate Water Supply: Water supply to this Project exists, installed by others. Connections to these supply lines shall be by this Contractor. Verify that proper connection is available to supply line and is of adequate size. Verify that secondary connection components may be installed if necessary. Perform static pressure test prior to commencement of work. Notify OAR in writing of problems encountered prior to proceeding.

D. Workmanship and Materials:

- a. It is the intent of this specification that all material herein specified and shown on the construction documents shall be of the highest quality available and meeting the requirements specified.
- b. All work shall be performed in accordance with the best standards of practice relating to the trade.

E. Contractor Qualifications:

- a. Contractor shall provide document or resume including at least the following items:
  - i. That Contractor has been installing sprinklers on commercial projects for five previous consecutive years.
  - ii. Contractor is licensed to perform Landscape and Irrigation construction in the State of this Project.
  - iii. Contractor is bondable for the work to be performed.
- iv. References of five projects of similar size and scope completed within the last five years. Three of the projects listed shall be local.
- v. Listing of suppliers where materials will be obtained for use on this Project.
- vi. Project site Foreman or Supervisor has at least five consecutive years of commercial irrigation installation experience. This person shall be a current Certified Irrigation Contractor in good standing as set forth by the

Irrigation Association. This person shall be on Project site at least 75% of each working day.

- vii. Evidence that Contractor currently employs workers in sufficient quantities to complete Project within time limits that are established by the Contract.
- viii. All General laborers or workers on the Project shall be previously trained and familiar with sprinkler installation and have a minimum of one-year experience. Those workers performing tasks related to PVC pipe shall have certificates designated below.

###### 1.7 DELIVERY-STORAGE-HANDLING

A. During delivery, installation and storage of materials for Project, all materials shall be protected from contamination, damage, vandalism, and prolonged exposure to sunlight. All material stored at Project site shall be neatly organized in a compact arrangement and storage shall not disrupt Project Owner or other trades on Project site. All material to be installed shall be handled by Contractor with care to avoid breakage or damage. Damaged materials attributed to Contractor shall be replaced with new at Contractor's expense.

###### 1.8 SEQUENCING

A. Perform site survey, research utility records, contact utility location services. The Contractor shall familiarize himself with all hazards and utilities prior to work commencement. Install sleeving prior to installation of concrete, paving or other permanent site elements. Irrigation system Point of Connection components, backflow prevention and pressure regulation devices shall be installed and operational prior to all downstream components. All main lines shall be thoroughly flushed of all debris prior to installation of any sprinkler heads.

###### 1.9 WARRANTY

A. Contractor shall provide one year Warranty. Warranty shall cover all materials, workmanship and labor. Warranty shall include filling and/or repairing depressions or replacing turf or other plantings due to settlement of irrigation trenches or irrigation system elements. Valve boxes, sprinklers or other components settles from original finish grade shall be restored to proper grade. Irrigation system shall have been adjusted to provide proper, adequate coverage of irrigated areas.

###### 1.10 OWNER'S INSTRUCTION

A. After system is installed, inspected, and approved, instruct Owner's Representatives in complete operation and maintenance procedures. Coordinate instruction with references to previously submitted Operation and Maintenance Manual.

###### 1.11 MAINTENANCE

A. Furnish the following items to Owner's Representative:

- a. Two quick coupler keys with hose swivels.
- b. One of each type or size of quick coupler valve and remote control valve. Five percent of total quantities used of each sprinkler and sprinkler nozzle.

B. Provide the following services:

- a. Winterize entire irrigation system installed under this contract. Winterize by 'blow-out' method using compressed air. Compressor shall be capable of minimum of 175 CFM. This operation shall occur at the end of first growing season after need for plant irrigation but prior to freezing. Compressor shall be capable of evacuation system of low water pressure regulation device. Compressor shall be regulated to not more than 60 PSI. Start up system the following spring after danger of freezing has passed. Contractor shall train Owner's Representative in proper start-up and winterization procedure.

##### PART 2 - PRODUCTS

###### 2.1 GENERAL NOTES

A. Contractor shall provide materials to be used on this Project. Contractor shall not remove any material purchased for this Project from the Project Site, nor mix Project materials with other Contractor owned materials. Owner retains right to purchase and provide project material.

###### 2.2 POINT OF CONNECTION

A. The Contractor shall connect onto existing irrigation or water main line as needed for Point(s) of Connection. Contractor shall install new main line as indicated.

###### 2.3 CONNECTION ASSEMBLY

A. Secondary water shall be used on this Project. Install filter and RPZ as needed.

###### 2.4 CONTROL SYSTEM

A. Power supply to the irrigation controller shall be provided for by this Contract.

B. Controller shall be as specified in the drawings. Controller shall be surge protected.

- a. Installation of wall-mount controllers: Irrigation controller shall be responsible for this task. Power configuration for wall-mount controllers shall be 120 VAC unless otherwise noted.
- b. Locate Controller(s) in general location shown on Construction drawings. Coordinate power supply and breaker allocation with electrical contractor. Contractor shall be responsible for all power connections to Controllers, whether they are wall mount or pedestal mount. Contractor shall coordinate with electrical or other Project trades as needed to facilitate installation of power to controllers.

C. Wires connecting the remote control valves to the irrigation controller are single conductors, type PE. Wire construction shall incorporate a solid copper conductor and polyethylene (PE) insulation with a minimum thickness of 0.045 inches. The wires shall be UL listed for direct burial in irrigation systems and be rated at a minimum of 30 VAC. Paige Electric Co., LP specification number P7079D.

- a. A minimum of 24" of additional wire shall be left at each valve, each splice box and at each controller.
- b. Common wire shall be white in color, 12 gauge. Control wire shall be red in color, 14 gauge. Spare wire shall be looped within each valve box of the grouping it is to service.

D. RCV wire splicing connectors shall be 3M brand DBY or DBR. Wire splicing between controller and valves shall be avoided if at all possible. Any wire splices shall be contained within a valve box. Splices within a valve box that contains no control valves shall be stamped "WIRE SPLICE" or "WS" on box lid.

###### 2.5 SLEEVING

A. Contractor shall be responsible to protect existing underground utilities and components. Sleeving minimum size shall be 2". Sleeving 2" through 4" in size shall be S/40 PVC solvent weld. Sleeving 6" and larger shall be CL 200 PVC gasketed. Sleeve diameter shall be at least two times the diameter of the pipe within the sleeve. Sleeves shall be extended 6" minimum beyond burr or edge of pavement. Wire or cable shall not be installed in the same sleeve as piping, but shall be installed in separate sleeves. Sleeve ends on sleeve sizes 4" and larger shall be capped with integral corresponding sized PVC slip cap, pressure fit, until used, to prevent contamination. Sleeves shall be installed at appropriate depths for main line pipe or lateral pipe.

###### 2.6 MAIN LINE PIPE

A. All main line pipe 4" and larger shall be Class 200 gasketed bell end. All main line pipe 3" in size and smaller shall be Schedule 40 PVC solvent weld bell end.

- a. Maximum flows allowed through main line pipe shall be:
  - 3/4" 8 GPM
  - 1" 12 GPM
  - 1-1/2" 30 GPM
  - 2" 53 GPM
  - 2-1/2" 75 GPM
  - 3" 110 GPM
  - 4" 180 GPM
- b. Main line pipe shall be buried with 24" cover

###### 2.7 MAIN LINE FITTINGS

A. All main line fittings 3" and larger shall be gasketed ductile iron material. All ductile iron fittings having change of direction shall have proper concrete thrust block installed. All main line fittings smaller than 3" in size shall be Schedule 80 PVC.

###### 2.8 ISOLATION VALVES

A. Isolation valves 3" and larger shall be Waterous brand model 2500 cast iron gate valve, resilient wedge, push on type, with 2" square operating nut. Place sleeve of 6" or larger pipe over top of valve vertically and then extend to grade. Place 10" round valve box over sleeve at grade.

B. Isolation valves 2-1/2" and smaller shall be Apollo brand 70 series brass ball valves, contained in a Carson Standard size valve box. Valves shall be installed with S/80 PVC TOE Nipples on both sides of the valve. Valve shall be placed so that the handle is vertical toward the top of the valve box in the 'off' position.

###### 2.9 MANIFOLDS

A. Action Manifold fittings shall be used to create unions on both sides of each control valve, allowing the valve to be removed from the box without cutting piping. Valves shall be located in boxes with ample space surrounding them to allow access for maintenance and repair. Where practical, group remote control valves in close proximity, and protect each grouping with a manifold isolation valve as shown in details. Manifold Main Line (or Sub-Main Line) and all manifold components and isolation valves shall be at least as large as the largest diameter lateral served by the respective manifold.

###### 2.10 REMOTE CONTROL VALVES

A. Remote control valves shall be as specified on the drawings. Remote control valves shall be located separately and individually in separate control boxes.

###### 2.11 MANUAL CONTROL VALVES

A. Quick coupler valve shall be attached to the manifold sub-main line using a Lasco G175212 swing joint assembly with snap-lock outlet and brass stabilizer elbow. Quick coupler valve shall be placed within a Carson 10" round valve box. Top of quick coupler valve cover shall allow for complete installation of valve box lid, but also allow for insertion and operation of key. Base of quick coupler valve and top of quick coupler swing joint shall be encased in 3/4" gravel. Contractor shall not place quick coupler valves further than 200 feet apart, to allow for spot watering or supplemental irrigation of new plant material. Quick coupler valve at POC shall not be eliminated or relocated.

###### 2.12 LATERAL LINE PIPE

A. All lateral piping shall be Schedule 40 PVC, solvent weld, and bell end. Lateral pipe shall be buried with 12-18" of cover typically. Lateral pipe shall be 3/4", 1", 1 1/4", 1 1/2" or 2" in size as indicated on Construction Drawings.

###### 2.13 LATERAL LINE FITTINGS

A. All lateral line fittings shall be S/40 PVC

###### 2.14 Spray Sprinklers

A. Spray head sprinklers shall be as specified on the drawings. Nozzles shall be as specified on the drawings.

###### 2.15 VALVE BOXES

A. Carson valve boxes shall be used on this project. Sizes are as directed in these Specifications, detail sheets or plan sheets. Valve boxes shall be centered over the control valve or element they cover. Valve box shall be sized large enough to allow ample room for services access, removal or replacement of valve or element. Valve box shall be set to flush to finish grade of topsoil or parked areas. Contractor shall provide extensions or stack additional valve boxes as necessary to bring valve box pit to above grade.

###### 2.16 IMPORT BACKFILL

A. All main line pipe, lateral line pipe and other irrigation elements shall be bedded and backfilled with clean soil, free of rocks 1" and larger. Contractor shall furnish and install additional backfill material as necessary due to rocky conditions. Trenches and other elements shall be compacted and/or water settled to eliminate settling. Debris from trenching operations unusable for fill shall be removed from project and disposed of properly by Contractor.

###### 2.17 OTHER PRODUCTS

A. Substitution of equivalent products is subject to the OAR's approval and must be designated as accepted in writing.

- a. The Contractor shall provide materials to make the system complete and operational.

##### PART 3 - EXECUTION

###### 3

###### 3.1 PREPARATION

A. Contractor shall repair or replace work damaged by irrigation system installation. If damaged work is new, replacement or the original installer of that work shall perform repairs. The existing landscape of this Project shall remain in place. Contractor shall protect and work around existing plant material. Coordination of trench and valve locations shall be laid out the OAR prior to any excavation occurring. Plant material deemed damaged by the OAR shall be replaced with new plant material at Contractor's expense. Contractor shall not cut existing tree roots larger than 2" to install this Project. Route pipe, wire and irrigation elements around tree canopy drip line to minimize damage to tree roots. Contractor shall have no part of existing system used by other portions of site landscape without water for without water for more than 24 hours at a time.

###### 3.2 TRENCHING AND BACKFILLING

A. Pulling of pipe shall not be permitted on this project. Over excavate trenches both in width and depth. Ensure base of trench is rock or debris free to protect pipe and wire. Grade trench base to ensure flat, even support of piping. Backfill with clean soil or import material. Contractor shall backfill no less than 2" around entire pipe with clean, rock free fill. Main line piping and fittings shall not be backfilled until OAR has inspected and pipe has passed pressure testing. Perform balance of backfill operation to eliminate any settling.

###### 3.3 SLEEVING

A. Sleeve all piping and wiring that pass under paving or hardscape features. Wiring shall be placed in separate sleeving from piping. Sleeves shall be positioned relative to structures or obstructions to allow for pipe or wire within to be removed if necessary.

###### 3.4 GRADES AND DRAINAGE

A. Place irrigation pipe and other elements at uniform grades. Winterization shall be by evacuation with compressed air. Automatic drains shall not be installed on this Project. Manual drains shall only be installed at POC where designated on Construction Drawings.

###### 3.5 PVC PIPE

A. Install pipe to allow for expansion and contraction as recommended by pipe manufacturer.

B. Install main line pipes with 18" of cover, lateral line pipes with 12" of cover.

C. Drawings show diagrammatic or conceptual location of piping. Contractor shall install piping to minimize change of direction, avoid placement under large trees or large shrubs, avoid placement under hardscape features.

D. Plastic pipe shall be cut squarely. Burrs shall be removed. Spigot ends of pipes 3" and larger shall be beveled.

E. Pipe shall not be glued unless ambient temperature is at least 50 degrees F. Pipe shall not be glued in rainy conditions unless properly tented. All solvent weld joints shall be assembled using IPS 711 glue and P70 primer according to manufacturer's specification, no exceptions. All workers performing glue operations shall provide evidence of certification. Glued main line pipe shall cure a minimum of 24 hours prior to being energized. Lateral lines shall cure a minimum of 2 hours prior to being energized and shall not remain under constant pressure unless cured for 24 hours.

F. Appropriate thrust blocking shall be performed on fittings 3" and larger. All threaded joints shall be wrapped with Teflon tape or paste unless directed by product manufacturer or sealing by o-ring.

###### 3.6 CONTROLLERS

A. All grounding for pedestal controllers shall be as directed by controller manufacturer and ASIC guidelines, not to exceed a resistance reading of 5 OHMS.

B. Locate controllers in protected, inconspicuous places, when possible. Coordinate location of pedestal controllers with Landscape Architect to minimize visibility.

C. Coordinate location of wall mount controllers with building or electrical Contractor to facilitate electrical service and future maintenance needs. Wall mount shall be securely fastened to surface. If exterior mounted, wall mount controllers shall have electrical service wire and field control wire in separate, appropriate sized weatherproof electrical conduit, PVC pipe shall not be used.

D. Wire under hardscape surfaces shall be placed continuously in conduit. Contractor shall be responsible to coordinate sleeving needs for conduit or sweeps elbows from exterior to interior of building.

E. Pedestal controllers shall be placed upon VIT-Strong Box Quick Pad as per manufacturer's recommendations. Controllers shall be oriented such that Owner's Representative maintenance personnel may access easily and perform field system tests efficiently.

F. Place Standard valve box at base of controller or nearby to allow for three to five feet of slack field control wire to be placed at each controller. This Contractor shall provide conduit access if needed for Electrical Contractor. Electrical supply and installation, as well as hook-up to controller shall be by this Contractor.

###### 3.7 VALVES

A. Isolation valves, remote control valves, and quick coupler valves shall be installed according to manufacturer recommendation and Contract Specifications and Details.

B. Valve boxes shall be set over valves so that all parts of the valve can be reached for service.

C. Valve box and lid shall be set to be flush with finished grade. Only one remote control valve may be installed in a Carson 1419124 box. Place a minimum of 4" of 3/4" washed gravel beneath valve box for drainage. Bottom of remote control valve shall be a minimum of 2" above gravel.

###### 3.8 SPRINKLER HEADS

A. No sprinkler shall be located closer than 6" to walls, fences, or buildings.

B. Heads adjacent to walks, curbs. Or paths shall be located at grade and 2" away from hardscape.

C. Control valves shall be opened and fully flush lateral line pipe and swing joints prior to installation of sprinklers.

D. Spray heads shall be installed and flushed again prior to installation of nozzles.

E. Contractor shall be responsible for adjustment if necessary due to grade changes during landscape construction.

###### 3.9 FIELD QUALITY CONTROL

A. Main line pipes shall not be backfilled or accepted until the system has been tested for 2 hours at 100 psi.

B. Main line pressure test shall include all pipe and components from the point of connection to the upstream side of remote control valves. Test shall include all manifold components under constant pressure. Piping may be tested in sections that can be isolated.

C. Contractor shall provide pressurized water pump to increase or boost pressure where existing static pressure is less than 100 psi.

D. Schedule testing with OAR 48 hours in advance for approval.

E. Leaks or defects shall promptly be repaired or rectified at the Contractors expense and retested until able to pass testing.

F. Grounding resistance at pedestal controller shall also be tested and shall not exceed 5 OHMS.

###### 3.10 ADJUSTMENT

A. Sprinkler heads shall be adjusted to proper height when installed. Changes in grade or adjustment of head height after installation shall be considered a part of the original contract and at Contractor's expense.

B. Adjust all sprinkler heads for arc, radius, proper trim and distribution to cover all landscaped areas that are to be irrigated.

C. Adjust sprinklers so they do not water buildings, structures, or other hardscape features.

D. Adjust run times of station to meet needs of plant material the station services.

###### 3.11 CLEANING

A. Contractor shall be responsible for cleanliness of jobsite. Work areas shall be swept cleanly and picker up daily.

B. Open trenches or hazards shall be protected with yellow caution tape.

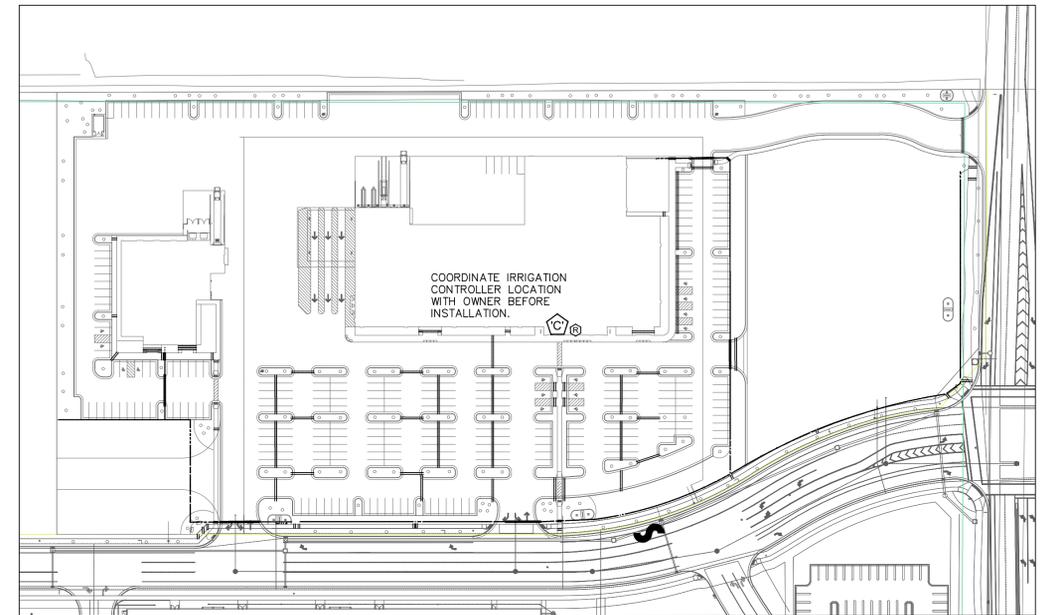
C. Contractor is responsible for removal and disposal offsite of trash and debris generated as a result of this Project.

- a. OAR shall perform periodic as well as a final cleanliness inspection.
- E. Contractor shall leave Project in at least a "broom clean" condition.

END OF SECTION

### REFERENCE MAP

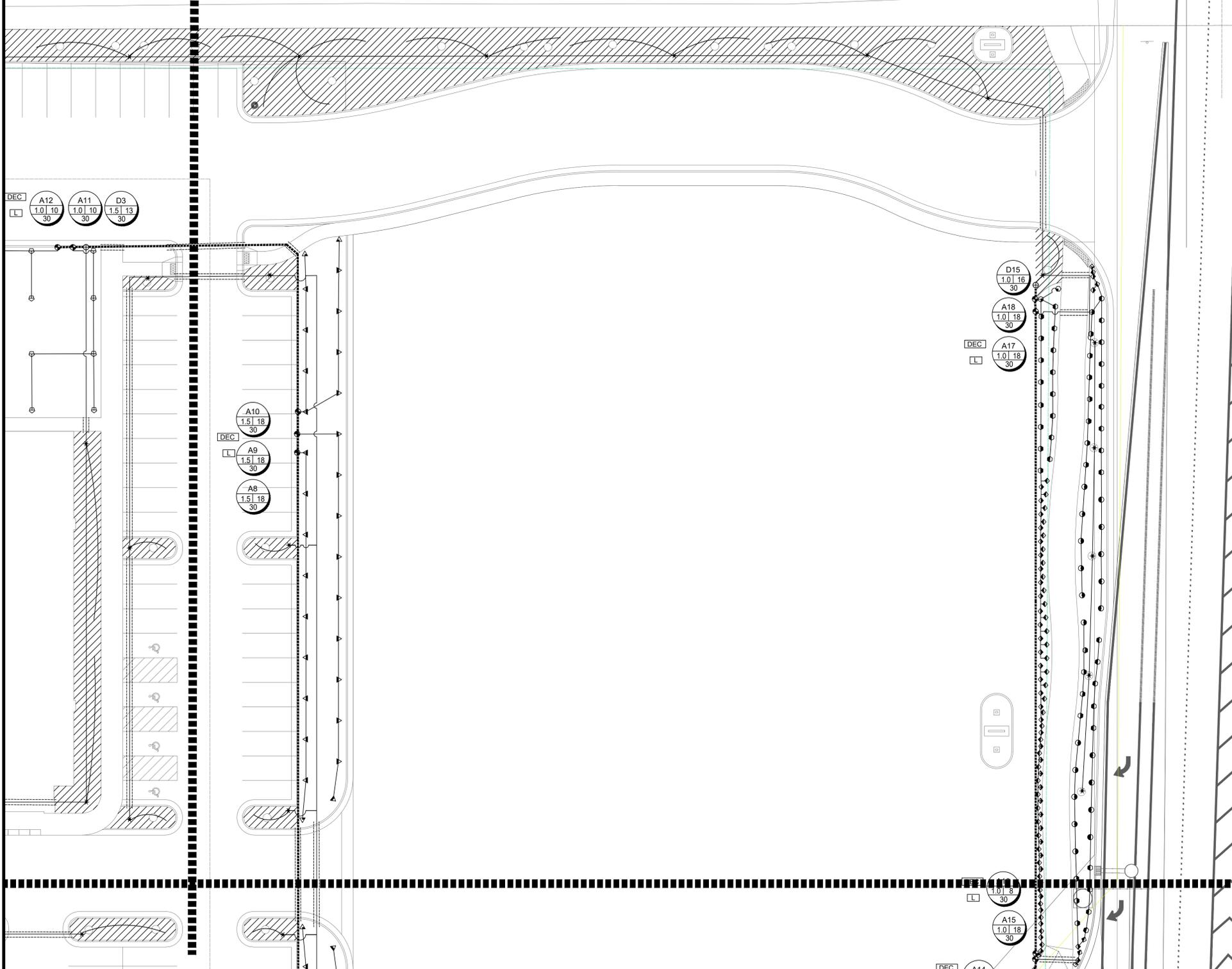
IR-1.3	IR-1.2	IR-1.1
IR-1.4	IR-1.5	IR-1.6



2" MAINLINE ROUTING ,CONTROLLER AND P.O.C. LOCATION OVERVIEW

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION	PROJECT INFORMATION	DEVELOPER / PROPERTY OWNER / CLIENT	LANDSCAPE ARCHITECT / PLANNER	LICENSE STAMP	PM:																								
06-30-2020	UT19010	 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC. 1-800-662-4111 www.bluestakes.org	<b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH	Developer / Property Owner: <b>JRW &amp; ASSOCIATES</b> ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309	 <b>PKJ DESIGN GROUP L.L.C.</b> 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com		JTA KBA																								
<table border="1"> <thead> <tr> <th>NO.</th> <th>REVISION</th> <th>DATE</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>XXXX</td> <td>XX-XX-XX</td> </tr> <tr> <td>2</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td></td> <td></td> </tr> <tr> <td>5</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td></td> <td></td> </tr> </tbody> </table>	NO.	REVISION	DATE	1	XXXX	XX-XX-XX	2			3			4			5			6			7					Client / Engineer: <b>LEI-ENGINEERING</b> 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com		<b>IRRIGATION PLAN</b>		TM 7/11/2020
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SHEET IR 1.2



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS	
					Q	T	H	TT	F		
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	8'	30	26	35	52	na	na	1.05	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	10'	30	39	53	79	na	na	1.58	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES MPX NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT, PLACE IN LXMM PEDESTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
○	MASTER VALVE										
○	FLOW SENSOR										
○	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
○	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
○	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
○	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
○	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
○	REMOTE CONTROL VALVE: RAINBIRD PFS-AN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
○	DRIP CONTROL ZONE KIT: RAINBIRD XCZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
*	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
-----	CLASS 200 SLEEVE PER PLAN										
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM			
MAXIMUM LATERAL LENGTH OF TUBING		350 FT			
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)			
APPLICATION RATE		64 INCH PER HOUR			

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

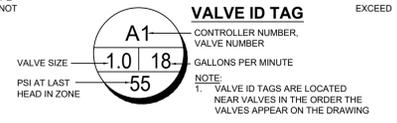
Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2" AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4" LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		

811 BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

GRAPHIC SCALE: 1" = 20'

# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

DEVELOPER / PROPERTY OWNER / CLIENT  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

Client / Engineer: LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

LANDSCAPE ARCHITECT / PLANNER  
PKJ DESIGN GROUP  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

LICENSE STAMP  
IR-1.1

PROJECT INFORMATION  
P.M.: JTA  
DRAWN: KBA  
CHECKED: TM  
PLOT DATE: 1/23/2020

**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM						REMARKS
					Q	T	H	TT	TQ	F	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F.	5'	30	10	15	20	na	na	40	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F.	8'	30	26	35	52	na	na	1.05	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F.	10'	30	39	53	79	na	na	1.58	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.TT	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES IMPR NOZZLES	Q.T.H.F.	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F.	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTE KIT. PLACE IN LXXM PER DETAIL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
○	MASTER VALVE										
○	FLOW SENSOR										
○	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
○	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
○	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
○	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
○	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
○	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
○	DRIP CONTROL ZONE KIT: RAINBIRD XCZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
*	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
*	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
-----	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
-----	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
-----	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
-----	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
-----	CLASS 200 SLEEVE PER PLAN										
NOT SHOWN	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
NOT SHOWN	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min		15 min		15 min		30 psi
Shrubs	45 min		45 min		45 min		45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

**IRRIGATION NOTES**

- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
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- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

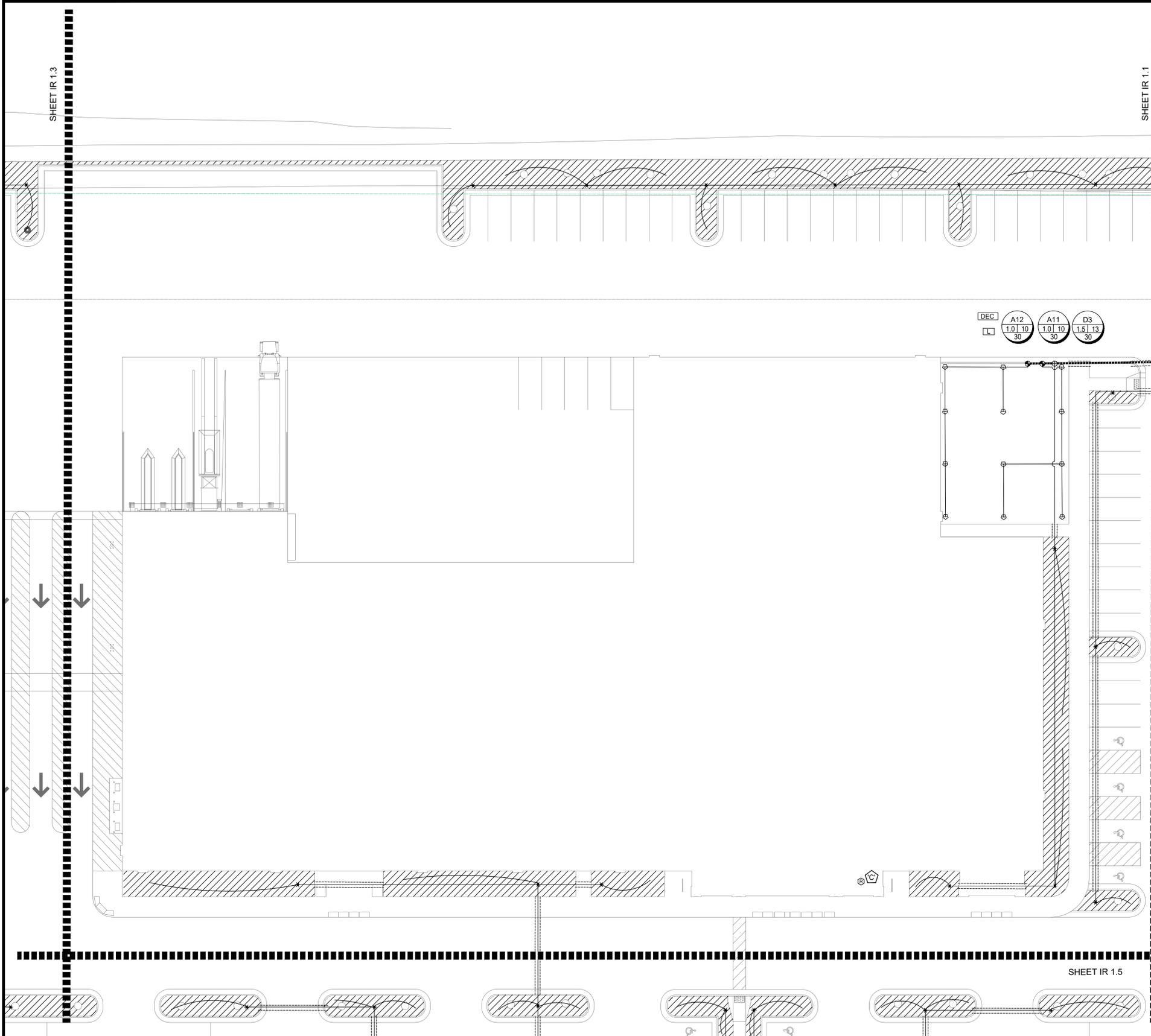
**VALVE ID TAG**

3/4"	8 GPM	CONTROLLER NUMBER
1"	12 GPM	VALVE NUMBER
1-1/2"	30 GPM	
2"	53 GPM	
2-1/2"	75 GPM	
3"	110 GPM	
4"	180 GPM	

VALVE SIZE: 1.0 18-55

PSI AT LAST HEAD IN ZONE

NOTE: 1. VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
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**811** BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
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**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
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**LANDSCAPE ARCHITECT / PLANNER**  
PKJ DESIGN GROUP  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

**LICENSE STAMP**

**IRRIGATION PLAN**

IR-1.2

DATE: 1/23/2020

PLOT DATE: 1/23/2020

**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM						QTY	REMARKS
					Q	T	H	TT	TQ	F		
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 9 U-SERIES	Q.T.H.F	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						--	
⊙	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
⊙	RAINBIRD 5000 SERIES MPX NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
⊙	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
⊙	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTE KIT, PLACE IN LXMM PER INSTALL CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
DEC	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
L	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
⊙	MASTER VALVE											
⊙	FLOW SENSOR											
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*	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
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**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
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TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
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**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min		15 min		15 min		30 psi
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**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	15 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

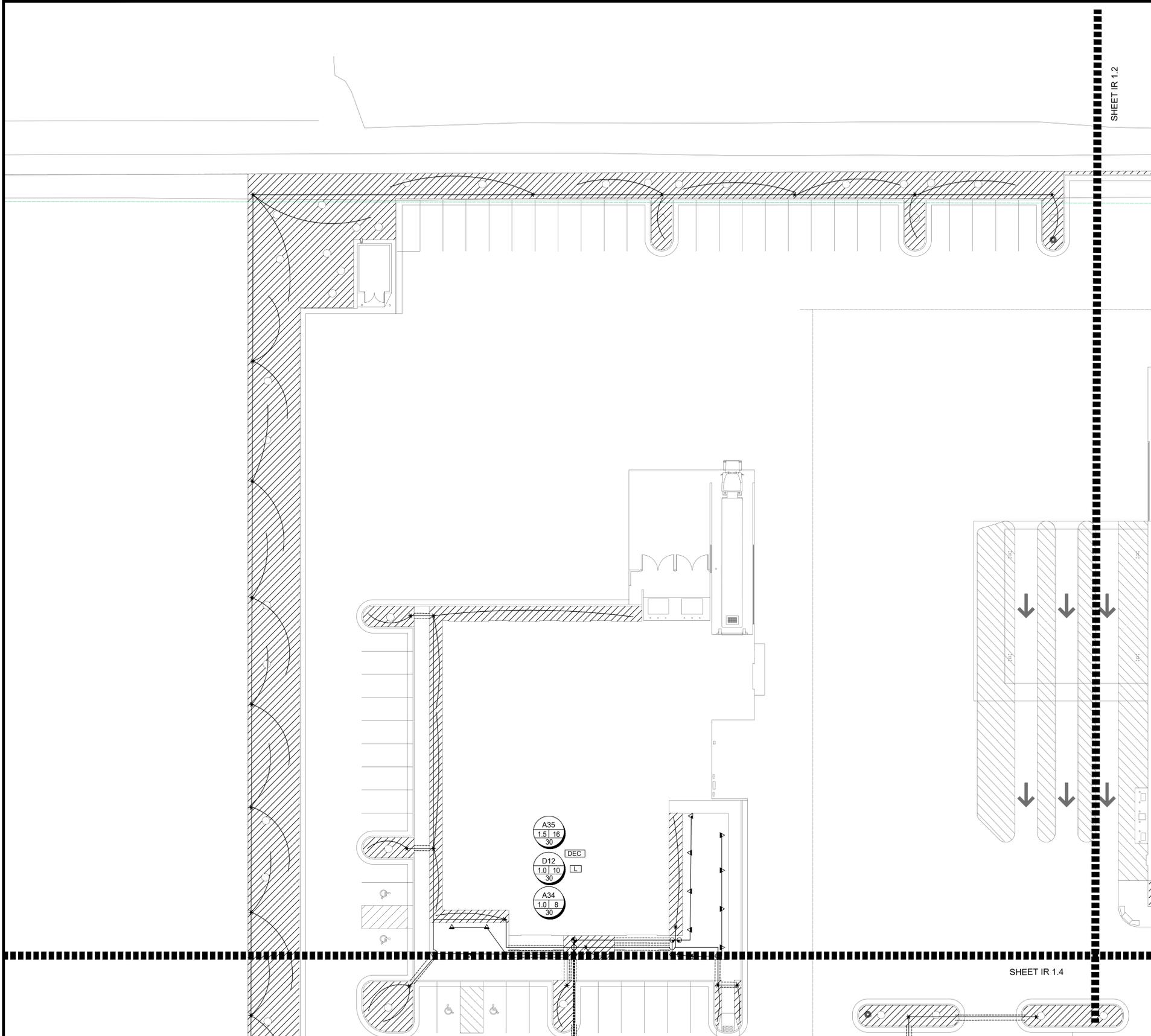
**IRRIGATION NOTES**

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- INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
- CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
- WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
- ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
- IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
- SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
- MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
- IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
- ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
- CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

CONTROLLER NUMBER: A1  
VALVE NUMBER: 18  
GALLONS PER MINUTE: 55

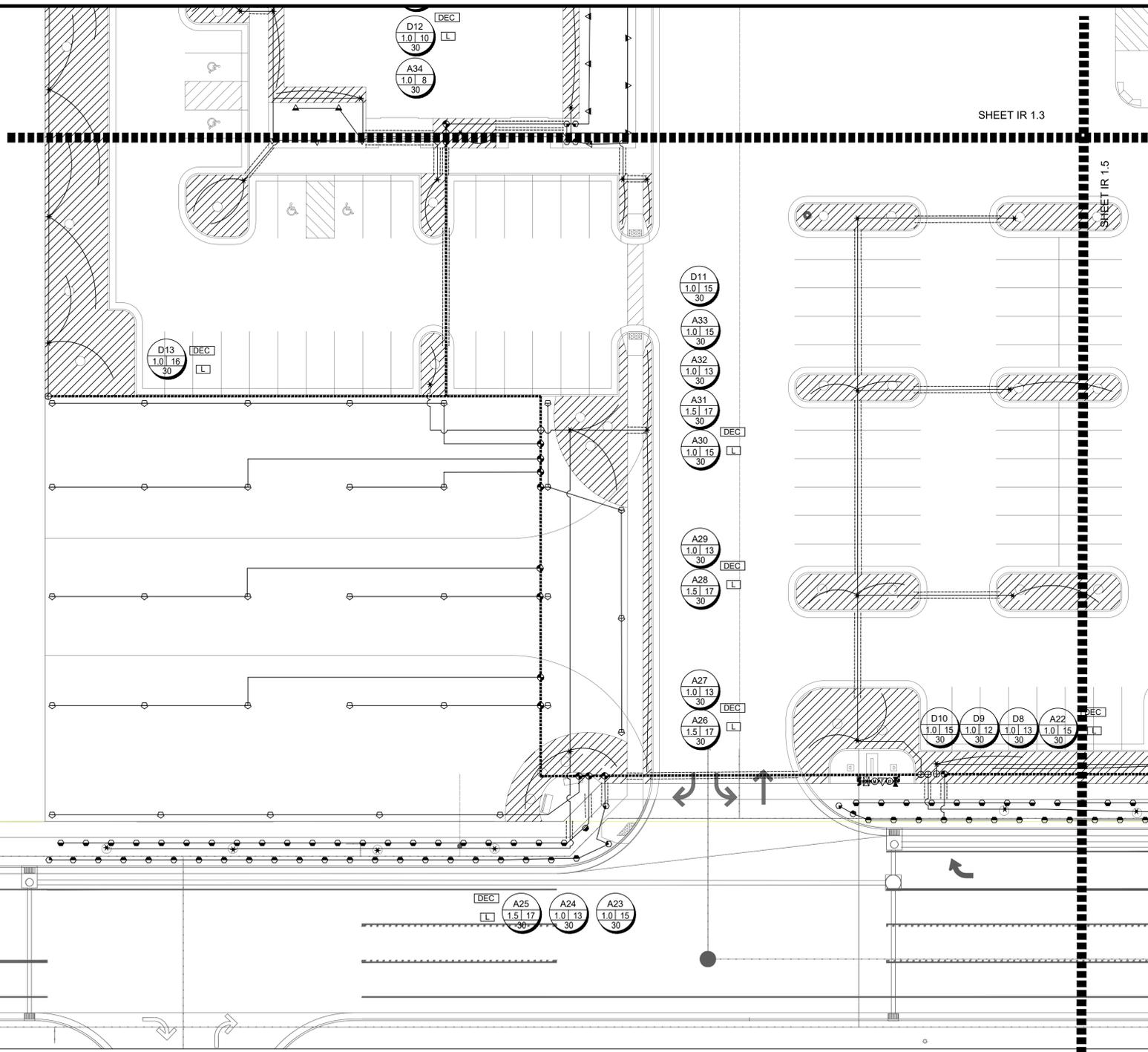
NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING



SHEET IR 1.2

SHEET IR 1.4

<p>ISSUE DATE: 06-30-2020</p> <p>PROJECT NUMBER: UT19010</p>		<p>PLAN INFORMATION</p> <p>811 BLUE STAKES OF UTAH UTILITY NOTIFICATION CENTER, INC 1-800-662-4111 www.bluestakes.org</p>		<p>PROJECT INFORMATION</p> <p><b>DI STOREHOUSE</b> SARATOGA SPRINGS, UTAH</p>		<p>DEVELOPER / PROPERTY OWNER / CLIENT</p> <p>Developer / Property Owner: JRW &amp; ASSOCIATES ATTN: JOHNNY WATSON 1152 BOND AVENUE, STE. A REXBURG, ID 83440 (208)359-2309</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020 UTAH</p>	
<p>NO. REVISION DATE</p> <p>1 XXXX XX-XX-XX</p>		<p>GRAPHIC SCALE: 1" = 20'</p>		<p>Developer / Engineer: LEI-ENGINEERING 3302 N. Main Street Spanish Fork, Ut. 84660 801-798-0555 ext. 226 www.lei-eng.com</p>		<p>LANDSCAPE ARCHITECT / PLANNER</p> <p>PKJ DESIGN GROUP L.L.C. 3450 N. TRIUMPH BLVD, SUITE 102 LEHI, UTAH 84043 (801) 960-2698 www.pkjdesigngroup.com</p>		<p>LICENSE STAMP</p> <p>PKJ DESIGN GROUP L.L.C. LICENSED LANDSCAPE ARCHITECT 8128121-6301 06/30/2020 UTAH</p>		<p>IR-1.3</p>	



**IRRIGATION LEGEND**

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM				QTY	REMARKS	
					Q	T	H	TQ			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	10	15	20	na	40	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	26	35	52	na	1.05	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	10'	30	39	53	79	na	1.58	USE HE-VAN NOZZLES AS NECESSARY	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	15'	30	92	1.23	1.85	2.48	2.78	3.70	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	SST	15'	30	1.21						
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						
○	RAINBIRD 5000 SERIES MPX NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LMR REMOTEKIT. PLACE IN LXXM PERISTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										
□	MASTER VALVE										
□	FLOW SENSOR										
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										
□	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										
□	CLASS 200 SLEEVE PER PLAN										
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										
□	NOT SHOWN										
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										

**DRIP ZONE**

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	3 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

**90 Day Establishment Period Irrigation Schedule (April, May, June)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Regular Irrigation Schedule (see Seasonal Differential Chart)**

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min	45 min	15 min	45 min	15 min	45 min	30 psi
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

**Seasonal Differential**

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	10 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

**IRRIGATION NOTES**

- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
- ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
- CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
- PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
- MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
- CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
- CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
- INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
- CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
- WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25' INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL, AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
- ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
- SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
- CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
- IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
- MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
- ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
- IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
- ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
- CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
- POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
- INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
- LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

3/4" 8 GPM  
1-1/2" 30 GPM  
2" 53 GPM  
2-1/2" 75 GPM  
3" 110 GPM  
4" 180 GPM

VALVE SIZE: 1.0 18  
PSI AT LAST HEAD IN ZONE: 55

NOTE:  
1. VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

EXCEED

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
06-30-2020	UT19010	

NO.	REVISION	DATE
1	XXXX	XX-XX-XX
2		
3		
4		
5		
6		
7		

**811** BLUE STAKES OF UTAH  
UTILITY NOTIFICATION CENTER, INC.  
1-800-662-4111  
www.bluestakes.org

**DI STOREHOUSE**  
SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**  
Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**  
LEI-ENGINEERING  
3302 N. Main Street  
Spanish Fork, Ut. 84660  
801-798-0555 ext. 226  
www.lei-eng.com

**LANDSCAPE ARCHITECT / PLANNER**  
PKJ DESIGN GROUP  
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

**LICENSE STAMP**

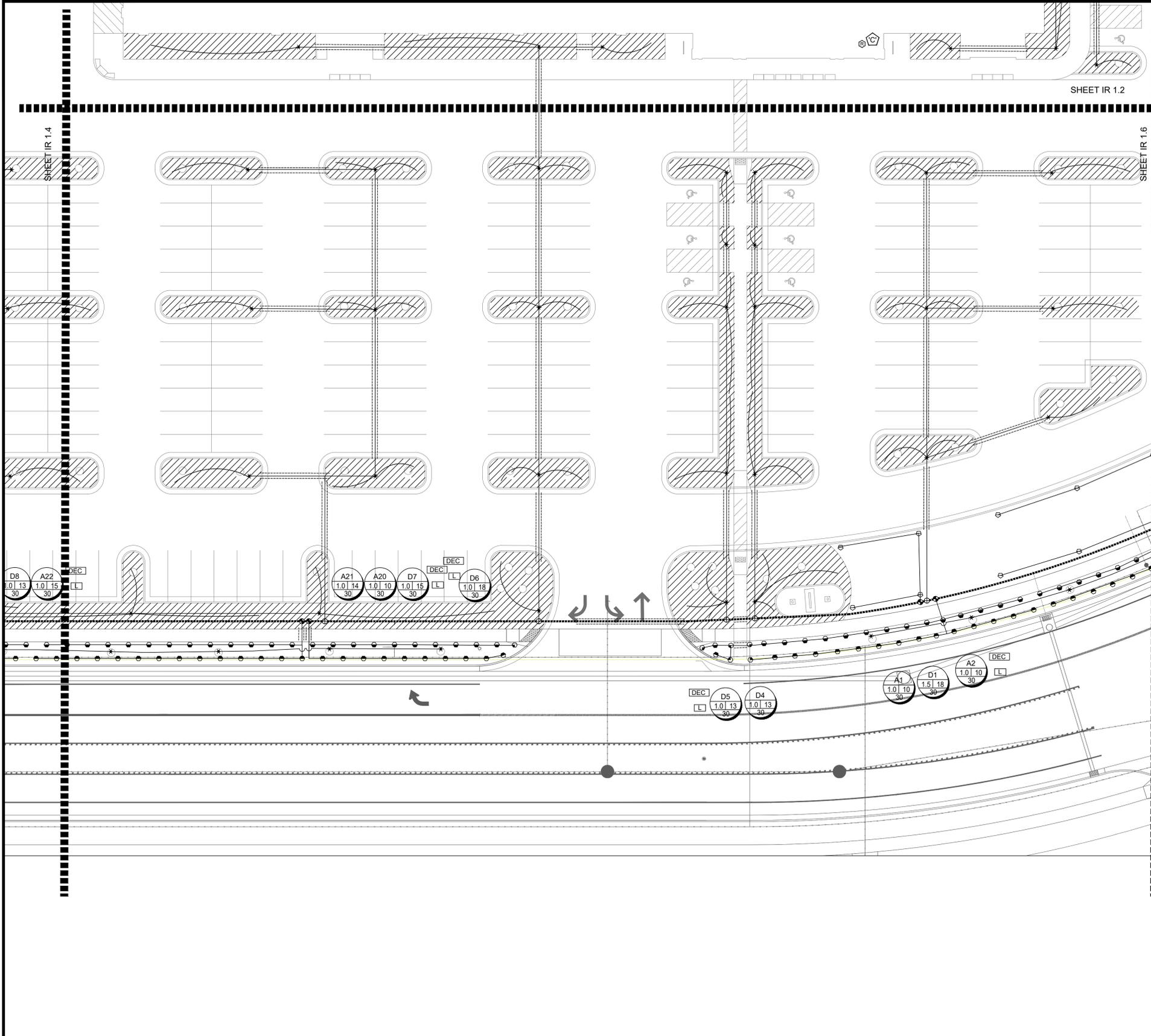
PKJ DESIGN GROUP L.L.C.  
3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

**IRRIGATION PLAN**

IR-1.4

DATE: 1/23/2020

PROJECT: JTA  
DRAWN: KBA  
CHECKED: TM



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER - MODEL NUMBER	PAT.	RD.	PSI	GPM					QTY	REMARKS	
					Q	T	H	TQ	F			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	Q.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	Q.T.H.F	10'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	Q.T.H.F	15'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 SST	Q.T.H.T	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	61						--	
○	RAINBIRD 5000 SERIES IMPR NOZZLES	Q.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	Q.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTE KIT, PLACE IN LXMM PEDESTAL, CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.										--	WALL MOUNT, COORDINATE WITH OWNER FOR EXACT LOCATION
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	MASTER VALVE										--	SEE DETAIL
□	FLOW SENSOR										--	SEE DETAIL
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE										--	SEE DETAIL
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE										--	SEE DETAIL
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)										--	SEE DETAIL
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.										--	10" RND. VALVE BOX. SEE DETAIL
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.										--	SEE DETAIL
□	REMOTE CONTROL VALVE: RAINBIRD PFSB-AP-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)										--	SEE DETAIL JUMBO BOX-PURPLE LID
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-FRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)										--	SEE DETAIL
□	DRIP CONNECTION, PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS										--	INSTALL FLUSH CAP. SEE DETAIL
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.										--	SEE DETAIL
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER										--	SEE PIPE SIZING CHART
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART										--	SEE DETAIL
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT										--	SEE DETAIL
□	CLASS 200 SLEEVE PER PLAN										--	SEE DETAIL
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN 1 1/4" DIAMETER MINIMUM										--	SEE DETAIL
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC. PROVIDE 2 WIRE LOOP SYSTEM.										--	SEE DETAIL
□	NOT SHOWN										--	SEE DETAIL
□	NOT SHOWN										--	SEE DETAIL

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

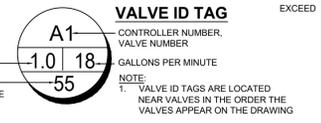
Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	45 min	0	45 min	0	45 min	0	45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	15 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
  - INSTALL DRIP IRRIGATION PER DETAILS. CONTRACTOR SHALL MAKE ADJUSTMENTS AS NECESSARY.
  - CONTRACTOR SHALL PROVIDE AND INSTALL SLEEVES FOR ALL PIPES AND WIRES UNDER PAVEMENT AND SIDEWALKS. SLEEVES SHALL BE 2 SIZES LARGER THAN PIPE INSIDE. ALL WIRE SHALL BE IN SEPARATE SLEEVES (NOT SHOWN). ALL CONTROL WIRE SHALL BE INSTALLED IN CLASS 200 PIPE. PLACE JUNCTION BOXES WHERE NECESSARY TO MINIMIZE LONG RUNS OR AT DIRECTIONAL CHANGES.
  - WATER LINES AND ELECTRICAL LINES MUST NOT SHARE CONDUITS. ALL WIRE CONNECTIONS MUST BE CONTAINED IN VALVE BOX WITH 3" OF EXTRA WIRE. WIRE TO BE CONNECTED TO MAIN LINE PIPE WHERE POSSIBLE WITH TAPE AT 25" INTERVALS. SLACK IN CONTROL WIRES REQUIRED AT EVERY CHANGE OF DIRECTION. WIRES MUST HAVE SEPARATE COLORS FOR COMMON, CONTROL AND SPARE. MINIMUM 1 SPARE WIRE FOR EVERY 5 VALVES. ALL CONTROL WIRES TO BE INSULATED 14 GAUGE COPPER. ALL SPARE WIRES MUST "HOME RUN" TO CONTROLLER AND SPARE WIRES AVAILABLE AT ALL VALVE MANIFOLDS AND CLUSTERS.
  - ALL SLEEVES INSTALLED SHALL BE DUCT TAPED TO PREVENT DIRT OR OTHER DEBRIS ENTERING PIPE. ALL SLEEVES SHALL BE IDENTIFIED BY WOOD OR PVC STAKES AND BE SPRAY PAINTED WITH MARKING PAINT. REMOVE STAKES ONCE IRRIGATION SYSTEM IS COMPLETE.
  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
  - SPACE ALL SPRAY HEADS 2' AWAY FROM ANY HARDSCAPE.
  - CONTRACTOR SHALL MATCH PRECIPITATION RATES AS MUCH AS POSSIBLE FOR ALL LANDSCAPED AREAS. OVERHEAD IRRIGATION MUST HAVE A MINIMUM DU (DISTRIBUTION UNIFORMITY) OF 60%.
  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
  - ALL WORK SHALL BE IN ACCORDANCE WITH APPLICABLE CITY AND/OR COUNTY CODES. THE CONTRACTOR SHALL APPLY AND PAY FOR ALL NECESSARY PERMITS.
  - IRRIGATION INSTALLATION TO COMPLY WITH APPLICABLE CITY SPECIFICATIONS AND DRAWINGS.
  - ACTUAL INSTALLATION OF IRRIGATION SYSTEM MAY VARY SOMEWHAT FROM PLANS. THE CONTRACTOR IS RESPONSIBLE TO MAKE ADJUSTMENTS AS NEEDED TO ENSURE PROPER COVERAGE OF ALL LANDSCAPED AREAS.
  - CONTRACTOR SHALL INSTALL IRRIGATION SYSTEM WITH HEAD TO HEAD COVERAGE IN ALL TURF AREAS. USE VAN AND/OR U-SERIES NOZZLES AS NECESSARY TO PROVIDE PROPER COVERAGE AND TO KEEP WATER OFF OF BUILDINGS AND HARDSCAPES.
  - POWER TO CONTROLLER TO BE PROVIDED BY OWNER. OWNER TO SPECIFY EXACT LOCATION OF CONTROLLER. INSTALL PER MANUFACTURER'S INSTRUCTIONS. CONTRACTOR SHALL INSTALL A RAIN SENSOR WITH CONTROLLER UNLESS OTHERWISE DIRECTED BY OWNER OR L.A.
  - INVESTIGATE TO MAKE SURE THAT THE IRRIGATION SYSTEM IS, IN FACT, BEING CONNECTED TO A SECONDARY SYSTEM. IF IT IS NOT CONNECTED TO SECONDARY, CONTACT THE OWNER AND LANDSCAPE ARCHITECT TO COORDINATE PROVISION AND INSTALLATION OF A BACKFLOW PREVENTOR.
  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.



ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
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# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

Developer / Property Owner:  
**JRW & ASSOCIATES**  
 ATTN: JOHNNY WATSON  
 1152 BOND AVENUE, STE. A  
 REXBURG, ID 83440  
 (208)359-2309

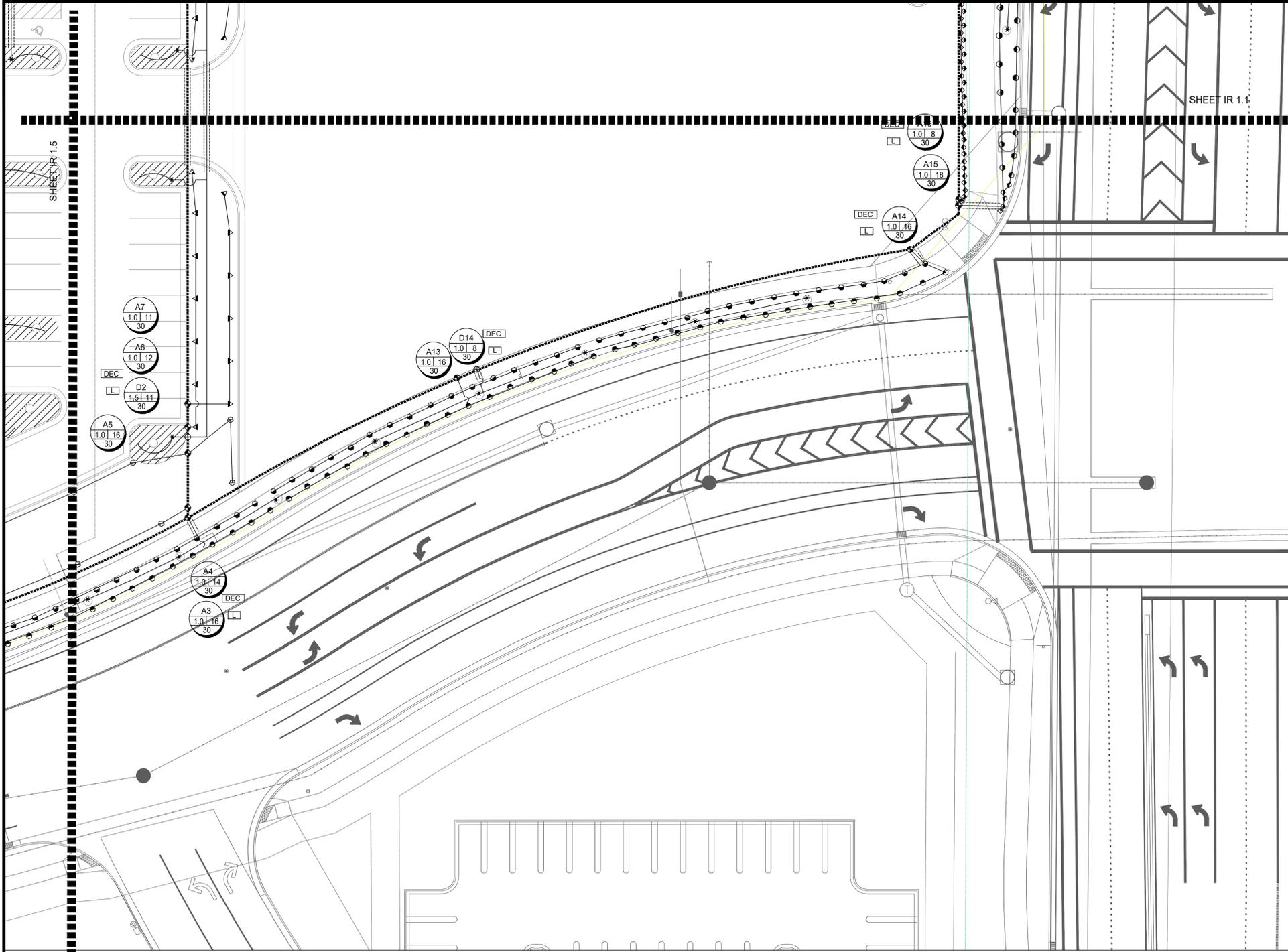
Client / Engineer:  
**LEI-ENGINEERING**  
 3302 N. Main Street  
 Spanish Fork, Ut. 84660  
 801-798-0555 ext. 226  
 www.lei-eng.com

LANDSCAPE ARCHITECT / PLANNER  
**PKJ DESIGN GROUP L.L.C.**  
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IR-1.5



### IRRIGATION LEGEND

SYMBOL	MANUFACTURER-MODEL NUMBER	PAT.	RD.	PSI	GPM					QTY	REMARKS	
					Q	T	H	TT	F			
○	RAINBIRD RD04-S-PRS POP UP SPRAY 5 SERIES	O.T.H.F	5'	30	10	15	20	na	na	40	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	8'	30	26	35	52	na	na	1.05	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 10 U-SERIES	O.T.H.F	10'	30	39	53	79	na	na	1.58	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	O.T.H.F	15'	30	92	1.23	1.85	2.48	2.78	3.70	--	USE HE-VAN NOZZLES AS NECESSARY
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 U-SERIES	SST	15'	30	1.21						--	
○	RAINBIRD RD04-S-PRS POP UP SPRAY 15 EST	EST	15'	30	.61						--	
○	RAINBIRD 5000 SERIES IMPR NOZZLES	O.T.H.F	varies	30	varies	varies	varies	na	na	varies	--	
○	RAINBIRD 8005 SERIES #8, #14, #26 NOZZLES	O.T.H.F	65'	30	6.6	12.6	24.3	na	na	varies	--	
□	CONTROLLER: RAINBIRD ESP-LXD CONTROLLER WITH LIMR REMOTEKIT. PLACE IN LXMM PEDESTAL. CONTRACTOR TO ADJUST LOCATION WITH OWNER PRIOR TO CONSTRUCTION.											
□	VALVE DECODER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	LIGHTNING ARRESTER (AT ALL VALVE GROUPINGS) INSTALL PER MANUFACTURER'S SPEC.											
□	MASTER VALVE											
□	FLOW SENSOR											
□	RAINBIRD WR2-RC WIRELESS RAIN SHUT OFF DEVICE											
□	POINT OF CONNECTION (SECONDARY WATER) SEE PLAN FOR SIZE											
□	2" T SUPER AMIAD PLASTIC FILTER - INSTALL PER MANUFACTURER'S RECOMMENDATIONS (130 MICRON)											
□	QUICK COUPLER: RAINBIRD 44LRC INSTALL PER MANUFACTURER'S SPEC.											
□	ISOLATION BALL VALVE - LINE SIZED INSTALL PER MANUFACTURER'S SPEC.											
□	REMOTE CONTROL VALVE: RAINBIRD PFS-AN-PRS-D AUTOMATIC CONTROL VALVE (SIZE AS NOTED ON PLAN)											
□	DRIP CONTROL ZONE KIT: RAINBIRD XGZ-(PER PLAN)-PRBR-COM MED FLOW (SIZE AS NOTED ON PLAN)											
□	DRIP CONNECTION. PROVIDE DRIP IRRIGATION TO ALL TREES, SHRUBS AND PERENNIALS IN PLANTER AREAS											
□	DRIP RWS-S-B-1401 (ROOT WATERING SYSTEM) PROVIDE 2 TO EACH TREE LOCATED IN THE LAWN AREAS.											
□	SUB-MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 2" DIAMETER 24" MIN. COVER											
□	LOOP MAINLINE: SCHEDULE 40 PVC WITH SCHEDULE 80 FITTINGS, 4" DIAMETER 24" MIN. COVER											
□	LATERAL LINE: SCHEDULE 40 PVC WITH SCH. 40 FITTINGS. SEE PIPE SIZING CHART											
□	DRIP LINE: RAINBIRD XFSP-09-18-100 OR EQUIVALENT											
□	CLASS 200 SLEEVE PER PLAN											
□	WIRE CHASE, SIZE TO BE TWICE THE DIAMETER OF THE WIRE BUNDLE WITHIN. 1 1/4" DIAMETER MINIMUM											
□	14 GAUGE SOLID COPPER SINGLE STRAND CONTROL WIRE. INSTALL PER MANUFACTURER'S SPEC.											
□	PROVIDE 2 WIRE LOOP SYSTEM.											

### DRIP ZONE

TYPE	PART NUMBER	EMITTER FLOW	EMITTER SPACING	ROW SPACING	RECOMMENDED ROW SPACING
XFSP DRIPLINE	XFSP-09-18	9 GPH	18"	18"	18-21 IN.
TOTAL DRIP ZONE FLOW		20 GPM		TIME TO APPLY 1/4" OF WATER	23
MAXIMUM LATERAL LENGTH OF TUBING		350 FT		REQUIRED NUMBER OF STAKES	500
TOTAL LENGTH OF ZONE DRIPLINE		2,000 FT (varies per plan)		NUMBER OF FLUSH POINTS	2
APPLICATION RATE		64 INCH PER HOUR		SUGGESTED HEADER AND FOOTER PIPE SIZE	CLASS 200 1 1/4"

\*NUMBERS MAY CHANGE DUE TO SIZE OF DRIP ZONE PER PLAN

### 90 Day Establishment Period Irrigation Schedule (April, May, June)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	30 psi						
Shrubs	25 min	0	25 min	0	25 min	0	25 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Regular Irrigation Schedule (see Seasonal Differential Chart)

Type	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	Operating Pressure
Turf	15 min	15 min		15 min		15 min		30 psi
Shrubs	45 min		45 min		45 min		45 min	40 psi

Note: Begin irrigation 4:00 am, only 1 cycle per day.

### Seasonal Differential

	April	May	June	July	August	Sept	October
Turf	10 min	10 min	15 min	15 min	15 min	10 min	10 min
Shrubs	30 min	30 min	45 min	45 min	45 min	30 min	30 min

- ### IRRIGATION NOTES
- ALL CONNECTIONS ARE SECONDARY WATER AND SHOULD BE NOTED AS SUCH. THEREFORE ALL PARTS MUST MEET SECONDARY WATER STANDARDS.
  - ALL PIPE TO BE SCHEDULE 40 PVC PIPE. NO POLY PIPE SHALL BE INCLUDED. FITTINGS UP TO 1 1/2" MUST BE SCHEDULE 40 OR BETTER. FITTINGS LARGER THAN 1 1/2" MUST BE SCHEDULE 80 OR BETTER.
  - CONTRACTOR SHALL HAVE ALL UTILITIES BLUE STAKED PRIOR TO DIGGING. ANY DAMAGE TO THE UTILITIES SHALL BE REPAIRED AT THE EXPENSE OF THE CONTRACTOR WITH NO ADDITIONAL COST TO THE OWNER.
  - PLACE ALL IRRIGATION IN LANDSCAPE AREAS AND ON THE PROPERTY OF THE OWNER.
  - MODIFY LOCATION OF IRRIGATION COMPONENTS TO AVOID PLACING TREES, SHRUBS AND OTHER SITE ELEMENTS DIRECTLY OVER PIPE. PER PLANS, DO NOT LOCATE VALVE BOXES IN LAWN AREAS UNLESS DIRECTED TO BY LANDSCAPE ARCHITECT.
  - CONTRACTOR SHALL INSTALL A 1" THREADED TEE WITH 1" THREADED PLUG AT POINT OF CONNECTION IN ORDER TO BLOW OUT THE SYSTEM WITH AN AIR COMPRESSOR EACH FALL.
  - CONTRACTOR SHALL USE ONLY COMMERCIAL GRADE IRRIGATION PRODUCTS AND IS RESPONSIBLE FOR ENSURING ACCURATE COUNTS AND QUANTITIES OF ALL IRRIGATION MATERIALS FOR BIDDING AND INSTALLATION PURPOSES.
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  - IRRIGATION SYSTEM MUST CONTAIN CHECK VALVES TO PREVENT LOW POINT DRAINAGE.
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  - IRRIGATION CONTRACTOR SHALL PRESSURE TEST MAINLINE FOR LEAKS PRIOR TO BACKFILLING.
  - MAIN LINES SHALL BE 18" DEEP MIN. AND LATERAL LINES 12" DEEP MIN. NO ROCK GREATER THAN 1/2" DIAMETER SHALL BE ALLOWED IN TRENCHES. TRENCHING BACKFILL MATERIAL SHALL BE COMPACTED TO PROPER FINISHED GRADE.
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  - LATERAL LINES SHALL BE NO SMALLER THAN 3/4". LANDSCAPE CONTRACTOR TO ENSURE THE FOLLOWING PIPE SIZES DO NOT EXCEED THE SUGGESTED GPM LISTED BELOW.

**VALVE ID TAG**

CONTROLLER NUMBER: A1

VALVE NUMBER: 1.0 18

GALLONS PER MINUTE: 55

NOTE: VALVE ID TAGS ARE LOCATED NEAR VALVES IN THE ORDER THE VALVES APPEAR ON THE DRAWING

**LICENSE STAMP**

PKJ DESIGN GROUP L.L.C.

3450 N. TRIUMPH BLVD, SUITE 102  
LEHI, UTAH 84043 (801) 960-2698  
www.pkjdesigngroup.com

ISSUE DATE	PROJECT NUMBER	PLAN INFORMATION
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# DI STOREHOUSE

## SARATOGA SPRINGS, UTAH

**DEVELOPER / PROPERTY OWNER / CLIENT**

Developer / Property Owner: JRW & ASSOCIATES  
ATTN: JOHNNY WATSON  
1152 BOND AVENUE, STE. A  
REXBURG, ID 83440  
(208)359-2309

**CLIENT / ENGINEER:**

LEI-ENGINEERING  
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Spanish Fork, Ut. 84660  
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**LANDSCAPE ARCHITECT / PLANNER**

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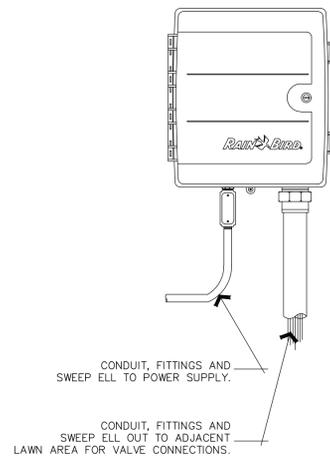
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**IRRIGATION PLAN**

IR-1.6

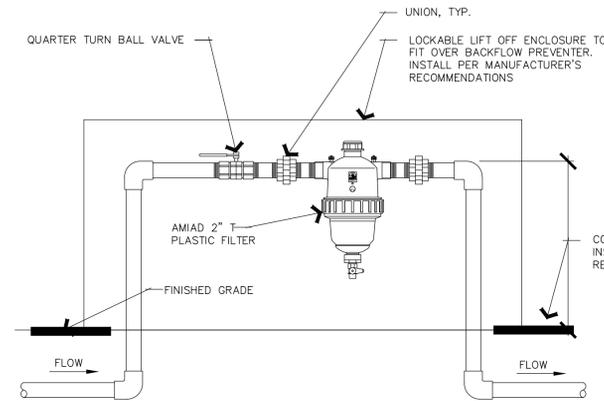
PLOT DATE: 1/23/2020

PM: JTA  
DRAWN: KBA  
CHECKED: TM

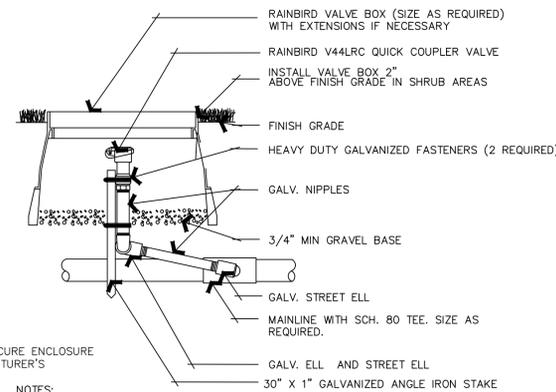


- NOTES:**
1. MOUNT CONTROLLER PER MANUFACTURER'S WRITTEN INSTRUCTIONS AND IN ACCORDANCE WITH ALL LOCAL CODES. EXACT LOCATION TO BE APPROVED BY OWNER. GROUND CONTROLLER PER MANUFACTURER'S RECOMMENDATION AND SPECIFICATIONS. ELECTRICAL CONTRACTOR SHALL GROUND CONTROLLER AND PROVIDE SLEEVING FROM ADJACENT LAWN AREA TO CONTROLLER LOCATION.
  2. CONNECT CONTROLLER TO POWER AND VALVES.
  3. LANDSCAPE CONTRACTOR TO COORDINATE WITH ELECTRICAL CONTRACTOR TO ENSURE PROPER GROUNDING OF CONTROLLER TO BUILDING GROUNDING GRID.

**A RAINBIRD CONTROLLER DETAIL**  
NOT TO SCALE

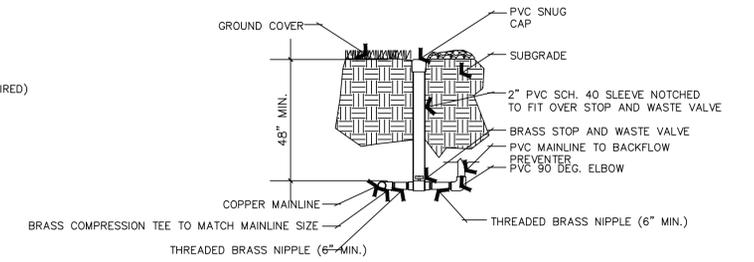


**B 2" PLASTIC FILTER DETAIL**  
NOT TO SCALE



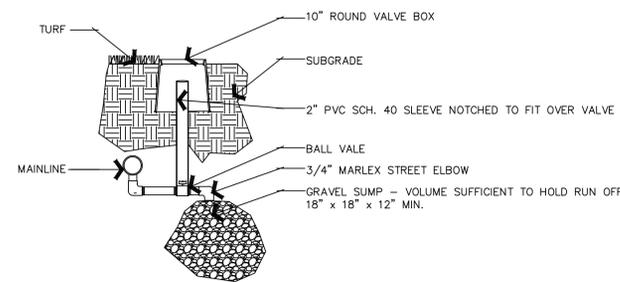
- NOTES:**
1. FLUSH ALL PIPING PRIOR TO INSTALLING VALVE.
  2. WRAP ALL THREADS WITH TEFLON TAPE. 1 1/2 TO 2 WRAPS MAXIMUM.
  3. COMPACT SOILS AROUND VALVE BOX TO 80% OF ORIGINAL DRY DENSITY.
  4. INSTALL GEOFABRIC UNDER VALVE BOXES AND TAPE TO PIPE NIPPLES AND VALVE BOX.
  5. BOX COLOR - GREEN IN TURF AND TAN IN PLANTER AREAS.
  6. IRRIGATION SYSTEM TO BE BLOWN OUT WITH AIR COMPRESSOR THROUGH QUICK COUPLERS BEFORE FREEZING TEMPERATURES OCCUR, TYP.

**C RAINBIRD QUICK COUPLER**  
NOT TO SCALE



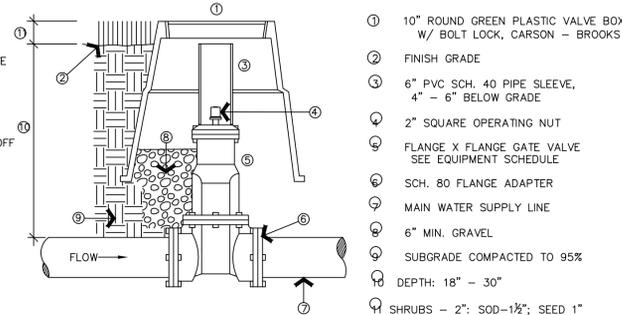
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 40 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**D STOP AND WASTE VALVE ASSEMBLY**  
NOT TO SCALE



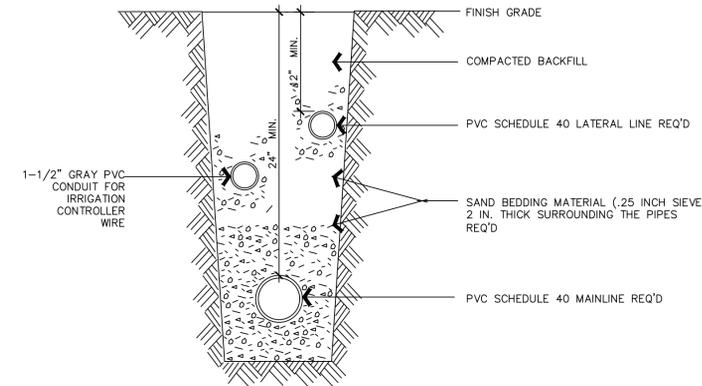
- NOTES:**
1. ALL PVC NIPPLES AND ELBOWS TO BE SCH. 80 UNLESS OTHERWISE NOTED.
  2. PROVIDE VALVE KEY TO OWNER

**E MANUAL DRAIN ASSEMBLY**  
NOT TO SCALE

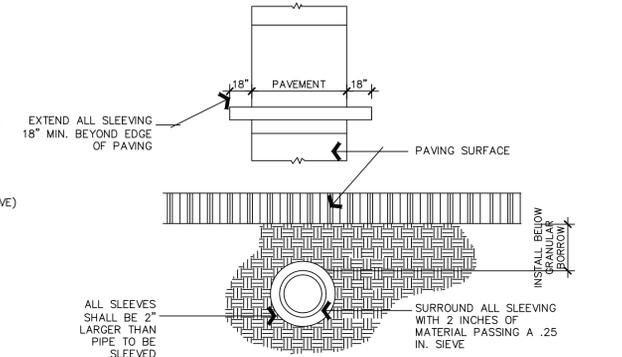


- 1 10" ROUND GREEN PLASTIC VALVE BOX W/ BOLT LOCK, CARSON - BROOKS
- 2 FINISH GRADE
- 3 6" PVC SCH. 40 PIPE SLEEVE, 4" - 6" BELOW GRADE
- 4 2" SQUARE OPERATING NUT
- 5 FLANGE X FLANGE GATE VALVE SEE EQUIPMENT SCHEDULE
- 6 SCH. 80 FLANGE ADAPTER
- 7 MAIN WATER SUPPLY LINE
- 8 6" MIN. GRAVEL
- 9 SUBGRADE COMPACTED TO 95%
- 10 DEPTH: 18" - 30"
- 11 SHRUBS - 2": SOD-1 1/2"; SEED 1"

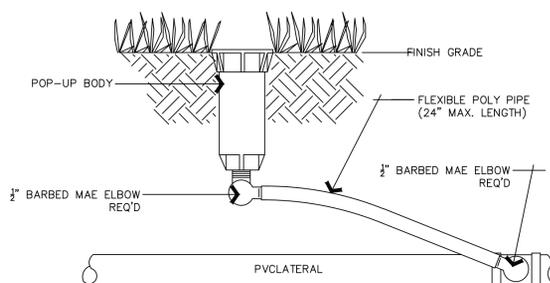
**F GATE VALVE ASSEMBLY**  
NOT TO SCALE



**G TRENCHING DETAIL**  
NOT TO SCALE

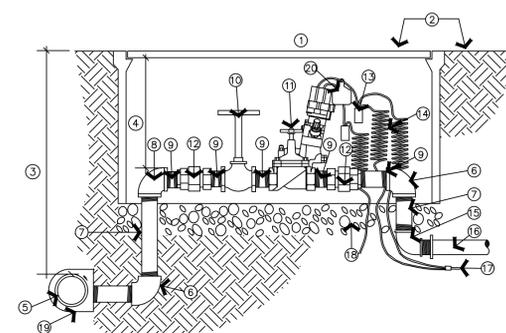


**H TYPICAL SLEEVING**  
NOT TO SCALE



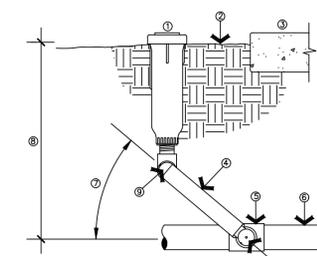
- NOTES:**
1. INSTALL SPRAY AND ROTARY HEADS PER THIS DETAIL.
  2. INSTALL 2" AWAY FROM HARDSCAPES.

**I SPRAY HEAD DETAIL**  
NOT TO SCALE



- NOTES:**
1. ONE REMOTE CONTROL VALVE PER BOX .
  2. ALL FITTINGS AND PIPE IN MANIFOLD SHALL BE THREADED SCH. 80 PVC USING TEFLON TAPE AND #5 RECTOR SEAL.

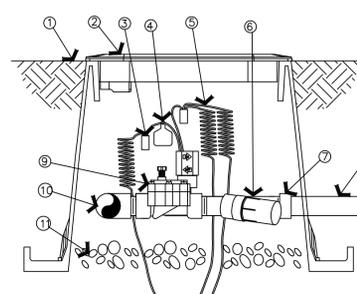
**J CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- 1 POP-UP ROTOR SPRINKLER - SEE LEGEND
- 2 FINISH GRADE
- 3 NOTE: ALL ROTOR HEADS TO BE PLACED 2" CLEAR OF ALL HARDSCAPE SURFACES
- 4 SCH. 80 THREADED NIPPLE
- 5 PVC SCH. 40 SxSxT TEE (OR ELL)
- 6 PVC LATERAL LINE, SIZE AS NOTED ON PLAN
- 7 SWING JOINT ARM INSTALLED AT ANGLE BETWEEN 30 AND 45 DRG. OF LATERAL PIPE. USE MALE THREAD MODEL
- 8 DEPTH - SEE NOTES & TRENCH DETAIL
- 9 MARLEX STREET ELL'S (3)

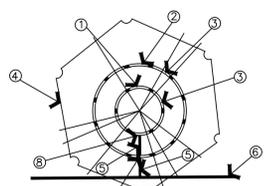
**K POP UP ROTOR DETAIL**  
NOT TO SCALE

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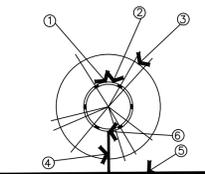
- 1 FINISH GRADE
- 2 STANDARD VALVE BOX WITH COVER: RAIN BIRD VB-STD
- 3 WATERPROOF CONNECTION: RAIN BIRD DB SERIES
- 4 VALVE ID TAG
- 5 30-INCH LINEAR LENGTH OF WIRE, COILED
- 6 PRESSURE REGULATING FILTER: RAIN BIRD PRF-100-RBY (INCLUDED IN XCZ-100-PRF KIT)
- 7 PVC SCH 40 FEMALE ADAPTOR
- 8 LATERAL PIPE
- 9 REMOTE CONTROL VALVE: RAIN BIRD 100-DV (INCLUDED IN XCZ-100-PRF KIT)
- 10 PVC SCH 40 TEE OR ELL TO MANIFOLD
- 11 3-INCH MINIMUM DEPTH OF 3/4-INCH WASHED GRAVEL

**L DRIP CONTROL VALVE ASSEMBLY**  
NOT TO SCALE



- TREE**
- 1 8' RADIUS
  - 2 16' RADIUS
  - 3 RAIN BIRD XFS-09-18-100 OR EQUIVALENT
  - 4 TREE (DECIDUOUS OR EVERGREEN)
  - 5 RAIN BIRD XT-700 TUBING OR EQUIVALENT AS APPROVED BY ARCHITECT
  - 6 LATERAL LINE
  - 7 4-WAY BARBED TEE
  - 8 BARBED TEE

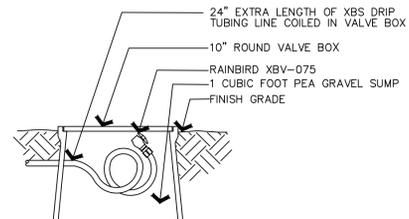
NOTES:  
1. LAYOUT DRIPLINE SO EMITTERS ARE IN TRIANGULAR PATTERN AS SHOWN  
2. APPROXIMATELY 16.2 GPH PER TREE



- SHRUB**
- 1 12" RADIUS
  - 2 RAIN BIRD XFS-09-18-100 OR EQUIVALENT
  - 3 SHRUB
  - 4 RAIN BIRD XT-700 TUBING OR EQUIVALENT AS APPROVED BY ARCHITECT
  - 5 LATERAL LINE
  - 6 BARBED TEE

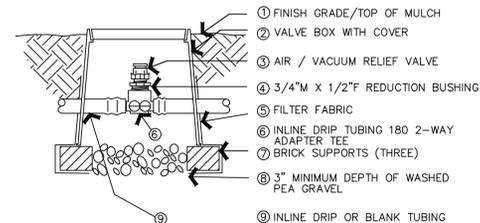
NOTE:  
1. APPROXIMATELY 5.4 GPH PER SHRUB

**M DRIP IRRIGATION - IN LINE EMITTERS**  
NOT TO SCALE



NOTE:  
1. INSTALL AT END OF DRIP LINE RUNS FOR WINTERIZATION IN THE FALL.

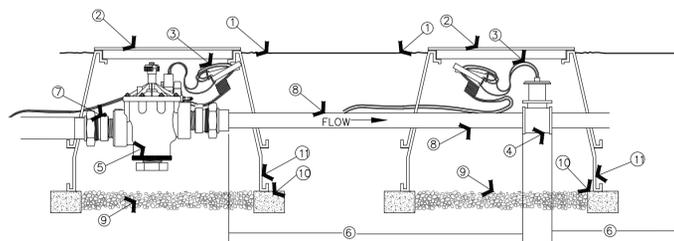
**N FLUSH CAP BOX**  
NOT TO SCALE



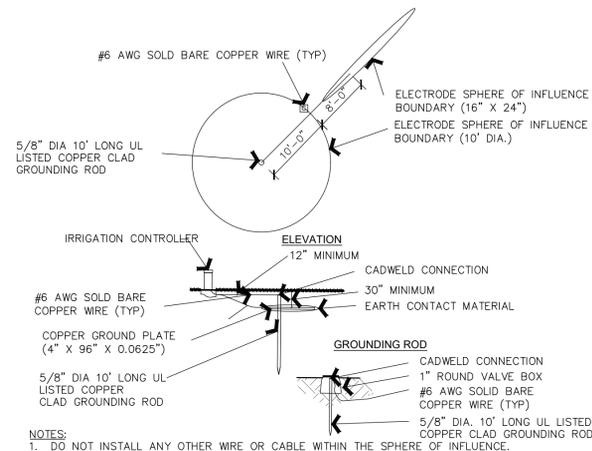
NOTES:  
1. SECURE ALL BARB FITTINGS WITH A STAINLESS STEEL PINCH CLAMP.  
2. INSTALL AN AIR/VACUUM RELIEF VALVE AT HIGH POINTS WITHIN DRIP ZONE.  
3. INSTALL FILTER FABRIC AROUND EXTERIOR OF VALVE BOX. USE DUCT TAPE TO SECURE FABRIC TO PIPE AND VALVE BOX.

**O DRIP AIR/VACUUM RELIEF VALVE ASSEMBLY**  
NOT TO SCALE

- 1 FINISH GRADE
- 2 GREEN VALVE BOX AND COVER
- 3 CONTROL WIRES WITH 12" MIN. SERVICE COIL AND WATERPROOF WIRE SPLICE CONNECTORS -
- 4 FLOW SENSOR PER IRRIGATION LEGEND
- 5 RAIN BIRD PESB SERIES MASTER VALVE
- 6 STRAIGHT PIPE REQUIRED: MINIMUM 10x PIPE DIAMETER UPSTREAM & MINIMUM 5x PIPE DIAMETER DOWNSTREAM
- 7 UNIONS
- 8 PVC MAINLINE - LENGTH AS REQUIRED
- 9 6" DEPTH OF WASHED 3/4" GRAVEL
- 10 CONTINUOUS BRICK SUPPORTS
- 11 VALVE BOX EXTENSIONS REQUIRED

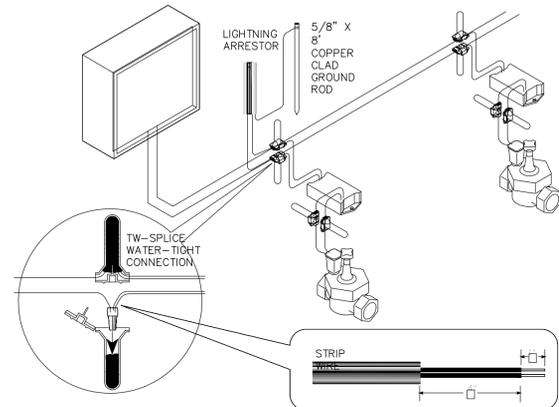


**P MASTER VALVE & FLOW SENSOR**  
NOT TO SCALE

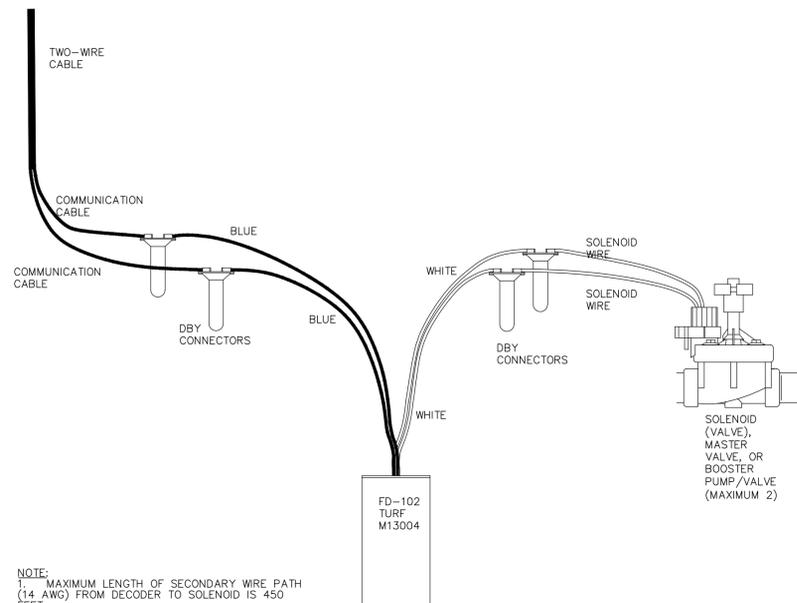


NOTES:  
1. DO NOT INSTALL ANY OTHER WIRE OR CABLE WITHIN THE SPHERE OF INFLUENCE.  
2. PLACE 100 LB POWER SET SOIL AMENDMENT TO EACH PLATE AS PER MANUFACTURER'S RECOMMENDATIONS.

**Q GROUNDING DETAIL**  
NOT TO SCALE



**R 2-WIRE CONNECTION**  
NOT TO SCALE



NOTE:  
1. MAXIMUM LENGTH OF SECONDARY WIRE PATH (14 AWG) FROM DECODER TO SOLENOID IS 450 FEET.

**S DECODER WIRING**  
NOT TO SCALE

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## APPENDIX C - PRELIMINARY STORM DRAIN ANALYSIS

# Deseret Industries and Bishop Storehouse

## PRELIMINARY DRAINAGE REPORT

November 25, 2019

Prepared By:



ENGINEERS

SURVEYORS

PLANNERS

3302 N Main Street  
Spanish Fork, UT 84660  
(801) 798-0555

## **DESCRIPTION OF DEVELOPMENT**

The Deseret Industries and Bishop Storehouse site is located within the city of Saratoga Springs, on the west side of Redwood Road and north of Medical Drive. The development area will be divided into two lots. Lot 1 will remain vacant until future development. Lot 2 will consist of the Deseret Industries and Bishop Storehouse site. There is approximately 10.15 acres in the development associated with Lot 2. It currently consists of a vacant field with natural vegetation.

## **OFF-SITE DRAINAGE FEATURES**

There are no offsite drainage features discharging to the site.

## **EXISTING STORM DRAINAGE FEATURES**

The site is currently vacant and is covered with native vegetation. There will be storm drain pipes installed in Medical Drive on the south side of the site with improvements to the Costco site to the south. These downstream pipes will be installed prior to the construction of the Deseret Industries and Bishops Storehouse Site. See the construction drawings for details on the location and sizing of these structures.

## **PROPOSED STORM DRAINAGE FACILITIES**

The proposed storm drain system within the site will consist of inlets and pipes that will be used to route runoff to a series of underground storm chambers before discharging the storm water into the existing downstream system. All pipe sizing and underground detention will be designed according standards set by Saratoga Springs City. The actual storm drain layout and design will be finalized as the site plan design progresses.

## **DRAINAGE CALCULATIONS**

See Appendix A for a complete summary of the calculations including the storage requirements for the underground detention chambers. Due to the size of the site, the rational method was used for the storm drain calculations. The runoff coefficient (c-value) was calculated taking a weighted average of the c-value of all types of proposed ground cover. The rainfall intensities used were taken from data provided in the City Standards. The storm chambers were sized to accommodate the runoff from a 100-year 24-hour storm. The release rate of 0.12 cfs/acre is based on the latest Market Street Storm Drain Capacity Analysis. Refer to Appendix A for the chamber sizing and c-value calculations.

## **STORM DRAIN DRAWINGS**

The exact layout and design of the on-site storm drain inlets, pipes, and underground detention system will be provided with final site plan drawings.

## **CONCLUSION**

Storm water runoff will be collected and detained before being discharged to the downstream system. See the storm drain report submitted for the Costco improvements as well as the Market Street Storm Drain Capacity Analysis for details on the downstream storm drain infrastructure.

## **APPENDIX A: STORM DRAIN CALCULATIONS**



Consulting Engineers and Surveyors, Inc.  
3302 N. Main, Spanish Fork, UT 84660 (801)798-0555

## Storm Drainage Calculations

**Deseret Industries and Bishop's Storehouse  
Saratoga Springs, UT**

Date: September 3, 2019  
Project #: 2019-0012  
Prepared By: EKB  
Revisions:

### Design Criteria

Intensity Table: **Saratoga Springs City Standards**  
Return Period: 100 year  
Allowable Discharge: 0.12 cfs/Ac

### Allowable Discharges

Orifice Discharge: 1.22 cfs  
Total Discharge: 1.22 cfs

### Weighted "C" Value

Surface Type	Area (ac)	C-Value	C*A
Roof	1.60	0.84	1.34
Pavement	6.51	0.89	5.79
Landscape/Open Space	2.04	0.44	0.90
<b>Totals</b>	<b>10.15</b>		<b>8.0</b>
<b>Weighted "C" Value</b>		<b>0.79</b>	

### Drainage Calculations

Duration	Intensity		Area	Rainfall	Accumulated		Discharge	Required
<i>min</i>	<i>in/hr</i>		<i>Ac</i>	<i>cfs</i>	<i>cf</i>		<i>cf</i>	<i>cf</i>
5.0	6.12	0.79	10.15	49.18	14,753	1.22	365	14,388
10.0	4.68	0.79	10.15	37.61	22,564	1.22	731	21,833
15.0	3.84	0.79	10.15	30.86	27,771	1.22	1,096	26,674
30.0	2.58	0.79	10.15	20.73	37,317	1.22	2,192	35,124
60.0	1.60	0.79	10.15	12.86	46,284	1.22	4,385	41,900
120.0	0.87	0.79	10.15	6.95	50,045	1.22	8,770	41,275
180.0	0.58	0.79	10.15	4.66	50,334	1.22	13,154	37,180
360.0	0.31	0.79	10.15	2.46	53,227	1.22	26,309	26,918
720.0	0.17	0.79	10.15	1.38	59,591	1.22	52,618	6,974
1440.0	0.09	0.79	10.15	0.71	61,038	1.22	105,235	-44,198

Maximum Storage Requirement: 41,900

### Detention Pond

Required Detention Volume: 41,900 cf  
Provided Detention Volume: 42,824 cf

### Notes / Details

Storm Tech MC-4500 Chamber and End Cap  
Number of Rows 10  
Number of End Caps 20  
Storage per End Cap 108.70 ft<sup>3</sup>  
Number of Chamber 250  
Storage per Chamber 162.60 ft<sup>3</sup>

Actual underground detention system to be designed with final site plan drawings.

## APPENDIX D - GEOTECHNICAL INVESTIGATION REPORT



**IGES**<sup>®</sup>

Intermountain GeoEnvironmental Services, Inc.  
12429 South 300 East, Suite 100, Draper, Utah, 84020  
Phone (801) 748-4044 | Fax (801) 748-4045  
www.igesinc.com

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Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah  
IGES Project No. 03019-001  
June 7, 2019

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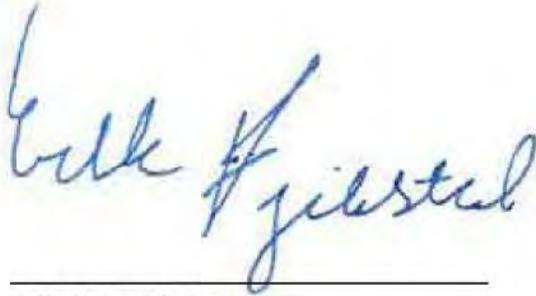
Prepared for  
**JRW & Associates**  
**1152 Bond Avenue, Suite A**  
**Rexburg, Idaho 83440**  
**Attn: Johnny Watson**

**Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah**

IGES Job No. 03019-001

June 7, 2019

Prepared by:



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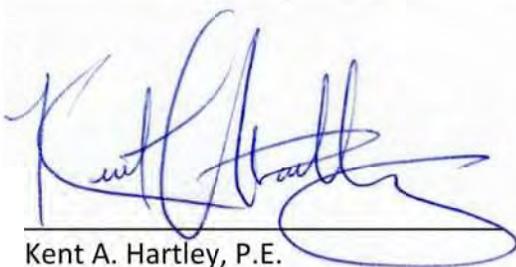
Erik Fjelsted, P.E.  
Staff Engineer



---

David A. Petersen, P.E.  
Project Engineer

Reviewed by



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Kent A. Hartley, P.E.  
Principal

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### APPENDICES

A	Figure A-1	Site Vicinity Map
	Figure A-2	Site Map
	Figures A-3 to A-10	Test Pit Logs
	Figure A-11	Key to USCS Soil Symbols and Terminology
B		CPT Report
C		Laboratory Test Results
D		MCE-PGA Design Response Spectra
E		Liquefaction Analysis Results

## 1.0 EXECUTIVE SUMMARY

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North and Redwood Road in Saratoga Springs, Utah. Based on the subsurface conditions encountered, the subject site is suitable for development provided that the recommendations presented in this report are incorporated into the design and construction of the project. A summary of the critical observations and recommendations are included below:

- Based on our observations, native soils consisted of Lean CLAY (CL), Silty SAND (SM), and Poorly Graded GRAVEL with silt (GP-GM).
- The site is covered by approximately 12 to 24 inches of topsoil, which will need to be removed before constructing footings.
- Groundwater was not encountered in any of the Test Pits. The CPT explorations encountered groundwater at a depth of approximately 29 to 43 feet below existing grade.
- Based on our liquefaction analysis up to ¼ inch of liquefaction induced settlement could occur during a seismic event. This estimate is a cumulative sum of numerous small layers, most of which are 4 to 6 inches or less in thickness. It is our judgment that liquefaction should not impact the proposed development at the site.
- Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. Footings established in this manner may be designed using an allowable bearing capacity of **1,500 psf** or if placed on a zone of structural fill having a minimum thickness of 24 inches the bearing capacity may be increased to **2,000 psf** (see section 6.3). Due to the variable nature of the subsurface soil conditions, IGES should observe all foundation excavations prior to placing concrete. To reduce the potential for excessive differential settlement, transition zones between fill and native soil are not recommended.
- Flexible (asphalt) and rigid (concrete) pavement sections have been prepared for parking lot, drives and heavy traffic areas. These pavement section designs have been completed for a 40-yr life expectancy and are summarized in Section 6.7 of this report.
- Active, at-rest and passive lateral earth pressure coefficients of 0.30, 0.50 and 3.0 respectively and seismic active lateral earth pressure coefficient of 0.75.
- Concrete slabs-on-grade should be constructed over at least 4 inches of compacted gravel overlying native soils or a zone of structural fill that is at least

12 inches thick. The slab may be designed with a modulus of subgrade reaction of **120 psi/inch**.

The recommendations made in this report are based on the assumption that an adequate program of tests and observations will be made during the construction. IGES staff should be on site to verify compliance with these recommendations.

This executive summary is not intended to replace the complete report and should not be used separately from the report. The executive summary omits a number of details, any one of which could be crucial to the proper application of this report.

## 2.0 INTRODUCTION

### 2.1 PURPOSE AND SCOPE OF WORK

This report presents the results of a geotechnical investigation conducted for the proposed Welfare Complex which includes a Deseret Industries Retail Store and Bishop's Storehouse, located at approximately 1200 North Redwood Road in Saratoga Springs, Utah as shown on the *Site Vicinity Map* (Figure A-1). The purposes of this investigation were to assess the nature and engineering properties of the subsurface soils at the site and to provide recommendations for general site grading and design and construction of foundations, pavements, slabs-on-grade and exterior concrete flatwork.

The scope of work completed for this study included a site reconnaissance, subsurface exploration, soil sampling, laboratory testing, engineering analyses and preparation of this report.

The recommendations contained in this report are subject to the limitations presented in Section 7.0 of this report.

### 2.2 PROJECT DESCRIPTION

It is our understanding that the development at the site will include two buildings, roadways, parking lots, landscaping and a detention pond on a 10.5-acre site. The bishop's storehouse is currently planned as a single-story, at-grade structure with a foot print of approximately 23,000 square feet. The Deseret Industries Retail store is currently planned as a single-story, at-grade structure with a foot print of approximately 60,000 square feet. It is anticipated that the parking lots, roadways and loading areas will be paved with either asphalt or concrete. It is anticipated that the proposed structures will be lightly loaded and will be constructed on conventional strip and spread footings.

### 3.0 METHOD OF STUDY

#### 3.1 FIELD INVESTIGATION

As part of this investigation, near-surface soil conditions were explored by completing 8 test pits to a maximum of 14 feet below existing grade and advancing two Cone Penetration Test (CPT) soundings to 50 feet below existing grade. A member of our technical staff visually logged soils at the time of exploration in general accordance with the *Unified Soil Classification System (USCS)*. The approximate locations of the test pits, CPTs, and infiltration test are shown on the *Site Map* (Figure A-2). The geologic conditions are discussed in greater detail in Section 5 of this report. The *Test Pit Logs* are included at the end of this report (Figures A-3 through A-11); a *Key to Soil Symbols and Terminology* is provided as Figure A-12. The CPT Logs are included as part of Appendix B. A discussion of the subsurface conditions encountered is provided in Section 4.0 of this report.

The test pits were completed using a JCB-4CX rubber-tired backhoe. Soil sampling was completed to collect representative samples of the various layers observed at the site. Disturbed samples were placed in plastic baggies and relatively undisturbed soil samples were collected with the use of a 6-inch long brass tube attached to a hand sampler driven with a 2-lb sledge hammer. All samples were transported to our laboratory to evaluate the engineering properties of the various earth materials observed. The soils were classified in accordance with the *Unified Soil Classification System (USCS)* by our field personnel. Classifications for the individual soil units are shown on the attached test pit logs (Figures A-3 through A-11).

The CPT was completed using a 25-ton box-truck. Additional calculations and analysis included as part of the CPT exploration completed at the site are included in Appendix B. These calculations include pore pressure dissipation (PPD) tests to assess groundwater levels and artesian conditions along with seismic tests to assess the representative shear wave velocity of site soils.

##### 3.1.1 Infiltration Testing

Infiltration tests were completed for the project in TP-1 at approximately 4 feet below existing site grade.

The test was performed as follows: a hole approximately 6 inches in diameter and 13 inches in depth was hand-excavated at the bottom of the test pit, and then filled with water. The soil was presoaked for approximately 30 minutes, after which periodic readings were made and recorded to measure the water level at time increments of approximately 10 minutes.

The test was continued until a steady-state infiltration rate could be identified in the records – testing continued for about 90 minutes after pre-soak.

Our test results indicated that the native Lean CLAY (CL) soils were moderately permeable, with measured infiltration measurements given in tables 3.3.1.

**Table 3.3.1 - Infiltration Test Summary – TP-1**

Diameter ~ 6 inches				
Time Elapsed (minutes)	Change in Depth (inch)	Infiltration Rate (min/in)	Infiltration Rate (in/hr)	Comments
0	0	0	0	Intermediate Reading
11	2.0	5.5	10.9	Intermediate Reading
20	1.0	9.0	6.7	Intermediate Reading
30	1.0	10.0	6.0	Intermediate Reading
41	0.88	12.6	4.8	Intermediate Reading
50	0.50	18.0	3.3	Intermediate Reading
60	0.63	16.0	3.8	Intermediate Reading
70	0.50	20.0	3.0	Intermediate Reading
81	0.50	22.0	2.7	Intermediate Reading
90	0.50	<b>18.0</b>	<b>3.3</b>	<b>Final Reading</b>

### 3.2 LABORATORY INVESTIGATION

Geotechnical laboratory tests were conducted on representative relatively undisturbed and bulk soil samples obtained during our field investigation. The laboratory testing program was designed to evaluate the engineering characteristics of onsite earth materials. Laboratory tests conducted during this investigation include:

- Laboratory Compaction Characteristics of Soil (Standard Proctor - ASTM D698/D1557)
- California Bearing Ratio (CBR) (ASTM D1883)
- Collapse/Swell Potential (ASTM D4546)

The results of laboratory tests are presented on the Boring Logs in Appendix A (Figures A-3 through A-11) and in Appendix C.

### 3.3 ENGINEERING ANALYSIS

Engineering analyses were performed using soil data obtained from the laboratory test results and empirical correlations from material density, depositional characteristics and classification. Analyses were performed using formulas, calculations and software that represent current methods accepted by the geotechnical industry. These methods include settlement, bearing capacity, lateral earth pressures, trench stability and pavement design. Appropriate factors of safety were applied to the results consistent with industry standards and the accepted standard of care. The results of our engineering analysis are presented in the recommendations section of this report.

## 4.0 GENERALIZED SITE CONDITIONS

### 4.1 SURFACE CONDITIONS

At the time of our subsurface investigation, the site was vacant and appeared to be used for farming. The surficial soils appeared to be comprised of topsoil consisting of lean clay. The site is relatively flat sloping very gradually down to the east between an elevation of approximately 4,540 feet above mean sea level.

### 4.2 SUBSURFACE CONDITIONS

#### 4.2.1 Soils

Based on our observations the site is overlain by 12 to 24 inches of topsoil comprised of Lean CLAY (CL). Based on our observations, native soils consisted primarily of Lean CLAY (CL) with some isolated layers of Silty SAND (SM) and Poorly Graded GRAVEL with silt (GP-GM).

##### Lean CLAY (CL)

The Lean CLAY (CL) was observed below the topsoil in each test pit. The clay extended to a depth of 10.5 to 14 feet below existing grade. It was generally medium stiff, slightly moist to moist, and moderate brown. Pinholes were observed primarily within the upper 6 feet.

##### Silty SAND (SM)

The Silty SAND was observed in TP-3, TP-5, TP-6 and TP-7. The silty sand was generally medium dense, moist and tan.

##### Poorly Graded GRAVEL with silt (GP-GM)

The Poorly Graded GRAVEL with silt (GP-GM) was observed in TP-5. The gravel was generally medium dense to dense and slightly moist to dry. These gravels have 5 to 12 percent fines. The typical gravel size is 1 inch with 3 inches being the maximum size.

Refer to the boring logs for a more detailed description of the soils encountered (Appendix A).

#### 4.2.2 Groundwater

Groundwater was not encountered in any test pits, however based on the CPT data groundwater was encountered at 29 and 43 feet below grade in CPT-01 and CPT-02, respectively. Seasonal fluctuations in precipitation, snowmelt, surface runoff from

adjacent properties, or other on or offsite sources including irrigation or other sources may increase moisture conditions; groundwater conditions can be expected to fluctuate several feet seasonally depending on the time of year. Groundwater is not anticipated to impact the planned construction.

#### 4.2.3 Collapsible Soils

Collapse is a phenomenon where undisturbed native soils under increased loading can exhibit volumetric strain and consolidation upon wetting. Collapsible soils can cause differential settling of structures and roadways. Collapsible soils do not necessarily preclude development and can be mitigated by over-excavating porous, potentially collapsible soils and replacing with engineered fill and by controlling surface drainage and runoff. Collapsible soils are typically characterized by a pinhole structure and relatively light in-situ density. Pinholes were observed in the native clay soil mainly in the upper 6 feet. IGES completed four collapse tests on representative soil samples; test results are summarized below in Table 4.2.3 . The complete results of the one-dimensional collapse tests can be seen in Appendix C.

**Table 4.2.3 - Summary Collapse Test Results**

Location	Depth	Collapse Load	Percent Collapse
TP-2	4.5	2000	5.1%
TP-3	6.0	2000	0.5%
TP-5	4.5	2000	2.6%
TP-7	3.5	2000	3.5%

## 5.0 GEOLOGIC CONDITIONS

### 5.1 GEOLOGIC SETTING

The site is located at an elevation between approximately 4,540 feet in the northwestern portion of Utah Valley. Utah Valley represents a deep, sediment-filled structural basin of Cenozoic-age flanked by uplifted blocks; the Wasatch Range on the east, and the Lake and East Tintic Mountains to the west (Hintze, 1980). The Wasatch Range is the easternmost expression of pronounced Basin and Range extension in north-central Utah.

The near-surface geology of the Utah Valley is dominated by sediments, which were deposited within the last 30,000 years by Lake Bonneville (Scott et al., 1983; Hintze, 1993; Machette, 1992). The lacustrine sediments near the mountain front consist mostly of gravel and sand. As the lake receded, streams began to incise large deltas that had formed at the mouths of major canyons along the Wasatch Range, and the eroded material was deposited in shallow lakes and marshes in the basin and in a series of recessional deltas and alluvial fans. Sediments toward the center of the valley are predominately deep-water deposits of clay, silt and fine sand. However, these deep-water deposits are in places covered by a thin post-Bonneville alluvial cover.

Surface sediments at the subject site are mapped as Upper Pleistocene lacustrine silt and clay (QImp) (Biek, 2004). QImp is described as calcareous silt with minor clay and laminated fine-grained sand that was deposited below the Provo shoreline of Lake Bonneville.

### 5.2 FAULTING AND SEISMICITY

The site lies within the north-south trending belt of seismicity known as the Intermountain Seismic Belt (ISB) (Hecker, 1993). The ISB extends from northwestern Montana through southwestern Utah. An active fault is generally defined as a fault that has had activity within the Holocene (<11ka). No active faults are mapped through or immediately adjacent to the site (Black et al., 2003). The site is located approximately 9.2 miles west of the main trace of the Provo segment of the Wasatch Fault Zone, the closest mapped active fault. Smaller detached splays of the Provo segment are located approximately 3.8 miles northeast and 7.8 miles east-northeast of the project site respectively. The Provo segment is one of the longest sections of the Wasatch Fault Zone (Hecker, 1993) and is estimated to be approximately 43 miles long with a reported rupture length of 37 miles and a maximum potential to produce earthquakes up to magnitude ( $M_s$ ) 7.5 to 7.7 (Black et al., 2003). The site is also located approximately 2.1 miles northwest of the Utah Lake Faults and Folds (ULFF). The ULFF consists of several northeast to northwest trending faults and folds located beneath Utah Lake and are reported to

have been active in the past 15 ka (Black et al., 2003). However, since the ULFF is at the bottom of a large lake these faults are poorly understood – as such, the USGS does not include ULFF in their fault database for seismic hazard analysis. Analysis of the ground shaking hazard along the Wasatch Front suggests that the Wasatch Fault Zone is the single greatest contributor to the seismic hazard in the Salt Lake City region.

Following the criteria outlined in the 2015 International Building Code (IBC, 2015), spectral response at the site was evaluated for the Maximum Considered Earthquake (MCE) which equates to a probabilistic seismic event having a two percent probability of exceedance in 50 years (2PE50). Spectral accelerations were determined based on the location of the site using the *U.S. Seismic Design Maps* USGS website. This tool incorporates seismic hazard maps depicting probabilistic ground motions and spectral response data developed for the United States by the U. S. Geological Survey as part of NEHRP/NSHMP (Frankel et al., 1996). These maps have been incorporated into both *NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures* (FEMA, 1997) and *the International Building Code* (IBC) (International Code Council, 2015).

Based on our understanding of the proposed project, it is recommended the building be designed with a structural *Building Risk Category* of *II*. To account for site effects, site coefficients that vary with the magnitude of spectral acceleration and *Site Class* are used. Site classification is based on the upper 100 feet of the site soil profile; based on our field exploration and understanding of the geology in this area, the subject site is best classified as Site Class D (*Stiff Soil*). Based on IBC criteria, the short-period ( $F_a$ ) and long-period ( $F_v$ ) site coefficients are 1.109 and 1.740, respectively. The Risk-Targeted Maximum Considered Earthquake (MCE<sub>R</sub>) *Spectral Response Accelerations* are presented in Table 3.3.1; a summary of the *Design Maps* data is presented in Appendix C. The *peak ground acceleration* (PGA) may be taken as 0.395g (see Appendix C). It should be noted that to more accurately determine the site classification and site-specific seismic design parameters a geotechnical investigation to a minimum depth of 100 feet is needed. The seismic design category for this site is D.

**Table 5.2.1 - Short- and Long-Period Spectral Accelerations for MCE**

Parameter	Short Period (0.2 sec)	Long Period (1.0 sec)
MCE Spectral Response Acceleration (g)	$S_S = 0.977$	$S_1 = 0.330$
MCE Spectral Response Acceleration Modified for Site Class D (g)	$S_{MS} = S_S F_a = 1.083$	$S_{M1} = S_1 F_v = 0.574$
Design Spectral Response Acceleration (g)	$S_{DS} = S_{MS}^2 / 3 = 0.722$	$S_{D1} = S_{M1}^2 / 3 = 0.383$

### 5.3 OTHER GEOLOGIC HAZARDS AND CONDITIONS

Geologic hazards and conditions can be defined as naturally occurring geologic conditions or processes that could present a danger to human life and property or result in impacts to conventional construction procedures. These hazards and conditions must be considered before development of the site. There are several hazards and conditions in addition to seismicity and faulting which, if present at a site, should be considered in the design of the site facilities. Liquefaction is the only other geologic hazard considered for this site.

#### 5.3.1 Liquefaction

Certain areas within the Intermountain region possess a potential for liquefaction during seismic events. Liquefaction is a phenomenon whereby loose, saturated, granular soil deposits lose a significant portion of their shear strength due to excess pore water pressure buildup resulting from dynamic loading such as that caused by an earthquake. Among other effects, liquefaction can result in densification of such deposits causing settlements of overlying layers after an earthquake as excess pore water pressures are dissipated. The primary factors affecting liquefaction potential of a soil deposit are: (1) level and duration of seismic ground motions; (2) soil type and consistency; and (3) depth to groundwater.

Referring to the *Liquefaction-Potential Map for Utah County, Utah* published by the Utah Geological Survey, the site is located within an area currently designated as "moderate" for liquefaction potential. Therefore, IGES completed two CPT explorations to depths of approximately 50 feet to evaluate the liquefaction potential at this site.

We have evaluated the liquefaction potential of the soil profile encountered in the CPT completed for this site in accordance with procedures detailed by Youd et al. (2001), and

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*Recommended Procedures for Implementation of CDMG Special Publication 117* (Martin and Lew, 1999). Our analysis considered groundwater levels directly observed with the CPT explorations and PPD tests; however, the groundwater level modeled for our liquefaction analysis was conservatively assumed to be about 4 feet higher than the groundwater level observed in the subsurface explorations to account for possible future groundwater level increases.

Our liquefaction model incorporates the PGA corresponding to the 2PE50 ground motion (see Section 5.2). The PGA is estimated to be 0.4g.

Liquefaction analysis also considers the *deaggregated* moment magnitude for a site (the moment magnitude that has the highest contribution to the hazard for the ground motion under consideration). Based on our experience in this area, IGES has used a deaggregated moment magnitude of 7.4 Mw.

For the purpose of our analysis, we have used a factor-of-safety against liquefaction of 1.4 to differentiate between potentially liquefiable and non-liquefiable soils (a factor-of-safety below 1.1 is considered liquefiable, between 1.1 and 1.4 *may* liquefy, and greater than 1.4 is considered to not liquefy). Potential dynamic settlement was evaluated using the methods developed by Tokimatsu and Seed (1987). A summary of the calculations is presented in Appendix E. No liquefaction induced settlement was calculated in CPT-02 and ¼-inch of settlement was calculated for CPT-01. This value is the cumulative sum of multiple small layers, most of which are isolated to 4 to 6 inches or less. These layers are also observed at depths of approximately 30 feet or greater. Based on a boundary curve chart used to predict liquefaction-induced ground damage (Ishihara, 1985), the potential for these discrete layers to manifest liquefaction-induced phenomena at the surface is low (e.g., settlement, sand boils, loss of bearing capacity, etc.).

## 6.0 ENGINEERING ANALYSIS AND RECOMMENDATIONS

### 6.1 GENERAL CONCLUSIONS

Based on the subsurface conditions encountered at the site, it is our opinion that the subject site is suitable for development provided that the recommendations included in this report are incorporated into the design and construction of the project. If development at the site does take place, IGES should be notified and allowed to review the proposed development in order to assess the suitability of this report in regard to the planned improvements and to recommend additional explorations, analysis and recommendations.

In general, 12 to 18 inches of topsoil was identified on site. Footings should be established entirely on competent native soils or on a zone of structural fill extending to competent native soils a minimum of 6 feet below existing grade. All footings or structural fill placed beneath footings should extend a minimum of 6 feet below existing grade to get below the collapsible soils. The following sub-sections present our recommendations for general site grading, design of foundations, slabs-on-grade, pavements, moisture protection and soil corrosivity that should be considered prior to developing this site.

### 6.2 EARTHWORK

Prior to the placement of foundations, general site grading is recommended to provide proper support for foundations, exterior concrete flatwork, concrete slabs-on-grade, and pavement sections. Site grading is also recommended to provide proper drainage and moisture control on the subject property and to aid in preventing differential movement in foundation soils as a result of variations in moisture conditions.

#### 6.2.1 General Site Preparation and Grading

Within the areas to be graded (below proposed structures, fill sections, concrete flatwork, and pavement sections) any existing surface vegetation, debris, undocumented fill, asphalt, concrete or other miscellaneous debris should be removed. All topsoil should be removed from below footings. Over-excavated soils can be used as structural fill if relatively free of deleterious material and organics and compacted in accordance with the recommendations presented in this report (Section 6.2.4). Topsoil shall be segregated from other soil and not be permitted to be used as structural fill.

An IGES representative should be on site at key points in construction to observe the site preparation and grading operations to assess whether the recommendations presented in this report have been complied with.

### 6.2.2 Trench Excavations

Based on our soil observations, fine-grained soils are prevalent at the site and are considered to be Type A soils (OSHA). Based on OSHA guidelines for excavation safety, trenches with vertical walls up to 5 feet in depth may be occupied. When the trench is deeper than 5 feet we recommend a trench-shield or shoring be used as a protective system to workers in the trench. Alternatively, excavations deeper than 5 feet (up to 20 feet) may be constructed with side slopes no steeper than one and three quarters horizontal to one vertical ( $1\frac{3}{4}H:1V$ ). When undocumented fill soils, saturated soils or wet conditions are encountered, side slopes may need to be further flattened to maintain stability. If excavations greater than 20 feet in depth are anticipated a registered professional engineer must design the protective system.

The contractor is ultimately responsible for trench and site safety. Pertinent OSHA requirements should be met to provide a safe work environment. If site specific conditions arise that require engineering analysis in accordance with OSHA regulations, IGES can respond and provide recommendations as needed.

We recommend that IGES observe all excavations to assess the exposed foundation soils. We also recommend that the geotechnical engineer be allowed to review the grading plans when they are prepared in order to evaluate their compatibility with these recommendations.

### 6.2.3 Excavations

Excavations should extend laterally at least two feet beyond slabs-on-grade, footings and pavements. Structural fill should be placed and compacted in accordance with and meet the recommendations included in this report.

Prior to placing structural fill, utilities or constructing footings any loose soils observed in excavation bottoms should be removed or moisture conditioned to within 2 percent of the optimum moisture content (OMC) and compacted to at least 95 percent of the maximum dry density (MDD) as determined by ASTM D-1557 (modified Proctor). If over-excavation is required, it should extend a minimum of 1 foot laterally for every foot of depth of over-excavation.

### 6.2.4 Structural Fill and Compaction

All fill placed for the support of structures, flatwork or pavements should consist of structural fill. Structural fill may consist of excavated onsite native fine-grained soils or an

approved imported granular soil. The native fine-grained soils may be challenging to work with to obtain the desired level of compaction. If native fine-grained soils are used as structural fill, they should be pulverized and moisture conditioned beyond the optimum moisture content (OMC) before being placed as structural fill. If import structural fill is used, it should be relatively well graded and have a minimum fines (material passing the No. 200 sieve) of 30 percent. A less permeable fill is desired due to the collapsible soils, hence the reason for requiring a “minimum” of 30% fines. In all cases, structural fill should be free of vegetation and debris, and contain no rock larger than 4 inches in nominal size (6 inches in greatest dimension).

Soil not meeting the aforementioned criteria may be suitable for use as structural fill; alternate borrow sources may be considered but should be reviewed and approved by IGES prior to use. All structural fill soils should be approved by the Geotechnical Engineer prior to placement.

All structural fill should be placed in maximum 6-inch loose lifts if compacted by small hand-operated compaction equipment, maximum 8-inch loose lifts if compacted by light-duty rollers, and maximum 12-inch loose lifts if compacted by heavy duty compaction equipment that is capable of efficiently compacting the entire thickness of the lift. These lift thicknesses are *maximums*; the contractor should understand that thinner lifts may be necessary to achieve the required compaction. We recommend that all structural fill be compacted on a horizontal plane, unless otherwise approved by IGES. The moisture content should be at or above the OMC based on the modified proctor (ASTM D1557) for all structural fill. Prior to placing any fill, the excavations should be observed by IGES to assess compliance with our recommendations. In addition, proper grading should precede placement of fill, as described in the General Site Preparation and Grading subsection of this report. All structural fill below footings, pavement, sidewalks and curb and gutter and other concrete slab on grade construction should be compacted to a minimum of 95 percent of the maximum dry density (MDD) based on the modified proctor (ASTMD 1557).

Specifications from governing authorities such as cities and special service districts having their own precedence for backfill and compaction should be followed where applicable. Structural fill as defined above or native soils may be used to backfill around the foundation walls and that it be placed in lifts not exceeding 12 inches prior to compaction, compacted to approximately 90 percent of the MDD and moisture conditioned to within 2 percent of the OMC.

### 6.2.5 Utility Trench Fill and Compaction

All utility trenches backfilled below footings, pavement sections, concrete flatwork, curb and gutter and/or sidewalks should be backfilled with structural fill that is at or slightly above the OMC when placed and compacted to at least 95 percent of the MDD as determined by ASTM D-1557. All other trenches in landscape areas should be backfilled and compacted to a minimum of 90 percent of the MDD and within 2 percent of the OMC as determined by ASTM D-1557.

Utility trenches should be backfilled with structural fill as discussed in Section 6.2.5 of this report. Pipe bedding should *not* be water-densified in-place (jetting). Alternatively, pipe bedding and shading may consist of clean  $\frac{3}{4}$ -inch gravel which generally does not require compaction. More stringent specifications from utility companies, cities or other governing authorities having their own precedence for backfill and compaction should be followed where applicable.

### 6.2.6 Soft Soil Stabilization

Due to the presence of fine-grained clayey soils, soft soils may be encountered at the site due to the presence of water following precipitation events; this condition may be exacerbated in cold weather. These soils may cause equipment mobility problems and may make it difficult to place and properly compact structural fill overlying the soft soils. If encountered, we recommend stabilizing these soils prior to placing structural fill, constructing pavement sections or foundation elements such as footings.

Stabilization can be accomplished by placing a woven geotextile over the soft subgrade; seams should be overlapped a minimum of 24 inches or as recommended by the manufacturer. The geotextile should be covered with a minimum of 18 inches of crushed, angular  $\frac{3}{4}$ - to 3-inch diameter drain rock. Structural fill (Section 6.2.4) may then be placed and compacted as recommended in this report. The woven geotextile should consist of TenCate Mirafi HP370 or an approved equivalent. The geotextile should be placed to cover the entire excavation bottom.

Alternatively, stabilization of soft or pumping subgrade can be accomplished using a clean, coarse angular material worked into the soft subgrade. We recommend the material be greater than 3 inches in nominal diameter, but less than 6 inches. The stabilization material should be worked (pushed) into the soft subgrade soils until a relatively firm and unyielding surface is established. Once a relatively firm and unyielding surface is achieved, the area may be brought to final design grade using structural fill. Other earth materials not meeting aforementioned criteria may also be suitable but will likely require a thicker section of aggregate; however, such material should be evaluated on a case-by-case basis and should be approved by IGES prior to use. The area should be

wheel-rolled with heavy equipment to evaluate whether a firm working surface has been achieved and that soft/pumping soils have been “bridged” to the greatest extent reasonably possible based on existing subsurface conditions. An IGES representative should be present during this evaluation.

The area of stabilization should extend a minimum of 3 feet beyond the footings and/or footprint of the structure, whichever is greater.

### 6.3 FOUNDATIONS

Prior to constructing footings, all topsoil and any undocumented fill soils should be removed before constructing footings. Footings should be established entirely on competent native soils or on a zone of structural fill that extends to competent native soils located at a minimum depth of 6 feet below existing side grade. Loose soils remaining in the excavation following excavation should either be removed or compacted in place. To reduce the potential for differential settlement, transition zones between fill and native soil are generally not recommended but can be evaluated on a case by case basis. If structural fill is used it should meet the criteria described in Section 6.2.5 and have a minimum thickness of 12 inches. The structural fill should also extend a minimum of 24 inches beyond the edge of the footings. Strip footings should be a minimum of 24 inches wide and no greater than 48 inches wide; spread footings should be a minimum of 30 inches wide and no greater than 9 feet wide. Exterior footings should be embedded at least 30 inches below final grade for frost protection and confinement. Interior footings not exposed to the full effects of frost (i.e., a continuously headed structure) should be embedded at least 18 inches for confinement.

Conventional strip footings founded as described above may be proportioned for a maximum net allowable bearing capacity of **1,500 pounds per square foot (psf)**. The bearing capacity may be increased to 2,000 if placed on a zone of structural fill having a minimum thickness of 24 inches. these values are for dead load plus live load conditions.

Static settlements of properly designed and constructed conventional footings, founded as described above, are anticipated to be less than 1 inch. Differential settlements should be on the order of half the total settlement over 30 feet.

### 6.4 CONCRETE SLAB-ON-GRADE CONSTRUCTION

Concrete slabs-on-grade should be constructed over at least 4 inches of gravel overlying a zone of structural fill (reworked native soils) with a minimum thickness of 18 inches due to the collapse potential of native soils. Native soils should be removed to a depth of at least 12 inches, the exposed soils may then be scarified to a minimum depth of 6 inches

and compacted in place and then the removed native soils can be replaced as structural fill in 6 inch lifts). The slab may be designed with a Modulus of Subgrade Reaction of **120 psi/inch**. The gravel should consist of clean drain rock with a  $\frac{3}{4}$ -inch maximum particle size and no more than 5 percent fines passing the No. 200 mesh sieve. The gravel layer should be vibrated in place until tight and relatively unyielding.

The maximum load on the floor slab should not exceed 300 psf; greater loads may be allowed but must be evaluated by IGES or a structural engineer on a case-by-case basis. All concrete slabs should be designed to minimize cracking as a result of shrinkage. Consideration should be given to reinforcing the slab with a welded wire fabric, re-bar, or fiber mesh. Slab reinforcement should be designed by the structural engineer; however, as a minimum, slab reinforcement should consist of W4.0 x W4.0 welded wire mesh within the middle third of the slab.

Our experience indicates that use of reinforcement in slabs and foundations can generally reduce the potential for drying and shrinkage cracking. However, some cracking can be expected as the concrete cures. Minor cracking is considered normal; however, it is often increased by a high water/cement ratio, high concrete temperature at the time of placement, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. The use of low slump concrete can reduce the potential for shrinkage cracking; saw cuts in the concrete at strategic locations can help to control and reduce undesirable shrinkage cracks.

We recommend a **minimum slab thickness of 4 inches**; a thicker slab section may be required if the slab-on-grade is designed to bear a significant structural load (i.e., a structural slab or mat foundation, which is different than slab-on-grade flooring). We recommend that concrete be tested to assess that the slump and/or air content is in compliance with the plans and specifications. We recommend that concrete be placed in general accordance with the requirements of the American Concrete Institute (ACI).

## 6.5 EARTH PRESSURE AND LATERAL RESISTANCE

Lateral forces imposed upon conventional foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footing and the supporting soils. In determining the frictional resistance, a coefficient of friction of 0.43 should be used for concrete in contact with native granular (sandy and gravelly) soils or granular structural fill.

Ultimate lateral earth pressures from backfill acting against retaining walls and buried structures may be computed from lateral pressure coefficients or equivalent fluid

densities. In general, foundation and other walls that are fixed at the top should be designed using at-rest lateral earth pressures. Retaining walls allowed to rotate at the top (unfixed) can be designed for active pressures based on the International Building Code (IBC, 2015). Foundation walls for buried or partially buried structures may also be designed for active pressures if no more than 8 feet of the wall extends below grade and is laterally supported by flexible diaphragms.

Based on an internal angle of friction of 28°, the ultimate lateral earth pressures for native fine-grained soils acting against buried structures may be computed from the lateral pressure coefficients or equivalent fluid densities presented in Table 6.5.1:

**Table 6.5.1 - Lateral Pressure Coefficients and Equivalent Fluid Densities**

Earth Pressure Condition	Lateral Pressure Coefficient (symbol)	Equivalent Fluid Density (pounds per cubic foot)
Active*	0.36 ( $k_A$ )	42
At-rest**	0.53 ( $k_0$ )	60
Passive*	2.77 ( $k_p$ )	310

\* Based on Coulomb's equation

\*\* Based on Jaky

Walls and structures allowed to rotate slightly should use the active condition. If the element is constrained against rotation the at-rest condition should be used unless the wall has 8 feet or less of depth below grade according to the IBC, as mentioned previously. These values should be used with an appropriate factor of safety against overturning and sliding. A value of 1.5 is typically used. Additionally, if passive resistance is calculated in conjunction with frictional resistance, the passive resistance should be reduced by ½.

Lateral pressures can increase during a seismic event and should be accounted for in the design of retaining walls. The interaction of dynamic loads from earthquakes and retaining walls is complex; assessing this interaction can require sophisticated analysis. The Mononobe-Okabe (M-O) pseudo-static approach simplifies this analysis and provides reasonable design values. With the M-O approach for seismic analyses, the *active* and *passive* earth pressure coefficients provided in the following table account for the both the dynamic horizontal thrust produced by ground motion and the static lateral earth pressure; therefore, for seismic analysis the static and seismic values reported below do not need to be added together, the seismic value alone can be used.

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**Table 6.5.2 – Recommended Lateral Earth Pressure Coefficients for Dynamic Conditions**

Condition	Lateral Pressure Coefficient	Equivalent Fluid Density (pcf)
Active (K <sub>ae</sub> )	0.75	90
Passive (K <sub>pe</sub> )	2.10	240

The pressure distribution of the dynamic horizontal thrust may be closely approximated as an inverted triangle with stress decreasing with depth and the resultant acting at a distance approximately 0.6 times the loaded height of the structure, measured upward from the bottom of the structure.

The coefficients and densities presented in the tables above for static and dynamic conditions assume no buildup of hydrostatic pressures, a vertical wall face and flat back slope. The force of the water should be added to the presented values if hydrostatic pressures are anticipated. Proper grading and other drainage recommendations provided previously in this report will help to reduce the potential for buildup of hydrostatic pressures if implemented.

Clayey soils drain poorly and may swell upon wetting, thereby greatly increasing lateral pressures acting on earth retaining structures; therefore, clayey soils with a potential for swelling should not be used as retaining wall backfill. Backfill should consist of soil with an Expansion Index (EI) less than 20.

## 6.6 MOISTURE PROTECTION AND SURFACE DRAINAGE

Moisture should not be allowed to infiltrate the soils near, or upslope from, the structures. Precautions should be taken during and after construction to minimize the potential for saturation of foundation soils beneath footings, exterior slab on grade construction, sidewalks and roadways. We recommend the following be implemented during and/or after construction is complete:

- We recommend rain gutters be installed around the entire perimeter of the buildings to collect and direct all roof runoff a minimum of 10 feet away from structures.
- The grade within 10 feet of the structures should be sloped a minimum of 5% away from the structure (6-inches). Alternatively, if the surface within 10 feet of the structure consists of a hard surface such as concrete or asphalt, the minimum recommended slope would be 2% away from the structure.

- No pressurized irrigation lines should be placed within 5 feet of the structures and we recommend the area within 5 feet of the structure be hardscaped, xeriscaped or planted with drought tolerant plants that do not require irrigation.
- Compact backfill against the foundation walls in maximum 12-inch loose lifts to approximately 90 to 95 percent of the MDD (ASTM D1557); native soils may be used as backfill.

## 6.7 ASPHALT & CONCRETE PAVEMENT DESIGN

IGES completed one CBR lab test (See Appendix C) to assess the suitability of native soils to support a pavement section. The laboratory test indicated a CBR value of 4.1 for near surface soils. For the pavement section designs presented below, IGES has used a CBR of 4.1. IGES has prepared pavement section designs for three different traffic scenarios: parking, drives and a trash enclosure approach slab (high traffic area). The pavement section designs presented below have been prepared for a 40-year design life assuming an annual growth rate of 0%.

IGES has estimated an equivalent single axle load (ESAL) of approximately 200,000 over a 40-year design life for the Parking Lot. IGES recommends that one of the following pavement thicknesses be used for the parking lot:

**Table 6.7.1 - Flexible (Asphalt) Pavement Section – Parking Lot**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Parking Lot 1</b>	<b>4</b>	<b>7</b>	<b>8</b>	<b>18</b>
<b>Parking Lot 2</b>	<b>5</b>	<b>9</b>	<b>-</b>	<b>18</b>

**Table 6.7.2 - Rigid (Concrete) Pavement Section – Parking Lot**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Parking Lot 3</b>	<b>6</b>	<b>8</b>	<b>18</b>

IGES has estimated an equivalent single axle load (ESAL) of approximately 500,000 over a 40-year design life for the Drive areas. IGES recommends that one of the following pavement thicknesses be used for the Drive areas at the site:

**Table 6.7.3 - Flexible (Asphalt) Pavement Section – Drives**

	Asphalt Concrete (in.)	Untreated Road Base (in.)	Granular Borrow (in.)	Reworked Native Soils (in)
<b>Main Drive 1</b>	<b>4</b>	<b>9</b>	<b>10</b>	<b>18</b>
<b>Main Drive 2</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>18</b>

**Table 6.7.4 - Rigid (Concrete) Pavement Section – Drives**

	Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>Main Drive 3</b>	<b>7</b>	<b>10</b>	<b>18</b>

It is our experience that pavement in areas where trucks frequently turn around, backup, or load and unload, including round-a-bouts, docks, trash enclosures, exit and entrances from the main roadways, etc., experience more distress. If the owner wishes to prolong the life of the pavement in these areas consideration should be given to using a Portland cement concrete (rigid) pavement in these areas. The following rigid pavement section is recommended:

**Table 6.7.5 - Rigid Pavement Section – High Traffic Areas**

Portland Cement Concrete (in.)	Untreated Road Base (in.)	Reworked Native Soils (in)
<b>7</b>	<b>12</b>	<b>18</b>

All undocumented fill soils should have been removed or compacted in place as structural fill in accordance with Section 6.2.5 of this report prior to starting construction on the pavement section. IGES recommends that the upper 18 inches be removed and replaced with structure fill (Section 6.2.4) prior to constructing the pavement sections. This can be accomplished by removing the upper 12 inches and scarifying the exposed subgrade soils to a minimum depth of 6 inches; the scarified soils should moisture conditioned and compacted as structural fill as recommended in Section 6.2.4. Additionally, if the subgrade soils are soft or pumping, they should be stabilized as recommended in section 6.2.6 prior to placing granular borrow or road base.

Ideas for a changing world

Asphalt has been assumed to be a high stability plant mix; base coarse material should be composed of crushed stone with a minimum CBR of 70. Granular borrow has been assumed to be a pit-run type material with a minimum CBR of 30. Asphalt should be compacted to a minimum density of 96% of the Marshall value; base coarse and granular borrow should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

Concrete should consist of a low slump, low water cement ratio mix with a minimum 28-day compressive strength of 4,000 psi. Base course should be compacted to at least 95% of the MDD as determined by ASTM D-1557.

If traffic conditions vary significantly from our stated assumptions, IGES should be contacted so we can modify our pavement design parameters accordingly. Specifically, if the traffic counts are significantly higher or lower, we should be contacted to revise the pavement section design as necessary. The pavement section thicknesses above assume that most construction traffic including cement trucks, cranes, loaded haulers, etc. has ceased. If a significant volume of construction traffic occurs after the pavement section has been constructed the owner should anticipate maintenance or a decrease in the design life of the pavement.

The owner should also consider the benefits of maintenance in extending the life of the pavement. Some heavy traffic areas may need to be repaired or replaced. Crack seal should be applied every 2-3 years to new cracks that have developed to help reduce the effects infiltrated water can have on deteriorating the pavement support materials.

The pavement section thicknesses above have been designed with the assumption that there is no mixing over time between the road base and the softer native layers below. In order to prevent mixing or fines migration, and thereby prolong the life of the pavement section, we recommend placing a non-woven filter fabric such as Mirafi TenCate 160N between the native soils and the road base.

## 6.8 SOIL CORROSIVITY

Chemical testing was not completed as a part of this investigation however the soils were predominantly fine-grained. It would be expected to get test results indicating that the corrosion potential of native soils on site can be characterized as **moderate to severe** with respect to steel that is in direct contact with native soils. Consideration should be given to consulting with a corrosion engineer to design appropriate cathodic protection or sacrificial thicknesses for metal that will be in contact with native site soils.

The soluble sulfate content is likely to be in a range that indicates a low to moderate risk of sulfate attack on concrete. Type I/II cement should be used for all concrete at this

project site. The provisions in American Concrete Institute (ACI) 318 Section 4.3 should be reviewed for further clarification.

No chemical testing was completed, however chemical testing can be completed upon request.

#### 6.9 OTHER CONSIDERATIONS

Moderate to highly collapsible soils were prevalent in the top 4.5 feet with minor pinholes observed up to 6 feet below existing grade. To reduce the risk associated with collapsible soils, we recommend removing all collapsible soils to a depth of 6 feet below existing grade where footings are planned. For parking lots, roadways or sidewalks, it is recommended to scarify and moisture condition the top 18 inches. Before placing structural fill, an IGES representative should be on site to observe that the exposed soils have been prepared as recommended in this report.

## 7.0 CLOSURE & LIMITATIONS

The concept of risk is a significant consideration of geotechnical analyses. The analytical means and methods used in performing geotechnical analyses and development of resulting recommendations do not constitute an exact science. Analytical tools used by geotechnical engineers are based on limited data, empirical correlations, engineering judgment and experience. As such the solutions and resulting recommendations presented in this report cannot be considered risk-free and constitute IGES's best professional opinions and recommendations based on the available data and other design information available at the time they were developed. IGES has developed the preceding analyses, recommendations and designs, at a minimum, in accordance with generally accepted professional geotechnical engineering practices and care being exercised in the project area at the time our services were performed. No warranties, guarantees or other representations are made.

The information contained in this report is based on limited field testing and understanding of the project. The subsurface data used in the preparation of this report were obtained largely from the explorations made for this project. It is very likely that variations in the soil, rock, and groundwater conditions exist between and beyond the points explored. The nature and extent of the variations may not be evident until construction occurs and additional explorations are completed. If any conditions are encountered at this site that are different from those described in this report, IGES must be immediately notified so that we may make any necessary revisions to recommendations contained in this report. In addition, if the scope of the proposed construction or grading changes from those described in this report, our firm must also be notified.

This report was prepared for the Welfare Complex. Use of the data, recommendations or design information contained herein for any other project or development of the site not as specifically described in this report is at the user's sole risk and without the approval of IGES, Inc. It is the client's responsibility to see that all parties to the project including the designer, contractor, subcontractors, etc. are made aware of this report in its entirety. The use of information contained in this report for bidding purposes should be done at the contractor's option and risk.

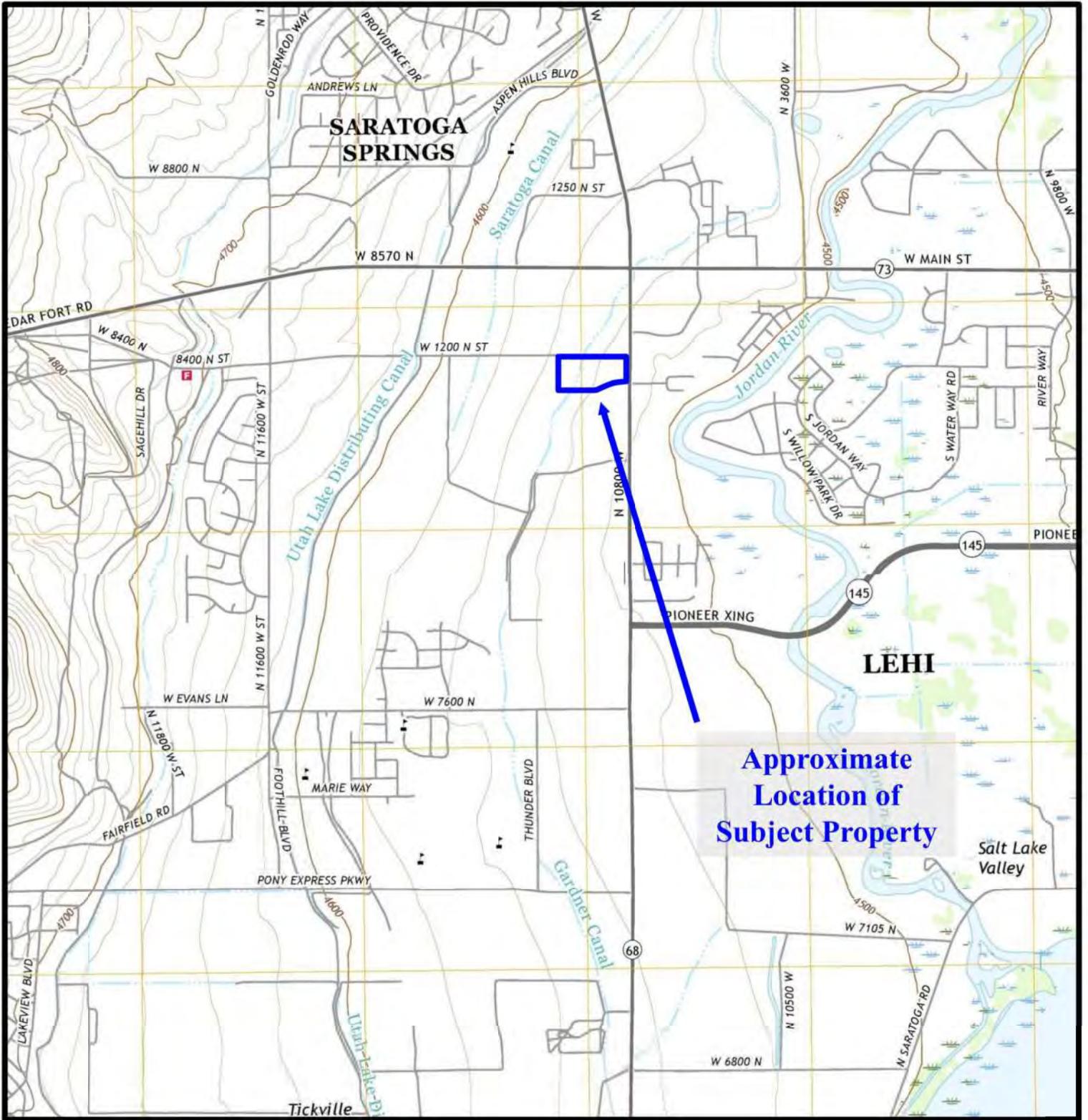
We recommend that IGES be retained to review the final design plans, grading plans and specifications to determine if our engineering recommendations have been properly incorporated in the project development documents. We also recommend that IGES be retained to evaluate, construction performance and other geotechnical aspects of the projects as construction initiates and progresses through its completion.

## 8.0 REFERENCES CITED

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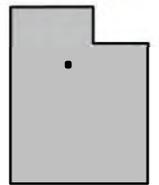
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# **APPENDIX A**



Base Map:  
 USGS Jordan Narrows  
 USGS Saratoga Springs  
 7.5-Minute Quadrangle Topographic Maps (2017)

0' 1000' 2000'  
 SCALE 1:24,000  
 Contour Interval – 20 feet



MAP LOCATION



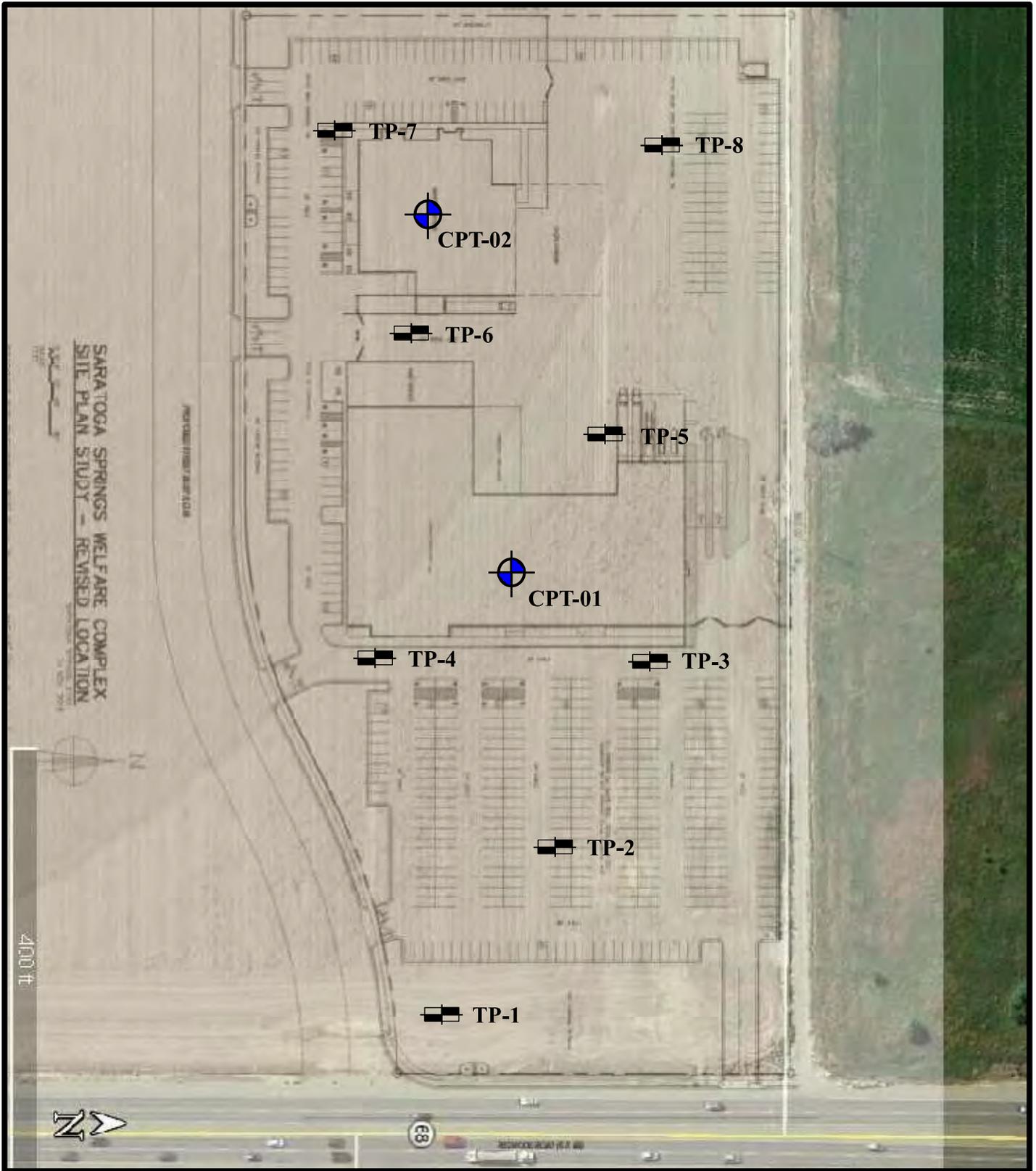
**IGES**<sup>®</sup>

Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE VICINITY MAP**

**Figure  
 A-1**



-  Approximate Test Pit Location
-  Approximate CPT Location



Project Number 03019-001

Geotechnical Investigation  
 JRW & Associates  
 1200 North Redwood Road  
 Saratoga Springs, Utah

**SITE MAP**

**Figure**  
**A-2**

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah			IGES Rep: JGS Rig Type: JCB-4CX		TEST PIT NO: <b>TP-1</b> Sheet 1 of 1								
STARTED: 3/11/19		Project Number 03019-001			Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits					
COMPLETED: 3/11/19										MATERIAL DESCRIPTION			Plastic Limit    Moisture Content    Liquid Limit		
BACKFILLED: 3/11/19													10 20 30 40 50 60 70 80 90		
DEPTH		LOCATION													
METERS	FEET	SAMPLES	WATER LEVEL	GRAPHICAL LOG	UNIFIED SOIL CLASSIFICATION										
0	0					Topsoil - Lean CLAY - medium stiff to stiff, moist, dark brown									
					CL	Lean CLAY - stiff, moist, brown frequent pinholes									
						- light brown									
						- occasional pinholes									
						- few to no pinholes									
						No groundwater was encountered									
						Bottom of test pit @ 14 Feet									

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**SAMPLE TYPE**  
 - GRAB SAMPLE  
 - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 - MEASURED  
 - ESTIMATED

**NOTES:**

**Figure**  
**A - 3**







LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-5</b>			
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1			
COMPLETED: 3/11/19											
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Moisture Content and Atterberg Limits			
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Percent minus 200			Liquid Limit	Plasticity Index	Plastic Limit	Moisture Content
		MATERIAL DESCRIPTION									
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown									
		Lean CLAY - stiff, moist, brown pinholes present									
		CL									
		- few to no pinholes									
		- gray to brown									
5						89.7	19.5				
		SM Silty SAND with gravel - medium dense, moist, tan with cobbles									
		GP-GM Poorly Graded GRAVEL with silt and sand - dense, moist, tan with cobbles									
		No groundwater was encountered									
4		Bottom of test pit @ 12.5 Feet									
15											



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- SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER
- WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure**  
**A - 7**



LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah				IGES Rep: JGS		TEST PIT NO: <b>TP-7</b>													
STARTED: 3/11/19		Project Number 03019-001				Rig Type: JCB-4CX		Sheet 1 of 1													
COMPLETED: 3/11/19																					
DEPTH		LOCATION				Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits										
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)	Plastic Limit						Moisture Content	Liquid Limit									
		MATERIAL DESCRIPTION									10	20	30	40	50	60	70	80	90		
0	0	Topsoil - Lean CLAY - stiff, moist, dark brown																			
		Lean CLAY - stiff, moist, brown to light brown pinholes present				79.1	17.2														
1		- few to no pinholes - brown																			
3	10	Silty SAND - medium dense, moist, tan																			
4		No groundwater was encountered																			
		Bottom of test pit @ 12.5 Feet																			



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**SAMPLE TYPE**  
 □ - GRAB SAMPLE  
 ▣ - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 ▼ - MEASURED  
 ▽ - ESTIMATED

**NOTES:**

**Figure  
A - 9**

LOG OF TEST PITS (A) - (4 LINE HEADER) 03019-001.GPJ IGES.GDT 5/24/19

DATE		Geotechnical Investigation JRW & Associates 1200 North Redwood Road Saratoga Springs, Utah			IGES Rep: JGS		TEST PIT NO: <b>TP-8</b>											
STARTED: 3/11/19		Project Number 03019-001			Rig Type: JCB-4CX		Sheet 1 of 1											
COMPLETED: 3/11/19																		
DEPTH		LOCATION			Dry Density(pcf)	Moisture Content %	Percent minus 200	Liquid Limit	Plasticity Index	Moisture Content and Atterberg Limits								
METERS	FEET	LATITUDE	LONGITUDE	ELEVATION (ft)						Plastic Limit	Moisture Content	Liquid Limit						
		MATERIAL DESCRIPTION																
0	0	Topsoil - stiff, moist, dark brown								10	20	30	40	50	60	70	80	90
		Lean CLAY - stiff, moist, brown trace pinholes																
		- no pinholes																
1																		
	5																	
2																		
	10																	
3																		
	15																	
4		No groundwater was encountered																
		Bottom of test pit @ 12.5 Feet																



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**SAMPLE TYPE**  
 - GRAB SAMPLE  
 - 3" O.D. THIN-WALLED HAND SAMPLER

**WATER LEVEL**  
 - MEASURED  
 - ESTIMATED

**NOTES:**

**Figure  
A - 10**

# UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS		USCS SYMBOL	TYPICAL DESCRIPTIONS	
COARSE GRAINED SOILS <small>(More than half of material is larger than the #200 sieve)</small>	GRAVELS <small>(More than half of coarse fraction is larger than the #4 sieve)</small>	Clean gravels with little or no fines	GW WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		Gravels with over 12% fines	GP POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES WITH LITTLE OR NO FINES	
		SANDS <small>(More than half of coarse fraction is smaller than the #4 sieve)</small>	Clean sands with little or no fines	GM SILTY GRAVELS, GRAVEL-SILT-SAND MIXTURES
			Sands with over 12% fines	GC CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	FINE GRAINED SOILS <small>(More than half of material is smaller than the #200 sieve)</small>	SILTS AND CLAYS <small>(Liquid limit less than 50)</small>	Inorganic silts & very fine sands, silty or clayey fine sands, clayey silts with slight plasticity	ML
			Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays	CL
			Organic silts & organic silty clays of low plasticity	OL
			Inorganic silts, micaceous or diatomaceous fine sand or silt	MH
SILTS AND CLAYS <small>(Liquid limit greater than 50)</small>	Inorganic clays of high plasticity, fat clays	CH		
	Organic clays & organic silts of medium-to-high plasticity	OH		
	Peat, humus, swamp soils with high organic contents	PT		
HIGHLY ORGANIC SOILS		US 14 45		

## LOG KEY SYMBOLS

	BORING SAMPLE LOCATION		TEST-PIT SAMPLE LOCATION
	WATER LEVEL (level after completion)		WATER LEVEL (level where first encountered)

## CEMENTATION

DESCRIPTION	DESCRIPTION
WEAKLY	CRUMBLES OR BREAKS WITH HANDLING OR SLIGHT FINGER PRESSURE
MODERATELY	CRUMBLES OR BREAKS WITH CONSIDERABLE FINGER PRESSURE
STRONGLY	WILL NOT CRUMBLE OR BREAK WITH FINGER PRESSURE

## OTHER TESTS KEY

C	CONSOLIDATION	SA	SIEVE ANALYSIS
AL	ATTERBERG LIMITS	DS	DIRECT SHEAR
UC	UNCONFINED COMPRESSION	T	TRIAXIAL
S	SOLUBILITY	R	RESISTIVITY
O	ORGANIC CONTENT	RV	R-VALUE
CBR	CALIFORNIA BEARING RATIO	SU	SOLUBLE SULFATES
COMP	MOISTURE/DENSITY RELATIONSHIP	PM	PERMEABILITY
CI	CALIFORNIA IMPACT	-200	% FINER THAN #200
COL	COLLAPSE POTENTIAL	Gs	SPECIFIC GRAVITY
SS	SHRINK SWELL	SL	SWELL LOAD

## MODIFIERS

DESCRIPTION	%
TRACE	<5
SOME	5 - 12
WITH	>12

## MOISTURE CONTENT

DESCRIPTION	FIELD TEST
DRY	ABSENCE OF MOISTURE, DUSTY, DRY TO THE TOUCH
MOIST	DAMP BUT NO VISIBLE WATER
WET	VISIBLE FREE WATER, USUALLY SOIL BELOW WATER TABLE

## STRATIFICATION

DESCRIPTION	THICKNESS	DESCRIPTION	THICKNESS
SEAM	1/16 - 1/2"	OCCASIONAL	ONE OR LESS PER FOOT OF THICKNESS
LAYER	1/2 - 12"	FREQUENT	MORE THAN ONE PER FOOT OF THICKNESS

## GENERAL NOTES

- Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual.
- No warranty is provided as to the continuity of soil conditions between individual sample locations.
- Logs represent general soil conditions observed at the point of exploration on the date indicated.
- In general, Unified Soil Classification designations presented on the logs were evaluated by visual methods only. Therefore, actual designations (based on laboratory tests) may vary.

## APPARENT / RELATIVE DENSITY - COARSE-GRAINED SOIL

APPARENT DENSITY	SPT (blows/ft)	MODIFIED CA SAMPLER (blows/ft)	CALIFORNIA SAMPLER (blows/ft)	RELATIVE DENSITY (%)	FIELD TEST
VERY LOOSE	<4	<4	<5	0 - 15	EASILY PENETRATED WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
LOOSE	4 - 10	5 - 12	5 - 15	15 - 35	DIFFICULT TO PENETRATE WITH 1/2-INCH REINFORCING ROD PUSHED BY HAND
MEDIUM DENSE	10 - 30	12 - 35	15 - 40	35 - 65	EASILY PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
DENSE	30 - 50	35 - 60	40 - 70	65 - 85	DIFFICULT TO PENETRATED A FOOT WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER
VERY DENSE	>50	>60	>70	85 - 100	PENETRATED ONLY A FEW INCHES WITH 1/2-INCH REINFORCING ROD DRIVEN WITH 5-LB HAMMER

## CONSISTENCY - FINE-GRAINED SOIL

CONSISTENCY	SPT (blows/ft)	TORVANE	POCKET PENETROMETER	FIELD TEST
		UNTRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	
VERY SOFT	<2	<0.125	<0.25	EASILY PENETRATED SEVERAL INCHES BY THUMB. EXUDES BETWEEN THUMB AND FINGERS WHEN SQUEEZED BY HAND.
SOFT	2 - 4	0.125 - 0.25	0.25 - 0.5	EASILY PENETRATED ONE INCH BY THUMB. MOLDED BY LIGHT FINGER PRESSURE.
MEDIUM STIFF	4 - 8	0.25 - 0.5	0.5 - 1.0	PENETRATED OVER 1/2 INCH BY THUMB WITH MODERATE EFFORT. MOLDED BY STRONG FINGER PRESSURE.
STIFF	8 - 15	0.5 - 1.0	1.0 - 2.0	INDENTED ABOUT 1/2 INCH BY THUMB BUT PENETRATED ONLY WITH GREAT EFFORT.
VERY STIFF	15 - 30	1.0 - 2.0	2.0 - 4.0	READILY INDENTED BY THUMBNAIL.
HARD	>30	>2.0	>4.0	INDENTED WITH DIFFICULTY BY THUMBNAIL.

# **APPENDIX B**

# PRESENTATION OF SITE INVESTIGATION RESULTS

## JRW

*Prepared for:*

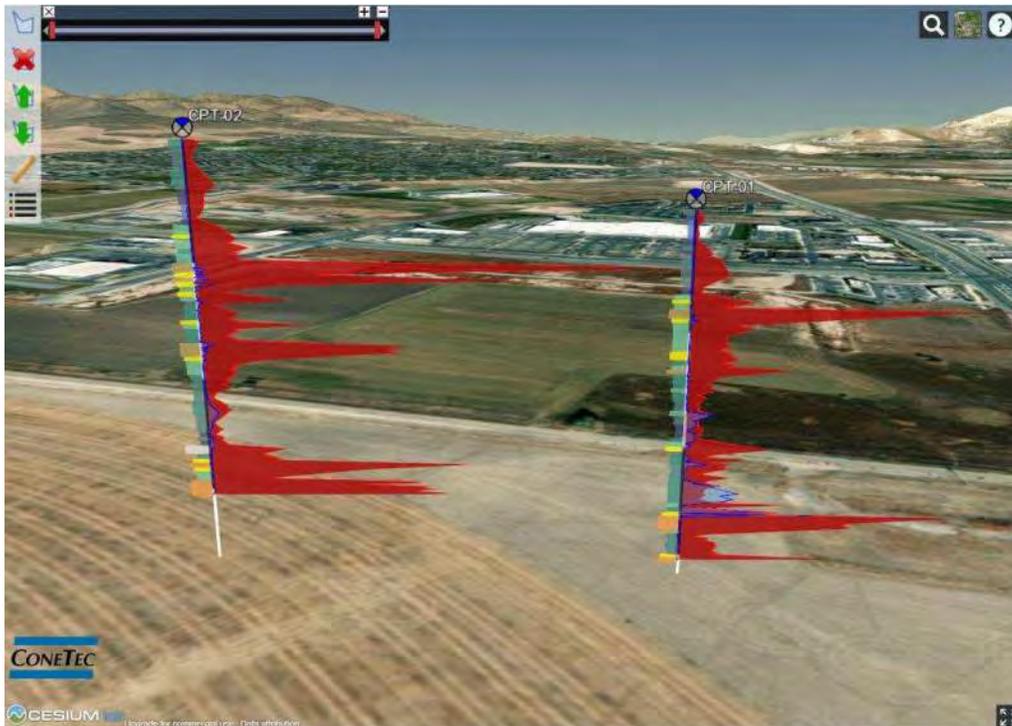
IGES, Inc.

ConeTec Job No: 19-52023

Project Start Date: 16-May-2019

Project End Date: 16-May-2019

Report Date: 24-May-2019



*Prepared by:*

ConeTec Inc.  
3750 West 500 South  
Salt Lake City, UT 84104

Tel: (801) 973-3801

Fax: (801) 973-3802

Email: [saltlakecity@conetec.com](mailto:saltlakecity@conetec.com)

[www.conetec.com](http://www.conetec.com)

[www.conetecdataservices.com](http://www.conetecdataservices.com)



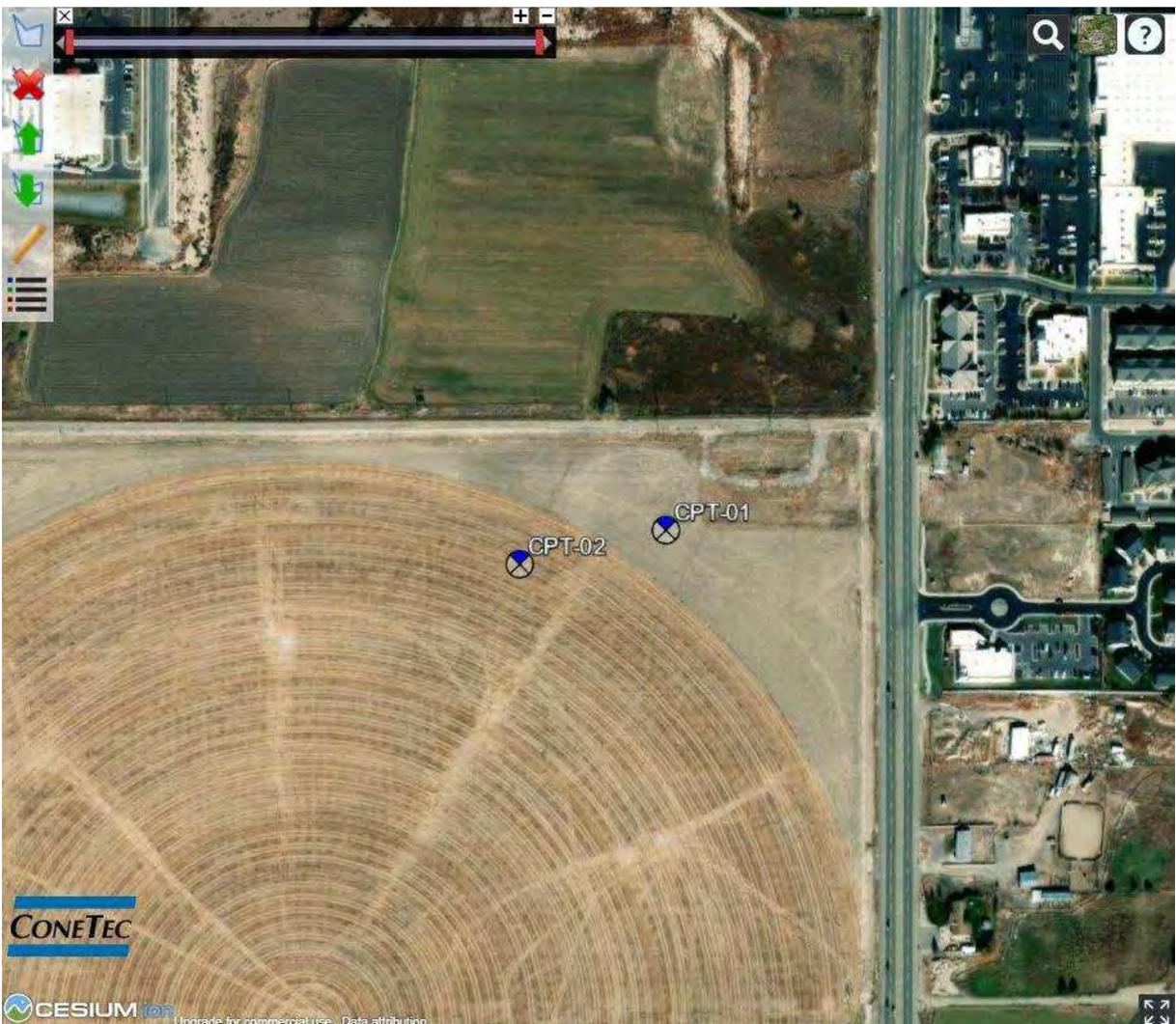
## Introduction

The enclosed report presents the results of the site investigation program conducted by ConeTec, Inc. for IGES, Inc. of Draper, Utah. The program consisted of cone penetration testing (CPT) at two (2) locations. Shear wave velocities were recorded in one (1) of the soundings. Pore pressure dissipation testing was performed as directed by IGES, Inc. field personnel. The water table used in the CPT interpretations is based on the results of the pore pressure dissipation tests performed within each sounding.

## Project Information

Project	
Client	IGES, Inc.
Project	JRW
ConeTec Project #	19-52023

A map from Bing maps including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT truck rig	25-ton truck mounted cylinder	SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
SCPT	USB/Serial GPS	4326 (WGS 84 / LatLong)

Cone Penetration Test (CPT)	
Depth reference	Existing ground surface at the time of the investigation
Tip and sleeve data offset	0.1 Meter This has been accounted for in the CPT data files
Additional Comments	None

Cone Penetrometers Used for this Project						
Cone Description	Cone Number	Cross Sectional Area (cm <sup>2</sup> )	Sleeve Area (cm <sup>2</sup> )	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
418:T1500F15U500	418	15	225	1500	15	500
Cone 418 was used in all soundings						

Calculated Geotechnical Parameter Tables	
Additional information	The Normalized Soil Behavior Type Chart based on Qtn (SBT Qtn) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPT parameters have been generated and are provided in Excel format files in the release folder. The CPT parameter calculations are based on values of corrected tip resistance (qt) sleeve friction (fs), and pore pressure (u2). Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile.

### Limitations

This report has been prepared for the exclusive use of IGES, Inc. (Client) for the project titled "JRW". The report's contents may not be relied upon by any other party without the express written permission of ConeTec, Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm<sup>2</sup> and 15 cm<sup>2</sup> tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table presented in the first Appendix. The 15 cm<sup>2</sup> penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm<sup>2</sup> piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u<sub>2</sub>" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

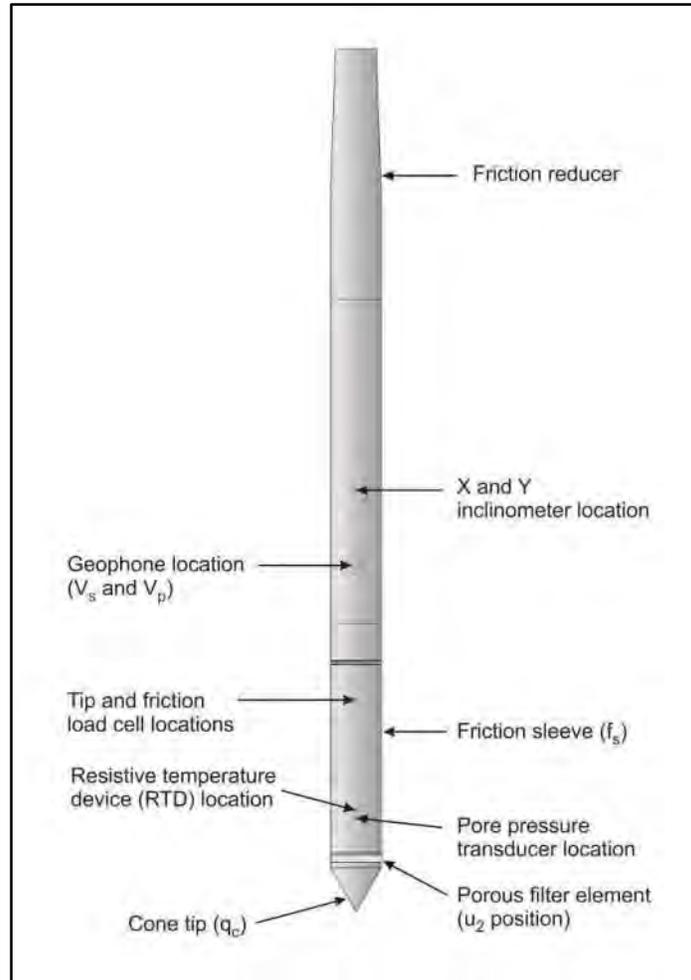


Figure CPTu. Piezocone Penetrometer (15 cm<sup>2</sup>)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ( $q_c$ )
- Sleeve friction ( $f_s$ )
- Dynamic pore pressure ( $u$ )
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ( $q_t$ ), sleeve friction ( $f_s$ ) and pore water pressure ( $u$ ). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance ( $q_c$ ) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ( $q_t$ ) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \cdot u_2$$

where:  $q_t$  is the corrected tip resistance

$q_c$  is the recorded tip resistance

$u_2$  is the recorded dynamic pore pressure behind the tip ( $u_2$  position)

$a$  is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ( $f_s$ ) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure ( $u$ ) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio ( $R_f$ ) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high

friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is also included in the data release folder.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave ( $V_p$ ) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

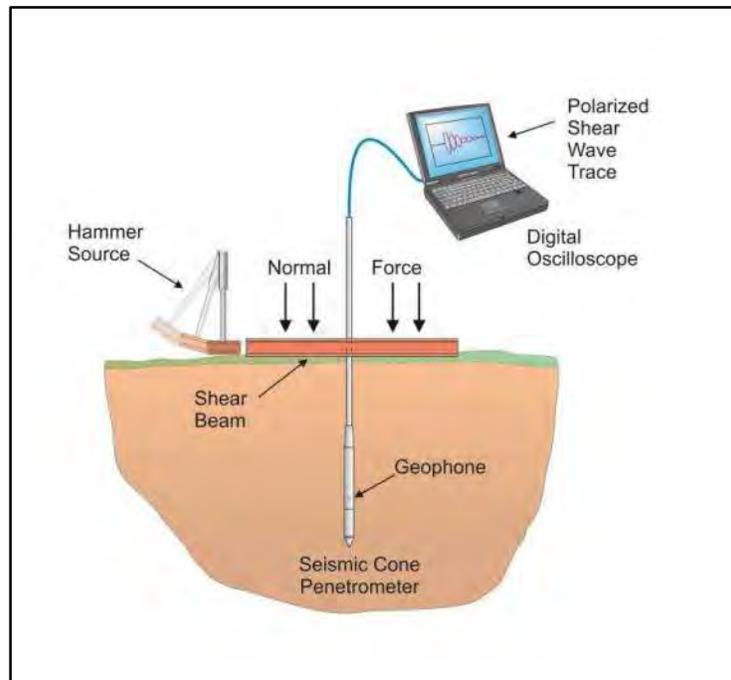


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

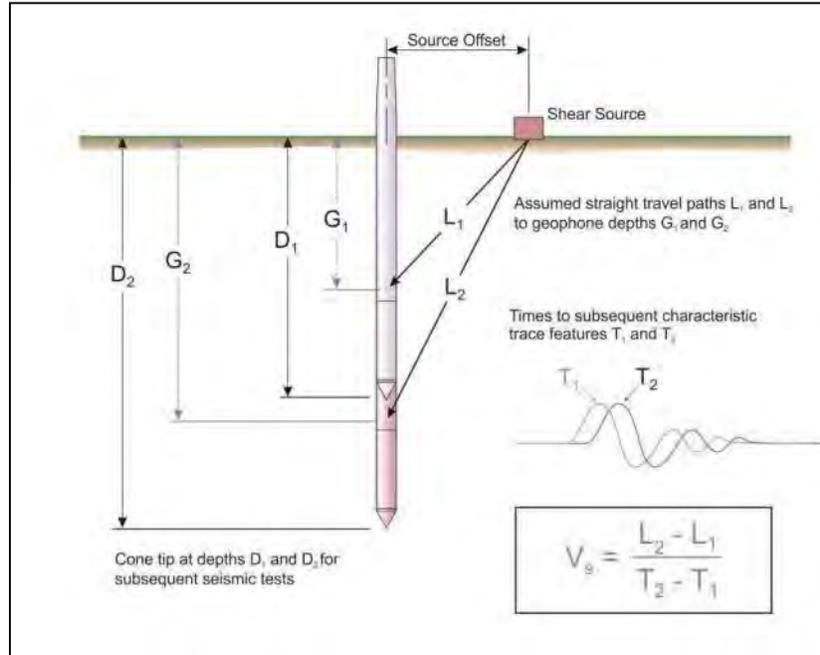


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ( $\bar{v}_s$ ) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{v_{si}}}$$

where:  $\bar{v}_s$  = average shear wave velocity ft/s (m/s)  
 $d_i$  = the thickness of any layer between 0 and 100 ft (30 m)  
 $v_{si}$  = the shear wave velocity in ft/s (m/s)  
 $\sum_{i=1}^n d_i = 100 \text{ ft (30 m)}$

Average shear wave velocity,  $\bar{v}_s$  is also referenced to  $V_{s100}$  or  $V_{s30}$ .

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure ( $u$ ) with time ( $t$ ).

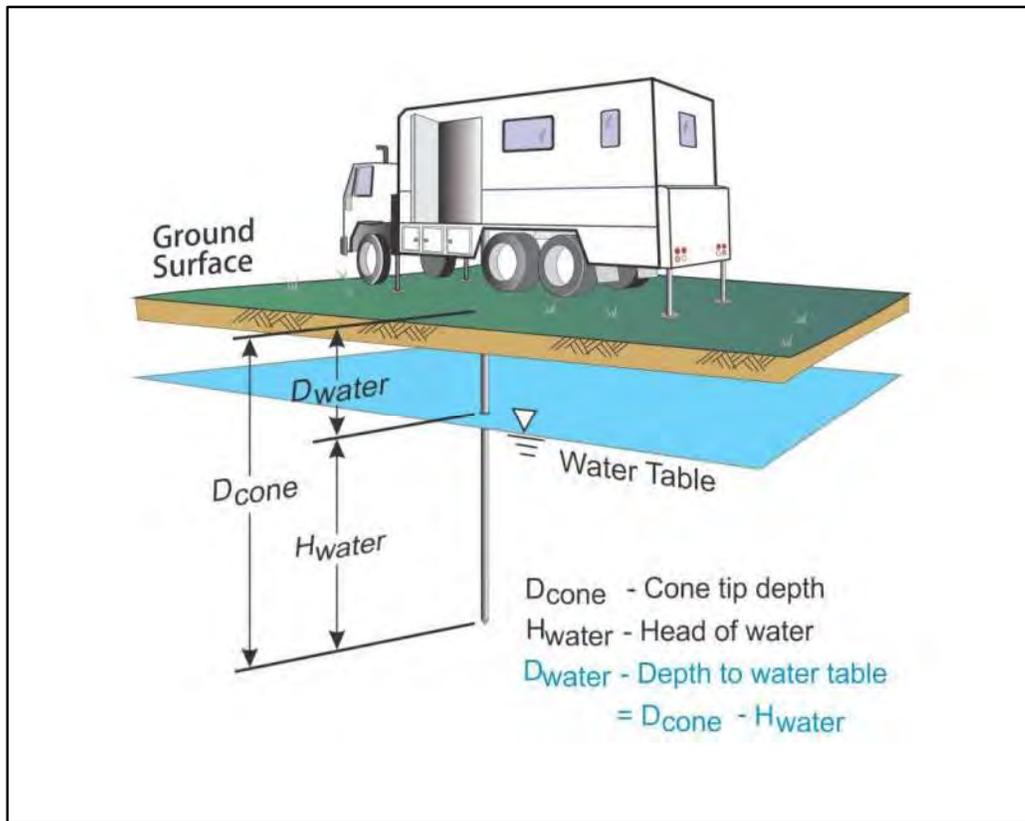


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

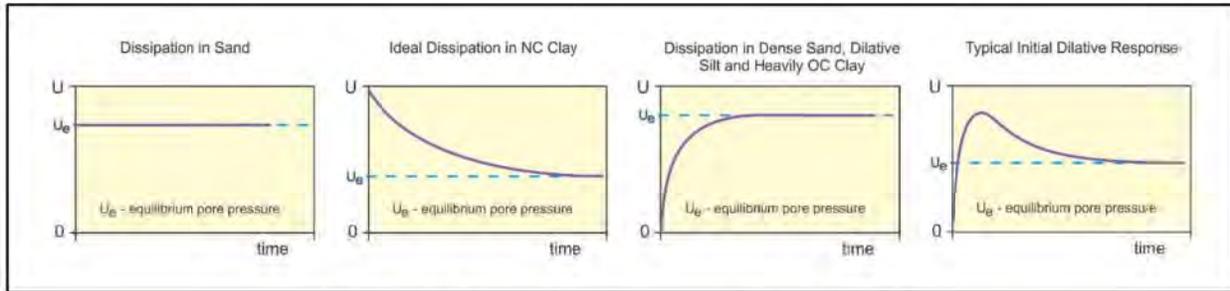


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure ( $u_{eq}$ ) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as  $t_{100}$ . In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to  $t_{100}$ . A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor ( $T^*$ ) may be used to calculate the coefficient of consolidation ( $c_h$ ) at various degrees of dissipation resulting in the expression for  $c_h$  shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

- $T^*$  is the dimensionless time factor (Table Time Factor)
- $a$  is the radius of the cone
- $I_r$  is the rigidity index
- $t$  is the time at the degree of consolidation

Table Time Factor.  $T^*$  versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
$T^* (u_2)$	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time ( $t_{50}$ ) corresponding to a degree of dissipation of 50% ( $u_{50}$ ). In order to determine  $t_{50}$ , dissipation tests must be taken to a pressure less than  $u_{50}$ . The  $u_{50}$  value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as  $u_{100}$ . To estimate  $u_{50}$ , both the initial maximum pore pressure and  $u_{100}$  must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure ( $u$  at  $t_{100}$ ) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly ( $u_{100}$ ), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of  $c_h$  (Teh and Houlsby, 1991),  $t_{50}$  values are estimated from the corresponding pore pressure dissipation curve and a rigidity index ( $I_r$ ) is assumed. For curves having an initial dilatatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining  $t_{50}$ . In cases where the time to peak is excessive,  $t_{50}$  values are not calculated.

Due to possible inherent uncertainties in estimating  $I_r$ , the equilibrium pore pressure and the effect of an initial dilatatory response on calculating  $t_{50}$ , other methods should be applied to confirm the results for  $c_h$ .

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

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## REFERENCES

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Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", *Geotechnique*, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Normalized Cone Penetration Test Plots
- SBT Zone Scatter Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Seismic Cone Penetration Wave Traces
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and  
Standard Cone Penetration Test Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

### CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface <sup>1</sup> (ft.)	Final Depth (ft.)	Latitude <sup>2</sup>	Longitude	Elevation <sup>3</sup> (ft.)	Refer to Notation Number
CPT-01	19-52023_SP01	16-May-2019	418:T1500F15U500	29.5	50.03	40.383219	-111.918333	4540	
CPT-02	19-52023_SP02	16-May-2019	418:T1500F15U500	43.4	50.03	40.383012	-111.919514	4549	

1. The assumed phreatic surface used in the CPT interpretations are based on the pore pressure dissipation tests performed within each sounding.
2. The coordinates are based on the WGS84 Datum and have an accuracy of ±30 feet.
3. Elevations are referenced to the ground surface and are derived from the Google Earth Elevation for the recorded coordinates.

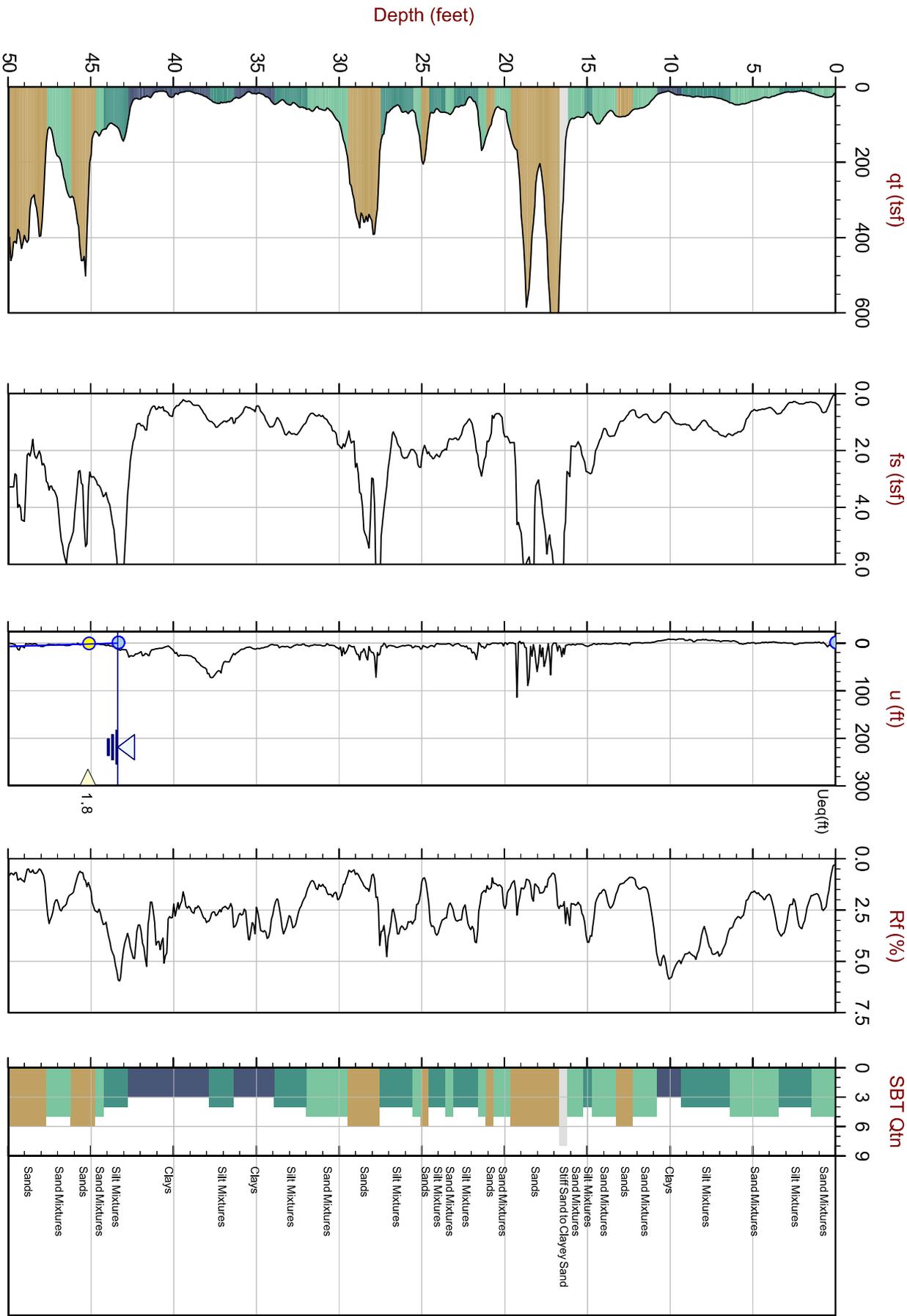




# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m

File: 19-52023\_SP02.COR  
 Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq ● Assumed Ueq ▲ Dissipation, Ueq achieved ▼ Dissipation, Ueq not achieved — Hydrostatic Line — Phreatic Surface

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

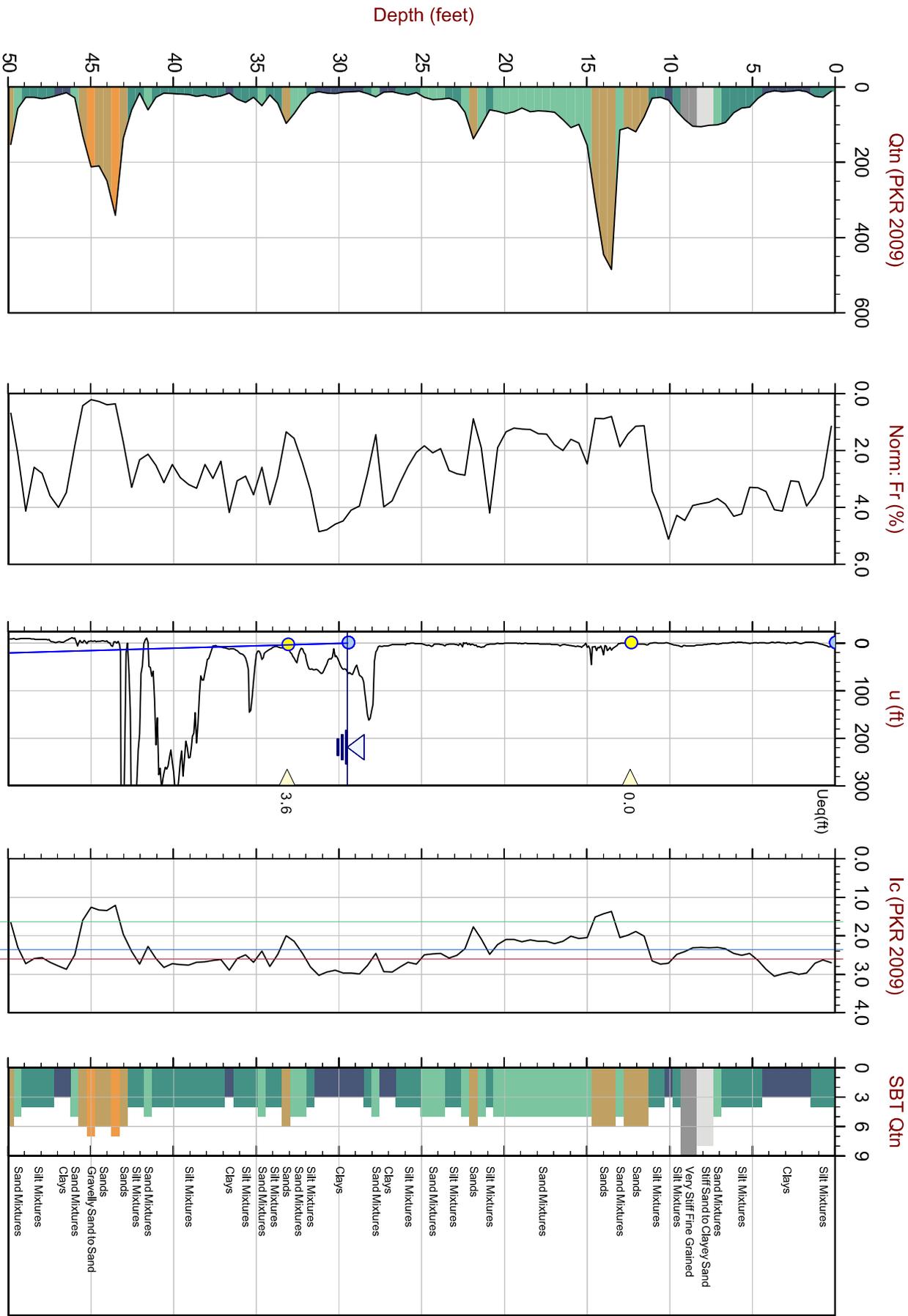
## Normalized Cone Penetration Test Plots



# IGES

Job No: 19-52023  
Date: 2019-05-16 09:01  
Site: JRW

Sounding: CPT-01  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: 0.150 m  
OverplotItem: Ueq (Assumed Ueq)

File: 19-52023\_CP01.COR  
Unit Wt: SBTQtn (PKR2009)  
Dissipation, Ueq achieved

Dissipation, Ueq not achieved

SBT: Robertson, 2009 and 2010  
Coords: Lat: 40.383220 Long: -111.918330  
Hydrostatic Line  
Pneumatic Surface

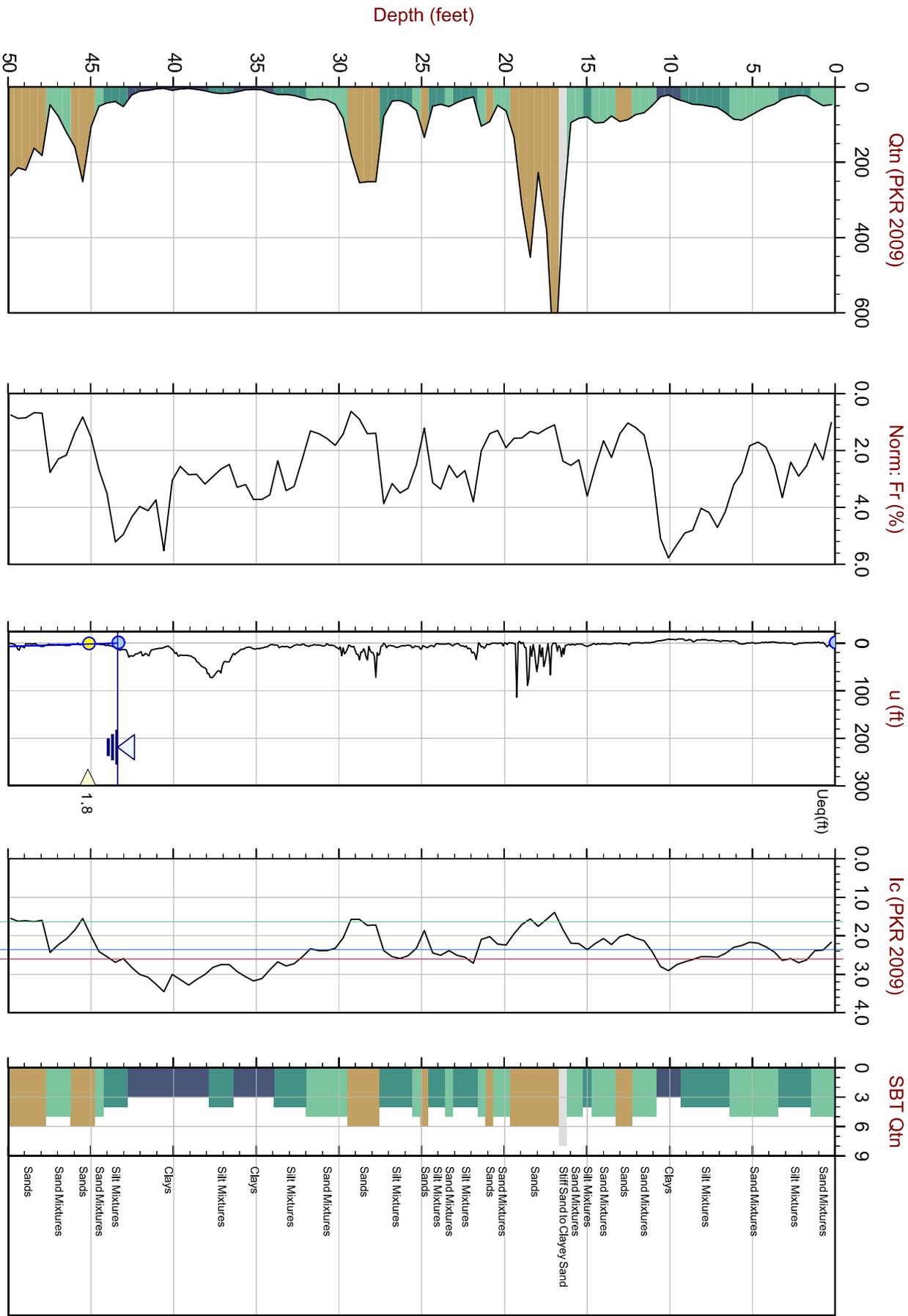
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
Depth Inc: 0.025 m / 0.082 ft  
Avg Int: 0.150 m

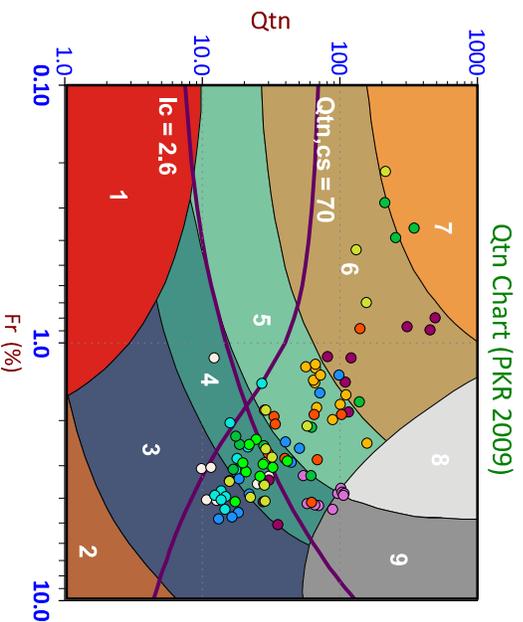
File: 19-52023\_SP02.COR  
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010  
Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq    ● Assumed Ueq    ▲ Dissipation, Ueq achieved    ▲ Dissipation, Ueq not achieved    — Hydrostatic Line    — Phreatic Surface

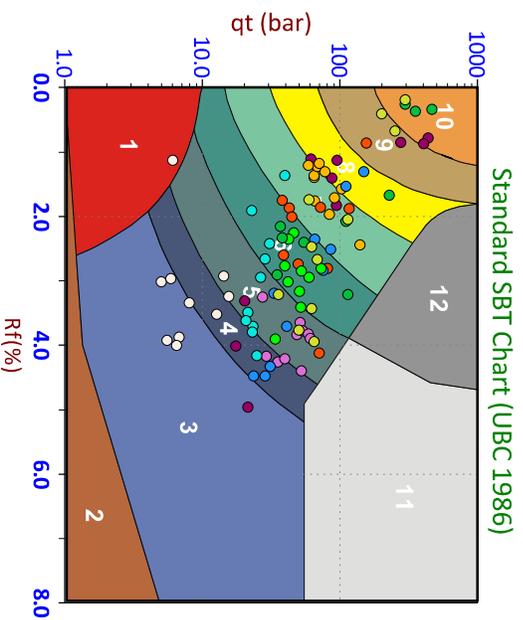
The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## SBT Zone Scatter Plots

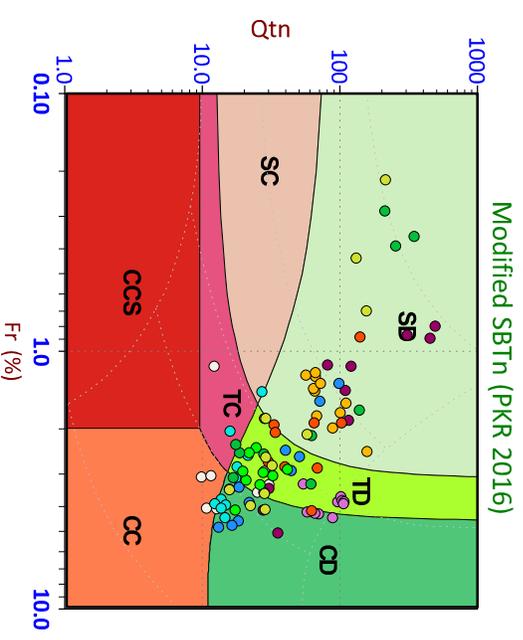


- #### Depth Ranges
- >0.0 to 5.0 ft
  - >5.0 to 10.0 ft
  - >10.0 to 15.0 ft
  - >15.0 to 20.0 ft
  - >20.0 to 25.0 ft
  - >25.0 to 30.0 ft
  - >30.0 to 35.0 ft
  - >35.0 to 40.0 ft
  - >40.0 to 45.0 ft
  - >45.0 to 50.0 ft
  - >50.0 ft

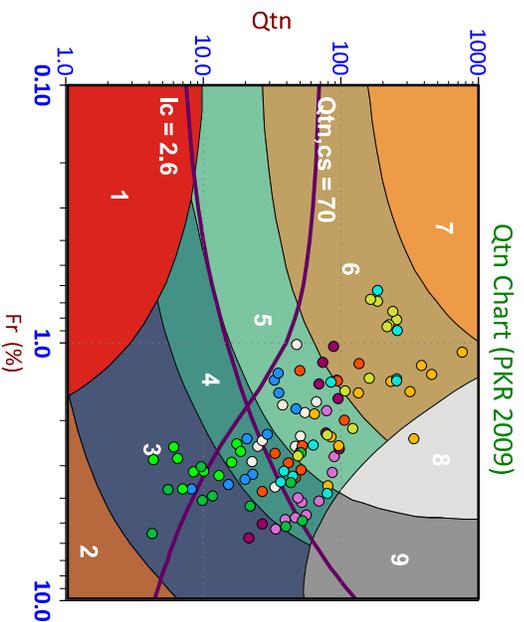
- #### Legend
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  - Organic Soils
  - Clays
  - Silt Mixtures
  - Sand Mixtures
  - Sands
  - Gravelly Sand to Sand
  - Stiff Sand to Clayey Sand
  - Very Stiff Fine Grained



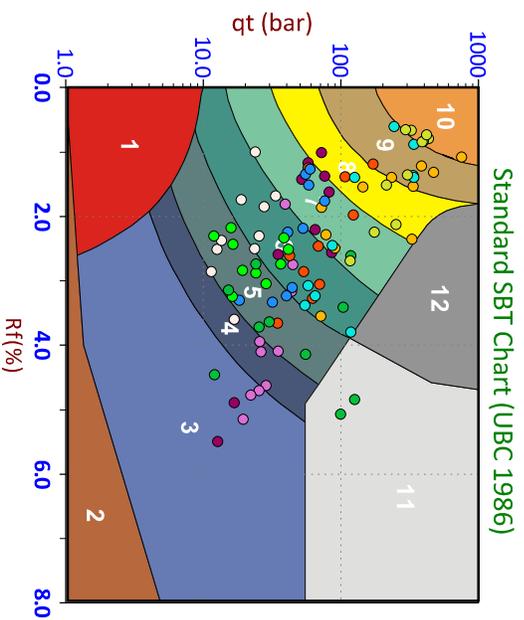
- #### Legend
- Sensitive Fines
  - Organic Soil
  - Clay
  - Silty Clay
  - Clayey Silt
  - Silt
  - Sandy Silt
  - Silty Sand/Sand
  - Sand
  - Gravelly Sand
  - Stiff Fine Grained
  - Cemented Sand



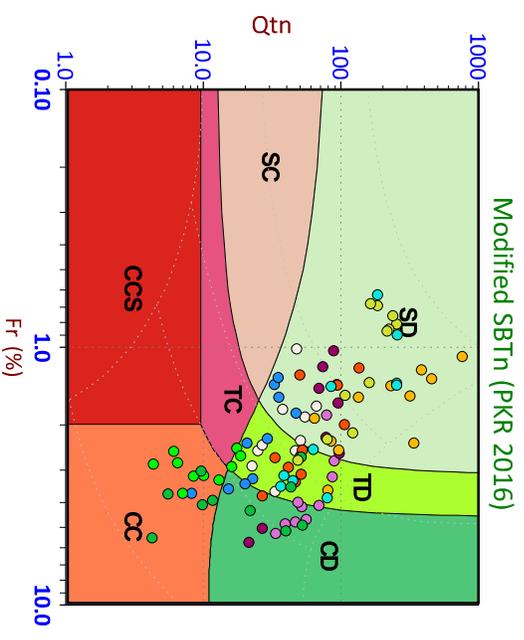
- #### Legend
- CCS (Cont. sensitive clay like)
  - CC (Cont. clay like)
  - TC (Cont. transitional)
  - SC (Cont. sand like)
  - CD (Dil. clay like)
  - TD (Dil. transitional)
  - SD (Dil. sand like)



- Depth Ranges**
- >0.0 to 5.0 ft
  - >5.0 to 10.0 ft
  - >10.0 to 15.0 ft
  - >15.0 to 20.0 ft
  - >20.0 to 25.0 ft
  - >25.0 to 30.0 ft
  - >30.0 to 35.0 ft
  - >35.0 to 40.0 ft
  - >40.0 to 45.0 ft
  - >45.0 to 50.0 ft
  - >50.0 ft
- Legend**
- Sensitive, Fine Grained
  - Organic Soils
  - Clays
  - Silt Mixtures
  - Sand Mixtures
  - Sands
  - Gravelly Sand to Sand
  - Stiff Sand to Clayey Sand
  - Very Stiff Fine Grained



- Legend**
- Sensitive Fines
  - Organic Soil
  - Clay
  - Silty Clay
  - Clayey Silt
  - Silt
  - Sandy Silt
  - Silty Sand/Sand
  - Sand
  - Gravelly Sand
  - Stiff Fine Grained
  - Cemented Sand



- Legend**
- CCS (Cont. sensitive clay like)
  - CC (Cont. clay like)
  - TC (Cont. transitional)
  - SC (Cont. sand like)
  - CD (Dil. clay like)
  - TD (Dil. transitional)
  - SD (Dil. sand like)

Seismic Cone Penetration Test Plots

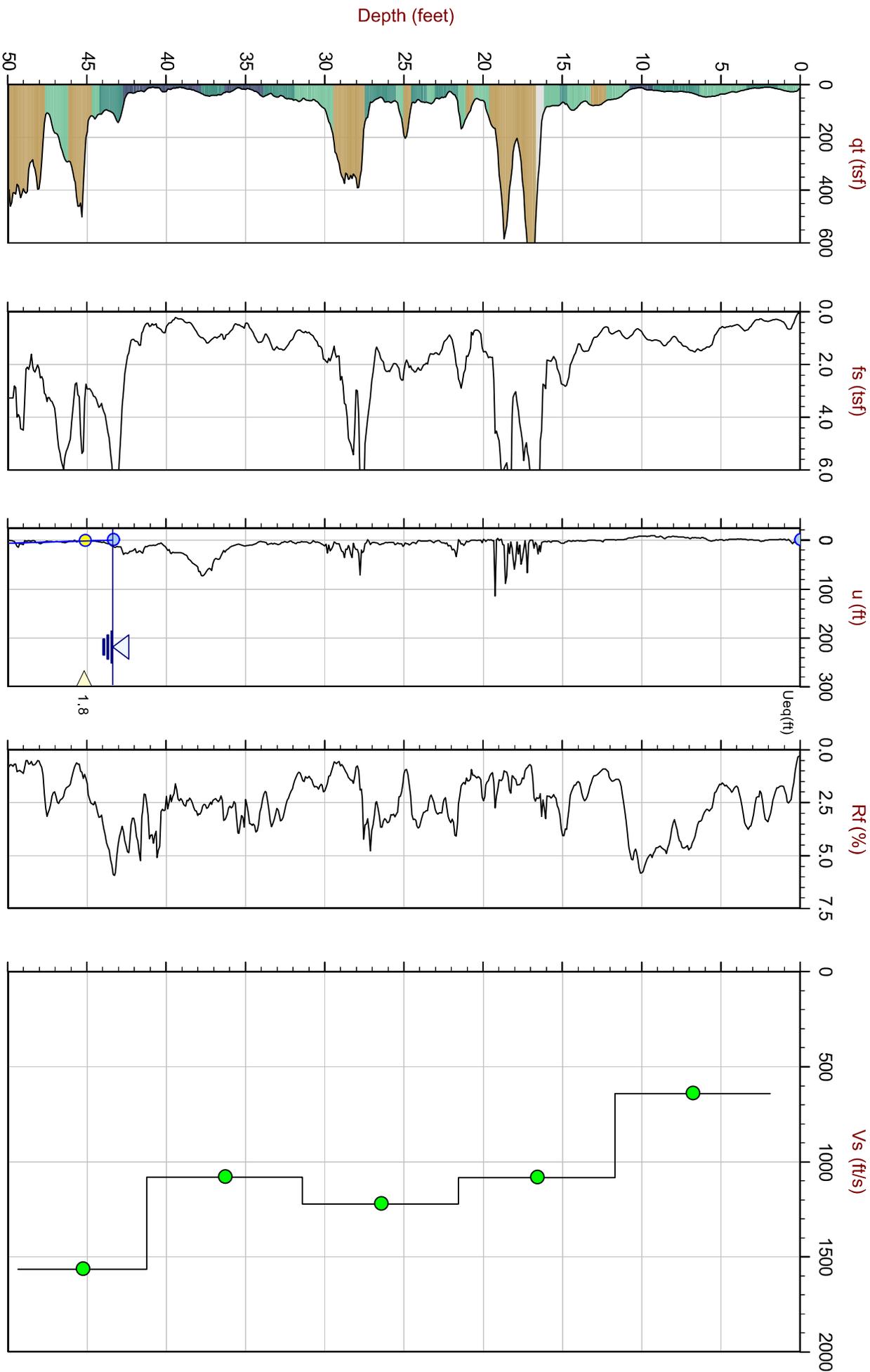




# IGES

Job No: 19-52023  
Date: 2019-05-16 10:19  
Site: JRW

Sounding: CPT-02  
Cone: 418:T1500F15U500



Max Depth: 15.250 m / 50.03 ft  
 Depth Inc: 0.025 m / 0.082 ft  
 Avg Int: 0.150 m  
 File: 19-52023\_SP02.COR  
 Unit Wt: SBTQIn (PKR2009)  
 SBT: Robertson, 2009 and 2010  
 Coords: Lat: 40.383010 Long: -111.919510

OverplotItem: ● Ueq ● Assumed Ueq ▲ Dissipation, Ueq achieved ▲ Dissipation, Ueq not achieved — Hydrostatic Line — Phreatic Surface

The reported coordinates were acquired from consumer grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

## Seismic Cone Penetration Test Tabular Results



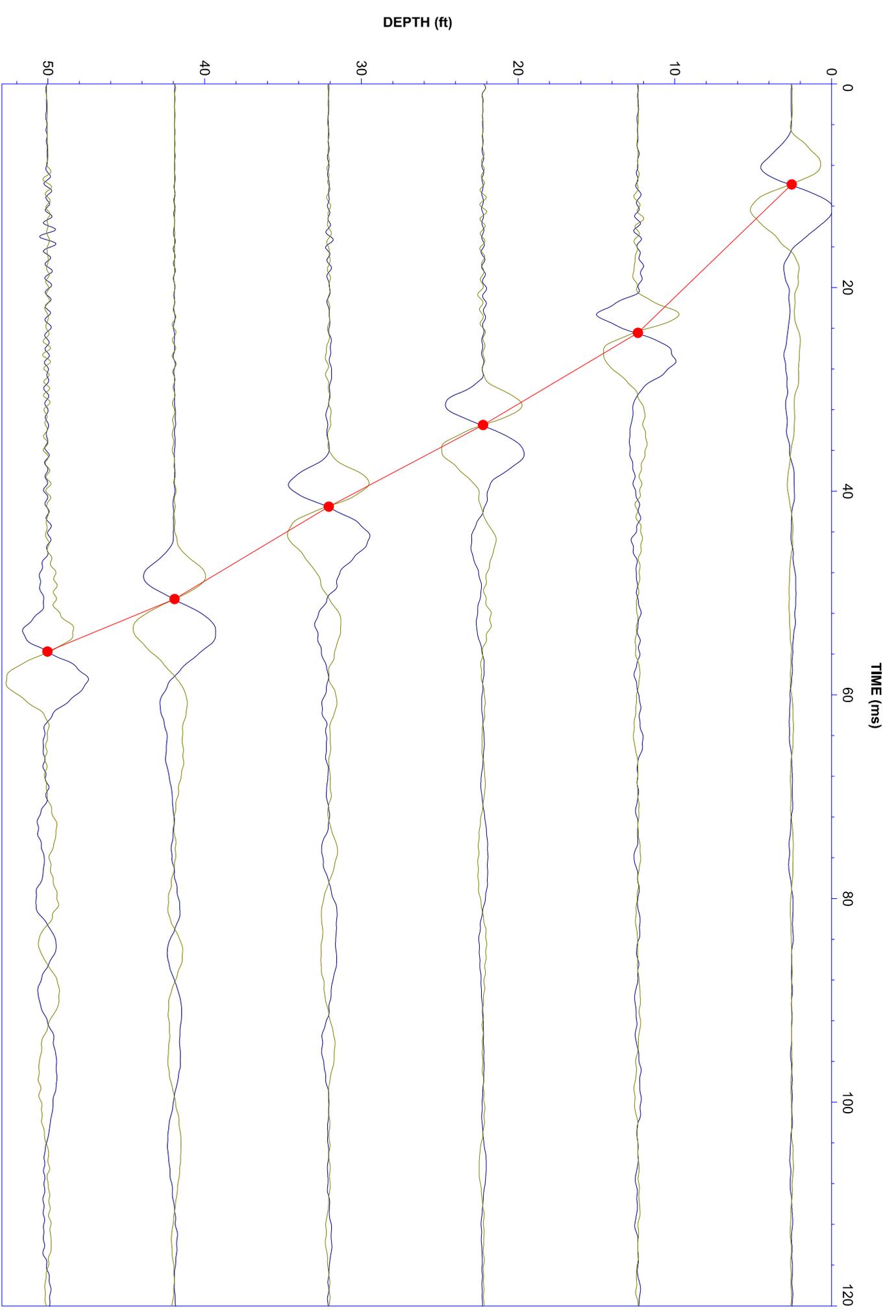
Job No: 19-52023  
Client: IGES  
Project: JRW  
Sounding ID: SCPT-02  
Date: 16-May-2019

Seismic Source: Beam  
Source Offset (ft): 1.50  
Source Depth (ft): 0.00  
Geophone Offset (ft): 0.66

**SCPT<sub>u</sub> SHEAR WAVE VELOCITY TEST RESULTS - V<sub>s</sub>**

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
2.56	1.90	2.42			
12.37	11.71	11.81	9.39	14.56	644
22.24	21.59	21.64	9.83	9.05	1087
32.09	31.43	31.47	9.83	8.02	1225
41.93	41.27	41.30	9.83	9.07	1084
50.03	49.38	49.40	8.10	5.16	1569

## Seismic Cone Penetration Wave Traces



Pore Pressure Dissipation Summary and  
Pore Pressure Dissipation Plots



Job No: 19-52023  
Client: IGES  
Project: JRW  
Start Date: 16-May-2019  
End Date: 16-May-2019

**CPT<sub>u</sub> PORE PRESSURE DISSIPATION SUMMARY**

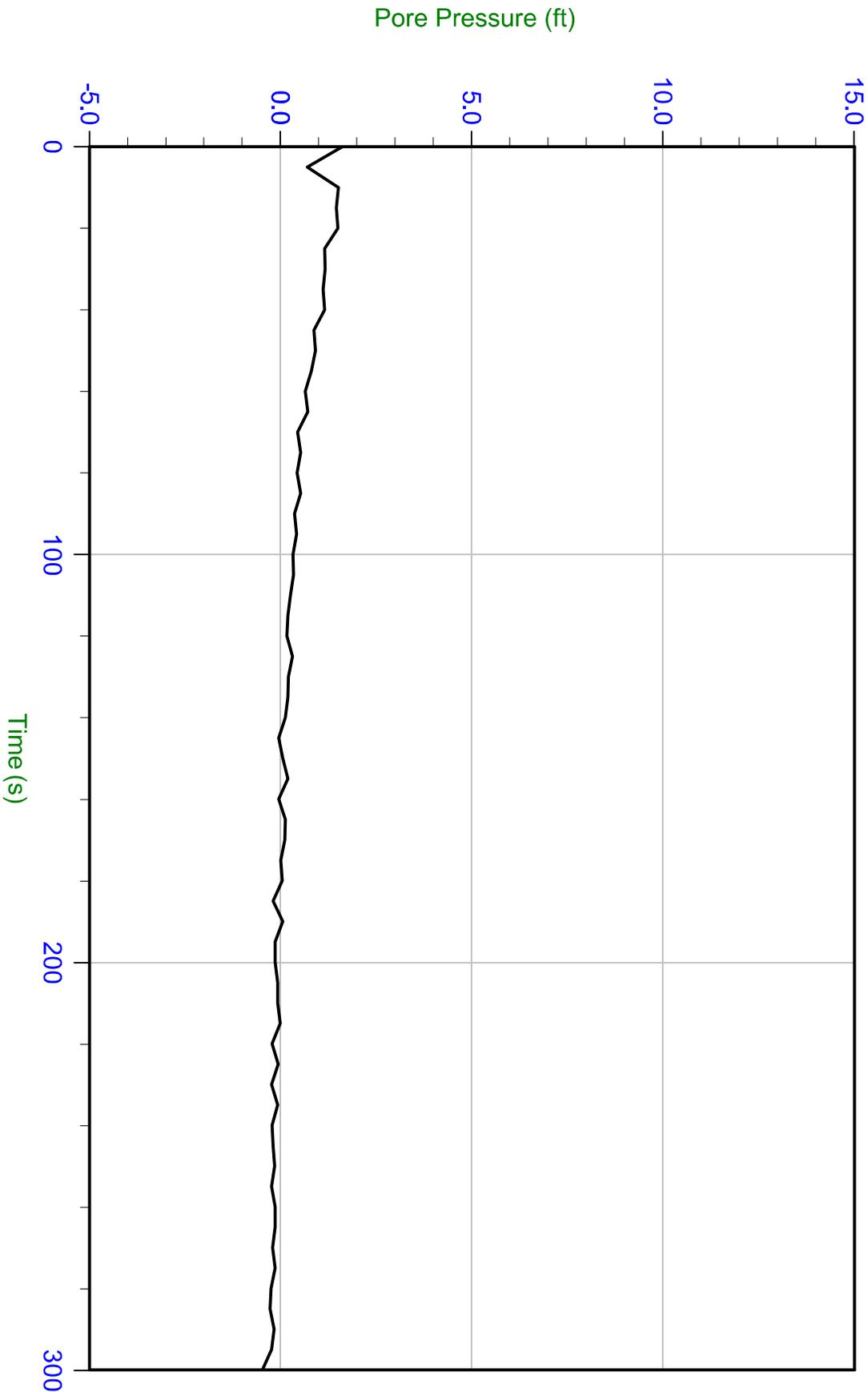
Sounding ID	File Name	Cone Area (cm <sup>2</sup> )	Duration (s)	Test Depth (ft.)	Estimated Equilibrium Pore Pressure U <sub>eq</sub> (ft.)	Calculated Phreatic Surface (ft.)	Refer to Notation Number
CPT-01	19-52023_CP01	15	300	12.39	0.0	12.4	
CPT-01	19-52023_CP01	15	1000	33.14	3.6	29.5	
CPT-02	19-52023_SP02	15	500	45.19	1.8	43.4	



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_CP01.PPD  
Depth: 3.775 m / 12.385 ft  
Duration: 300.0 s

u Min: -0.5 ft  
u Max: 1.6 ft  
u Final: -0.5 ft

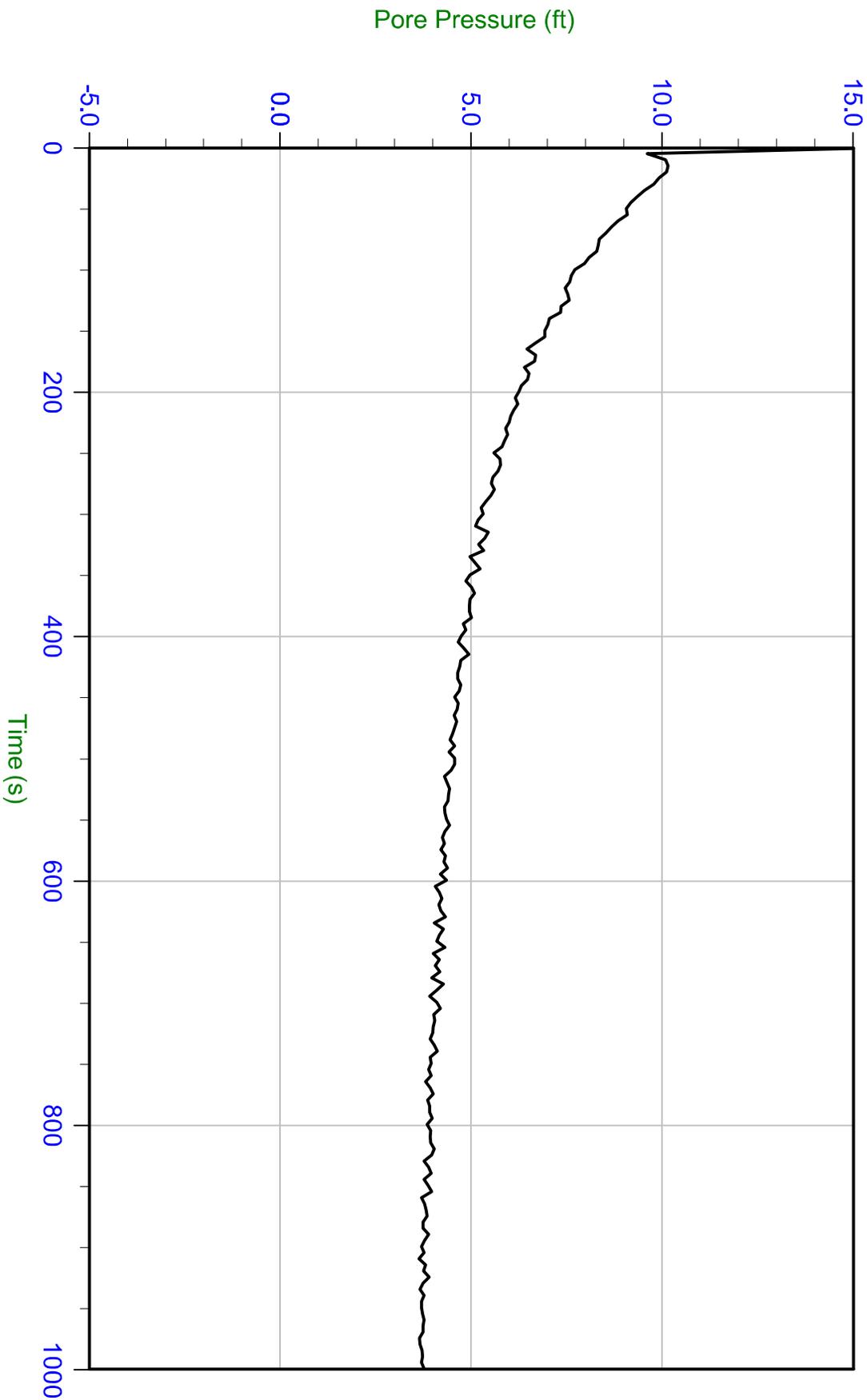
WT: 3.772 m / 12.374 ft  
Ueq: 0.0 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 09:01:27  
Site: JRW

Sounding: CPT-01  
Cone: 418 Area=15 cm<sup>2</sup>



**Trace Summary:**

Filename: 19-52023\_CP01.PPD  
Depth: 10.100 m / 33.136 ft  
Duration: 1000.0 s

u Min: 3.6 ft  
u Max: 15.5 ft  
u Final: 3.8 ft

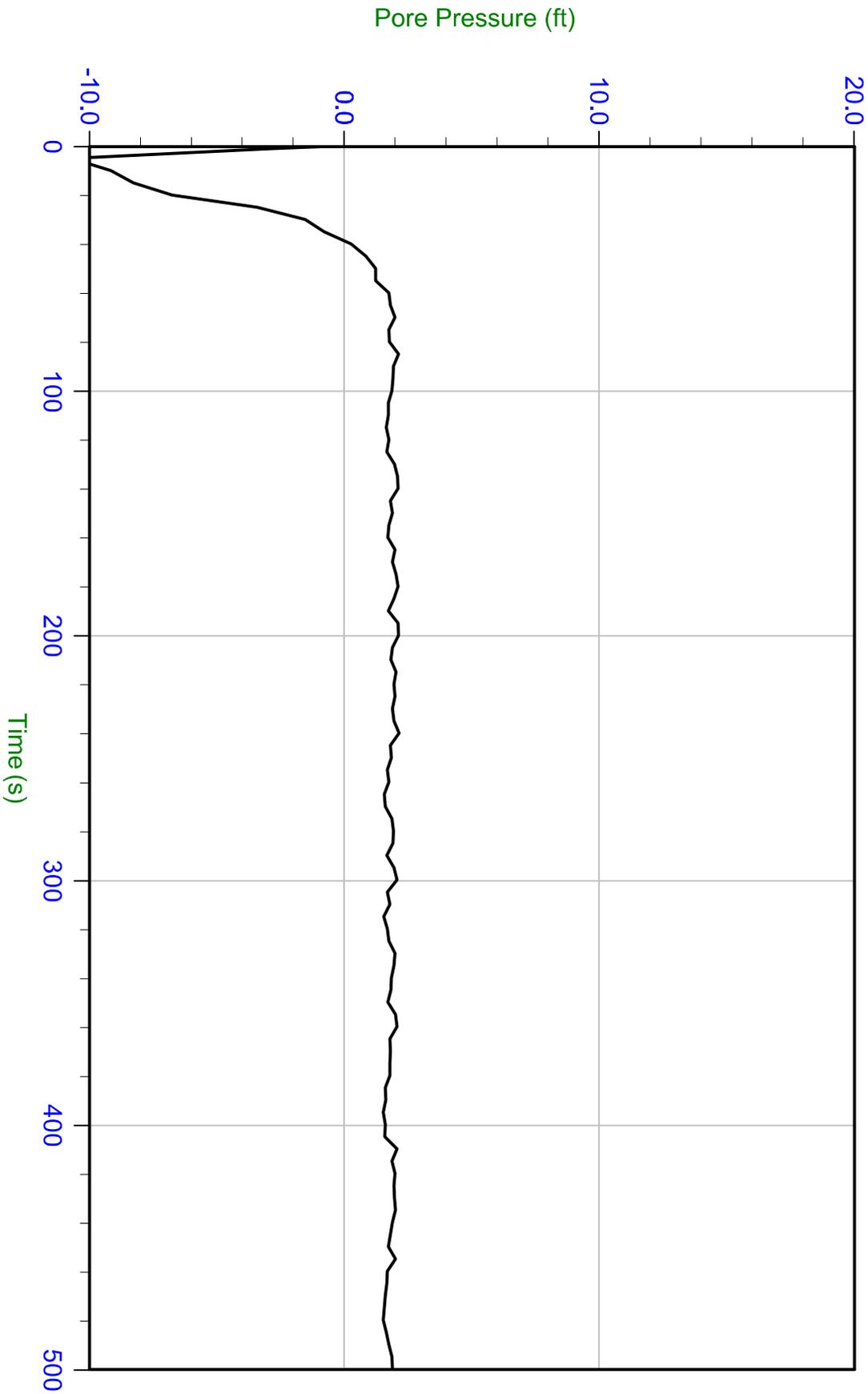
WT: 8.989 m / 29.491 ft  
Ueq: 3.6 ft



**IGES**

Job No: 19-52023  
Date: 16-May-2019 10:19:35  
Site: JRW

Sounding: CPT-02  
Cone: 418 Area=15 cm<sup>2</sup>



Trace Summary:

Filename: 19-52023\_SP02.PPD  
Depth: 13.775 m / 45.193 ft  
Duration: 500.0 s

u Min: -10.7 ft  
u Max: 2.2 ft  
u Final: 1.9 ft  
WT: 13.233 m / 43.415 ft  
Ueq: 1.8 ft

# **APPENDIX C**

# Laboratory Compaction Characteristics of Soil

(ASTM D698 / D1557)

**Project: GTI Welfare Complex**  
**No: 03019-001**

Location: **Saratoga Springs**

Date: **3/18/2019**

By: **JAB**

Method: **ASTM D698 B**

Mold Id. **Inc 1**

Mold volume (ft<sup>3</sup>): **0.0333**

**Boring No.: TP-2**

**Sample:**

**Depth: 2.0-4.0'**

Sample Description: **Brown clay**

Engineering Classification: **Not requested**

As-received water content (%): **Not requested**

Preparation method: **Moist**

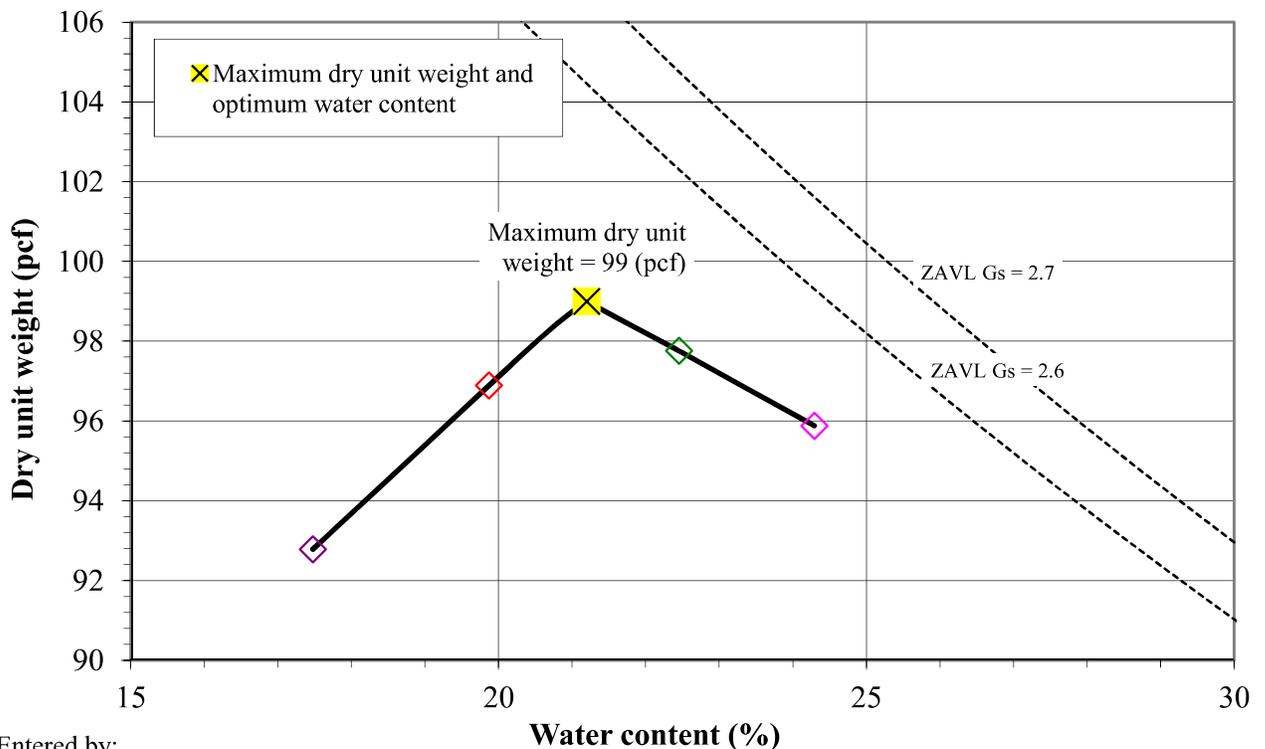
Rammer: **Mechanical-circular face**

Rock Correction: **No**

**Optimum water content (%): 21.2**

**Maximum dry unit weight (pcf): 99**

Point Number	As-Is	+2%	+4%	+6%				
Wt. Sample + Mold (g)	5876.9	5984.7	6038.6	6030.5				
Wt. of Mold (g)	4231.4	4231.4	4231.4	4231.4				
Wet Unit Wt., $\gamma_m$ (pcf)	109.0	116.1	119.7	119.2				
Wet Soil + Tare (g)	1297.47	1411.96	1563.23	1561.59				
Dry Soil + Tare (g)	1153.89	1232.32	1351.73	1317.51				
Tare (g)	332.26	328.19	409.82	312.77				
Water Content, w (%)	17.5	19.9	22.5	24.3				
Dry Unit Wt., $\gamma_d$ (pcf)	92.8	96.9	97.8	95.9				



Entered by: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**California Bearing Ratio**

(ASTM D 1883)



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**Project: GTI Welfare Complex**

**Number: 03019-001**

Location: **Saratoga Springs**

Date: **3/26/2019**

By: **JWB**

Maximum Dry Unit Weight (pcf): **99**  
 Optimum Water Content (%): **21.2**  
 Relative Compaction (%): **101.3**  
**0.1 in. Corrected CBR (%): 4.1**  
**0.2 in. Corrected CBR (%): 5.3**

**Boring No.: TP-2**

**Sample:**

**Depth: 2.0-4.0'**

Original Method: **ASTM D698 B**

Engineering Classification: **Not requested**

Condition of Sample: **Soaked**

Scalp and Replace: **No**

As Compacted Data		Before	After
Mold Id.	<b>E</b>	Wet Soil + Tare (g)	<b>1661.81</b> <b>1919.54</b>
Wt. of Mold + Sample (g)	<b>11346.6</b>	Dry Soil + Tare (g)	<b>1430.37</b> <b>1639.72</b>
Wt. of Mold (g)	<b>7224.9</b>	Tare (g)	<b>327.89</b> <b>315.02</b>
Dry Unit Weight (pcf)	<b>100.3</b>	Water Content (%)	<b>21.0</b> <b>21.1</b>
After Soaking Data		Average	Top 1 in.
Wt. of Mold + Sample (g)	<b>11454.3</b>	Wet Soil + Tare (g)	<b>1730.68</b> <b>483.43</b>
Dry Unit Weight (pcf)	<b>98.9</b>	Dry Soil + Tare (g)	<b>1439.57</b> <b>411.33</b>
		Tare (g)	<b>222.26</b> <b>122.4</b>
		Water Content (%)	<b>23.9</b> <b>25.0</b>

**Swell Data**

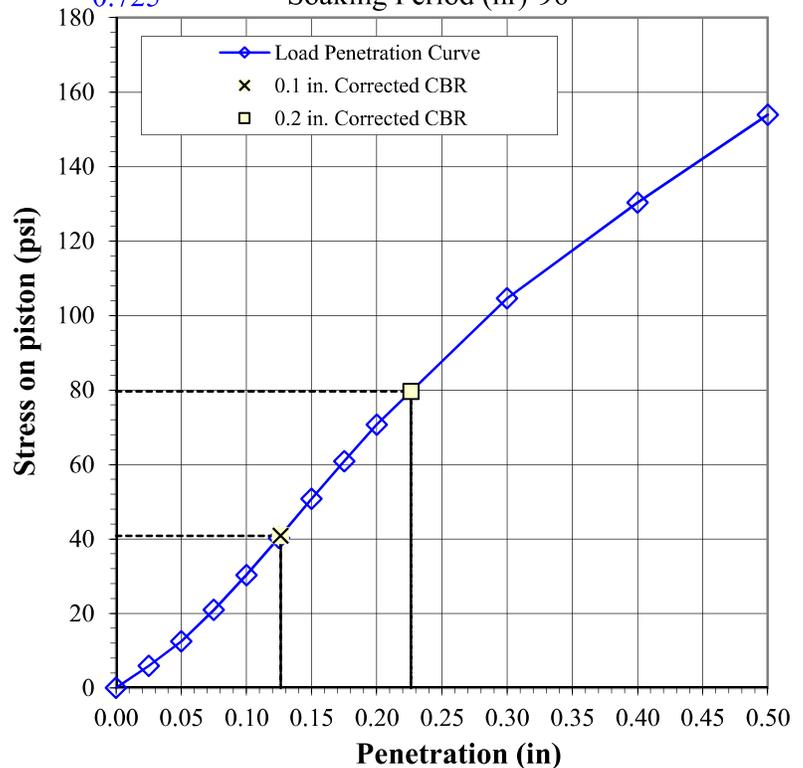
Date: **3/21/2019**    Time: **11:15**    Dial: **0.661**    Surcharge (psf) **50**  
 Date: **3/25/2019**    Time: **11:00**    Dial: **0.725**    Swell (%) **1.40**  
 Soaking Period (hr) **96**

Penetration Data	Piston ID	CBR T1
------------------	-----------	--------

Zero load (lb) = **0**

Area of Piston (in<sup>2</sup>) = **3.0**

Penetration (in.)	Raw Load (lb)	Piston Stress (psi)	Std. Stress (psi)
0.000	0	0	
0.025	18	6	
0.050	37	12	
0.075	63	21	
0.100	91	30	1000
0.125	121	40	1125
0.150	152	51	1250
0.175	182	61	1375
0.200	212	71	1500
0.300	314	105	1900
0.400	391	130	2300
0.500	462	154	2600



Entered By: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-2**

Sample:

Depth: **4.5'**

Sample Description: **Brown silt**

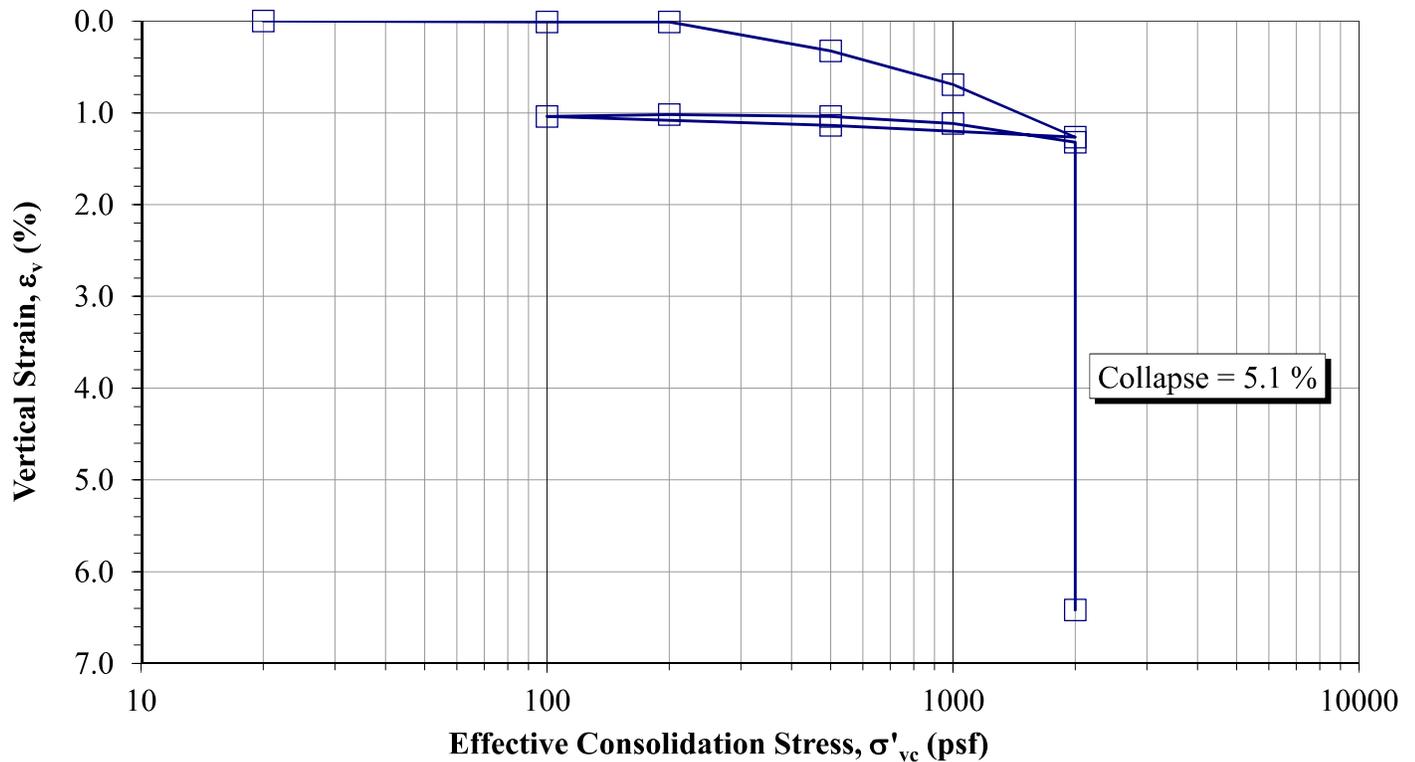
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 4  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 5.1  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.924	0.865
Sample diameter, D (in.)	2.419	2.419
Mass rings + wet soil (g)	149.22	161.41
Mass rings/tare (g)	46.11	46.11
Moist unit wt., $\gamma_m$ (pcf)	92.50	110.53
Wet soil + tare (g)	231.92	236.70
Dry soil + tare (g)	217.75	211.02
Tare (g)	126.53	123.05
Water content, w (%)	15.5	29.2
Dry unit wt., $\gamma_d$ (pcf)	80.06	85.55
Saturation	37.95	81.24

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.0732	0.00	0.9240	1.105
20	0.0732	0.00	0.9240	1.105
100	0.0733	0.01	0.9239	1.105
200	0.0733	0.01	0.9239	1.105
500	0.0762	0.32	0.9210	1.098
1000	0.0796	0.69	0.9176	1.091
2000	0.0849	1.27	0.9123	1.079
500	0.0837	1.14	0.9135	1.081
100	0.0828	1.04	0.9144	1.083
200	0.0826	1.02	0.9146	1.084
500	0.0828	1.04	0.9144	1.083
1000	0.0835	1.11	0.9137	1.082
2000	0.0854	1.32	0.9118	1.077
2000	0.1325	6.42	0.8647	0.970



Comments: **Test specimen contains pinholes.**

Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-3**

Sample:

Depth: **6.0'**

Sample Description: **Brown clay**

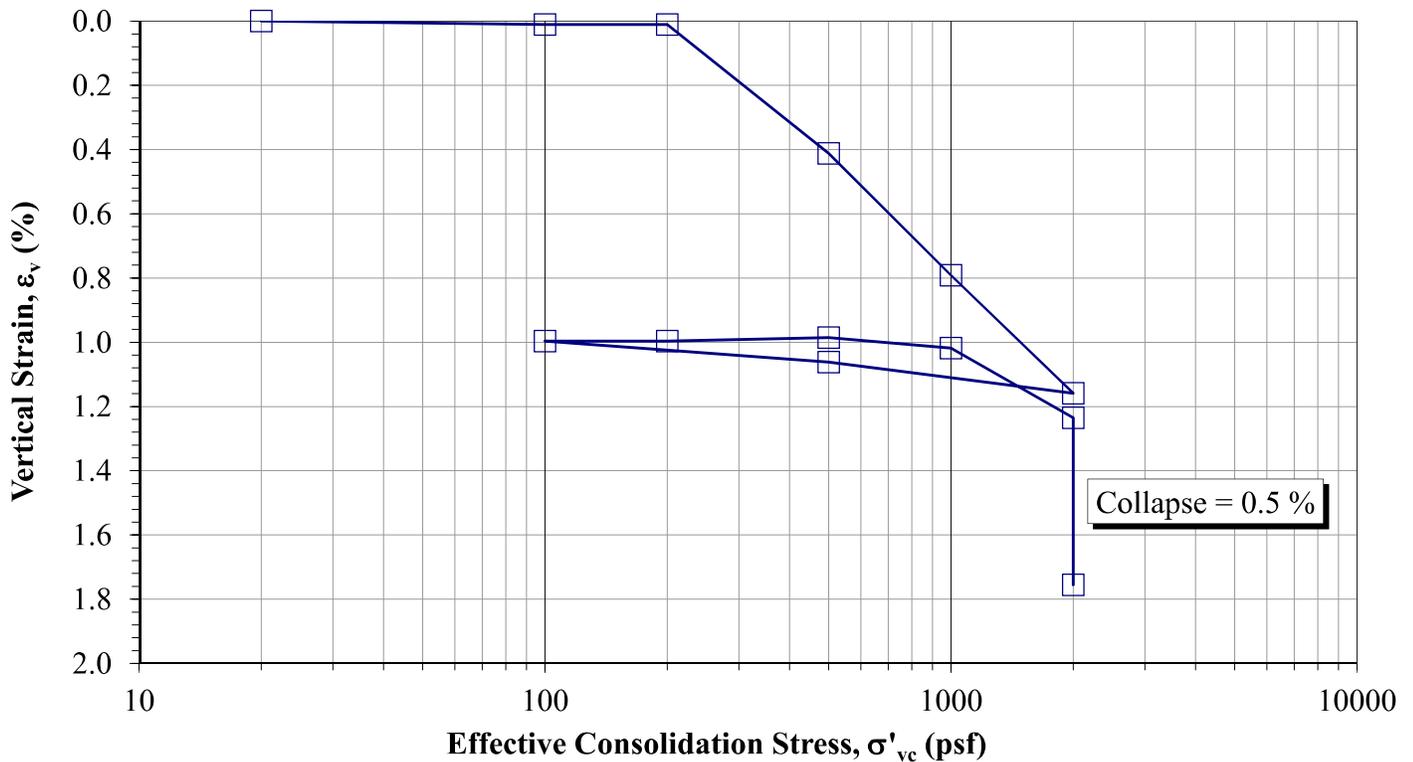
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 7  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 0.5  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.923	0.907
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	163.95	172.94
Mass rings/tare (g)	44.87	44.87
Moist unit wt., $\gamma_m$ (pcf)	107.38	117.56
Wet soil + tare (g)	242.53	247.71
Dry soil + tare (g)	224.50	221.21
Tare (g)	121.61	120.83
Water content, w (%)	17.5	26.4
Dry unit wt., $\gamma_d$ (pcf)	91.37	93.01
Saturation	56.01	87.75

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1466	0.00	0.9230	0.845
20	0.1466	0.00	0.9230	0.845
100	0.1467	0.01	0.9229	0.844
200	0.1467	0.01	0.9229	0.844
500	0.1504	0.41	0.9192	0.837
1000	0.1539	0.79	0.9157	0.830
2000	0.1573	1.16	0.9123	0.823
500	0.1564	1.06	0.9132	0.825
100	0.1558	1.00	0.9138	0.826
200	0.1558	1.00	0.9138	0.826
500	0.1557	0.99	0.9139	0.826
1000	0.1560	1.02	0.9136	0.826
2000	0.1580	1.24	0.9116	0.822
2000	0.1628	1.76	0.9068	0.812



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

**Collapse/Swell Potential of Soils**

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-5**

Sample:

Depth: **4.5'**

Sample Description: **Brown clay with sand**

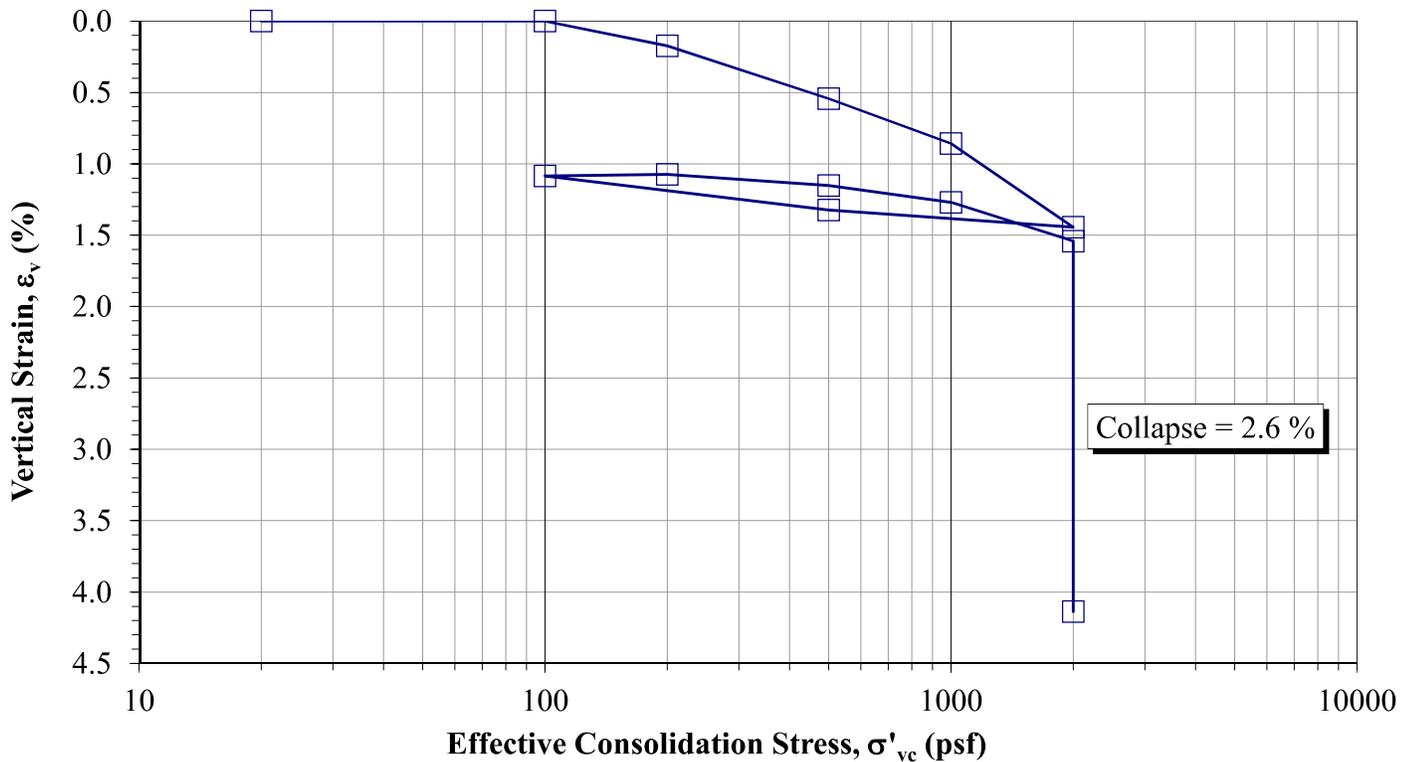
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 8  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 2.6  
 Collapse stress (psf): 2000  
 Water type used for inundation **Tap**

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.883
Sample diameter, D (in.)	2.415	2.415
Mass rings + wet soil (g)	164.24	171.73
Mass rings/tare (g)	45.55	45.55
Moist unit wt., $\gamma_m$ (pcf)	107.18	118.86
Wet soil + tare (g)	281.26	253.68
Dry soil + tare (g)	256.11	226.92
Tare (g)	127.36	128.09
Water content, w (%)	19.5	27.1
Dry unit wt., $\gamma_d$ (pcf)	89.66	93.53
Saturation	59.94	91.15

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1597	0.00	0.9210	0.880
20	0.1597	0.00	0.9210	0.880
100	0.1597	0.00	0.9210	0.880
200	0.1613	0.17	0.9194	0.877
500	0.1647	0.54	0.9160	0.870
1000	0.1676	0.86	0.9131	0.864
2000	0.1730	1.44	0.9077	0.853
500	0.1719	1.32	0.9088	0.855
100	0.1697	1.09	0.9110	0.859
200	0.1696	1.07	0.9111	0.860
500	0.1703	1.15	0.9104	0.858
1000	0.1714	1.27	0.9093	0.856
2000	0.1739	1.54	0.9068	0.851
2000	0.1978	4.14	0.8829	0.802



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

### Collapse/Swell Potential of Soils

(ASTM D4546 Method B)

Project: **GTI Welfare Complex**

No: **03019-001**

Location: **Saratoga Springs**

Date: **3/19/2019**

By: **EH**

Boring No.: **TP-7**

Sample:

Depth: **3.5'**

Sample Description: **Brown clay**

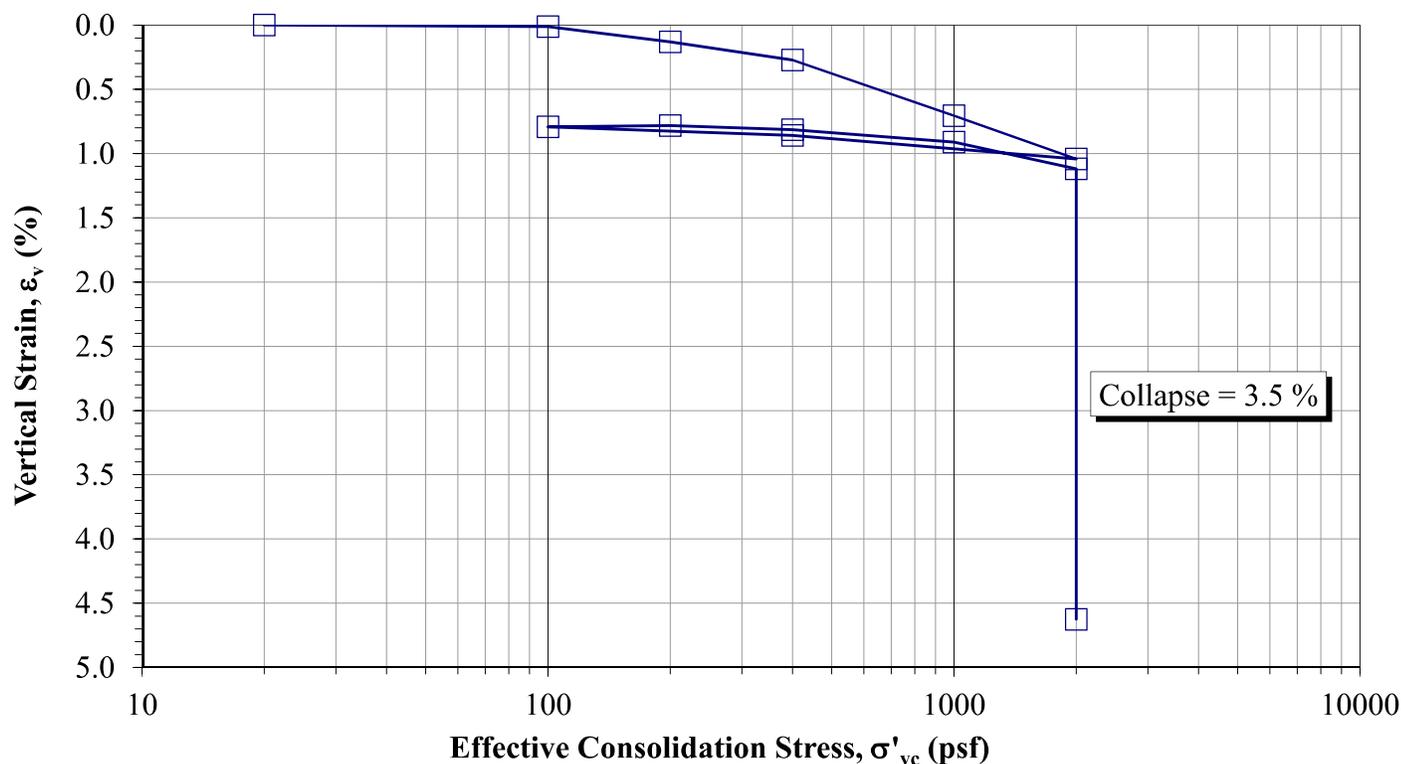
Engineering Classification: **Not requested**

Sample type: **Undisturbed-trimmed from thin-wall**

Consolidometer No.: 9  
 Specific gravity,  $G_s$ : 2.70 Assumed  
 Collapse (%): 3.5  
 Collapse stress (psf): 2000  
 Water type used for inundation Tap

	Initial (o)	Final (f)
Sample height, H (in.)	0.921	0.878
Sample diameter, D (in.)	2.414	2.414
Mass rings + wet soil (g)	148.00	161.60
Mass rings/tare (g)	45.46	45.46
Moist unit wt., $\gamma_m$ (pcf)	92.67	110.05
Wet soil + tare (g)	248.57	237.33
Dry soil + tare (g)	229.70	208.72
Tare (g)	120.17	121.44
Water content, w (%)	17.2	32.8
Dry unit wt., $\gamma_d$ (pcf)	79.05	82.88
Saturation	41.08	85.63

Stress (psf)	Dial (in.)	1-D $\epsilon_v$ (%)	$H_c$ (in.)	e
Seating	0.1130	0.00	0.9210	1.132
20	0.1130	0.00	0.9210	1.132
100	0.1131	0.01	0.9209	1.132
200	0.1142	0.13	0.9198	1.129
400	0.1155	0.27	0.9185	1.126
1000	0.1195	0.71	0.9145	1.117
2000	0.1226	1.04	0.9114	1.110
400	0.1209	0.86	0.9131	1.114
100	0.1203	0.79	0.9137	1.115
200	0.1202	0.78	0.9138	1.116
400	0.1205	0.81	0.9135	1.115
1000	0.1214	0.91	0.9126	1.113
2000	0.1233	1.12	0.9107	1.108
2000	0.1556	4.63	0.8784	1.034



Entered: \_\_\_\_\_

Reviewed: \_\_\_\_\_

# **APPENDIX D**



Date: 2019-05-24T19:18:40.163Z

Reference Document: IBC-2015

URL: [https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare Complex](https://earthquake.usgs.gov/ws/designmaps/ibc-2015.json?latitude=40.383064&longitude=-111.918064&riskCategory=II&siteClass=D&title=Welfare%20Complex)

Parameters: latitude: 40.383064, longitude: -111.918064

Risk Category: II

Site Class: D

Title: Welfare Complex

Response Data:

pgauh: 0.395

pgad: 0.612

pga: 0.395

fpga: 1.105

pgam: 0.437

ssrt: 0.974

crs: 0.855

ssuh: 1.139

ssd: 1.759

ss: 0.974

fa: 1.11

sms: 1.082

sds: 0.721

sdcs: D

s1rt: 0.329

cr1: 0.854

s1uh: 0.385

s1d: 0.658

s1: 0.329

fv: 1.741

sm1: 0.573

sd1: 0.382

sd1: D

sd1: D



Project Number 03019-001

Geotechnical Investigation  
JRW & Associates  
1200 North Redwood Road  
Saratoga Springs, Utah

**MCE-PGA DESIGN RESONSE SPECTRA**

**Figure**

**C-1**

# **APPENDIX E**















Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

0.001

Lamp	Material	In	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG	BH	BI	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS	BT	BU	BV	BW	BX	BY	BZ	CA	CB	CC	CD	CE	CF	CG	CH	CI	CJ	CK	CL	CM	CN	CO	CP	CQ	CR	CS	CT	CU	CV	CW	CX	CY	CZ	DA	DB	DC	DD	DE	DF	DG	DH	DI	DJ	DK	DL	DM	DN	DO	DP	DQ	DR	DS	DT	DU	DV	DW	DX	DY	DZ	EA	EB	EC	ED	EE	EF	EG	EH	EI	EJ	EK	EL	EM	EN	EO	EP	EQ	ER	ES	ET	EU	EV	EW	EX	EY	EZ	FA	FB	FC	FD	FE	FF	FG	FH	FI	FJ	FK	FL	FM	FN	FO	FP	FQ	FR	FS	FT	FU	FV	FW	FX	FY	FZ	GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV	GW	GX	GY	GZ	HA	HB	HC	HD	HE	HF	HG	HH	HI	HJ	HK	HL	HM	HN	HO	HP	HQ	HR	HS	HT	HU	HV	HW	HX	HY	HZ	IA	IB	IC	ID	IE	IF	IG	IH	II	IJ	IK	IL	IM	IN	IO	IP	IQ	IR	IS	IT	IU	IV	IW	IX	IY	IZ	JA	JB	JC	JD	JE	JF	JG	JH	JI	JJ	JK	JL	JM	JN	JO	JP	JQ	JR	JS	JT	JU	JV	JW	JX	JY	JZ	KA	KB	KC	KD	KE	KF	KG	KH	KI	KJ	KL	KM	KN	KO	KP	KQ	KR	KS	KT	KU	KV	KW	KX	KY	KZ	LA	LB	LC	LD	LE	LF	LG	LH	LI	LJ	LK	LL	LM	LN	LO	LP	LQ	LR	LS	LT	LU	LV	LW	LX	LY	LZ	MA	MB	MC	MD	ME	MF	MG	MH	MI	MJ	MK	ML	MM	MN	MO	MP	MQ	MR	MS	MT	MU	MV	MW	MX	MY	MZ	NA	NB	NC	ND	NE	NF	NG	NH	NI	NJ	NK	NL	NM	NN	NO	NP	NQ	NR	NS	NT	NU	NV	NW	NX	NY	NZ	OA	OB	OC	OD	OE	OF	OG	OH	OI	OJ	OK	OL	OM	ON	OO	OP	OQ	OR	OS	OT	OU	OV	OW	OX	OY	OZ	PA	PB	PC	PD	PE	PF	PG	PH	PI	PJ	PK	PL	PM	PN	PO	PP	PQ	PR	PS	PT	PU	PV	PW	PX	PY	PZ	QA	QB	QC	QD	QE	QF	QG	QH	QI	QJ	QK	QL	QM	QN	QO	QP	QQ	QR	QS	QT	QU	QV	QW	QX	QY	QZ	RA	RB	RC	RD	RE	RF	RG	RH	RI	RJ	RK	RL	RM	RN	RO	RP	RQ	RR	RS	RT	RU	RV	RW	RX	RY	RZ	SA	SB	SC	SD	SE	SF	SG	SH	SI	SJ	SK	SL	SM	SN	SO	SP	SQ	SR	SS	ST	SU	SV	SW	SX	SY	SZ	TA	TB	TC	TD	TE	TF	TG	TH	TI	TJ	TK	TL	TM	TN	TO	TP	TQ	TR	TS	TT	TU	TV	TW	TX	TY	TZ	UA	UB	UC	UD	UE	UF	UG	UH	UI	UJ	UK	UL	UM	UN	UO	UP	UQ	UR	US	UT	UU	UV	UW	UX	UY	UZ	VA	VB	VC	VD	VE	VF	VG	VH	VI	VJ	VK	VL	VM	VN	VO	VP	VQ	VR	VS	VT	VU	VV	VW	VX	VY	VZ	WA	WB	WC	WD	WE	WF	WG	WH	WI	WJ	WK	WL	WM	WN	WO	WP	WQ	WR	WS	WT	WU	WV	WW	WX	WY	WZ	XA	XB	XC	XD	XE	XF	XG	XH	XI	XJ	XK	XL	XM	XN	XO	XP	XQ	XR	XS	XT	XU	XV	XW	XX	XY	XZ	YA	YB	YC	YD	YE	YF	YG	YH	YI	YJ	YK	YL	YM	YN	YO	YP	YQ	YR	YS	YT	YU	YV	YW	YX	YZ	ZA	ZB	ZC	ZD	ZE	ZF	ZG	ZH	ZI	ZJ	ZK	ZL	ZM	ZN	ZO	ZP	ZQ	ZR	ZS	ZT	ZU	ZV	ZW	ZX	ZY	ZZ
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

## APPENDIX E - TRAFFIC STUDY

# Welfare Complex

## Traffic Impact Study



## Saratoga Springs, Utah

July 2, 2020

UT19-1451



## EXECUTIVE SUMMARY

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The Welfare Complex project is located on the west side of Redwood Road (SR-68), just north of 1140 North.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.

The evening peak hour level of service (LOS) was computed for each study intersection. The results of this analysis are shown in Table ES-1. Recommended storage lengths are shown in Table ES-2.

TABLE ES-1 LOS Analysis - Evening Peak Hour Saratoga Springs - Welfare Complex TIS Update				
Intersection	Level of Service (Sec/Veh) <sup>1</sup>			
	Existing (2020)		Future (2025)	
	Background	Plus Project	Background	Plus Project
Medical Drive (1140 North) / Redwood Road (SR-68)	B (11.4)	B (14.8)	B (17.1)	C (27.1)
Market Street / Redwood Road (SR-68)	A (8.0)	A (8.7)	B (10.9)	B (18.7)
Market Street / Pioneer Crossing (SR-145)	B (14.8)	B (14.8)	B (18.5)	B (14.6)
Commerce Drive / Redwood Road (SR-68)	f (>50) / WBL	f (>50) / WBL	B (12.7)	B (11.6)
Medical Drive / Exchange Drive	-	-	a (6.4) / EBT	a (6.5) / EBT
Access 1 / Redwood Road (SR-68) <sup>2</sup>	-	f (>50) / EBL	-	f (>50) / EBL
Access 2 / Medical Drive <sup>2</sup>	-	a (4.6) / SBL	-	a (6.1) / SBL
Access 3 / Medical Drive <sup>2</sup>	-	a (4.0) / SBL	-	a (6.2) / SBL

1. Intersection LOS and delay (seconds/vehicle) values represent the overall intersection average for roundabout, signalized, all-way stop-controlled intersections and the worst movement for all other unsignalized intersections. Uppercase LOS used for signalized, roundabout, and all-way stop-controlled intersections. Lowercase LOS used for one-way & two-way stop-controlled intersections.

2. This intersection is a project access and was only analyzed in "plus project" scenarios.

Source: Hales Engineering, July 2020

**TABLE ES-2**  
**Recommended Storage Lengths**  
**Saratoga Springs - Welfare Complex TIS Update**

Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

## **SUMMARY OF KEY FINDINGS/RECOMMENDATIONS**

The following is a summary of key findings and recommendations:

- The Commerce Drive / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour in existing (2020) background conditions. All other study intersections are currently operating at an acceptable LOS.
  - Commerce Drive / Redwood Road (SR-68) is anticipated to be signalized by the year 2025 with the completion of the Foothill Boulevard project as per UDOT agreement.
- The development will consist of welfare facilities, including a Deseret Industries thrift store and a Bishop's Storehouse/LDS Family Services facility.
- The Access 1 / Redwood Road (SR-68) intersection is anticipated to operate at LOS F during the evening peak hour with project traffic added. All other study intersections are anticipated to operate at an acceptable LOS.
  - It is anticipated that traffic will reroute to avoid left-turn movement delays onto Redwood Road. There is excess capacity at the accesses on Medical Drive that will accommodate these volumes. It is recommended that safety and operations be evaluated at this access and left-turn movements restricted if future problems are observed.
- All study intersections are anticipated to operate at an acceptable LOS during the evening peak hour in future (2025) background and plus project conditions.
- While no operational problems were observed between the offset of the western Costco access and the Access 2 / Medical Drive intersection, it is recommended that this access be evaluated for safety and restricted to right-in right-out (RIRO) access only if safety concerns are present.

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## I. INTRODUCTION

### A. Purpose

This study addresses the traffic impacts associated with the proposed Welfare Complex development located in Saratoga Springs, Utah. The proposed project is located on the west side of Redwood Road (SR-68), just north of 1140 North. Figure 1 shows a vicinity map of the proposed development.

Included within the analyses for this study are the traffic operations and recommended mitigation measures for existing conditions and plus project conditions (conditions after development of the proposed project) at key intersections and roadways near the site. Future 2025 and 2040 conditions were also analyzed.



Figure 1: Vicinity map showing the project location in Saratoga Springs, Utah

## **B. Scope**

The study area was defined based on conversations with the development team. This study was scoped to evaluate the traffic operational performance impacts of the project on the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)
- Commerce Drive / Redwood Road (SR-68)
- Medical Drive / Exchange Drive (completed by 2025)
- Project Access / Redwood Road (SR-68)
- Project Accesses (2) / Medical Drive

## **C. Analysis Methodology**

Level of service (LOS) is a term that describes the operating performance of an intersection or roadway. LOS is measured quantitatively and reported on a scale from A to F, with A representing the best performance and F the worst. Table 1 provides a brief description of each LOS letter designation and an accompanying average delay per vehicle for both signalized and unsignalized intersections. Figure 2 provides a visual representation of each LOS letter designation.

The *Highway Capacity Manual* (HCM), 6<sup>th</sup> Edition, 2016 methodology was used in this study to remain consistent with “state-of-the-practice” professional standards. This methodology has different quantitative evaluations for signalized and unsignalized intersections. For signalized and all-way stop intersections, the LOS is provided for the overall intersection (weighted average of all approach delays). For all other unsignalized intersections, LOS is reported based on the worst movement.

Using Synchro/SimTraffic software, which follow the HCM methodology, the peak hour LOS was computed for each study intersection. Multiple runs of SimTraffic were used to provide a statistical evaluation of the interaction between the intersections. The detailed LOS reports are provided in Appendix B. Hales Engineering also calculated the 95<sup>th</sup> percentile queue lengths for the study intersections using SimTraffic. The detailed queue length reports are provided in Appendix D.

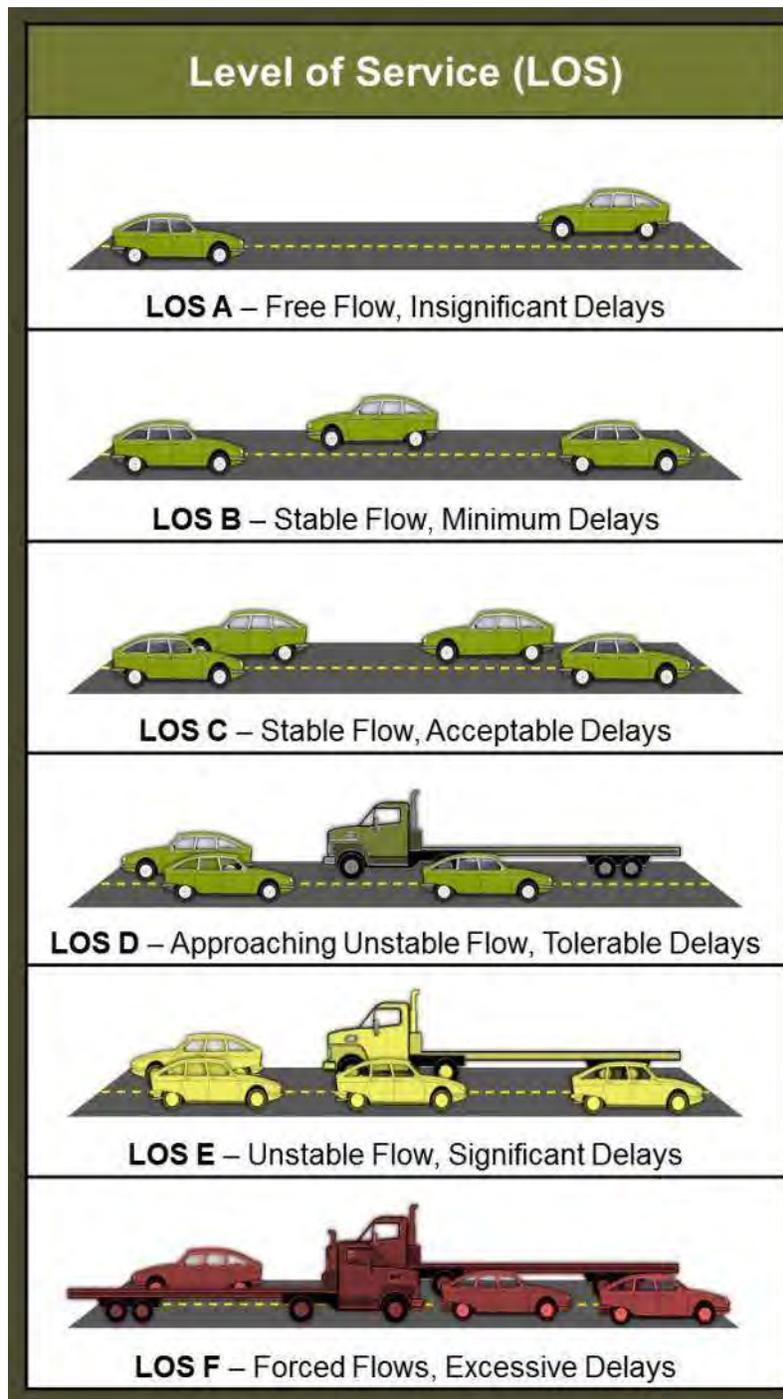
## **D. Level of Service Standards**

For the purposes of this study, a minimum acceptable intersection performance for each of the study intersections was set at LOS D. If levels of service E or F conditions exist, an explanation and/or mitigation measures will be presented. A LOS D threshold is consistent with “state-of-the-practice” traffic engineering principles for urbanized areas.

**Table 1: Level of Service Description**

Level of Service	Description of Traffic Conditions	Average Delay (seconds/vehicle)
		Signalized Intersections
A	Extremely favorable progression and an extremely low level of control delay. Individual users are virtually unaffected by others in the traffic stream.	0 ≤ 10.0
B	Good progression and a low level of control delay. The presence of other users in the traffic stream becomes noticeable.	> 10.0 and ≤ 20.0
C	Fair progression and a moderate level of control delay. The operation of individual users becomes somewhat affected by interactions with others in the traffic stream.	>20.0 and ≤ 35.0
D	Marginal progression with relatively elevated levels of control delay. Operating conditions are noticeably more constrained.	> 35.0 and ≤ 55.0
E	Poor progression with unacceptably elevated levels of control delay. Operating conditions are at or near capacity.	> 55.0 and ≤ 80.0
F	Unacceptable progression with forced or breakdown operating conditions.	> 80.0
Unsignalized Intersections		Worst Approach
A	Free Flow / Insignificant Delay	0 ≤ 10.0
B	Stable Operations / Minimum Delays	>10.0 and ≤ 15.0
C	Stable Operations / Acceptable Delays	>15.0 and ≤ 25.0
D	Approaching Unstable Flows / Tolerable Delays	>25.0 and ≤ 35.0
E	Unstable Operations / Significant Delays Can Occur	>35.0 and ≤ 50.0
F	Forced Flows / Unpredictable Flows / Excessive Delays Occur	> 50.0

Source: Hales Engineering Descriptions, based on the *Highway Capacity Manual (HCM)*, 6<sup>th</sup> Edition, 2016 Methodology (Transportation Research Board)



**Figure 2: Visual representation of the LOS letter designations**

## **II. EXISTING (2020) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the background analysis is to study the intersections and roadways during the peak travel periods of the day with background traffic and geometric conditions. Through this analysis, background traffic operational deficiencies can be identified, and potential mitigation measures recommended. This analysis provides a baseline condition that may be compared to the build conditions to identify the impacts of the development.

### **B. Roadway System**

The primary roadways that will provide access to the project site are described below:

Redwood Road (SR-68) – is a state-maintained roadway (classified by UDOT access management standards as a “Regional – Priority Urban Importance” facility, or access category 5 roadway). Redwood Road (SR-68) has two travel lanes in each direction separated by a two-way left-turn lane (TWLTL). As identified and controlled by UDOT, a “Regional – Priority Urban Importance” access classification identifies minimum signalized intersection spacing of one-half mile (2,640 feet), minimum unsignalized street spacing of 660 feet, and minimum driveway spacing of 350 feet. The posted speed limit on Redwood Road (SR-68) is 45 mph.

Medical Drive – is a future city-maintained roadway which is classified by the Saratoga Springs Transportation Master Plan (January 2019) as a local road. It was assumed that the roadway will have one lane in each direction separated by a TWLTL. The posted speed limit was assumed to be 30 mph in the study area.

### **C. Traffic Volumes**

Weekday morning (7:00 to 9:00 a.m.) and evening (4:00 to 6:00 p.m.) peak period traffic counts were performed at the following intersections:

- Commerce Drive / Redwood Road (SR-68)

The counts were performed on Wednesday, June 24, 2020. The morning peak hour was determined to be between 7:45 and 8:45 a.m., and the evening peak hour was determined to be between 5:00 and 6:00 p.m. The evening peak hour volumes were approximately 70% higher than the morning peak hour volumes. Therefore, the evening peak hour volumes were used in the analysis to represent the worst-case conditions. Detailed count data are included in Appendix A.

*These traffic counts were collected during the COVID-19 pandemic when traffic volumes were slightly reduced due to social distancing measures. According to the UDOT Automatic Traffic Signal Performance Measures (ATSPM) website, the traffic volumes on March 10 (pre-social*

*distancing) were approximately 15% higher than those on June 14. Therefore, the collected data were increased by 15% to represent normal conditions.*

In addition to the counts conducted at the Commerce Drive / Redwood Road (SR-68) intersection, volumes from the previously conducted Kittelson & Associates Saratoga Springs Costco and Hales Engineering Osmond Development traffic impact studies were used for the evening peak hour background volumes at the following intersections:

- 1140 North (Medical Drive) / Redwood Road (SR-68)
- Market Street / Redwood Road (SR-68)
- Market Street / Pioneer Crossing (SR-145)

Figure 3 shows the existing evening peak hour volumes as well as intersection geometry at the study intersections.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement.

In addition to the two planned signals, the previously completed Kittelson & Associates TIS for the Costco development recommends a signal at the Medical Drive (1140 South) / Redwood Road (SR-68) intersection, which is also warranted by the projected volumes. While this signal does not meet current spacing requirements with the planned signal at Commerce Drive, it is anticipated that the necessary administrative decisions will be made to allow a signal at this location. Thus, for the 2020 background conditions analysis, it is assumed that the Market Street / Pioneer Crossing (SR-145), Commercial Drive / Redwood Road (SR-68), and Market Street (1140 North) / Redwood Road (SR-68) signals have been installed with the completion of the Costco development.

#### **D. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) intersection is currently operating at LOS F. All other study intersections are currently operating at acceptable levels of service during the evening peak hour, as shown in Table 2. These results serve as a baseline condition for the impact analysis of the proposed development during existing (2020) conditions.

#### **E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. Queuing of up to 800 feet was present on the westbound leg of the Commerce Drive / Redwood

Road (SR-68) intersection. No other significant queuing was observed during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended. The Commerce Drive / Redwood Road (SR-68) intersection is planned to be signalized with the completion of the Foothill Boulevard project as per UDOT agreement. Until then, traffic will reroute to adjacent signals if heavy delays are present.

Saratoga Springs - Welfare Complex TIS Update  
Existing (2020) Background

Evening Peak Hour  
Figure 3



**Table 2: Existing (2020) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	11.4	B
Market Street / Redwood Road (SR-68)	Signal	-	8.0	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
 2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

### **III. PROJECT CONDITIONS**

#### **A. Purpose**

The project conditions discussion explains the type and intensity of development. This provides the basis for trip generation, distribution, and assignment of project trips to the surrounding study intersections defined in Chapter I.

#### **B. Project Description**

The proposed Welfare Complex development is located on the west side of Redwood Road (SR-68), just north of 1140 North. The development will consist of welfare facilities owned and operated by The Church of Jesus Christ of Latter-day Saints including a Deseret Industries store, a Bishop's Storehouse, and a Family Services office. A concept plan for the proposed development is provided in Appendix C.

The proposed land use for the development has been identified as follows:

- Deseret Industries ~60,000 square feet
- Bishop's Storehouse / Family Services ~20,000 square feet

#### **C. Trip Generation**

Trip generation for the development is normally calculated using trip generation rates published in the Institute of Transportation Engineers (ITE), *Trip Generation*, 10<sup>th</sup> Edition, 2017. However, due to the unique land use of this development, Hales Engineering used trip generation data provided by the developer. Data were collected at the Welfare Complex in Springville, Utah in April 2019 for an entire week. According to the developer, the proposed facility will be practically identical to the Springville facility in size and operations. Detailed trip generation data is provided in Appendix E.

The peak days for trip generation were observed to be Friday and Saturday. However, it is anticipated that the highest combined volumes will be observed on a standard weekday when the background traffic volumes are highest. The Thursday trip generation was observed to be the highest of Tuesday, Wednesday, and Thursday. Therefore, the Thursday trip generation was applied as the proposed project's trip generation.

Trip generation for the proposed project is included in Table 3 and is as follows.

- Daily Trips: 3,014
- Morning Peak Hour Trips: 31
- Evening Peak Hour Trips: 266

**Table 3: Trip Generation**

<b>Saratoga Springs - Welfare Complex TIS Trip Generation</b>					
<b>Weekday Daily</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total Daily Trips
Deseret Industries	60	1,000 sq. ft.	1,356	1,356	2,712
Bishop's Storehouse	20	1,000 sq. ft.	108	108	216
Family Services			43	43	86
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>1,507</b>	<b>1,507</b>	<b>3,014</b>
<b>Morning Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total a.m. Trips
Deseret Industries	60	1,000 sq. ft.	17	9	26
Bishop's Storehouse	20	1,000 sq. ft.	2	0	2
Family Services			3	0	3
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>22</b>	<b>9</b>	<b>31</b>
<b>Evening Peak Ho</b>					
Land Use	# of Units	Unit Type	Trips Entering	Trips Exiting	Total p.m. Trips
Deseret Industries	60	1,000 sq. ft.	109	119	228
Bishop's Storehouse	20	1,000 sq. ft.	15	15	30
Family Services			3	5	8
<b>Total</b>	<b>80</b>	<b>1,000 sq. ft.</b>	<b>127</b>	<b>139</b>	<b>266</b>

1. Trip generation based on data collection completed at the Springville Welfare Complex in April 2019.  
SOURCE: Hales Engineering, July 2020

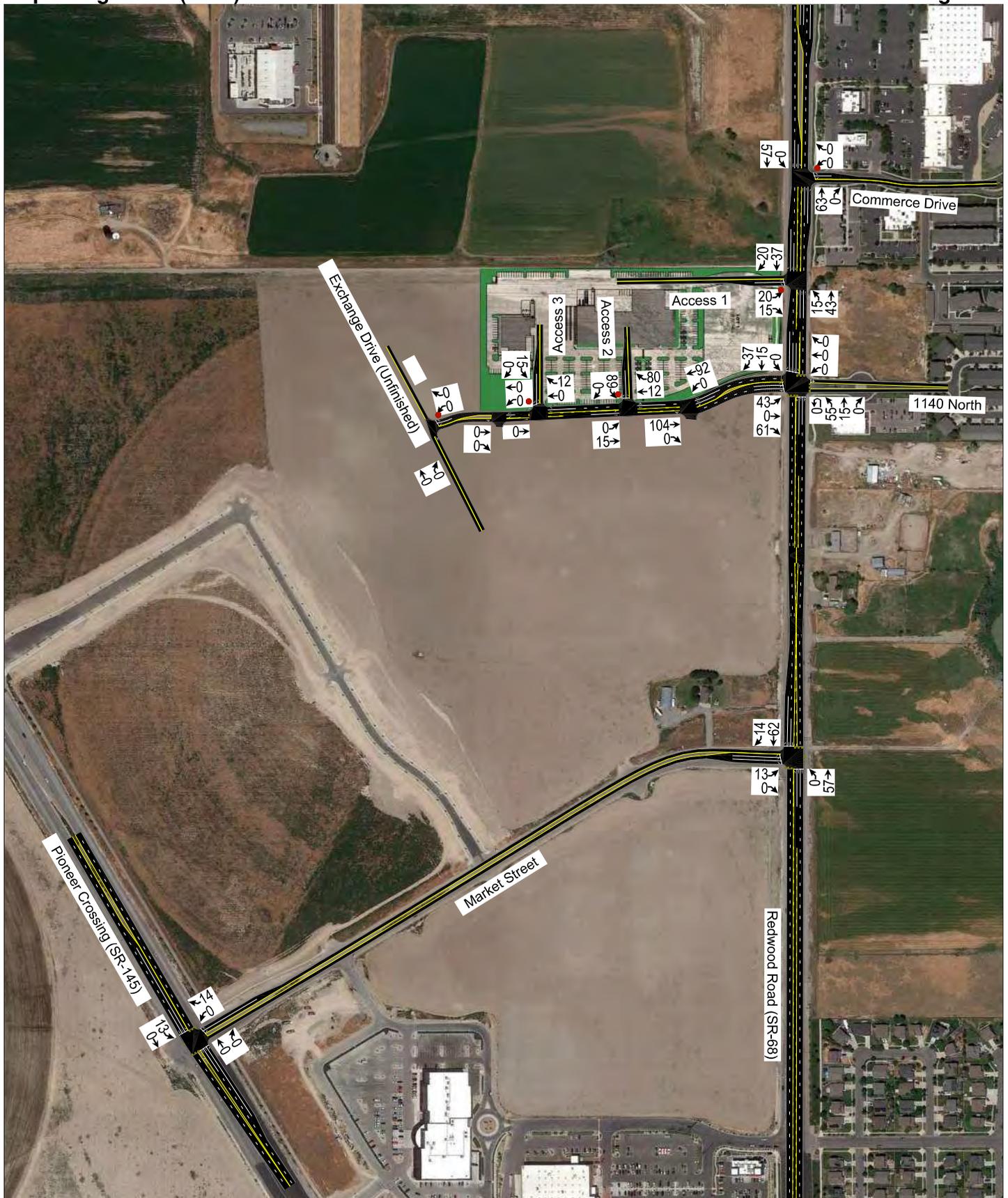
**D. Trip Distribution and Assignment**

Project traffic is assigned to the roadway network based on the type of trip and the proximity of project access points to major streets, high population densities, and regional trip attractions. Existing travel patterns observed during data collection also provide helpful guidance to establishing these distribution percentages, especially near the site. The resulting distribution of project generated trips during the evening peak hour is as follows:

To/From Project:

- 45% North
- 45% South
- 10% West

These trip distribution assumptions were used to assign the evening peak hour generated traffic at the study intersections to create trip assignment for the proposed development. Trip assignment for the development in 2020 conditions is shown in Figure 4. Considering future roadway connections via Exchange Drive to the north, south, and west, the trip assignment for the development in 2025 conditions is shown in Figure 5.





## **E. Access**

The proposed access for the site will be gained at the following locations (see also concept plan in Appendix C):

### Redwood Road (SR-68):

- Access 1 will be located approximately 320 feet south of the Commerce Drive / Redwood Drive (SR-68) intersection and approximately 350 north of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection. It will access the project on the west side of Redwood Road (SR-68). *It is anticipated that a variance will be needed for this access because it does not meet driveway spacing (350 feet) to the north.* It was assumed that this would be a full-movement access.
- The primary access road to the project will be Medical Drive. Medical Drive will be located on the west side of Redwood Road (SR-68), directly across from the existing 1140 North alignment. Medical Drive will eventually be a through road to Pioneer Crossing with other development in the area.

### Medical Drive:

- Access 2 will be located approximately 675 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.
- Access 3 will be located approximately 925 feet west of the Medical Drive (1140 North) / Redwood Drive (SR-68) intersection and will be stop-controlled.

It is recommended that separate egress left- and right-turn lanes be provided at all project accesses.

## **F. Auxiliary Lane Requirements**

Based on Administrative Rule R930-6, the following auxiliary lanes may be required for the proposed accesses onto Redwood Road (SR-68) (UDOT Access Category 5 roadway):

### Left-turn Deceleration Lane:

*Required when the projected peak hour left-turn ingress volume is greater than 10 vph:*

- With 15 northbound left-turns assumed, a left-turn lane may be required at Access 1. A center TWLTL currently exists and will serve as a left-turn lane for this access.
- With 55 northbound left-turns assumed, a left-turn lane may be required at Medical Drive. A center TWLTL currently exists and will serve as a left-turn lane at Medical Drive.

### Right-turn Deceleration Lane:

*Required when the projected peak hour right-turn ingress volume is greater than 25 vph:*

- With 20 southbound right-turns assumed, a southbound right-turn deceleration lane may not be required at Access 1. Therefore, a right-turn deceleration lane was not assumed for this access.
- With 37 southbound right-turns assumed, a southbound right-turn deceleration lane may be required at Medical Drive. It is recommended that a southbound right-turn lane be installed at this location.

Right-turn Acceleration Lane:

*Required when the projected peak hour right-turn egress volume is greater than 50 vph when the posted speed limit on the highway is greater than 40 mph.*

- With 15 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may not be required at Access 1. Therefore, a right-turn acceleration lane was not assumed for this access.
- With 61 eastbound right-turns assumed, an eastbound-to-southbound right-turn acceleration lane may be required at Medical Drive. However, a right-turn acceleration lane was not assumed for this access.

Left-turn Acceleration Lane:

*May be required if such a design will be a benefit to the safety and operation of the roadway.*

- A left-turn acceleration lane is not recommended at either access to Redwood Road (SR-68) due to the greater need for left-turn deceleration lane space in the TWLTL.

## **IV. EXISTING (2020) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the existing (2020) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for existing background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the existing (2020) background traffic volumes to predict turning movement volumes for existing (2020) plus project conditions. Existing (2020) plus project evening peak hour turning movement volumes are shown in Figure 6.

### **C. Level of Service Analysis**

Hales Engineering determined that the Commerce Drive / Redwood Road (SR-68) and Access 1 / Redwood Road (SR-68) intersections are anticipated to operate at LOS F during the evening peak hour with project traffic added. All other intersections are anticipated to operate at acceptable levels of service, as shown in Table 4.

### **D. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

The delay at the Access 1 / Redwood Road (SR-68) intersection is due to the difficulty in turning left onto Redwood Road during peak hours. Drivers at this access will learn to reroute to the accesses onto Medical Drive to avoid delays. Additional connections in the future with the construction of Exchange Drive and other roadways to the southwest of the development will provide other connection options. Drivers will continue to reroute at the Commerce Drive / Redwood Road (SR-68) intersection to avoid delays.



**Table 4: Existing (2020) Plus Project Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	14.8	B
Market Street / Redwood Road (SR-68)	Signal	-	8.7	A
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.8	B
Commerce Drive / Redwood Road (SR-68)	WB Stop	WBL	>50	f
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	4.6	a
Access 3 / Medical Drive	SB Stop	SBL	4.0	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **V. FUTURE (2025) BACKGROUND CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) background analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions. Through this analysis, future background traffic operational deficiencies can be identified, and potential mitigation measures recommended.

### **B. Roadway Network**

According to the Wasatch Front Regional Council (WFRC) Regional Transportation Plan, there are no projects planned before 2025 in the study area. Therefore, no changes were made to the roadway network for the future (2025) analysis.

The Saratoga Springs Transportation Master Plan (January 2019) indicates planned signals at both Commerce Drive / Redwood Road (SR-68) and Market Street / Pioneer Crossing (SR-145) intersections. The projected 2020 traffic volumes from previous traffic studies in the area suggest that these signals will be warranted with the completion of the nearby Costco development; however, the signal at Commerce Drive is not anticipated to be completed until the completion of the Foothill Boulevard project by 2025 as per UDOT agreement; therefore, the signal has been included within this analysis.

### **C. Traffic Volumes**

Hales Engineering obtained future (2025) forecasted volumes from the previously completed Saratoga Springs Costco TIS conducted by Kittelson & Associates in July 2019. This was done to maintain uniformity with other projects in the area and to layer these project volumes with those of previous studies. The Kittelson & Associates study assumed an annual growth rate of 2%, based on historic trends. In addition to the projected future background and Costco traffic, trip assignment from the nearby Osmond Development was also added into the background. Future (2025) evening peak hour turning movement volumes are shown in Figure 7.

### **D. Level of Service Analysis**

Hales Engineering determined that all study intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) background conditions, as shown in Table 5. These results serve as a baseline condition for the impact analysis of the proposed development for future (2025) conditions.

**E. Queuing Analysis**

Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

**F. Mitigation Measures**

No mitigation measures are recommended.



**Table 5: Future (2025) Background Evening Peak Hour LOS**

Intersection		Level of Service		
Description	Control	Movement <sup>1</sup>	Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	17.1	B
Market Street / Redwood Road (SR-68)	Signal	-	10.9	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	18.5	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	12.7	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.4	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.

2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

## **VI. FUTURE (2025) PLUS PROJECT CONDITIONS**

### **A. Purpose**

The purpose of the future (2025) plus project analysis is to study the intersections and roadways during the peak travel periods of the day for future background traffic and geometric conditions plus the net trips generated by the proposed development. This scenario provides valuable insight into the potential impacts of the proposed project on future background traffic conditions.

### **B. Traffic Volumes**

Hales Engineering added the project trips discussed in Chapter III to the future (2025) background traffic volumes to predict turning movement volumes for future (2025) plus project conditions. Future (2025) plus project evening peak hour turning movement volumes are shown in Figure 8.

### **C. Level of Service Analysis**

Hales Engineering determined that all intersections are anticipated to operate at acceptable levels of service during the evening peak hour in future (2025) plus project conditions, as shown in Table 6.

### **D. Queuing Analysis**

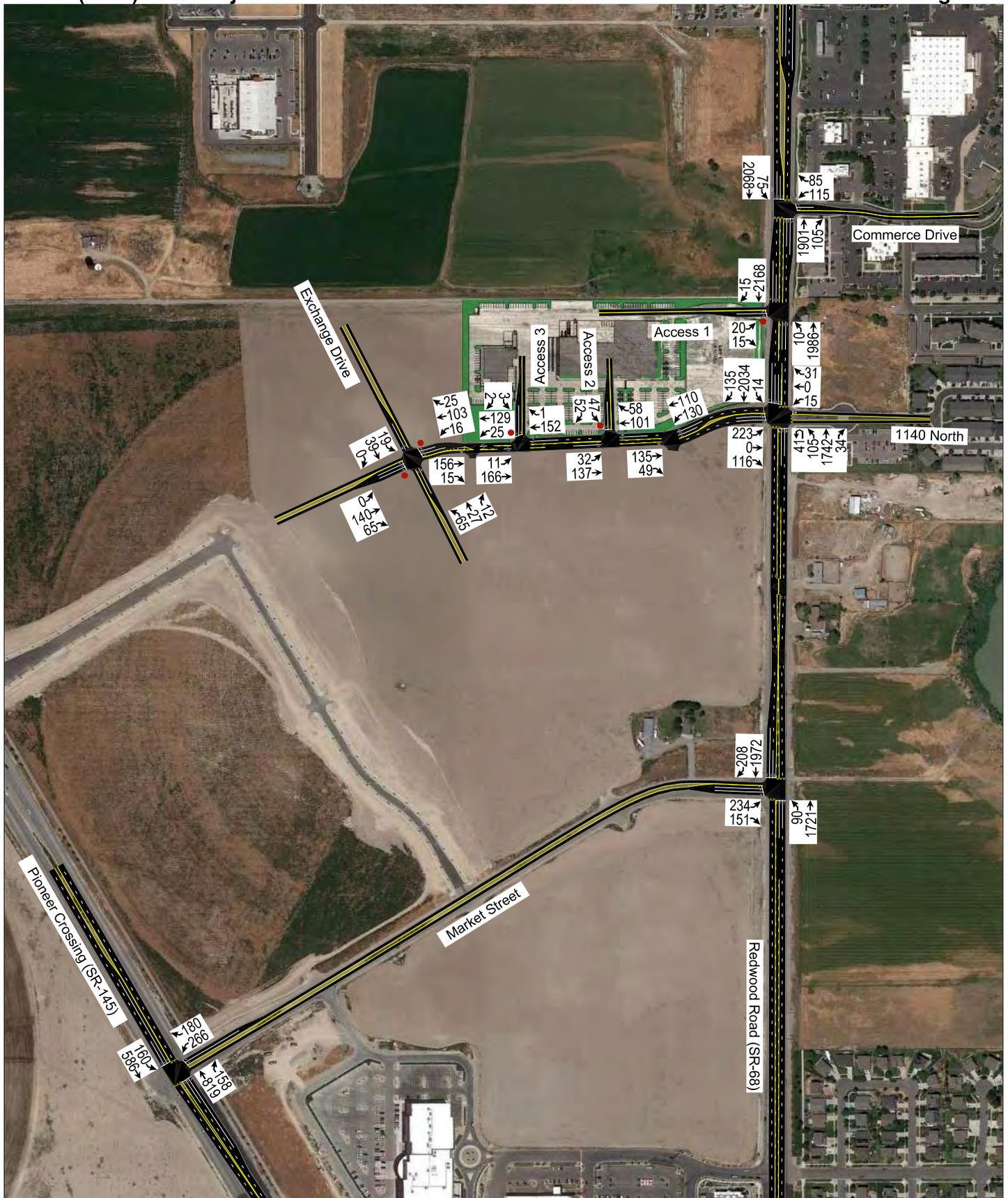
Hales Engineering calculated the 95<sup>th</sup> percentile queue lengths for each of the study intersections. No significant queuing is anticipated during the evening peak hour.

### **E. Mitigation Measures**

No mitigation measures are recommended.

### **F. Recommended Storage Lengths**

Hales Engineering determined recommended storage lengths based on the 95<sup>th</sup> percentile queue lengths given in the future (2040) plus project scenario. These storage lengths do not include the taper length. Recommended storage lengths for the study intersections are shown in Table 7. Intersections shown in Table 7 include new intersections and existing intersections that have recommended storage length changes.



**Table 6: Future (2025) Plus Project Evening Peak Hour LOS**

Intersection Description	Control	Movement <sup>1</sup>	Level of Service	
			Aver. Delay (Sec/Veh)	LOS <sup>2</sup>
Medical Drive (1140 North) / Redwood Road (SR-68)	Signal	-	27.1	C
Market Street / Redwood Road (SR-68)	Signal	-	18.7	B
Market Street / Pioneer Crossing (SR-145)	Signal	-	14.6	B
Commerce Drive / Redwood Road (SR-68)	Signal	-	11.6	B
Medical Drive / Exchange Drive	EB/WB Stop	EBT	6.5	a
Access 1 / Redwood Road (SR-68)	EB Stop	EBL	>50	f
Access 2 / Medical Drive	SB Stop	SBL	6.1	a
Access 3 / Medical Drive	SB Stop	SBL	6.2	a

1. Movement indicated for unsignalized intersections where delay and LOS represents worst movement. SBL = Southbound left movement, etc.  
2. Uppercase LOS used for signalized, roundabout, and AWSC intersections. Lowercase LOS used for non-AWSC intersections.

Source: Hales Engineering, July 2020

**Table 7: Recommended Storage Lengths**

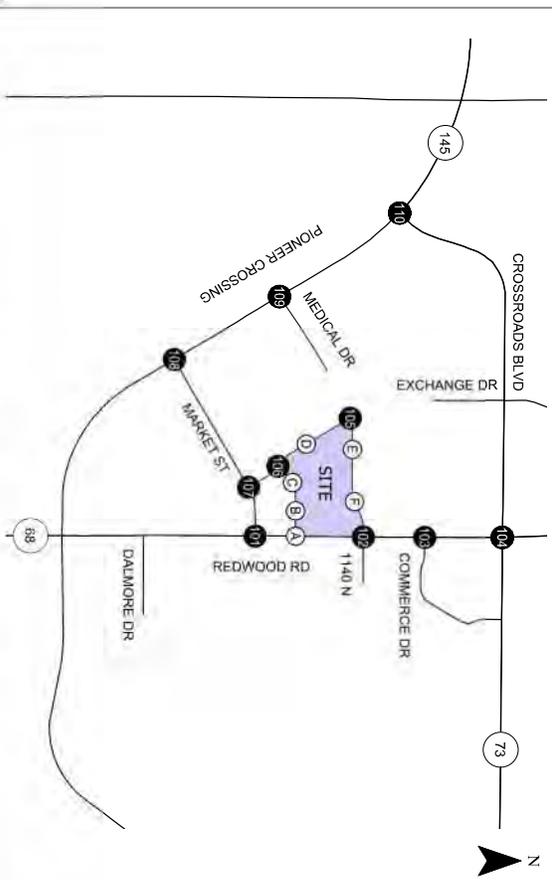
Recommended Storage Lengths Saratoga Springs - Welfare Complex TIS Update								
Intersection	Storage Length (feet)							
	Northbound		Southbound		Eastbound		Westbound	
	LT	RT	LT	RT	LT	RT	LT	RT
Medical Drive (1140 North) / Redwood Road (SR-68)	325	-	100	200	200	-	-	-
Market Street / Redwood Road (SR-68)	130 / 200	-	-	-	155 / 200	160 / 175	-	-
Market Street / Pioneer Crossing (SR-145)	-	100	-	-	-	-	-	-
Commerce Drive / Redwood Road (SR-68)	-	-	90 / 100	-	-	-	-	150
Access 1 / Redwood Road (SR-68)	100	-	-	100	-	50	-	-
Access 2 / Medical Drive	-	-	-	50	50	-	-	-
Access 3 / Medical Drive	-	-	-	50	50	-	-	-

*Current storage length (if applicable) / Recommended storage length*  
Source: Hales Engineering, July 2020

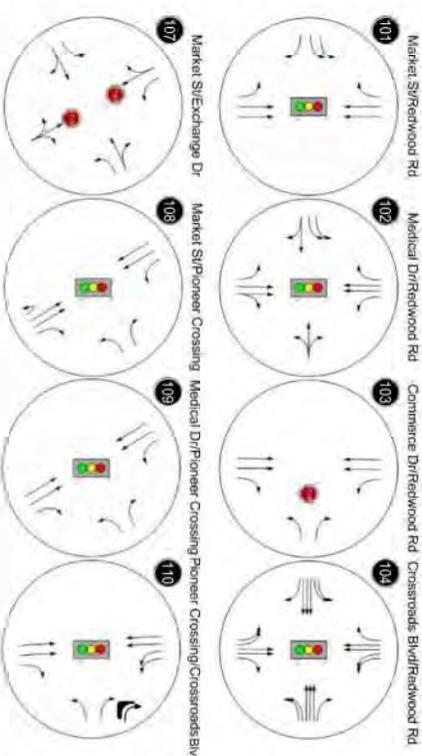
# **APPENDIX A**

## Turning Movement Counts





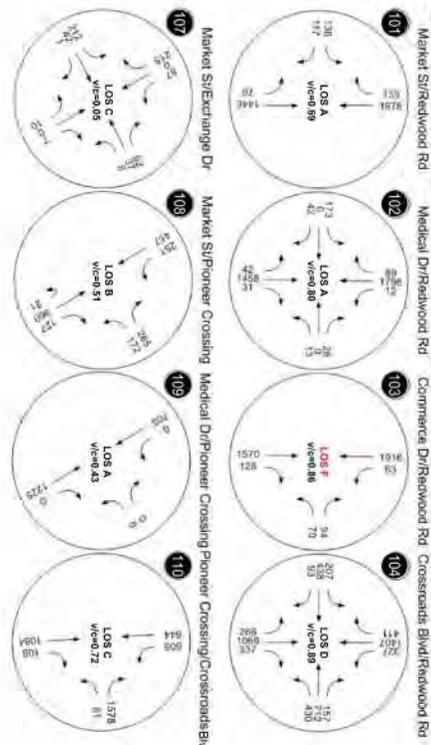
Lane Configurations



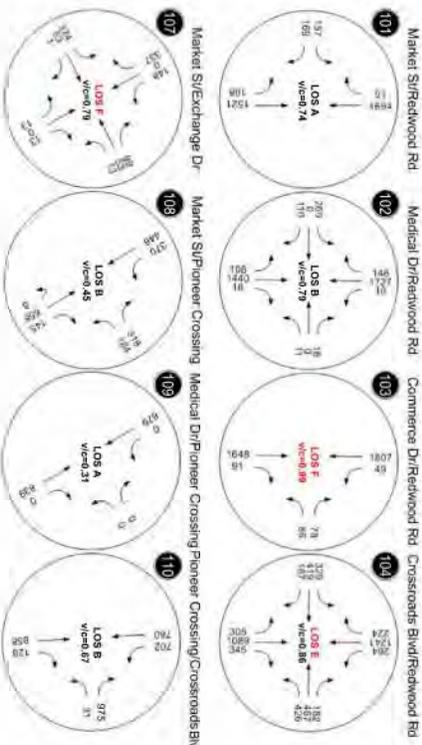
• Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



Weekday PM Peak Hour

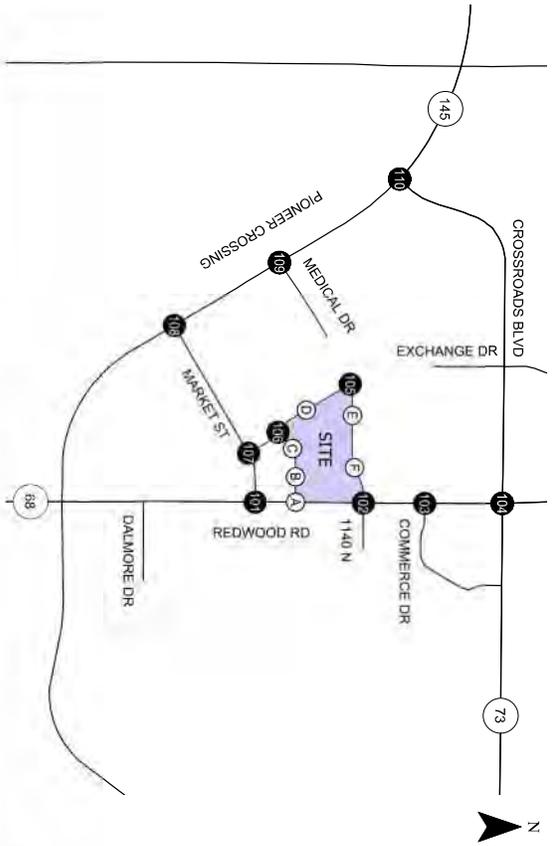


Saturday Midday Peak Hour

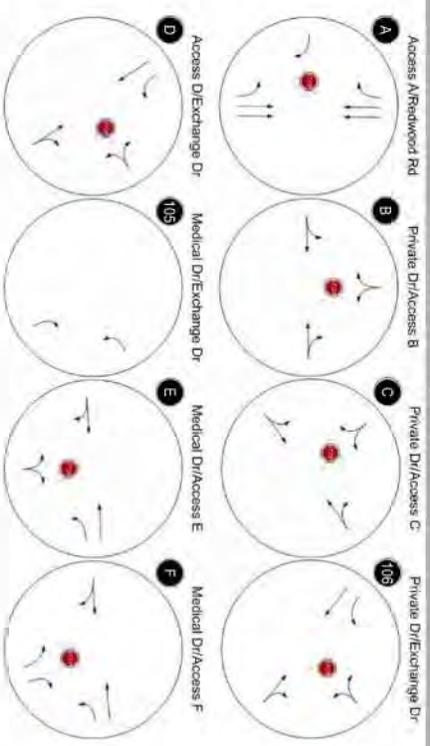


Year 2020 Total Traffic Conditions (Offsite Intersections)  
 Weekday PM and Saturday Midday Peak Hour  
 Saratoga Springs, Utah

Figure 9A



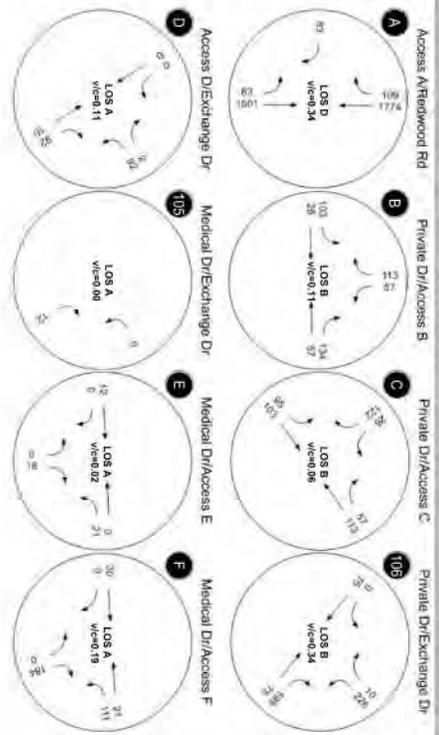
**Lane Configurations**



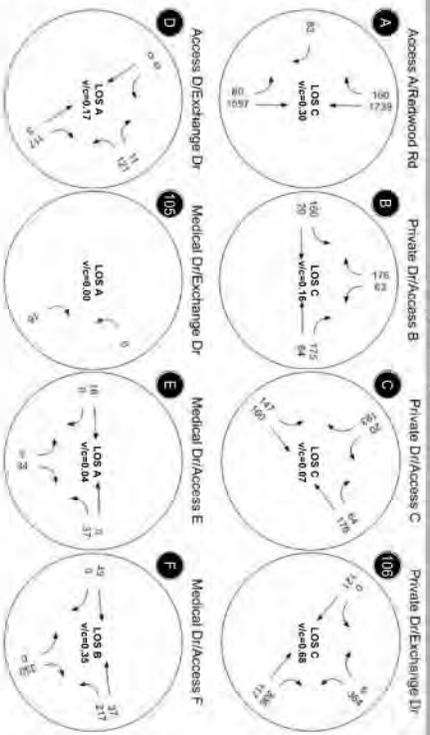
- Stop Sign      LOS =      Intersection Level of Service (Signalized/AVSC) / Critical movement Level of Service (TWSC)  
 - Traffic Signal      V/C =      Critical Volume-to-capacity ratio  
 TWSC =      Two-way stop control  
 AVSC =      Allway stop control  
 Note: Red text represents intersections that do not meet Level of Service (LOS) standards.



**Weekday PM Peak Hour**



**Saturday Midday Peak Hour**



**Year 2020 Total Traffic Conditions (Onsite Intersections)**  
**Weekday PM and Saturday Midday Peak Hour**  
**Saratoga Springs, Utah**

Figure  
**9B**



# **APPENDIX B**

## **LOS Results**

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	42	43	102	56.6	E
	T	1,472	1,476	100	6.2	A
	R	31	33	106	3.7	A
	Subtotal	1,545	1,552	100	7.5	A
SB	L	12	12	100	22.6	C
	T	1,818	1,814	100	7.0	A
	R	89	88	99	3.0	A
	Subtotal	1,919	1,914	100	6.9	A
EB	L	173	172	99	73.2	E
	T	1	1	133	0.4	A
	R	42	44	104	32.8	C
	Subtotal	216	217	100	64.7	E
WB	L	13	12	92	67.9	E
	R	28	30	106	21.2	C
	Subtotal	41	42	102	34.5	C
<b>Total</b>		3,763	3,767	100	11.4	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	45.9	D
	T	1,486	1,502	101	4.8	A
	Subtotal	1,556	1,570	101	6.6	A
SB	T	1,723	1,719	100	2.2	A
	R	166	165	99	1.4	A
	Subtotal	1,889	1,884	100	2.1	A
EB	L	163	156	96	79.9	E
	T	98	103	105	1.9	A
	R	117	116	99	30.1	C
	Subtotal	378	375	99	43.1	D
<b>Total</b>		3,823	3,829	100	8.0	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	971	101	11.4	B
	R	127	129	102	4.6	A
	Subtotal	1,087	1,100	101	10.6	B
SB	L	251	248	99	27.5	C
	T	457	457	100	4.1	A
	Subtotal	708	705	100	12.3	B
WB	L	172	175	102	52.9	D
	R	265	263	99	13.2	B
	Subtotal	437	438	100	29.1	C
<b>Total</b>		2,232	2,243	101	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,576	1,576	100	2.8	A
	R	97	98	101	2.4	A
	Subtotal	1,673	1,674	100	2.8	A
SB	L	66	64	97	31.3	D
	T	1,814	1,825	101	7.8	A
	Subtotal	1,880	1,889	100	8.6	A
WB	<b>L</b>	<b>105</b>	<b>88</b>	<b>84</b>	<b>412.9</b>	<b>F</b>
	R	78	68	87	258.9	F
	Subtotal	183	156	85	345.8	F
<b>Total</b>		3,736	3,719	100	22.2	C

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>12</b>	<b>100</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	12	100	0.0	A
<b>Total</b>		12	12	100	0.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	3.6	0.0	0.4	0.2	0.2	0.7	0.7	2.6	0.0	0.1	3.5	0.1
Total Del/Veh (s)	73.2	0.4	32.8	67.9	21.2	56.8	56.6	6.2	3.7	22.6	7.0	3.0
Vehicles Entered	172	1	44	12	30	41	43	1475	33	12	1813	88
Vehicles Exited	172	1	44	12	30	42	43	1476	33	12	1814	88
Hourly Exit Rate	172	1	44	12	30	42	43	1476	33	12	1814	88
Input Volume	173	1	42	13	28	41	42	1472	31	12	1818	89
% of Volume	99	133	104	92	106	102	102	100	106	100	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	12.0
Total Del/Veh (s)	11.4
Vehicles Entered	3764
Vehicles Exited	3767
Hourly Exit Rate	3767
Input Volume	3763
% of Volume	100

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.5	0.1	1.0	0.9	2.0	1.0	0.1	8.6
Total Del/Veh (s)	79.9	1.9	30.1	45.9	4.8	2.2	1.4	8.0
Vehicles Entered	157	104	116	68	1505	1718	164	3832
Vehicles Exited	156	103	116	68	1502	1719	165	3829
Hourly Exit Rate	156	103	116	68	1502	1719	165	3829
Input Volume	163	98	117	70	1486	1723	166	3823
% of Volume	96	105	99	97	101	100	99	100

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.4	1.7	0.3	2.5	3.1	0.2	0.9
Total Delay (hr)	2.6	1.0	3.1	0.2	1.9	0.5	9.3
Total Del/Veh (s)	52.9	13.2	11.4	4.6	27.5	4.1	14.8
Vehicles Entered	174	264	973	129	248	457	2245
Vehicles Exited	175	263	971	129	248	457	2243
Hourly Exit Rate	175	263	971	129	248	457	2243
Input Volume	172	265	960	127	251	457	2232
% of Volume	102	99	101	102	99	100	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	2.0	1.2	0.0	0.0	0.0	0.0	3.2
Denied Del/Veh (s)	68.3	58.3	0.0	0.0	0.0	0.0	3.1
Total Delay (hr)	12.0	5.3	1.2	0.1	0.6	4.0	23.2
Total Del/Veh (s)	412.9	258.9	2.8	2.4	31.3	7.8	22.2
Vehicles Entered	98	74	1580	98	65	1826	3741
Vehicles Exited	88	68	1576	98	64	1825	3719
Hourly Exit Rate	88	68	1576	98	64	1825	3719
Input Volume	105	78	1576	97	66	1814	3736
% of Volume	84	87	100	101	97	101	100

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	12	12
Vehicles Exited	12	12
Hourly Exit Rate	12	12
Input Volume	12	12
% of Volume	100	100

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Total Zone Performance

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Denied Delay (hr)	4.0
Denied Del/Veh (s)	3.7
Total Delay (hr)	58.9
Total Del/Veh (s)	25.1
Vehicles Entered	3813
Vehicles Exited	8271
Hourly Exit Rate	8271
Input Volume	21708
% of Volume	38

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	146	173	77	90	136	243	274	38	284	308	118
Average Queue (ft)	71	97	25	33	67	103	104	10	106	126	17
95th Queue (ft)	130	157	59	74	117	209	218	32	227	257	81
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			180			180
Storage Blk Time (%)	4	14			1	4			2	4	
Queuing Penalty (veh)	3	12			8	3			0	4	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	136	162	150	118	214	197	134	127	59
Average Queue (ft)	71	79	58	50	71	56	35	35	13
95th Queue (ft)	124	136	116	97	172	150	99	95	39
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0	0	1			0	
Queuing Penalty (veh)	0	0	1	2	1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	243	189	360	299	99	236	120	98
Average Queue (ft)	133	72	180	127	36	113	50	36
95th Queue (ft)	213	140	318	264	79	196	105	84
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	4	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	SB	SB	SB
Directions Served	L	R	R	L	T	T
Maximum Queue (ft)	671	150	23	101	122	8
Average Queue (ft)	443	103	2	42	6	0
95th Queue (ft)	785	208	13	84	51	8
Link Distance (ft)	658				865	865
Upstream Blk Time (%)	25					
Queuing Penalty (veh)	0					
Storage Bay Dist (ft)		50	130	85		
Storage Blk Time (%)	98	11		2	0	
Queuing Penalty (veh)	76	11		15	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 142

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	97	96	99	65.6	E
	T	1,487	1,492	100	7.9	A
	R	31	31	99	5.6	A
	Subtotal	1,615	1,619	100	11.3	B
SB	L	12	12	100	34.0	C
	T	1,833	1,792	98	9.0	A
	R	126	123	98	2.1	A
	Subtotal	1,971	1,927	98	8.7	A
EB	L	216	218	101	69.0	E
	T	1	1	100	0.5	A
	R	103	104	101	38.0	D
	Subtotal	320	323	101	58.8	E
WB	L	13	11	85	72.8	E
	R	28	32	113	25.1	C
	Subtotal	41	43	105	37.3	D
<b>Total</b>		3,988	3,952	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	70	68	97	44.3	D
	T	1,543	1,541	100	5.4	A
	Subtotal	1,613	1,609	100	7.0	A
SB	T	1,784	1,752	98	2.9	A
	R	180	178	99	1.6	A
	Subtotal	1,964	1,930	98	2.8	A
EB	L	176	175	99	76.3	E
	T	98	103	105	2.0	A
	R	117	113	97	30.8	C
	Subtotal	391	391	100	43.6	D
<b>Total</b>		3,968	3,930	99	8.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	960	942	98	10.8	B
	R	127	132	104	4.5	A
	Subtotal	1,087	1,074	99	10.0	A
SB	L	264	258	98	27.2	C
	T	457	451	99	4.3	A
	Subtotal	721	709	98	12.6	B
WB	L	172	170	99	55.6	E
	R	279	275	99	13.3	B
	Subtotal	451	445	99	29.5	C
<b>Total</b>		2,259	2,228	99	14.8	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,639	1,642	100	1.2	A
	R	97	102	105	0.5	A
	Subtotal	1,736	1,744	100	1.2	A
SB	L	66	70	106	41.0	E
	T	1,872	1,856	99	8.6	A
	Subtotal	1,938	1,926	99	9.8	A
WB	<b>L</b>	<b>105</b>	<b>79</b>	<b>75</b>	<b>535.8</b>	<b>F</b>
	R	78	58	75	339.5	F
	Subtotal	183	137	75	452.7	F
<b>Total</b>		3,856	3,807	99	25.2	D

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive/Exchange Drive (Unfinished) & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	<b>R</b>	<b>12</b>	<b>11</b>	<b>92</b>	<b>0.0</b>	<b>A</b>
	Subtotal	12	11	92	0.0	A
<b>Total</b>		12	11	92	0.0	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>NB</b>	L	15	15	100	76.3	F
	T	1,716	1,725	101	2.0	A
	Subtotal	1,731	1,740	101	2.6	A
<b>SB</b>	T	1,956	1,914	98	2.0	A
	R	20	20	100	0.4	A
	Subtotal	1,976	1,934	98	2.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>189.8</b>	<b>F</b>
	R	15	16	107	45.2	E
	Subtotal	35	35	100	123.7	F
<b>Total</b>		3,742	3,709	99	3.5	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Existing (2020) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>89</b>	<b>90</b>	<b>101</b>	<b>4.6</b>	<b>A</b>
	Subtotal	89	90	101	4.6	A
EB	T	45	47	104	0.3	A
	Subtotal	45	47	104	0.3	A
WB	T	34	33	97	0.3	A
	R	80	79	99	0.2	A
	Subtotal	114	112	98	0.2	A
<b>Total</b>		248	249	101	1.8	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	<b>L</b>	<b>15</b>	<b>17</b>	<b>113</b>	<b>4.0</b>	<b>A</b>
	Subtotal	15	17	113	4.0	A
EB	T	31	31	100	0.2	A
	Subtotal	31	31	100	0.2	A
WB	T	22	20	91	0.1	A
	R	12	12	100	0.2	A
	Subtotal	34	32	94	0.1	A
<b>Total</b>		80	80	100	1.0	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.1	0.2	0.2	0.8	1.7	3.3	0.0	0.1	4.5	0.1
Total Del/Veh (s)	69.0	0.5	38.0	72.8	25.1	68.1	65.6	7.9	5.6	34.0	9.0	2.1
Vehicles Entered	217	1	104	11	32	40	96	1495	31	12	1795	123
Vehicles Exited	218	1	104	11	32	40	96	1492	31	12	1792	123
Hourly Exit Rate	218	1	104	11	32	40	96	1492	31	12	1792	123
Input Volume	216	1	103	13	28	41	97	1487	31	12	1833	126
% of Volume	101	100	101	85	113	97	99	100	99	100	98	98

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	16.3
Total Del/Veh (s)	14.8
Vehicles Entered	3957
Vehicles Exited	3952
Hourly Exit Rate	3952
Input Volume	3988
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBT	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	0.4	0.0	0.0	0.2
Total Delay (hr)	3.8	0.1	1.0	0.8	2.3	1.4	0.1	9.5
Total Del/Veh (s)	76.3	2.0	30.8	44.3	5.4	2.9	1.6	8.7
Vehicles Entered	175	103	113	68	1541	1751	178	3929
Vehicles Exited	175	103	113	68	1541	1752	178	3930
Hourly Exit Rate	175	103	113	68	1541	1752	178	3930
Input Volume	176	98	117	70	1543	1784	180	3968
% of Volume	99	105	97	97	100	98	99	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.2	0.0	0.5
Denied Del/Veh (s)	0.3	1.6	0.2	2.6	3.0	0.2	0.9
Total Delay (hr)	2.7	1.0	2.9	0.2	2.0	0.5	9.3
Total Del/Veh (s)	55.6	13.3	10.8	4.5	27.2	4.3	14.8
Vehicles Entered	170	274	943	132	259	451	2229
Vehicles Exited	170	275	942	132	258	451	2228
Hourly Exit Rate	170	275	942	132	258	451	2228
Input Volume	172	279	960	127	264	457	2259
% of Volume	99	99	98	104	98	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	6.2	4.5	0.0	0.0	0.0	0.0	10.7
Denied Del/Veh (s)	210.3	211.4	0.0	0.0	0.0	0.0	10.0
Total Delay (hr)	14.7	6.4	0.5	0.0	0.8	4.4	26.9
Total Del/Veh (s)	535.8	339.5	1.2	0.5	41.0	8.6	25.2
Vehicles Entered	90	64	1642	102	69	1858	3825
Vehicles Exited	79	58	1642	102	70	1856	3807
Hourly Exit Rate	79	58	1642	102	70	1856	3807
Input Volume	105	78	1639	97	66	1872	3856
% of Volume	75	75	100	105	106	99	99

8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive Performance by movement

Movement	NBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.0
Total Del/Veh (s)	0.0	0.0
Vehicles Entered	11	11
Vehicles Exited	11	11
Hourly Exit Rate	11	11
Input Volume	12	12
% of Volume	92	92

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.1	0.2	0.3	1.0	1.0	0.0	3.6
Total Del/Veh (s)	189.8	45.2	76.3	2.0	2.0	0.4	3.5
Vehicles Entered	19	16	15	1727	1916	20	3713
Vehicles Exited	19	16	15	1725	1914	20	3709
Hourly Exit Rate	19	16	15	1725	1914	20	3709
Input Volume	20	15	15	1716	1956	20	3742
% of Volume	95	107	100	101	98	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1
Total Delay (hr)	0.0	0.0	0.0	0.1	0.1
Total Del/Veh (s)	0.3	0.3	0.2	4.6	1.8
Vehicles Entered	47	32	79	90	248
Vehicles Exited	47	33	79	90	249
Hourly Exit Rate	47	33	79	90	249
Input Volume	45	34	80	89	248
% of Volume	104	97	99	101	101

27: Medical Drive & Access 3 Performance by movement

Movement	EBT	WBT	WBR	SBL	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	0.2	0.1	0.2	4.0	1.0
Vehicles Entered	31	20	12	17	80
Vehicles Exited	31	20	12	17	80
Hourly Exit Rate	31	20	12	17	80
Input Volume	31	22	12	15	80
% of Volume	100	91	100	113	100

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Total Zone Performance

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Denied Delay (hr)	11.5
Denied Del/Veh (s)	10.4
Total Delay (hr)	71.8
Total Del/Veh (s)	29.8
Vehicles Entered	3947
Vehicles Exited	8447
Hourly Exit Rate	8447
Input Volume	26562
% of Volume	32

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	171	195	148	97	220	271	268	67	272	294	130
Average Queue (ft)	88	114	63	34	111	132	133	9	142	154	22
95th Queue (ft)	153	175	124	75	193	242	239	37	257	277	77
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)									0	1	0
Queuing Penalty (veh)									4	5	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	21			11	6			15	11	
Queuing Penalty (veh)	8	22			85	8			2	14	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	165	169	145	104	207	193	166	167	61
Average Queue (ft)	82	90	56	49	77	64	57	63	18
95th Queue (ft)	137	147	116	90	184	164	137	146	48
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	0	0	0		2			0	
Queuing Penalty (veh)	0	1	0		1			0	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	238	171	335	306	89	227	115	94
Average Queue (ft)	131	73	168	121	37	118	51	35
95th Queue (ft)	211	137	297	261	72	199	107	81
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	2	0		0				
Queuing Penalty (veh)	5	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	R	L	T	T
Maximum Queue (ft)	679	150	4	32	114	122	47
Average Queue (ft)	506	92	0	3	49	11	2
95th Queue (ft)	844	203	4	19	97	67	25
Link Distance (ft)	658		303			865	865
Upstream Blk Time (%)	44						
Queuing Penalty (veh)	0						
Storage Bay Dist (ft)		50		130	85		
Storage Blk Time (%)	97	8			3	0	
Queuing Penalty (veh)	75	8			32	0	

Intersection: 8: Exchange Drive/Exchange Drive (Unfinished) & Medical Drive

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	SB	SB	SB
Directions Served	L	R	L	T	T	R
Maximum Queue (ft)	96	48	63	40	55	2
Average Queue (ft)	31	12	17	3	4	0
95th Queue (ft)	84	35	50	29	35	2
Link Distance (ft)	595			303	303	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)		100	100			150
Storage Blk Time (%)	3		1		0	
Queuing Penalty (veh)	0		5		0	

Intersection: 24: Medical Drive & Access 2

Movement	SB
Directions Served	L
Maximum Queue (ft)	67
Average Queue (ft)	35
95th Queue (ft)	56
Link Distance (ft)	256
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	0
Queuing Penalty (veh)	0

Intersection: 27: Medical Drive & Access 3

Movement	SB
Directions Served	L
Maximum Queue (ft)	28
Average Queue (ft)	10
95th Queue (ft)	29
Link Distance (ft)	278
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 278

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	75	75	100	79.2	E
	T	1,732	1,728	100	9.6	A
	R	34	34	99	7.4	A
	Subtotal	1,841	1,837	100	12.4	B
SB	L	14	14	100	54.7	D
	T	2,134	2,079	97	13.3	B
	R	106	102	96	6.7	A
	Subtotal	2,254	2,195	97	13.3	B
EB	L	208	209	100	71.3	E
	R	81	79	98	40.6	D
	Subtotal	289	288	100	62.9	E
WB	L	15	14	93	71.4	E
	R	31	36	115	31.9	C
	Subtotal	46	50	109	43.0	D
<b>Total</b>		4,472	4,407	99	17.1	B

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	74	73	99	57.0	E
	T	1,681	1,670	99	7.6	A
	Subtotal	1,755	1,743	99	9.7	A
SB	T	1,922	1,864	97	3.2	A
	R	208	204	98	1.8	A
	Subtotal	2,130	2,068	97	3.1	A
EB	L	234	239	102	68.5	E
	R	139	141	101	39.0	D
	Subtotal	373	380	102	57.6	E
<b>Total</b>		4,258	4,191	98	10.9	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	822	100	7.2	A
	R	158	159	101	3.8	A
	Subtotal	977	981	100	6.6	A
SB	L	160	165	103	22.5	C
	T	586	578	99	4.5	A
	Subtotal	746	743	100	8.5	A
WB	L	266	256	96	91.1	F
	R	180	177	98	18.8	B
	Subtotal	446	433	97	61.5	E
<b>Total</b>		2,169	2,157	99	18.5	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,866	1,866	100	6.5	A
	R	105	107	102	4.3	A
	Subtotal	1,971	1,973	100	6.4	A
SB	L	75	69	92	61.8	E
	T	2,140	2,083	97	12.4	B
	Subtotal	2,215	2,152	97	14.0	B
WB	L	115	116	101	76.6	E
	R	85	84	99	40.1	D
	Subtotal	200	200	100	61.3	E
<b>Total</b>		4,385	4,325	99	12.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Background  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	65	100	1.7	A
	T	27	26	95	0.1	A
	R	2	2	100	0.1	A
	Subtotal	94	93	99	1.2	A
SB	T	39	37	94	0.1	A
	Subtotal	39	37	95	0.1	A
<b>EB</b>	<b>T</b>	<b>126</b>	<b>126</b>	<b>100</b>	<b>6.4</b>	<b>A</b>
	R	65	65	100	3.1	A
	Subtotal	191	191	100	5.3	A
WB	T	90	86	95	5.2	A
	Subtotal	90	86	96	5.2	A
<b>Total</b>		416	407	98	3.9	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.9	0.3	0.3	0.8	1.7	4.7	0.1	0.2	7.8	0.2	21.1
Total Del/Veh (s)	71.3	40.6	71.4	31.9	76.9	79.2	9.6	7.4	54.7	13.3	6.7	17.1
Vehicles Entered	208	79	13	36	37	76	1726	33	14	2082	102	4406
Vehicles Exited	209	79	14	36	37	75	1728	34	14	2079	102	4407
Hourly Exit Rate	209	79	14	36	37	75	1728	34	14	2079	102	4407
Input Volume	208	81	15	31	41	75	1732	34	14	2134	106	4472
% of Volume	100	98	93	115	90	100	100	99	100	97	96	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.2	0.0	0.0	0.3
Denied Del/Veh (s)	0.2	0.5	1.9	0.4	0.0	0.0	0.2
Total Delay (hr)	4.6	1.6	1.2	3.6	1.7	0.1	12.8
Total Del/Veh (s)	68.5	39.0	57.0	7.6	3.2	1.8	10.9
Vehicles Entered	238	141	73	1673	1864	204	4193
Vehicles Exited	239	141	73	1670	1864	204	4191
Hourly Exit Rate	239	141	73	1670	1864	204	4191
Input Volume	234	139	74	1681	1922	208	4258
% of Volume	102	101	99	99	97	98	98

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.4	0.2	2.7	3.0	0.2	0.7
Total Delay (hr)	6.7	0.9	1.7	0.2	1.0	0.7	11.2
Total Del/Veh (s)	91.1	18.8	7.2	3.8	22.5	4.5	18.5
Vehicles Entered	257	178	822	159	165	579	2160
Vehicles Exited	256	177	822	159	165	578	2157
Hourly Exit Rate	256	177	822	159	165	578	2157
Input Volume	266	180	819	158	160	586	2169
% of Volume	96	98	100	101	103	99	99

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.9	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	0.9	3.4	0.1	1.2	7.2	15.4
Total Del/Veh (s)	76.6	40.1	6.5	4.3	61.8	12.4	12.7
Vehicles Entered	117	84	1865	107	69	2082	4324
Vehicles Exited	116	84	1866	107	69	2083	4325
Hourly Exit Rate	116	84	1866	107	69	2083	4325
Input Volume	115	85	1866	105	75	2140	4385
% of Volume	101	99	100	102	92	97	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBT	NBL	NBT	NBR	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.4	3.8	0.0	4.0	0.3	0.2	0.1	1.4
Total Delay (hr)	0.2	0.1	0.1	0.0	0.0	0.0	0.0	0.4
Total Del/Veh (s)	6.4	3.1	5.2	1.7	0.1	0.1	0.1	3.9
Vehicles Entered	126	65	86	65	26	2	37	407
Vehicles Exited	126	65	86	65	26	2	37	407
Hourly Exit Rate	126	65	86	65	26	2	37	407
Input Volume	126	65	90	65	27	2	39	416
% of Volume	100	100	95	100	95	100	94	98

Total Zone Performance

Denied Delay (hr)	1.0
Denied Del/Veh (s)	0.8
Total Delay (hr)	67.5
Total Del/Veh (s)	26.4
Vehicles Entered	4257
Vehicles Exited	8999
Hourly Exit Rate	8999
Input Volume	24695
% of Volume	36

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	176	200	125	101	236	338	354	81	379	398	248
Average Queue (ft)	86	113	50	40	106	170	169	16	193	212	35
95th Queue (ft)	152	175	103	84	191	306	309	53	335	351	146
Link Distance (ft)		316	316	494		542	542		675	675	
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	20			9	9			20	15	
Queuing Penalty (veh)	8	20			77	10			3	16	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	174	238	206	150	282	282	180	188	63
Average Queue (ft)	94	113	83	60	134	112	70	66	20
95th Queue (ft)	150	186	163	115	237	225	140	141	53
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	1	1	4			0	
Queuing Penalty (veh)	2	6	2	6	3			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	495	279	263	216	95	150	147	124
Average Queue (ft)	260	110	139	77	40	76	70	47
95th Queue (ft)	498	292	227	174	78	129	128	102
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	29	0		0				
Queuing Penalty (veh)	53	0		0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	281	150	188	179	74	129	179	202
Average Queue (ft)	119	63	80	83	12	56	78	94
95th Queue (ft)	220	136	162	168	46	108	161	185
Link Distance (ft)	658		675	675			865	865
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	14		2		6	5	
Queuing Penalty (veh)	48	16		2		64	4	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	NB	SB
Directions Served	T	R	T	L	TR
Maximum Queue (ft)	80	45	62	30	2
Average Queue (ft)	38	27	25	3	0
95th Queue (ft)	66	44	46	19	3
Link Distance (ft)	501		151		492
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		100		100	
Storage Blk Time (%)	0		0		
Queuing Penalty (veh)	0		0		

Zone Summary

Zone wide Queuing Penalty: 341

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Redwood Road (SR-68) & Medical Drive/1140 North  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	105	98	94	219.6	F
	T	1,743	1,689	97	20.2	C
	R	34	34	99	13.3	B
	Subtotal	1,882	1,821	97	30.8	C
SB	L	14	13	93	54.4	D
	T	2,034	2,037	100	14.0	B
	R	135	133	99	3.3	A
	Subtotal	2,183	2,183	100	13.6	B
EB	L	223	223	100	67.8	E
	T	1	1	133	0.6	A
	R	116	118	102	48.3	D
	Subtotal	340	342	101	60.9	E
WB	L	15	16	107	73.3	E
	R	31	30	96	39.3	D
	Subtotal	46	46	100	51.1	D
<b>Total</b>		4,492	4,432	99	27.1	C

**Intersection:** Redwood Road (SR-68) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	90	91	101	70.3	E
	T	1,721	1,682	98	24.5	C
	Subtotal	1,811	1,773	98	26.9	C
SB	T	1,972	1,967	100	4.6	A
	R	208	214	103	2.6	A
	Subtotal	2,180	2,181	100	4.4	A
EB	L	234	246	105	68.6	E
	R	151	153	101	44.7	D
	Subtotal	385	399	104	59.4	E
<b>Total</b>		4,376	4,353	99	18.7	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Pioneer Crossing (SR-145) & Market Street  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	819	824	101	10.5	B
	R	158	165	104	3.7	A
	Subtotal	977	989	101	9.4	A
SB	L	160	167	104	23.2	C
	T	586	578	99	6.0	A
	Subtotal	746	745	100	9.9	A
WB	L	266	273	103	48.1	D
	R	180	184	102	10.3	B
	Subtotal	446	457	102	32.9	C
<b>Total</b>		2,169	2,191	101	14.6	B

**Intersection:** Redwood Road (SR-68) & Commerce Drive  
**Type:** Signalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	T	1,902	1,844	97	5.2	A
	R	105	106	101	2.0	A
	Subtotal	2,007	1,950	97	5.0	A
SB	L	75	74	99	60.7	E
	T	2,069	2,075	100	11.2	B
	Subtotal	2,144	2,149	100	12.9	B
WB	L	115	113	98	79.8	E
	R	85	82	97	41.8	D
	Subtotal	200	195	98	63.8	E
<b>Total</b>		4,350	4,294	99	11.6	B

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Exchange Drive & Medical Drive  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	65	61	93	1.6	A
	T	27	26	95	0.2	A
	R	12	12	100	0.2	A
	Subtotal	104	99	95	1.1	A
SB	L	19	19	100	1.6	A
	T	39	38	97	0.1	A
	Subtotal	58	57	98	0.6	A
<b>EB</b>	<b>T</b>	<b>140</b>	<b>136</b>	<b>97</b>	<b>6.5</b>	<b>A</b>
	R	65	68	104	3.3	A
	Subtotal	205	204	100	5.4	A
WB	L	16	15	94	5.1	A
	T	103	101	98	5.7	A
	R	25	28	111	2.4	A
	Subtotal	144	144	100	5.0	A
<b>Total</b>		512	504	98	3.9	A

**Intersection:** Redwood Road (SR-68) & Access 1  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
NB	L	10	8	80	71.8	F
	T	1,987	1,933	97	3.7	A
	Subtotal	1,997	1,941	97	4.0	A
SB	T	2,168	2,172	100	4.0	A
	R	15	15	100	1.0	A
	Subtotal	2,183	2,187	100	4.0	A
<b>EB</b>	<b>L</b>	<b>20</b>	<b>19</b>	<b>95</b>	<b>296.9</b>	<b>F</b>
	R	15	15	100	75.7	F
	Subtotal	35	34	97	199.3	F
<b>Total</b>		4,214	4,162	99	5.7	A

## SimTraffic LOS Report

**Project:** Saratoga Springs - Welfare Complex TIS Update  
**Analysis Period:** Future (2025) Plus Project  
**Time Period:** Evening Peak Hour **Project #: UT19-1451**

**Intersection:** Medical Drive & Access 2  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	47	47	99	6.1	A
	R	52	53	101	3.0	A
	Subtotal	99	100	101	4.5	A
EB	L	32	28	87	2.2	A
	T	138	140	102	0.1	A
	Subtotal	170	168	99	0.5	A
WB	T	101	99	98	0.3	A
	R	58	59	101	0.4	A
	Subtotal	159	158	99	0.3	A
<b>Total</b>		428	426	99	1.3	A

**Intersection:** Medical Drive & Access 3  
**Type:** Unsignalized

Approach	Movement	Demand Volume	Volume Served		Delay/Veh (sec)	
			Avg	%	Avg	LOS
<b>SB</b>	L	3	3	100	6.2	A
	R	2	3	150	2.6	A
	Subtotal	5	6	120	4.4	A
EB	L	11	9	82	2.0	A
	T	166	164	99	0.1	A
	Subtotal	177	173	98	0.2	A
WB	T	152	151	99	0.2	A
	R	1	1	100	0.2	A
	Subtotal	153	152	99	0.2	A
<b>Total</b>		335	331	99	0.3	A

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	EBL	EBT	EBR	WBL	WBR	NBU	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	4.2	0.0	1.6	0.3	0.3	2.8	6.5	9.6	0.1	0.2	8.0	0.1
Total Del/Veh (s)	67.8	0.6	48.3	73.3	39.3	235.1	219.6	20.2	13.3	54.4	14.0	3.3
Vehicles Entered	223	1	117	16	30	41	103	1696	35	13	2041	133
Vehicles Exited	223	1	118	16	30	40	98	1689	34	13	2037	133
Hourly Exit Rate	223	1	118	16	30	40	98	1689	34	13	2037	133
Input Volume	223	1	116	15	31	41	105	1743	34	14	2034	135
% of Volume	100	133	102	107	96	97	94	97	99	93	100	99

1: Redwood Road (SR-68) & Medical Drive/1140 North Performance by movement

Movement	All
Denied Delay (hr)	0.0
Denied Del/Veh (s)	0.0
Total Delay (hr)	33.8
Total Del/Veh (s)	27.1
Vehicles Entered	4449
Vehicles Exited	4432
Hourly Exit Rate	4432
Input Volume	4492
% of Volume	99

2: Redwood Road (SR-68) & Market Street Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.1	0.3	0.0	0.0	0.4
Denied Del/Veh (s)	0.2	0.6	2.0	0.5	0.0	0.0	0.3
Total Delay (hr)	4.8	1.9	1.8	11.7	2.5	0.2	22.9
Total Del/Veh (s)	68.6	44.7	70.3	24.5	4.6	2.6	18.7
Vehicles Entered	244	153	92	1698	1969	214	4370
Vehicles Exited	246	153	91	1682	1967	214	4353
Hourly Exit Rate	246	153	91	1682	1967	214	4353
Input Volume	234	151	90	1721	1972	208	4376
% of Volume	105	101	101	98	100	103	99

3: Pioneer Crossing (SR-145) & Market Street Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.1	0.1	0.1	0.0	0.4
Denied Del/Veh (s)	0.2	1.3	0.2	2.7	2.9	0.2	0.7
Total Delay (hr)	3.8	0.5	2.4	0.2	1.1	1.0	9.0
Total Del/Veh (s)	48.1	10.3	10.5	3.7	23.2	6.0	14.6
Vehicles Entered	273	186	822	165	167	578	2191
Vehicles Exited	273	184	824	165	167	578	2191
Hourly Exit Rate	273	184	824	165	167	578	2191
Input Volume	266	180	819	158	160	586	2169
% of Volume	103	102	101	104	104	99	101

4: Redwood Road (SR-68) & Commerce Drive Performance by movement

Movement	WBL	WBR	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.0	0.1
Denied Del/Veh (s)	0.4	3.8	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	2.5	1.0	2.7	0.1	1.3	6.5	14.0
Total Del/Veh (s)	79.8	41.8	5.2	2.0	60.7	11.2	11.6
Vehicles Entered	113	83	1845	106	73	2076	4296
Vehicles Exited	113	82	1844	106	74	2075	4294
Hourly Exit Rate	113	82	1844	106	74	2075	4294
Input Volume	115	85	1902	105	75	2069	4350
% of Volume	98	97	97	101	99	100	99

8: Exchange Drive & Medical Drive Performance by movement

Movement	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	All
Denied Delay (hr)	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2
Denied Del/Veh (s)	0.3	3.8	0.0	0.0	0.0	4.0	0.3	0.3	4.2	0.2	1.3
Total Delay (hr)	0.2	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Total Del/Veh (s)	6.5	3.3	5.1	5.7	2.4	1.6	0.2	0.2	1.6	0.1	3.9
Vehicles Entered	136	68	15	102	28	61	26	12	19	38	505
Vehicles Exited	136	68	15	101	28	61	26	12	19	38	504
Hourly Exit Rate	136	68	15	101	28	61	26	12	19	38	504
Input Volume	140	65	16	103	25	65	27	12	19	39	512
% of Volume	97	104	94	98	111	93	95	100	100	97	98

22: Redwood Road (SR-68) & Access 1 Performance by movement

Movement	EBL	EBR	NBL	NBT	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.1	4.1	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	0.3	0.2	2.0	2.4	0.0	6.6
Total Del/Veh (s)	296.9	75.7	71.8	3.7	4.0	1.0	5.7
Vehicles Entered	20	15	8	1933	2172	15	4163
Vehicles Exited	19	15	8	1933	2172	15	4162
Hourly Exit Rate	19	15	8	1933	2172	15	4162
Input Volume	20	15	10	1987	2168	15	4214
% of Volume	95	100	80	97	100	100	99

24: Medical Drive & Access 2 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.3	4.0	0.5
Total Delay (hr)	0.0	0.0	0.0	0.0	0.1	0.0	0.2
Total Del/Veh (s)	2.2	0.1	0.3	0.4	6.1	3.0	1.3
Vehicles Entered	28	140	99	60	47	53	427
Vehicles Exited	28	140	99	59	47	53	426
Hourly Exit Rate	28	140	99	59	47	53	426
Input Volume	32	138	101	58	47	52	428
% of Volume	87	102	98	101	99	101	99

27: Medical Drive & Access 3 Performance by movement

Movement	EBL	EBT	WBT	WBR	SBL	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.1	3.9	0.0
Total Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.0	0.1	0.2	0.2	6.2	2.6	0.3
Vehicles Entered	9	164	151	1	3	3	331
Vehicles Exited	9	164	151	1	3	3	331
Hourly Exit Rate	9	164	151	1	3	3	331
Input Volume	11	166	152	1	3	2	335
% of Volume	82	99	99	100	100	150	99

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Total Zone Performance

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Denied Delay (hr)	1.2
Denied Del/Veh (s)	0.9
Total Delay (hr)	94.0
Total Del/Veh (s)	35.8
Vehicles Entered	4486
Vehicles Exited	9209
Hourly Exit Rate	9209
Input Volume	30150
% of Volume	31

Intersection: 1: Redwood Road (SR-68) & Medical Drive/1140 North

Movement	EB	EB	EB	WB	NB	NB	NB	SB	SB	SB	SB
Directions Served	L	L	TR	LTR	UL	T	TR	L	T	T	R
Maximum Queue (ft)	169	200	185	118	284	550	564	107	307	319	265
Average Queue (ft)	88	111	80	41	230	340	315	14	226	243	42
95th Queue (ft)	142	169	155	87	339	619	644	61	339	351	165
Link Distance (ft)		316	316	494		542	542		291	291	
Upstream Blk Time (%)						9	6		2	4	0
Queuing Penalty (veh)						89	58		23	40	0
Storage Bay Dist (ft)	100				135			100			150
Storage Blk Time (%)	8	18			73	11		0	25	22	
Queuing Penalty (veh)	9	20			639	16		0	4	30	

Intersection: 2: Redwood Road (SR-68) & Market Street

Movement	EB	EB	EB	NB	NB	NB	SB	SB	SB
Directions Served	L	L	R	L	T	T	T	T	R
Maximum Queue (ft)	209	264	224	187	654	624	205	221	81
Average Queue (ft)	102	118	92	94	255	231	94	94	21
95th Queue (ft)	165	199	170	201	804	776	173	185	59
Link Distance (ft)		2341			1554	1554	408	408	
Upstream Blk Time (%)					1	0			
Queuing Penalty (veh)					0	0			
Storage Bay Dist (ft)	165		165	135					180
Storage Blk Time (%)	1	2	2	2	14			1	
Queuing Penalty (veh)	3	6	5	21	13			1	

Intersection: 3: Pioneer Crossing (SR-145) & Market Street

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	350	258	298	262	87	176	168	154
Average Queue (ft)	193	60	157	107	38	79	77	56
95th Queue (ft)	311	167	270	230	71	136	144	123
Link Distance (ft)	2341		586	586			811	811
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)		200			300	350		
Storage Blk Time (%)	9			0				
Queuing Penalty (veh)	16			0				

Intersection: 4: Redwood Road (SR-68) & Commerce Drive

Movement	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	R	T	T	R	L	T	T
Maximum Queue (ft)	258	150	235	230	110	124	239	143
Average Queue (ft)	117	63	88	91	17	57	36	39
95th Queue (ft)	221	138	208	210	80	104	151	99
Link Distance (ft)	658		303	303			865	865
Upstream Blk Time (%)			1	1			0	
Queuing Penalty (veh)			5	7			0	
Storage Bay Dist (ft)		50			130	85		
Storage Blk Time (%)	57	13		4		6	1	
Queuing Penalty (veh)	48	15		4		58	1	

Intersection: 8: Exchange Drive & Medical Drive

Movement	EB	EB	WB	WB	WB	NB	SB
Directions Served	T	R	L	T	R	L	L
Maximum Queue (ft)	84	56	30	59	41	32	19
Average Queue (ft)	40	29	10	26	13	5	1
95th Queue (ft)	67	46	31	45	33	22	9
Link Distance (ft)	501			151			
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		100	50		50	100	100
Storage Blk Time (%)	0		0	0	0		
Queuing Penalty (veh)	0		0	0	0		

Intersection: 22: Redwood Road (SR-68) & Access 1

Movement	EB	EB	NB	NB	NB	SB	SB
Directions Served	L	R	L	T	T	T	T
Maximum Queue (ft)	140	62	42	80	85	165	179
Average Queue (ft)	48	15	9	8	9	22	34
95th Queue (ft)	128	51	33	85	89	100	126
Link Distance (ft)	595			291	291	303	303
Upstream Blk Time (%)				0	0		0
Queuing Penalty (veh)				1	2		0
Storage Bay Dist (ft)		100	100				
Storage Blk Time (%)	9			1			0
Queuing Penalty (veh)	1			0			0

Intersection: 24: Medical Drive & Access 2

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	34	6	55	54
Average Queue (ft)	5	0	26	26
95th Queue (ft)	23	4	52	49
Link Distance (ft)		150	256	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	100			100
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 27: Medical Drive & Access 3

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	18	24	15
Average Queue (ft)	1	2	2
95th Queue (ft)	11	13	10
Link Distance (ft)		278	
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	25		100
Storage Blk Time (%)	0		
Queuing Penalty (veh)	0		

Zone Summary

Zone wide Queuing Penalty: 1137

# APPENDIX C

## Site Plan

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# **APPENDIX D**

## **95<sup>th</sup> Percentile Queue Length Reports**



# SimTraffic Queuing Report



**Project: Saratoga Springs - Welfare Complex TIS Update**

Analysis: Existing (2020) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)

Project #: UT19-1451

Intersection	NB			SB			EB			WB				
	L	R	T	TR	UL	L	R	T	L	R	TR	L	LTR	R
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	209	218	117	32	81	242	144	--	59	--	74	--
02: Redwood Road (SR-68) & Market Street	97	--	161	--	--	--	39	97	130	116	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	79	291	--	--	196	--	95	--	--	--	213	--	140
04: Redwood Road (SR-68) & Commerce Drive	--	13	--	--	--	84	--	30	--	--	--	785	--	208



# SimTraffic Queuing Report

Project: Saratoga Springs - Welfare Complex TIS Update

Analysis: Future (2025) Background

Time Period: Evening Peak Hour

95<sup>th</sup> Percentile Queue Length (feet)



Project #: UT19-1451

Intersection	NB				SB				EB				WB				
	L	R	T	TR	UL	L	R	T	TR	L	R	T	TR	L	LTR	R	T
01: Redwood Road (SR-68) & Medical Drive/1140 North	--	--	306	309	191	53	146	343	--	164	--	--	103	--	84	--	--
02: Redwood Road (SR-68) & Market Street	115	--	231	--	--	--	53	141	--	168	163	--	--	--	--	--	--
03: Pioneer Crossing (SR-145) & Market Street	--	78	201	--	--	129	--	115	--	--	--	--	--	498	--	292	--
04: Redwood Road (SR-68) & Commerce Drive	--	46	165	--	--	108	--	173	--	--	--	--	--	220	--	136	--
05: Exchange Drive & Medical Drive	19	--	--	--	--	--	--	--	3	--	44	66	--	--	--	--	46



# **APPENDIX E**

## Trip Generation Data

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## MEMORANDUM

Date: July 9, 2020  
To: Gordon L. Miner, M.E.M., P.E.  
From: Hales Engineering  
Subject: **Saratoga Springs Welfare Complex Access 3 Analysis**

UT19-1451

This memorandum discusses the study completed for the proposed Welfare Complex in Saratoga Springs. Plans currently exist for a property access onto Medical Drive on the west end of the project, designated as "Access 3" in the TIS report. This proposed access is negatively offset from the existing Costco access (labeled as "Access E" in the Kittelson & Associates Costco TIS) on the south side of Medical Drive, approximately 150 feet to the west of the proposed access.

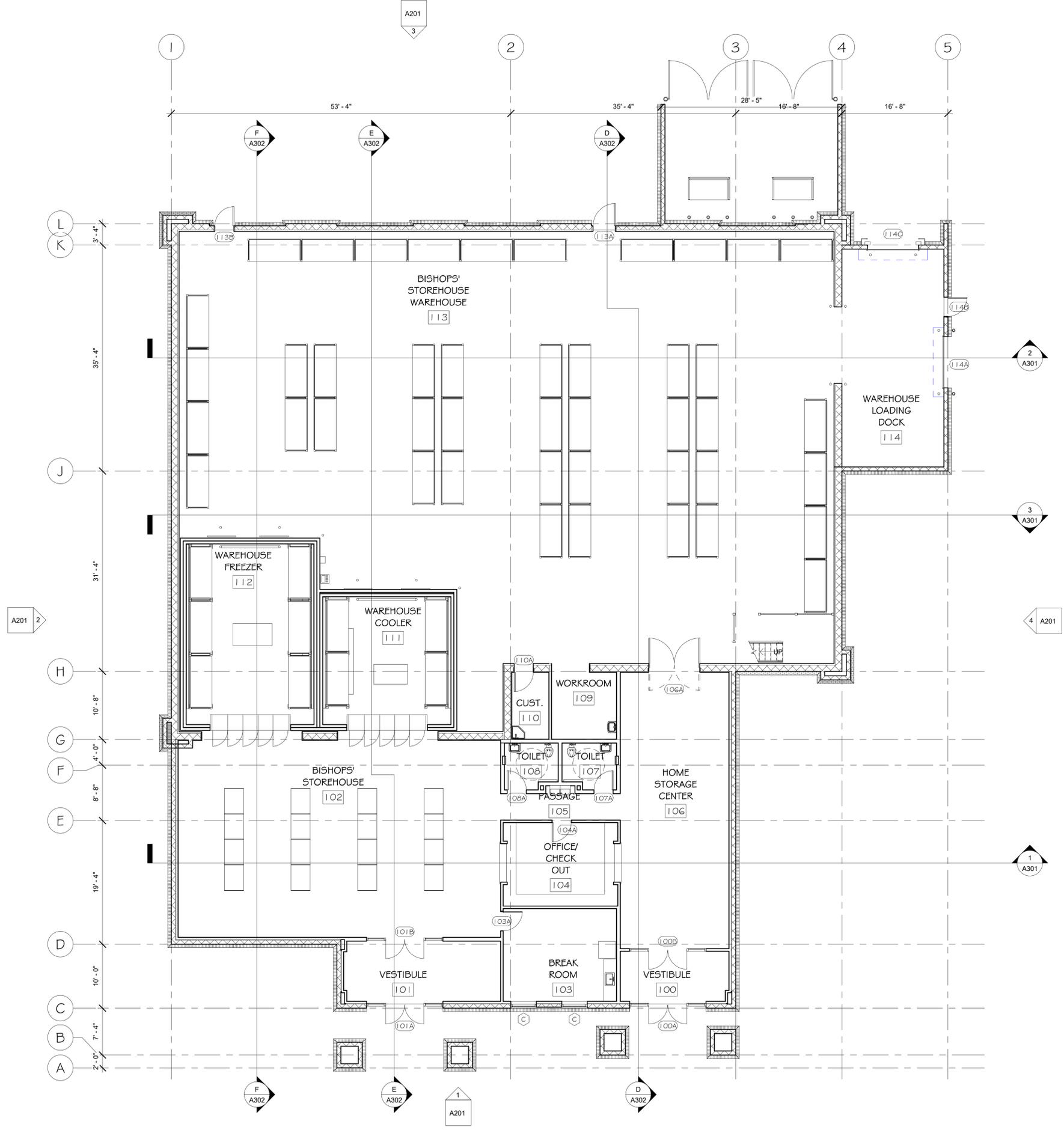
Based on projected 2020 evening peak hour traffic volumes on Medical Drive, as estimated by the Kittelson & Associates Costco TIS as well as additional traffic from the Welfare Complex, no major left-turning movement conflict is expected to exist going into these accesses prior to the completion of Exchange Drive.

In the 2025 plus project evening peak hour traffic condition, only 25 westbound left-turning vehicles are projected with 11 conflicting eastbound left-turning vehicles. Synchro and SimTraffic analysis of these offset accesses yield excellent levels of service in the report and show a 95<sup>th</sup> percentile eastbound left-turn queue of 15 feet at Access 3 and a 95<sup>th</sup> percentile westbound left-turn queue of 25 feet. This indicates that ample storage length would exist for both eastbound left-turn and westbound left-turn movements to queue and make their movements with minimal delay during the evening peak hour in future (2025) conditions.

**Hales Engineering recommends that a center two-way left-turn lane (TWLTL) be utilized for left-turn movements between the Costco Access E and the project Access 3 on Medical Drive.** It is not anticipated that significant queuing will occur by the year 2025 that would create safety concerns at this location. However, it is important to consider that future traffic on Medical Drive may continue to increase beyond the 2025 horizon year and that these offset accesses should be monitored and evaluated if potential left-turn queuing conflicts arise after the year 2025.



## APPENDIX F - ARCHITECTURAL RENDERING AND ELEVATIONS



1 A101/1 - FLOOR PLAN 12,303 sqft. 1/8" = 1'-0" NORTH

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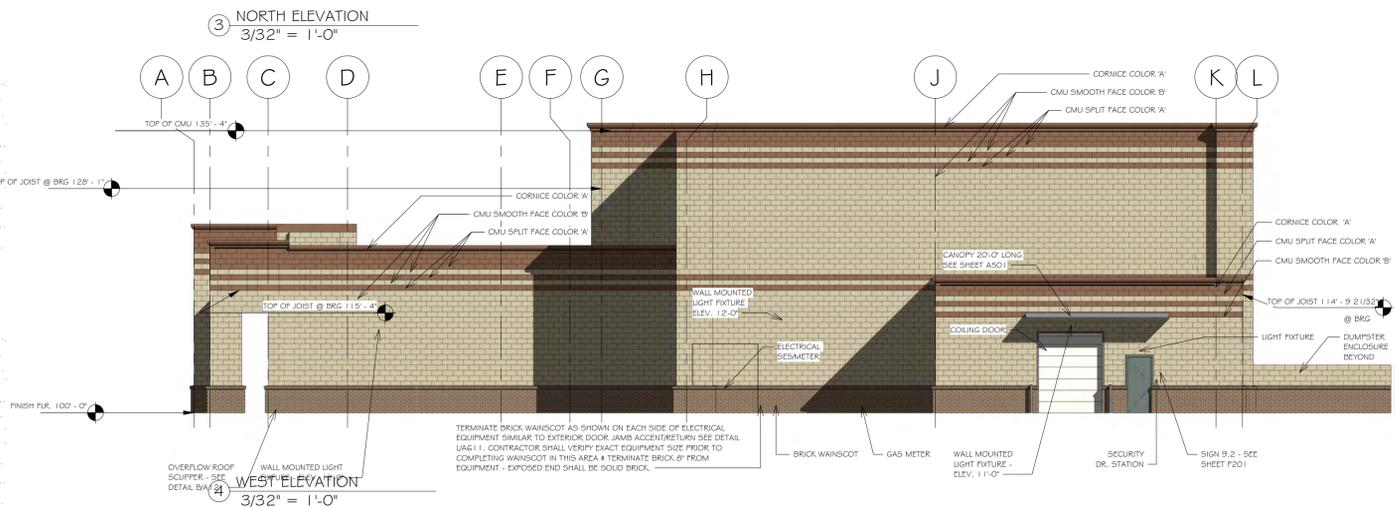
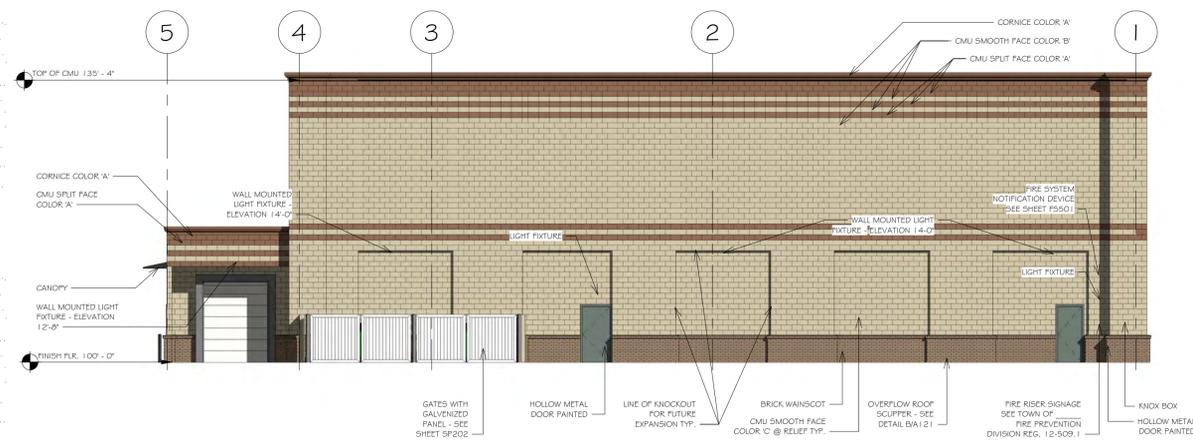
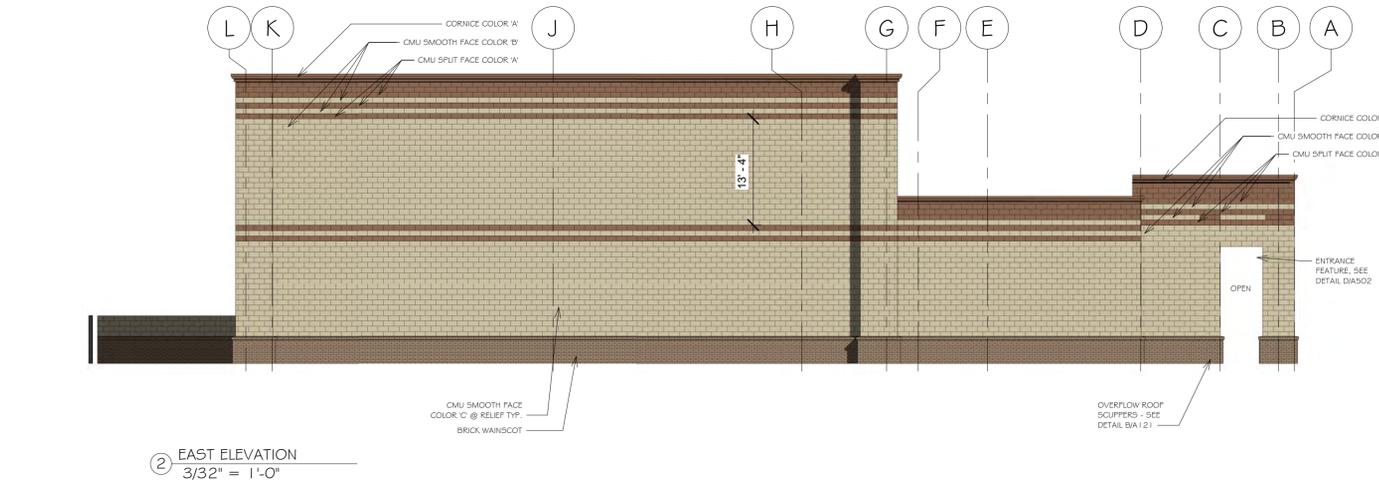
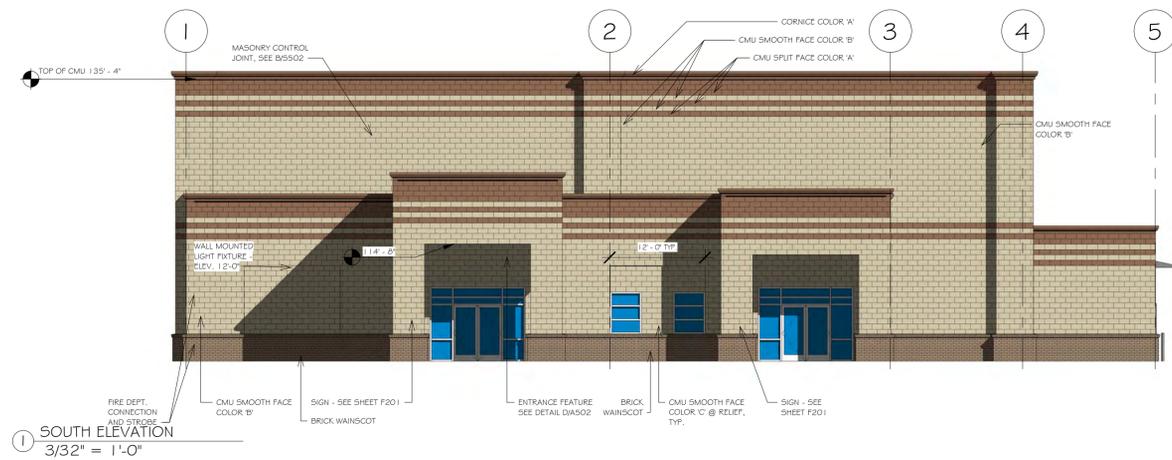
Project For:  
**THE CHURCH OF  
 JESUS CHRIST  
 OF LATTER-DAY SAINTS**

**SARATOGA SPRINGS  
 BISHOPS' STOREHOUSE**  
 PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123  
 Plan Series: 123 JRWA Project: 757  
 Property Number: 123

SHEET:  
**FLOOR PLANS**



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Project For:  
**THE CHURCH OF  
 JESUS CHRIST  
 OF LATTER-DAY SAINTS**

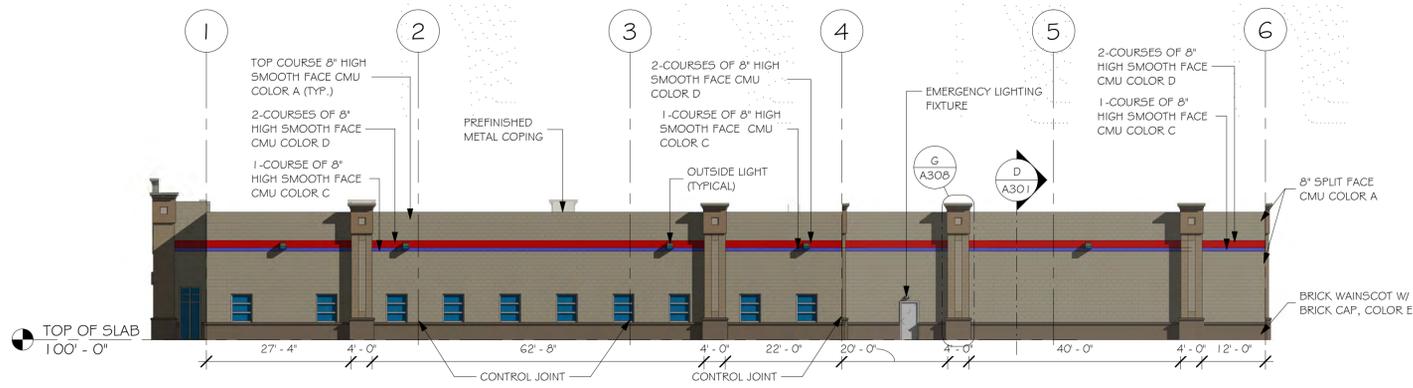
**SARATOGA SPRINGS  
 BISHOPS' STOREHOUSE**  
 PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

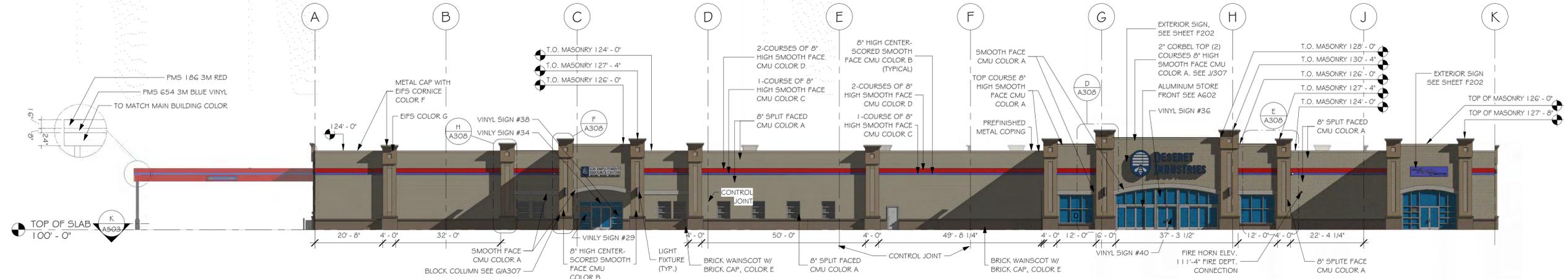
Project Number:  
123  
 Plan Series:  
123  
 Property Number:  
123

SHEET:  
**EXTERIOR  
 ELEVATIONS**

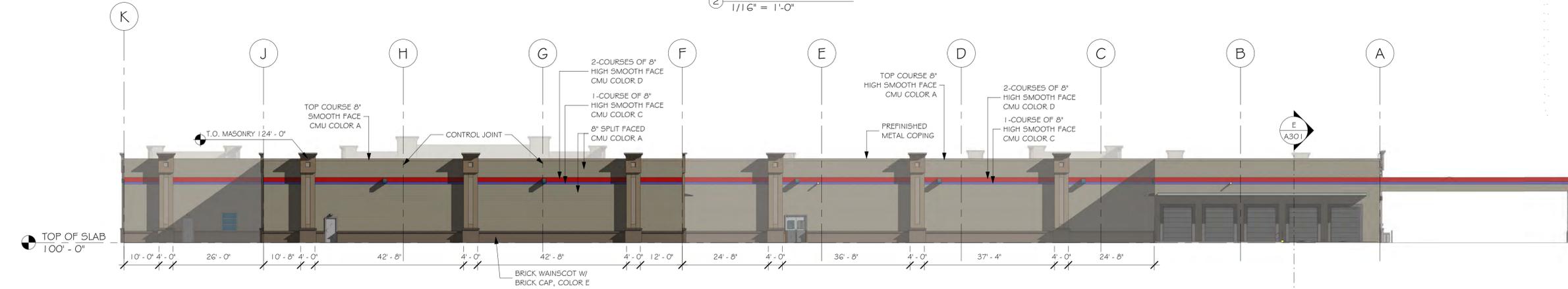




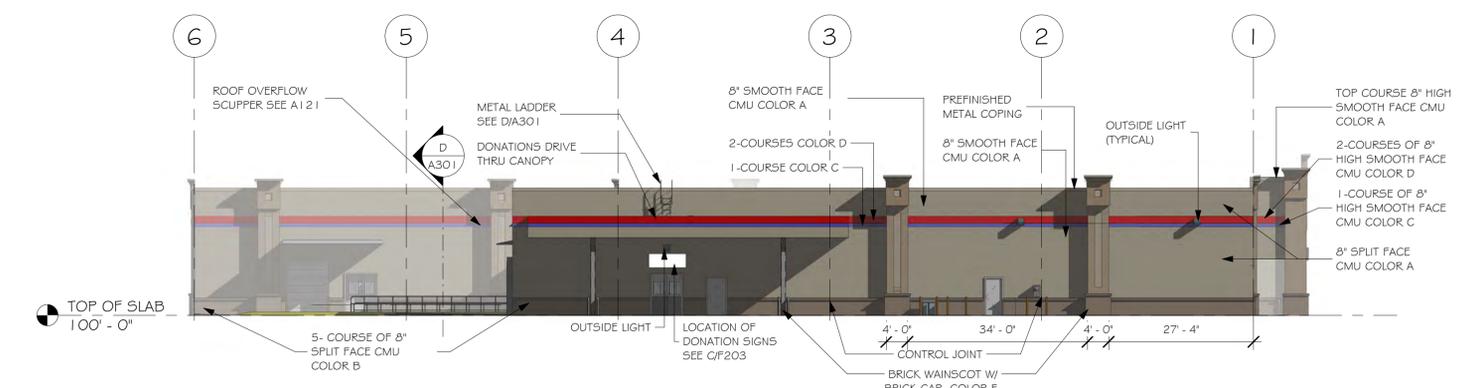
① WEST ELEVATION  
1/16" = 1'-0"



② SOUTH ELEVATION  
1/16" = 1'-0"



③ NORTH ELEVATION  
1/16" = 1'-0"

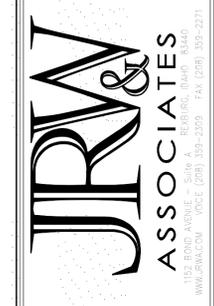


④ EAST ELEVATION  
1/16" = 1'-0"

### EXTERIOR CMU COLORS

NOTE: BLOCK COLORS ARE BY AMCOR  
BRICK COLOR IS BY INTERSTATE BRICK  
EIFS COLORS ARE BY GRVIT

COLOR A SPLIT FACE	PEPPERCREAM	COLOR E BRICK VENEER WAINSCOT	WALNUT (INTERSTATE BRICK)
COLOR B SPLIT FACE	INCA TAN	COLOR F MET CAP AND EIFS CORNICE	"TAMALE #382" METAL CAP TO MATCH EIFS COLOR
COLOR C STRIP	D.I. BLUE	COLOR G EIFS COLUMN CAPS	"VAN DYKE#110"
COLOR D STRIP	D.I. RED		



Project For:  
**THE CHURCH OF  
JESUS CHRIST  
OF LATTER-DAY SAINTS**

SARATOGA SPRINGS,  
UTAH  
DESERET INDUSTRIES  
PROJECT ADDRESS

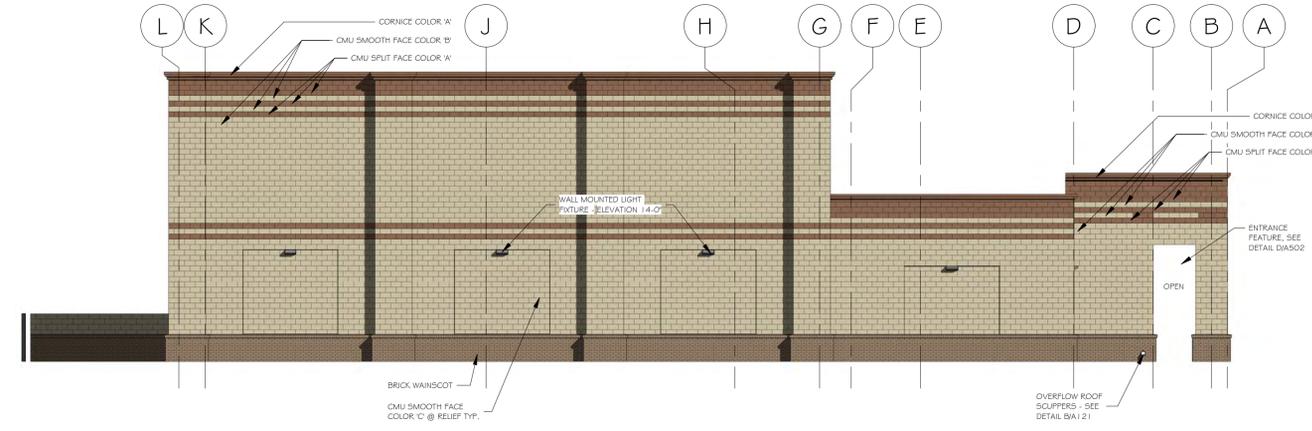
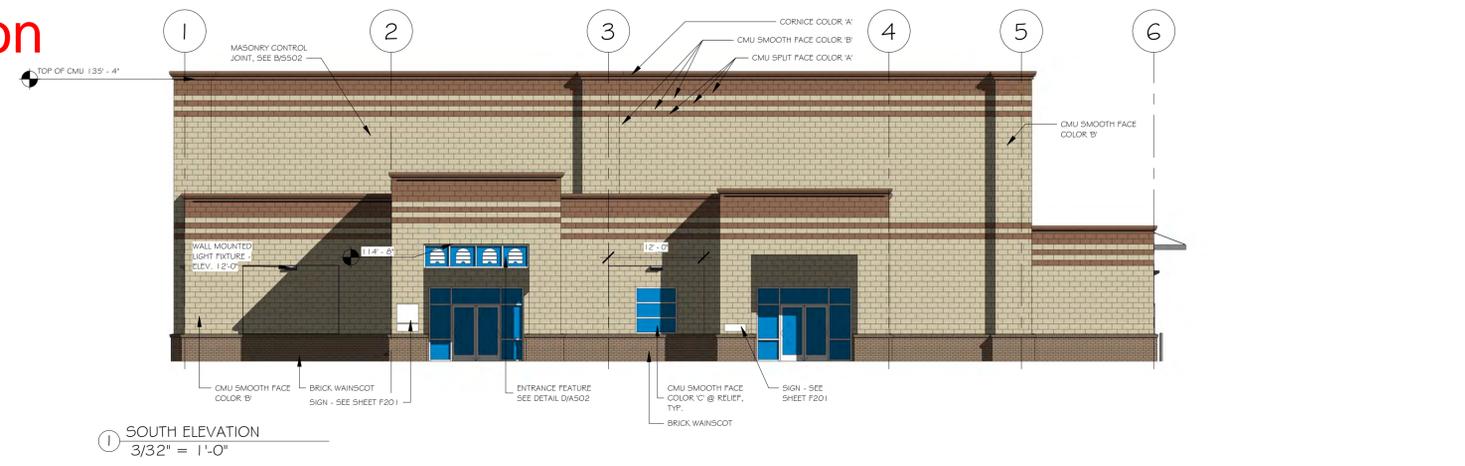
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MARK	DATE (D-M-Y)	DESCRIPTION

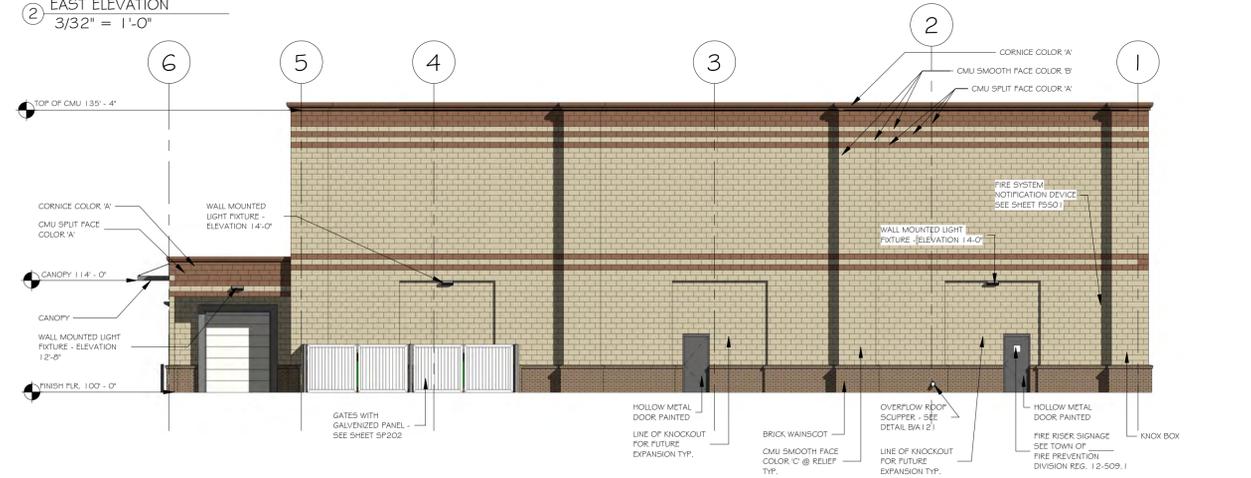
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Plan Series: 123	Property Number: 123

SHEET:  
**EXTERIOR  
ELEVATIONS**

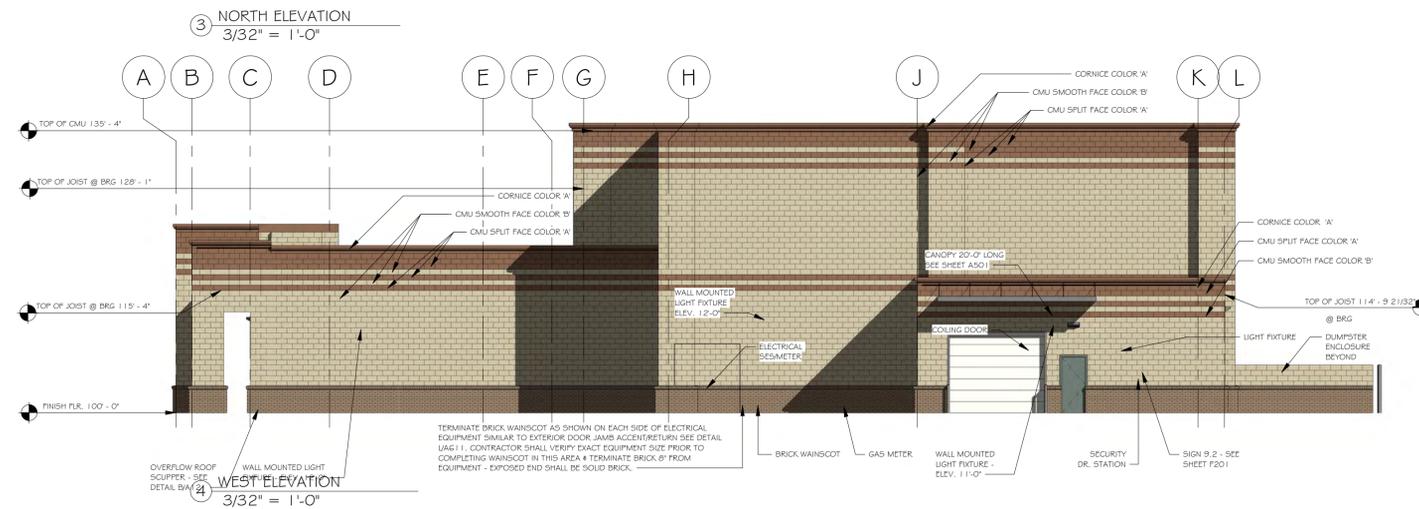
# Revised elevations as per PC recommendation



② EAST ELEVATION  
3/32" = 1'-0"



③ NORTH ELEVATION  
3/32" = 1'-0"



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Project For:  
**THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

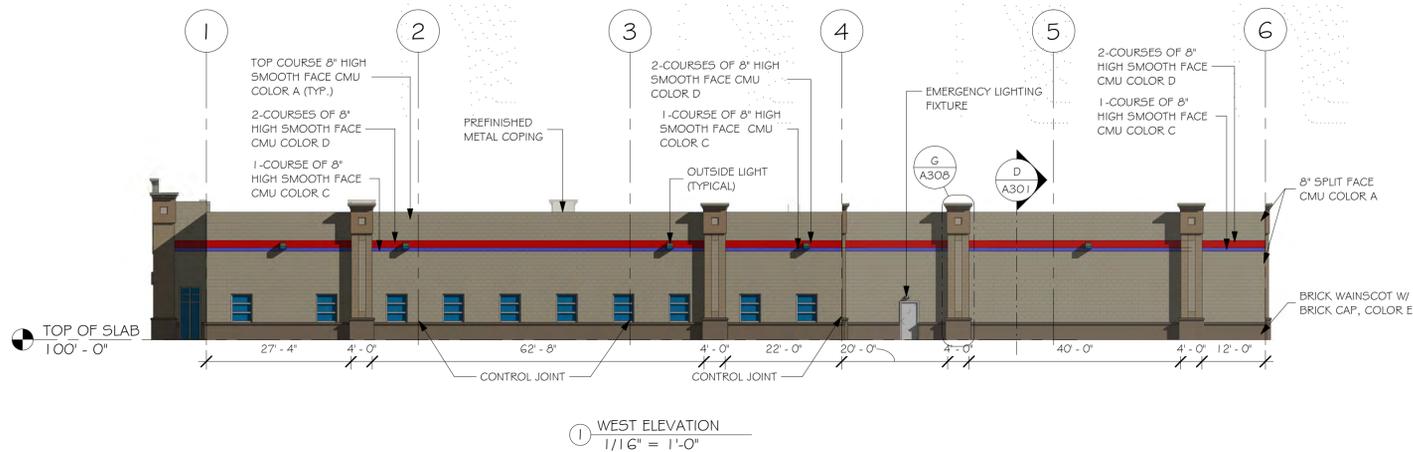
**SARATOGA SPRINGS BISHOPS' STOREHOUSE**  
PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123  
Plan Series: JRWA Project: 757  
Property Number: 123

SHEET:  
**EXTERIOR ELEVATIONS**

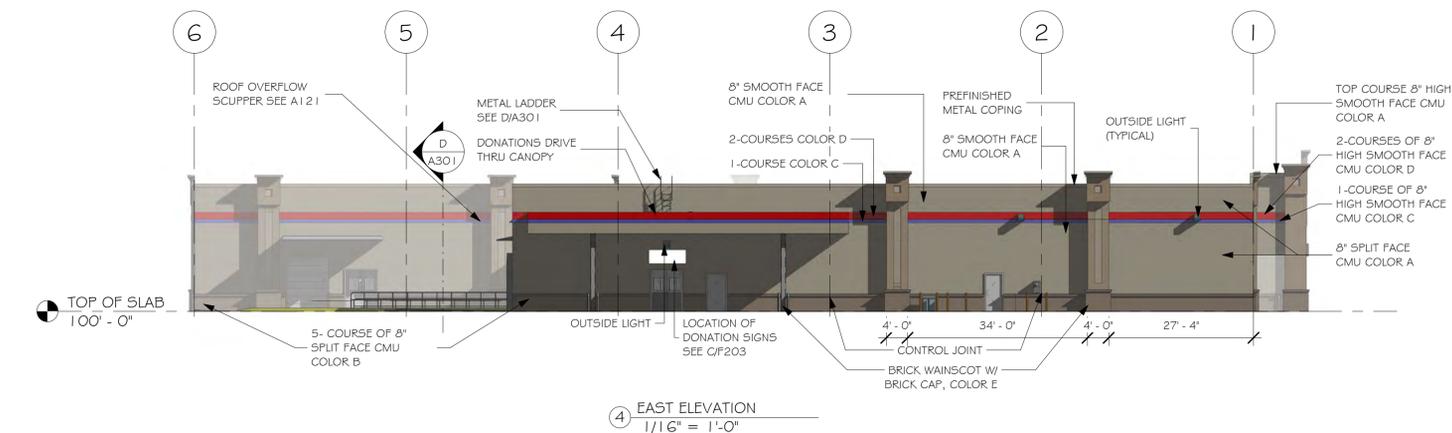
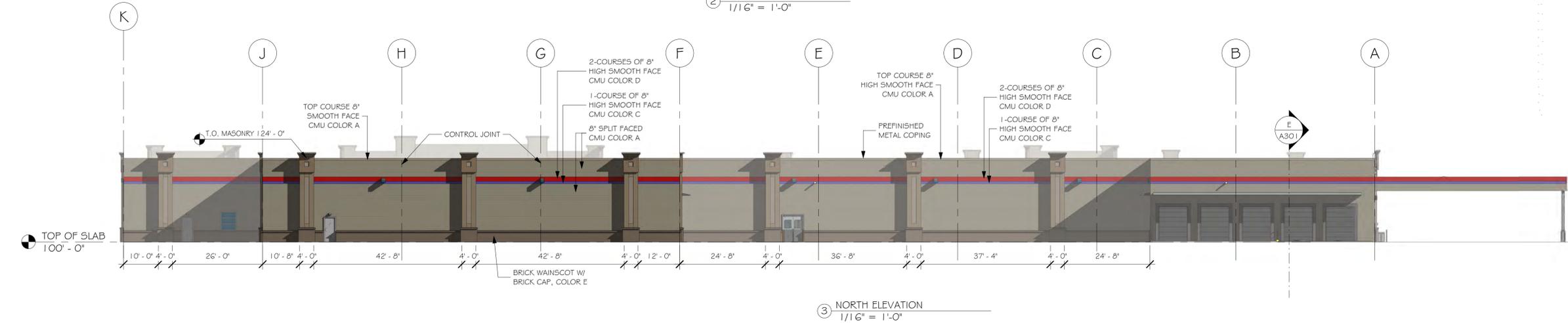
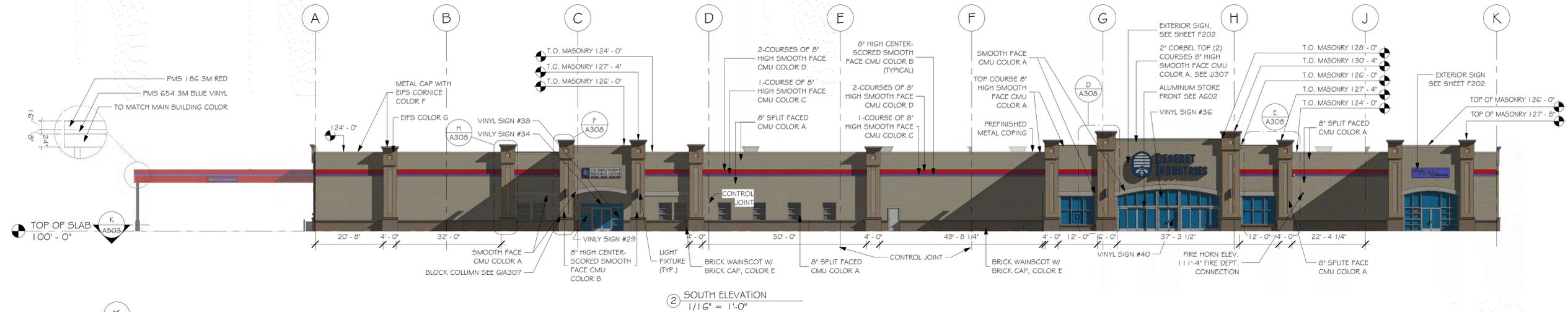




### EXTERIOR CMU COLORS

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COLOR A SPLIT FACE	PEPPERCREAM	COLOR E BRICK VENEER WAINSCOT	WALNUT (INTERSTATE BRICK)
COLOR B SPLIT FACE	INCA TAN	COLOR F MET CAP AND EIFS CORNICE	"TAMALE #382" METAL CAP TO MATCH EIFS COLOR
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COLOR D STRIP	D.I. RED		



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Project For:  
**THE CHURCH OF  
JESUS CHRIST  
OF LATTER-DAY SAINTS**

SARATOGA SPRINGS,  
UTAH  
DESERET INDUSTRIES  
PROJECT ADDRESS

MARK	DATE (D-M-Y)	DESCRIPTION

Project Number: 123  
Plan Series: 123  
Property Number: 123

SHEET:  
**EXTERIOR  
ELEVATIONS**

A201



# MINUTES – Planning Commission

Thursday, July 23, 2020

City of Saratoga Springs City Offices

1307 North Commerce Drive, Suite 200, Saratoga Springs, Utah 84045

## PLANNING COMMISSION MEETING MINUTES - DRAFT

**Call to Order - 6:00 p.m.** by Chairman Troy Cunningham

**Present:** Via Video Conference

5 Commission Members: Bryce Anderson, Audrey Barton, Troy Cunningham, Ken Kilgore, Reed Ryan, Josh Wagstaff.

Staff: Dave Stroud, Planning Director; Maren Barker, Assistant City Attorney; Gordon Miner, City Engineer; Nicolette Fike, Deputy Recorder.

Others: Johnny Watson, Sam Knecht, Greg Magleby

10

Commissioner Cunningham read the following statement: I, Troy Cunningham, Planning Commission Chair, hereby determine that conducting the Planning Commission meeting at an anchor location presents a substantial risk to the health and safety of those who may be present at the anchor location. The World Health Organization, the President of the United States, the Governor of Utah, and the County Health Department have all recognized a global pandemic exists related to the new strain of the coronavirus, SARS-CoV-2 (COVID-19). Due to the State of emergency caused by the global pandemic, I find that conducting a meeting at an anchor location under the current state of public health emergency constitutes a substantial risk to the health and safety of those who may be present at the location. Signed July 16, 2020.

20

1. **Pledge of Allegiance** - led by Commissioner Barton.

2. **Roll Call** – A quorum was present

25

3. **Public Hearing: Community Plan and Village Plan for LDS Welfare Complex, located approximately Medical Drive and Redwood Road. Suburban Land Reserve/LEI as applicants.**

Planning Director Dave Stroud presented the item. The Community Plan covers approximately 11.82 acres.

The proposed plan contains a one village plan and one lot with a tenant to be approved at a later date. The Community Plan contains development standards and other information necessary to develop the Village Plan parcel. The vacant parcel will be developed in the future and will follow Title 19 standards pertaining to development in the Regional Commercial zone.

30

The village plan contained in this request outlines the development standards of the Welfare Complex. The subsequent village plan provides the on-site details necessary to construct the two buildings, landscaping, and parking of the complex.

35

Johnny Watson with JRW & Associates was present as applicant. He noted the coordination needed with the Costco to the south. The solution has been refined to a better product through the process. They are excited to be in the community. Greg Magleby, with LEI and Sam Knecht were also present.

40

Commissioner Kilgore

- Asked the applicant if the elevations were their preferred plan or would they be able to conform to the City's standards. Johnny Watson showed a recently built facility which would be similar to the one to be built here with its design features that add more architectural features. They feel with as small as the building is and irregular shape, they have more than complied. Planning Director Dave Stroud noted the side and rear elevations that were a bigger concern, the decision was up to legislation. Commissioner Kilgore asked if the sides were visible from main roads. Planning Director Dave Stroud advised to orientation.

45

- Commissioner Anderson agreed that the front façade looked good but did have some concern with the lack of features on the two sides. He asked for clarification on why they wanted the minimal façade.

- 50 Johnny Watson responded that they would be happy to add some insets or pilasters to add more shadow lines and detail. He noted a few on the current plan. Commissioner Kilgore thought that would be terrific.
- Received confirmation that it complied with all ADA standards.

55 **Public Hearing Opened** by Chairman Troy Cunningham. Receiving no public comment, the public hearing was closed by the Chair.

Commissioner Anderson

- Is happy to have the facility come to the city.

60 Commissioner Ryan

- Received clarification on the size of lot 1. Planning Director Dave Stroud noted it was adequate to build a two or three tenant building, plenty of room.
- He noted that the report stated Access 1/Redwood Road was anticipated to be LOS F in peak hours. He would hope this can be mitigated sooner than later. City Engineer Gordon Miner noted that they still need to get a permits from UDOT for the necessary mitigation. Greg Magleby from LEI noted that ultimately this was to be a right/right. They can't do that as a developer, UDOT would need to install the median. It will by a type of cart-before-the-horse with UDOT, once it's built it will be warranted.

65

Commissioner Cunningham

- Agrees with some additional architectural features.
- Agrees that it would be good to for UDOT to build the required median prior to opening. Johnny Watson agrees that it would be better taken care of prior to opening.

70

75 **Motion made by Commissioner Kilgore to recommend approval of the Church of Jesus Christ of Latter-day Saints Saratoga Springs Welfare Complex Community Plan and Village Plan with the findings and conditions in the staff report. Also adding a condition to request applicant to take a look at enhancing the walls visually with pilasters or some-such detail to bring it closer to compliance to city code. And that City Council look at suggesting to UDOT to mitigate Access 1 and its LOS F with a possible right/right median installed. Seconded by Commissioner Anderson. Aye: Bryce Anderson, Audrey Barton, Troy Cunningham, Ken Kilgore, Reed Ryan, Josh Wagstaff. Motion passed 6 - 0.**

80

4. **Public Hearing: Update to Code, Title 19 regarding: Definitions, Land Use regulations in Residential and Non-Residential zones, and Clear Site Triangle design standards. City initiated.**

85 5. **Business Item: Update to Code, Title 13 – Traffic & Parking. City initiated.**

**Items 4 & 5 were heard together.**

90

Planning Director Dave Stroud presented the items. Changes that are needed provide additional clarity and effectiveness, to remove inconsistencies and typos, and incorporate best practices, and keep the Code current. The proposed changes include Title 13.08.01 Illegal Parking – In General, and changes to Title 19 include Definitions, Land Use Zone Regulations, Accessory Buildings, and Clear Site Triangle. City Engineer Gordon Miner presented information pertaining to clear site triangles.

95

**Public Hearing Opened** by Chairman Troy Cunningham. Receiving no public comment, the public hearing was closed by the Chair.

Commissioner Kilgore

100

- Asked if reducing the setback to two feet would be harder for maintaining the area, such as using a lawn mower. Planning Director Dave Stroud gave an example that you probably wouldn't grow grass back there but 2 feet is doable.

Commissioner Barton

105

- Asked about parking on the sidewalk. Was it more for safety or concern from citizens? Planning Director Dave Stroud noted there was a lot of complaints, it was also a safety issue for pedestrians. There can be damage in the parkstrip to landscaping and water meters. This is fairly standard and will give more teeth to

enforcement. She noted how there are neighborhoods that can't park on the street but there isn't room in the driveway for all the cars and some end up hanging over.

- 110 Commissioner Cunningham
- Was somewhat surprised this wasn't already in code.
  - In response to question about enforcement during snow Planning Director Dave Stroud noted that the police worked with code enforcement on that.

115 **Motion made by Commissioner Ryan that based upon the evidence and explanations received today, I move to forward a positive recommendation to the City Council for the proposed amendments to Sections 13.08.01, 19.02.02, 19.04.03, 19.04.07, 19.04.10, 19.05.11, 19.06.11, with the findings and conditions in the staff report dated July 16, 2020. Seconded by Commissioner Barton. Aye: Bryce Anderson, Audrey Barton, Troy Cunningham, Ken Kilgore, Reed Ryan, Josh Wagstaff. Motion passed 6 - 0.**

120

6. **Approval of Minutes: June 25, 2020**

125 **Motion made by Commissioner Ryan to approve the minutes of June 25, 2020. Seconded by Commissioner Kilgore. Aye: Bryce Anderson, Audrey Barton, Troy Cunningham, Ken Kilgore, Reed Ryan, Josh Wagstaff. Motion passed 6 - 0.**

7. **Reports of Action.** – No Reports were needed.

130 8. **Commission Comments.**

Commissioner Kilgore commented that it was great that the city was now able to support jobs close to home, especially for kids so they don't have to drive far.

Commissioner Barton thanked Commissioner Ryan for the attention to wanting the access point being taken care of before it would be a problem with the road.

135 9. **Director's Report.** – Planning Director Dave Stroud advised that interviews had been conducted for the Planning Commission vacancy. Costco opening set for August 13.

140 10. **Possible motion to enter into closed session** – No closed session was held.

11. **Meeting Adjourned Without Objection at 7:04 p.m. by Chairman** Troy Cunningham.

145 \_\_\_\_\_  
Date of Approval

\_\_\_\_\_  
Planning Commission Chair

150 \_\_\_\_\_  
Deputy City Recorder

**ORDINANCE NO. 20-27 (8-4-20)**

**AN ORDINANCE OF THE CITY OF SARATOGA SPRINGS,  
UTAH, APPROVING THE COMMUNITY PLAN AND  
VILLAGE PLAN OF THE CHURCH OF JESUS CHRIST OF  
LATTER-DAY SAINTS WELFARE COMPLEX**

**WHEREAS**, the City of Saratoga Springs, Utah (“City”) approved the City Center District Area plan (“DAP”) in 2010 following annexation of 2,883 acres into the City, which vested the Developer with 16,000 residential units and 10,000,000 square feet of non-residential density; and

**WHEREAS**, the Special Projects Department of The Church of Jesus Christ of Latter-day Saints and JRW & Associates applied for Community Plan and Village Plan approval pursuant to Chapter 19.26 of the Land Development Code (“Application”); and

**WHEREAS**, the application allocates up to 32 Equivalent Residential Units (ERUs) and smaller ERU number TBD on Lot 1 with one ERU equal to 2,165 square feet of non-residential use to 11.82 acres within the DAP; and

**WHEREAS**, the application also establishes development standards, design guidelines, and other standards for the development of the property; and

**WHEREAS**, pursuant to its legislative authority under Utah Code Annotated § 10-9a-101, et seq., the City Council, in exercising its legislative discretion, has determined that approving the application furthers the health, safety, prosperity, security, and general welfare of the residents and taxpayers of the City.

**NOW THEREFORE**, the City Council of the City of Saratoga Springs, Utah hereby ordains as follows:

**SECTION I – ENACTMENT**

The Church of Jesus Christ of Latter-day Saints Welfare Complex Community Plan and Village Plan attached hereto as Exhibit A and incorporated herein by this reference, is hereby approved and enacted, subject to the City Council’s adopted findings and conditions of approval.

**SECTION II – AMENDMENT OF CONFLICTING ORDINANCES**

If any ordinances, resolutions, policies, or zoning maps of the City of Saratoga Springs heretofore adopted are inconsistent herewith they are hereby amended to comply with the provisions hereof. If they cannot be amended to comply with the provisions hereof, they are hereby repealed.

**SECTION III – EFFECTIVE DATE**

This ordinance shall take effect upon its passage by a majority vote of the Saratoga Springs City Council and following notice and publication as required by the Utah Code.

**SECTION IV – SEVERABILITY**

If any section, subsection, sentence, clause, phrase, or portion of this ordinance is, for any reason, held invalid or unconstitutional by any court of competent jurisdiction, such provision shall be deemed a separate, distinct, and independent provision, and such holding shall not affect the validity of the remaining portions of this ordinance.

**SECTION V – PUBLIC NOTICE**

The Saratoga Springs Recorder is hereby ordered, in accordance with the requirements of Utah Code § 10-3-710—711, to do as follows:

- a. deposit a copy of this ordinance in the office of the City Recorder; and
- b. publish notice as follows:
  - i. newspaper of general circulation in the City; or
  - ii. post a complete copy of this ordinance in 3 public places within the City.

**ADOPTED AND PASSED** by the City Council of the City of Saratoga Springs, Utah, this 4<sup>th</sup> day of August, 2020.

Signed: \_\_\_\_\_  
Jim Miller, Mayor

Attest: \_\_\_\_\_  
Cindy LoPiccolo, City Recorder

**VOTE**

Chris Carn	_____
Michael McOmber	_____
Ryan Poduska	_____
Chris Porter	_____
Stephen Willden	_____

**EXHIBIT A**

**The Church of Jesus Christ of Latter-day Saints Community/Village Plan**

# City Council Staff Report

**Author:** Jeremy D. Lapin, P.E., Public Works Director  
**Subject:** Agreement with Avative for Use of Conduit for Fiber  
**Date:** August 4, 2020  
**Type of Item:** Exchange Agreement



## Description:

**A. Topic:** This item is regarding the City entering into an exchange agreement with Avative for their Use of the City's Existing Conduit that was installed alongside the new sewer main along the Future Pony Express Parkway from Riverside Drive to Saratoga Road in exchange for the installation of conduit and fiber optic cable as needed to connect the public works offices to their fiber optic network.

**B. Background:** The City has developed a Fiber Optic Master Plan and has been installing conduit in select locations throughout the City to prepare the framework for the implementation of a fiber optic network. This network will provide for the fast and secure communication to all City Facilities and signals for monitoring, systems control, and data acquisition. When the City installs conduit, extra conduit is typically installed to facilitate the ability to lease and trade with Fiber Optic Companies to leverage these assets and quickly expand the City's Fiber Optic infrastructure in a cost effective manner.

Avative has identified that they would like to exchange with the City one of the conduits installed along the Future Pony Express alignment from Riverside Drive to the intersection of Saratoga Road and 145 North in exchange for the installation of approximately \$45,000 worth of improvements including about 560-LF of new conduit near the public works office, about 1,600 LF of conduit along Saratoga road just north of the new police station, and the installation of about 5,100-LF of fiber optic cable from the police station to the public works office.

**C. Analysis:** This exchange will provide a direct fiber optic connection for the public works office to the servers at City Hall via Avatives fiber optic system. This will also allow Public Works to begin making hardwire SCADA connections to our facilities throughout the City wherever there is an existing City or Avative fiber optic line in the vicinity. This will provide a faster and more secure connection for both the City Server and our Facilities via SCADA. The exchange of assets will be of similar value with Avative acquiring approximately 7,660 LF of 1.25" conduit valued at \$3/LF and the City receiving improvements valued at \$46,769.60.

**D. Fiscal Impact:** This lease agreement has no financial obligations for the City. The conduit to be traded with Avative has already been installed and there are no ongoing maintenance obligations on behalf of the City.

**E. Recommendation:** Staff recommends that the City Council approve Resolution R20-37 (8-4-20) authorizing the City Manager to enter into an agreement with Avative to exchange existing conduit for the improvements needed to connect the public works office to Fiber Optic System.

# LightLink

COMMUNICATIONS

## Estimate

Date	Estimate #
6/26/2020	3075

<b>Customer</b>
Saratoga Springs City 1307 N Commerce Drive Suite 200 Saratoga Springs, Utah 84045

2947 E Fort Hill Rd  
Eagle Mountain, UT 84005

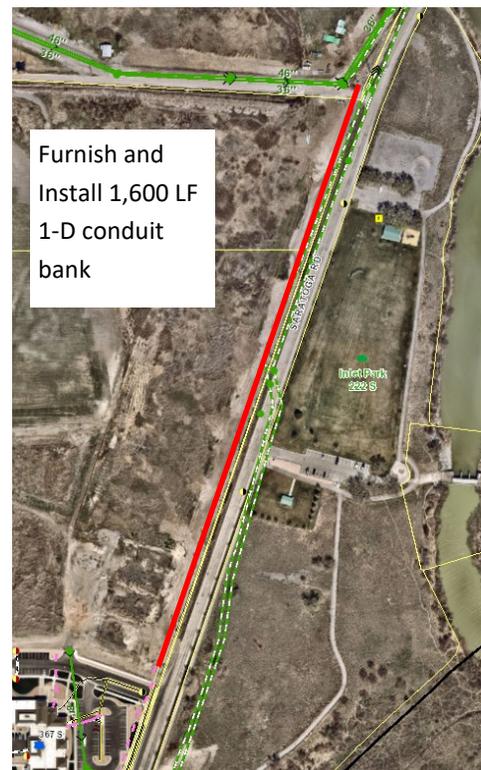
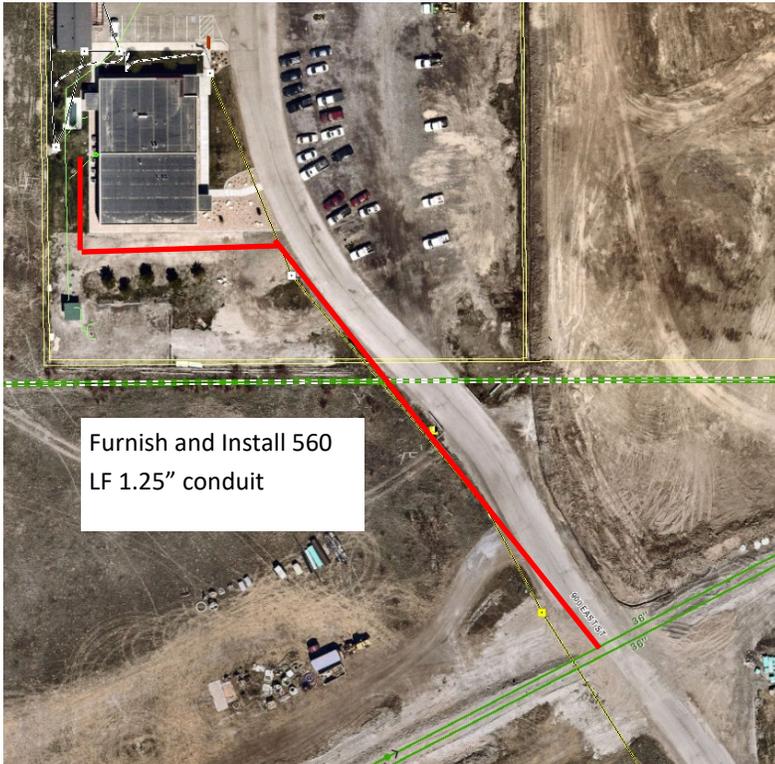
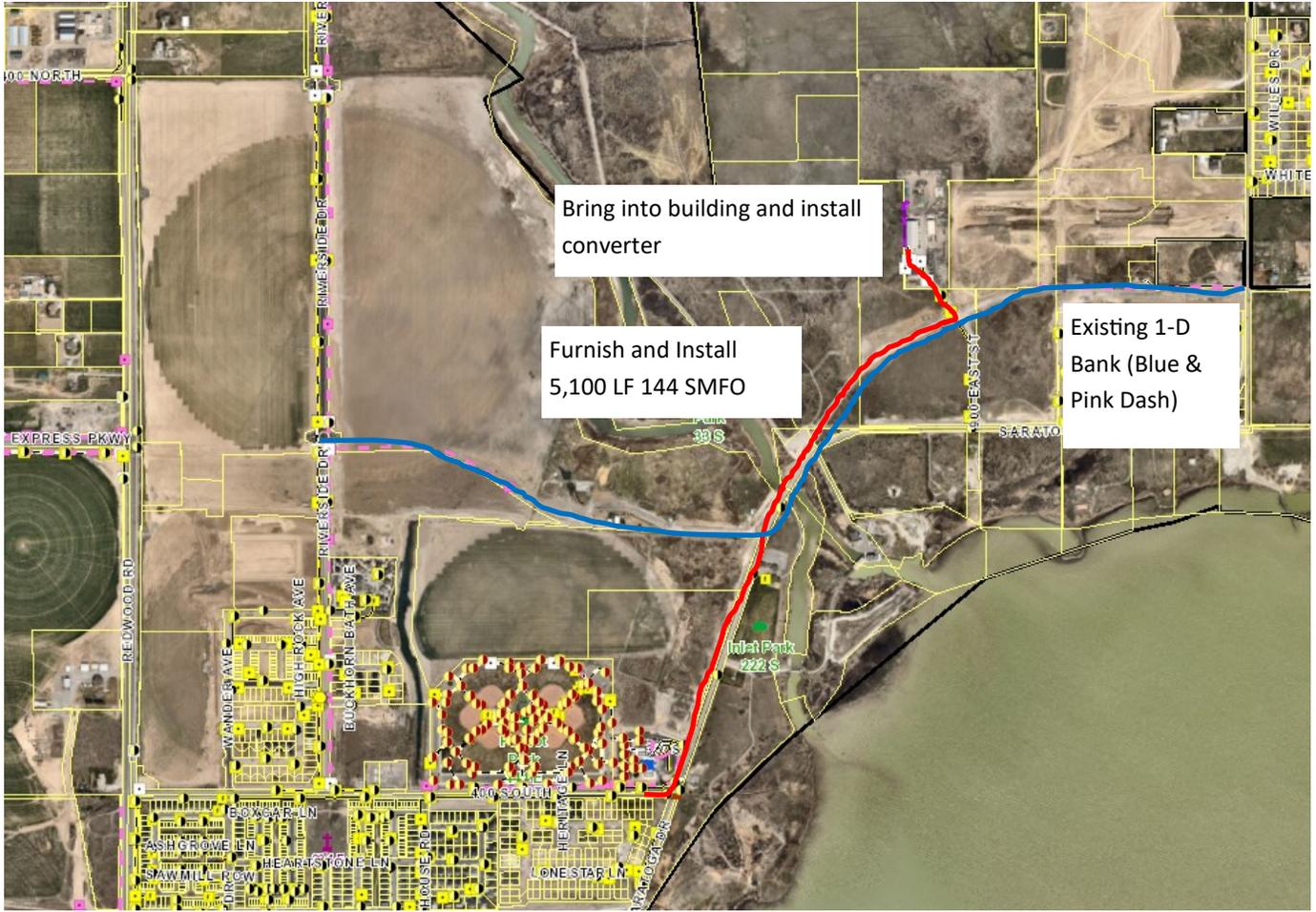
Phone 801-318-9948  
Fax 801-766-4231  
cory@lightlinkinc.com

<b>Terms</b>

Qty	Description	Cost	Total
	SARATOGA PUBLIC WORKS HOOK-UP PROPOSAL		
1,600	BORE 1-D CONDUIT	14.76	23,616.00
560	BORE 1-1.25" CONDUIT	13.21	7,397.60
1	BUILDING ENTRANCE, CORE, RISER, BOX, LB	2,700.00	2,700.00
5,100	FURNISH AND INSTALL 144 CT FIBER	2.56	13,056.00
<b>Total</b>			\$46,769.60

Exhibit A

Saratoga Public Works Hook-up Proposal



**RESOLUTION NO. R20-37 (8-4-20)**

**RESOLUTION OF THE CITY OF SARATOGA SPRINGS, UTAH  
AUTHORIZING THE CITY MANAGER TO ENTER INTO AN AGREEMENT WITH  
AVATIVE FOR THE EXCHANGE OF CONDUIT FOR FIBER-OPTIC IMPROVMENTS**

**WHEREAS**, The City of Saratoga Springs owns a 1-D bank (4 - 1.25” conduits) along the future alignment of Pony Express Parkway between Riverside Drive and Saratoga Road; and

**WHEREAS**, Avative desires to acquire one of these conduits for the purpose of installing a fiber optic communications system to service the residents of the City; and

**WHEREAS**, The City is willing to allow Avative to possess one of these conduits in exchange for the installation of improvements (“Improvements”) necessary to connect the existing public works office to the existing fiber optic system at the police station located at the intersection of 400 South and Saratoga Road; and

**WHEREAS**, the Improvements shall include 560 LF of 1.25” conduit, 1,600 LF of 1-D bank (4 - 1.25” conduits), and 5,100 LF of Single Mode Fiber Optic (SMFO) cable at the locations shown on Exhibit A; and

**WHEREAS**, The Improvements shall be furnished and installed by Avative within 3 months of the execution of an agreement between the City and Avative.

**NOW THEREFORE, BE IT RESOLVED** by the City Council of the City of Saratoga Springs, Utah that the City Manager is hereby authorized to enter into an agreement with Avative in accordance with the to the terms and conditions identified above. This resolution shall take effect immediately upon passage.

**PASSED AND APPROVED** this 4<sup>th</sup> day of August, 2020.

City of Saratoga Springs

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Jim Miller, Mayor

ATTEST:

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Cindy LoPiccolo, City Recorder

# City Council Staff Report

**Author:** Gordon Miner, City Engineer

**Subject:** Reimbursement Agreement for Saratoga Springs Commercial Plat E

**Date:** Aug 04, 2020

**Type of Item:** Legislative Action



1. **Summary:** The developer of the Subject plats, Westlake Partners, LLC, will install City system improvements.
2. **Funding Sources:** Impact fee credits, impact fee funds and cash in a funded budget cycle.
  - A. Drinking Water: \$0
  - B. Secondary Water: \$13,867.92
  - C. Sewer: \$0
  - D. Storm Drain: \$4,990.67
  - E. Open Space (Trails): \$0

3. **Review:**

The engineering plans were accepted for construction. The Engineering Department found the improvements listed in the reimbursement agreement to be consistent with the accepted engineering plans. The City Attorney found the agreement to be acceptable as to form.

4. **Alternatives:** The following alternative motions are available to the Council in consideration of the proposed reimbursement agreement:

**Adoption**

“I move to approve the attached resolution for the City to enter into this reimbursement agreement with Westlake Partners, LLC for system improvements being installed with the Subject development.”

**Alternative Motion with Modifications**

“I move to approve the attached resolution for the City to enter into this reimbursement agreement with Westlake Partners, LLC for system improvements being installed with the Subject development, with the following modifications:”

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

**Negative Motion**

“I move to deny the attached resolution for the City to enter into this reimbursement agreement.”

**5. Attachments:**

- A. Proposed Reimbursement Agreement
- B. Proposed Resolution

**REIMBURSEMENT AGREEMENT AND RELEASE OF ALL CLAIMS**

This Reimbursement Agreement and Release of All Claims (hereinafter “Agreement”) is made and entered into as of the \_\_\_ day of \_\_\_\_\_, 2020, by and between CITY OF SARATOGA SPRINGS, a Utah municipal corporation, (the “City”), and Westlake Partners, LLC, a Utah Limited Liability Corporation (the “Developer”).

**RECITALS:**

**WHEREAS**, Developer is developing subdivisions within the City, which subdivision plats will be recorded as Saratoga Springs Commercial Plat E (“Project”); and

**WHEREAS**, the Project requires certain facilities and improvements including roadway, water, irrigation, sewer, storm drain, and other improvements; and

**WHEREAS**, Developer has agreed to complete certain improvements (“System Improvements”) within the Project above and beyond what is required to service the Project, which are more particularly described in Exhibit A, attached hereto and by this reference made a part hereof; and

**WHEREAS**, the System Improvements will provide capacity that benefits neighboring properties and the City; and

**WHEREAS**, the System Improvements will result in additional costs and the City wishes to provide Developer reimbursements as consideration and in satisfaction in whole of any additional expenses incurred by Developer relating to the System Improvements that will benefit other neighboring properties and the City;

**NOW, THEREFORE**, in consideration of the mutual covenants contained herein, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties hereby agree as follows:

**AGREEMENT**

**1. CONSIDERATION**

As a compromise and full settlement of all claims which Developer may have against the City with respect to the installation of all improvements for the Project, whether or not such improvements are System Improvements, Developer agrees to accept the consideration provided for in this Agreement and to withdraw with prejudice and waive any and all claims it may have against the City for compensation, reimbursement, capacity reservations, and credits with regard to the System Improvements and other improvements required for the Project. Developer agrees to comply with the provisions in this Agreement and to install the System Improvements.

**2. REIMBURSABLE EXPENSES**

Developer and City hereby agree that Developer’s bid attached hereto as Exhibit A, which is incorporated herein by this reference, enumerates in full the estimated additional expenses incurred by Developer to install the System Improvements which are eligible for reimbursement (the “Reimbursable Expenses”).

Subject to the terms of this agreement, Developer agrees to accept a reimbursement in an amount up to the Total Eligible Expenses of \$58,191.22 (“Reimbursement” or “Reimbursement Amount”) as satisfaction in whole of City’s obligations under this agreement and with respect to the installation of Project and System Improvements.

### **3. ADDITIONAL TERMS OF REIMBURSEMENT**

As material consideration of the Reimbursement, installation of the System Improvements, and other provisions of this Agreement, Developer and City agrees as follows:

- A. Reimbursement shall be primarily based upon the unit prices and quantities specified in Exhibit A. Exhibit A represents plan quantities while final reimbursement shall be based on the actual quantities and measurements of work performed during the installation of the System Improvements as evidenced by material tickets and invoices. In no case shall the City be obligated to reimburse Developer for an item until sufficient evidence is provided as to the actual quantities and prices of the installed and accepted System Improvements. In addition, in no case shall the City be obligated to reimburse Developer for expenses that exceed ten (10) percent of the Reimbursement Amount. Further, in no case shall City reimburse Developer for any labor, products, tools, equipment, plant, transportation, services, incidentals, erection, installation costs, overhead, or any item not listed in Exhibit A. Prior to reimbursement, the following requirements must be met:
  - i. Developer shall submit a request for reimbursement in writing after full installation.
  - ii. Prior to any reimbursement, Developer shall post applicable performance and warranty bonds in accordance with City ordinances to guarantee the installation and workmanship of the System Improvements and to ensure that the System Improvements remain in good condition and free from defects for a period of one (1) year, in accordance with City ordinances, regulations, and standards.
  - iii. Prior to any reimbursement, City must approve the System Improvements in writing in connection with the standard inspections conducted by City to ensure that the System Improvements are constructed per City standards.
  - iv. Prior to any reimbursement, Developer shall deliver a certified set of as-built plans (in both paper and electronic format) along with the verified actual costs of construction of the Improvements.
  - v. City shall first issue impact fee credits for up to the Reimbursement Amount. If the Reimbursement Amount exceeds the impact fees for which Developer is required to pay, the City shall issue payment to Developer for the remaining amount, subject to the availability of funds and all City polices and state law requirements with respect to budgeting for capital expenses.

### **4. MUTUAL RELEASE OF CLAIMS**

In return for the Reimbursement and installation of the System Improvements, as well as all other promises, covenants, and consideration in this Agreement, the receipt and sufficiency of which is hereby acknowledged and accepted, each party hereby fully and completely releases and forever discharges the other party, its elected officials, officers, agents, servants, employees, and former elected officials, officers,

agents, servants, and employees from any and all claims, damages, and demands of every nature whatsoever which were asserted, could have been asserted, or will be asserted by either party arising out of and pertaining to each party's obligations for the System Improvements and other project improvements, including but not limited to any claims for impact fee credits, illegal exactions, reimbursements, or credits because of Developer's installation of the System Improvements or project improvements.

## **5. AUTHORITY TO SETTLE; INDEMNIFICATION**

As an express condition of this Agreement, the signor below represents and warrants that he and Developer:

- A. have the power to enter into and perform this Agreement;
- B. are the lawful representatives of the Developer;
- C. are the sole owner(s), assignee(s), heir(s), obligor(s), beneficiary(ies), etc. of the Project and the consideration in this Agreement;
- D. have not transferred, assigned, or sold, or promised to transfer, assign, or sell their interest in the Project; and
- E. shall indemnify, defend, and hold harmless the City with respect to any future claim related to this Agreement and with respect to any claim against the City for compensation, reimbursement, reservation of capacities, and credits for the installation of the System Improvements or project improvements brought against the City by any party, person, entity, corporation, homeowners association, government entity, third party, etc.

## **6. PARTIES REPRESENTATIVES; NOTICES**

All notices, demands, and requests required or permitted to be given hereunder shall be in writing and shall be deemed duly given if delivered in person or after three business days if mailed by registered or certified mail, postage prepaid, addressed to the following:

If to Developer:

Westlake Partners LLC  
Attn: Daniel Schmidt  
5455 W 11000 N Ste 202  
Highland, UT 84003  
Telephone: (801) 787-5598  
Facsimile: (801) 231-5732

If to City:

City of Saratoga Springs  
Attn: City Manager – Mark Christensen  
1307 N. Commerce Drive, Suite 200  
Saratoga Springs, Utah 84045  
Telephone: (801) 766-9793  
Facsimile: (801) 766-9794

Either party shall have the right to specify in writing another name or address to which subsequent notices to such party shall be given. Such notice shall be given as provided above.

**7. COMPLETE AGREEMENT, MODIFICATION**

This Agreement, together with the attached exhibits, constitutes the entire agreement between the parties and supersedes and replaces any and all prior negotiations, representations, warranties, understandings, contracts, or agreements, whether written or oral, between the parties on all matters. This Agreement cannot be modified except by written agreement between the Parties.

**8. SETTLEMENT**

The undersigned certifies that he or she has read this Agreement, that it:

- A. voluntarily enters into it of its own free will;
- B. has had ample opportunity to review this Agreement with legal counsel;
- C. is a legally incorporated entity;
- D. has performed all corporate formalities to execute this Agreement; and
- E. accepts the consideration set forth herein is in full accord and satisfaction of claims which it may have with respect to the subject matter.

**9. ATTORNEY FEES**

Each party hereto shall bear its own attorneys' fees and costs arising from the actions of its own counsel in connection with this Agreement and the subject matter. In any action of any kind relating to this Agreement, the prevailing party shall be entitled to collect reasonable attorneys' fees and costs from the non-prevailing party in addition to any other recovery to which the prevailing party is entitled.

**10. GOVERNMENTAL IMMUNITY**

Nothing in this Agreement shall adversely affect any immunity from suit, or any right, privilege, claim, or defense, which the City or its employees, officers, and directors may assert under state or federal law, including but not limited to The Governmental Immunity Act of Utah, Utah Code Ann. §§ 63G-7-101 et seq., (the "Act"). All claims against the City or its employees, officers, and directors are subject to the provisions of the Act, which Act controls all procedures and limitations in connection with any claim of liability.

**11. MISCELLANEOUS PROVISIONS**

- A. If, after the date hereof, any provision of this Agreement is held to be invalid, illegal, or unenforceable under present or future law effective during its term, such provisions shall be fully severable. In lieu thereof, there shall be added a provision, as may be possible, that give effect to the original intent of this Agreement and is legal, valid, and enforceable.
- B. The validity, construction, interpretation, and administration of this Agreement shall be governed by the laws of the State of Utah.
- C. All titles, headings, and captions used in this Agreement have been included for administrative convenience only and do not constitute matters to be construed in interpreting this Agreement.
- D. This Agreement and release given hereunder shall be effective upon execution by both parties.

**IN WITNESS WHEREOF**, the parties hereto have executed this Reimbursement Agreement by and through their respective, duly authorized representatives as of the day and year first above written.

ATTEST:

**CITY OF SARATOGA SPRINGS**

By: \_\_\_\_\_  
City Recorder

\_\_\_\_\_  
City Manager

Approved as to Form: \_\_\_\_\_  
City Attorney

**DEVELOPER**

By: \_\_\_\_\_

Its: \_\_\_\_\_

State of Utah            )  
                                  :ss  
County of Utah         )

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, personally appeared before me \_\_\_\_\_, whose identity is personally known to me or proved to me on the basis of satisfactory evidence, and who affirmed that he/she is the authorized representative of \_\_\_\_\_, a Utah \_\_\_\_\_, and said document was signed by him/her in behalf of said company/corporation by proper authority, and he/she acknowledged to me that said company/corporation executed the same.

\_\_\_\_\_  
Notary Public



**Saratoga Springs Plat E City Reimbursement Calculations (Sunroc Numbers)**

77' Collector ROW					59' Local Roadway ROW				
	Amount	Unit Cost	Measurement	Total Costs		Amount	Unit Cost	Measurement	Total Costs
<b>Road</b>									
Curb and Gutter 30"	905	\$ 29.75	lf	\$ 26,923.75	Curb and Gutter 2'	810	\$ 25.00	lf	\$ 20,250.00
5" Thick Sidewalk	4568	\$ 7.00	sf	\$ 31,976.00	5" Thick Sidewalk	4089	\$ 7.00	sf	\$ 28,632.00
backfill curb	453	\$ 5.50	lf	\$ 2,491.50	backfill curb	358	\$ 5.50	lf	\$ 1,969.00
Asphalt 4"	20028	\$ 2.00	sf	\$ 40,056.00	Asphalt 3"	13200	\$ 1.60	sf	\$ 21,120.00
Road Base 8"	20028	\$ 0.09	sf	\$ 18,025.20	Road Base 8"	13200	\$ 0.90	sf	\$ 11,880.00
Granular Burrow 12"	817	\$ 26.50	cy	\$ 21,650.50	Granular Burrow 12"	538	\$ 26.50	cy	\$ 14,257.00
Striping	1	\$ 1,050.00	ls	\$ 1,050.00	Striping	1	\$ 1,050.00	ls	\$ 1,050.00
<b>Total</b>				<b>\$142,172.95</b>	<b>Total</b>				<b>\$ 99,158.00</b>

Earth Work					Earth Work				
Saw Cutting	62	\$ 1.60	lf	\$ 99.20	Saw Cutting	62	\$ 1.60	lf	\$ 99.20
Clear and Grub	773	\$ 8.75	cy	\$ 6,763.75	Clear and Grub	773	\$ 8.75	cy	\$ 6,763.75
Roadway ex placed on lots	118	\$ 6.50	cy	\$ 1,222.00	Roadway ex placed on lots	118	\$ 6.50	cy	\$ 1,222.00
imported fill	1381	\$ 26.00	cy	\$ 35,906.00	imported fill	1313	\$ 26.00	cy	\$ 34,138.00
place trench spoils on lot	500	\$ 2.75	cy	\$ 1,375.00	place trench spoils on lot	500	\$ 2.75	cy	\$ 1,375.00
Site grading	41780	\$ 0.10	sf	\$ 4,178.00	Site grading	41780	\$ 0.10	sf	\$ 4,178.00
<b>Total</b>				<b>\$49,543.95</b>	<b>Total</b>				<b>\$ 47,775.95</b>

Storm Drain					Storm Drain				
15" RCP	422	\$ 52.25	lf	\$ 22,049.00	15" RCP	395	\$ 52.25	lf	\$ 20,638.75
Combo Box	2	\$ 7,550.00	ea	\$ 15,100.00	Combo Box	2	\$ 7,550.00	ea	\$ 15,100.00
Curb Inlet	2	\$ 3,450.00	ea	\$ 6,900.00	Curb Inlet	2	\$ 3,450.00	ea	\$ 6,900.00
15" concrete end section	1	\$ 800.00	ea	\$ 800.00	15" concrete end section	1	\$ 800.00	ea	\$ 800.00
Imported Back fill	325	\$ 11.75	ton	\$ 3,818.75	Imported Back fill	318	\$ 11.75	ton	\$ 3,736.50
<b>Total</b>				<b>\$48,667.75</b>	<b>Total</b>				<b>\$ 47,175.25</b>

Culinary Water					Culinary Water				
12" C-900	456	\$ 39.75	lf	\$ 18,126.00	8" C900	468	\$ 35.00	lf	\$ 16,380.00
8" C900	12	\$ 35.00	lf	\$ 420.00	6" C-900	89	\$ 24.00	lf	\$ 2,136.00
6" C-900	89	\$ 24.00	lf	\$ 2,136.00	2" Service	1	\$ 7,875.00	Each	\$ 7,875.00
2" Service	1	\$ 7,875.00	Each	\$ 7,875.00	Misc Valves and Fittings	5	\$ 1,800.00	Each	\$ 9,000.00
Misc Valves and Fittings	5	\$ 2,157.00	Each	\$ 10,875.00	12" blow off	1	\$ 3,600.00	each	\$ 3,600.00
12" Blowoff	1	\$ 3,600.00	Each	\$ 3,600.00	8" Stub and Plug w/blow off	1	\$ 3,525.00	Each	\$ 3,525.00
8" Stub and Plug w/blow off	1	\$ 3,525.00	Each	\$ 3,525.00	Fire hydrant	2	\$ 7,350.00	Each	\$ 14,700.00
Fire hydrant	2	\$ 7,350.00	Each	\$ 14,700.00	Imported Trench backfill	318	\$ 11.75	Ton	\$ 3,736.50
Imported Trench backfill	318	\$ 11.75	TON	\$ 3,736.50	Connect to existing	1	\$ 2,200.00	Each	\$ 2,200.00
Connect to existing	1	\$ 2,200.00	Each	\$ 2,200.00	<b>Total</b>				<b>\$ 63,152.50</b>
<b>Total</b>				<b>\$67,193.50</b>					

Secondary Water					Secondary Water				
12" c909	456	\$ 39.75	LF	\$18,126.00	6" c909	456	\$ 25.00	lf	\$ 11,400.00
2" service	1	\$ 3,625.00	Each	\$3,625.00	2" service	1	\$ 3,625.00	Each	\$ 3,625.00
Misc Vavles	1	\$ 3,575.00	Each	\$3,575.00	Misc Vavles	1	\$ 2,426.23	Each	\$ 2,426.23
Connect to Existing	1	\$ 2,200.00	Each	\$2,200.00	Connect to Existing	1	\$ 2,200.00	Each	\$ 2,200.00
12" Stub and Plug w/blow off	1	\$ 3,600.00	Each	\$3,600.00	6" Stub and Plug w/blow off	1	\$ 3,600.00	Each	\$ 3,600.00
Imported Backfill	223	\$ 11.75	LF	\$2,620.25	Imported Backfill	223	\$ 11.75	Ton	\$ 2,620.25
Tail water ditch	490	\$ 21.50	LF	\$10,535.00	Tail water ditch	490	\$ 21.50	LF	\$ 10,535.00
<b>Total</b>				<b>\$44,281.25</b>	<b>Total</b>				<b>\$ 36,406.48</b>

Cost Difference	
Road	\$43,014.95
Earth Work	\$1,768.00
Storm Drain	\$1,492.50
Water Main	\$4,041.00
Secondary Water Main	\$7,874.77
<b>Total City Reimbursement</b>	<b>\$58,191.22</b>



# SUNROC CORPORATION

## CONSTRUCTION DIVISION

525 ARROWHEAD TRAIL, SPANISH FORK, UTAH 84660 (801) 722-2100

### CONTRACT PROPOSAL

<b>Customer:</b> Western Paving Inc <b>Address:</b>	<b>Contact:</b> Thomas Lehnardt <b>Phone:</b> <b>Fax:</b>
<b>Project:</b> Plat E 59' ROW w/ Pricing <b>Project Location:</b> Saratoga Springs, UT	<b>Addendum:</b> <b>Date:</b> 7.22.20

SUNROC CORPORATION MAY WITHDRAW THIS PROPOSAL IF WRITTEN ACCEPTANCE IS NOT RECEIVED FROM THE BUYER WITHIN 30 DAYS OF THE PROPOSAL DATE

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
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-General Conditions

-Erosion Control

-Earthwork

210	Sawcutting	62.000	LF	\$ 1.60	\$ 99.20
220	Clear & Grub	773.000	CY	\$ 8.75	\$6,763.75
230	Roadway Ex- Place on Lots	188.000	CY	\$ 6.50	\$1,222.00
240	Imported Fill	1,313.000	CY	\$ 26.00	\$34,138.00
250	Place Trench Spoils on Lot	500.000	CY	\$ 2.75	\$1,375.00
260	Site Grading - Site	41,780.000	SF	\$ 0.10	\$4,178.00
<b>*** Earthwork Total ***</b>					<b>\$47,775.95</b>

-Storm Drain

310	15" RCP (5-7' Deep)	395.000	LF	\$ 52.25	\$20,638.75
320	Combo Box	2.000	EA	\$7,550.00	\$15,100.00
330	Curb Inlet	2.000	EA	\$3,450.00	\$6,900.00
340	15" Concrete End Section	1.000	EA	\$ 800.00	\$ 800.00
350	Imported Trench Backfill	318.000	TON	\$ 11.75	\$3,736.50
<b>*** Storm Drain Total ***</b>					<b>\$47,175.25</b>

-Culinary Water

410	8" C-900	468.000	LF	\$ 35.00	\$16,380.00
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ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
415	6" C-900	89.000	LF	\$ 24.00	\$2,136.00
420	2" Culinary Service	1.000	EA	\$7,875.00	\$7,875.00
425	Misc Valves & Fittings	5.000	EA	\$1,800.00	\$9,000.00
432	Connect to Existing	1.000	EA	\$2,200.00	\$2,200.00
435	12" Blowoff	1.000	EA	\$3,600.00	\$3,600.00
440	8" Blowoff	1.000	EA	\$3,525.00	\$3,525.00
445	12" x 6" Fire Hydrant Saratoga	2.000	EA	\$7,350.00	\$14,700.00
450	Imported Trench Backfill	318.000	TON	\$ 11.75	\$3,736.50
<b>*** Culinary Water Total ***</b>					<b>\$63,152.50</b>

**-Pressurized Irrigation**

510	6" C-909	456.000	LF	\$ 25.00	\$11,400.00
520	2" Secondary Service	1.000	EA	\$3,625.00	\$3,625.00
530	Misc Valves and Fittings	1.000	EA	\$2,426.23	\$2,426.23
540	Connect to Existing	1.000	EA	\$2,200.00	\$2,200.00
550	12" Blowoff	1.000	EA	\$3,600.00	\$3,600.00
560	Imported Trench Backfill	223.000	TON	\$ 11.75	\$2,620.25
570	New Tail Water Ditch	490.000	LF	\$ 21.50	\$10,535.00
<b>*** Secondary Water Total ***</b>					<b>\$36,406.48</b>

**-Sanitary Sewer**

**-Asphalt/Roadbase**

710	24" Curb & Gutter	810.000	LF	\$ 25.00	\$20,250.00
720	5" Thick Sidewalk	4,089.000	SF	\$ 7.00	\$28,623.00
730	Backfill Curb/Subgrade Walk	358.000	LF	\$ 5.50	\$1,969.00
740	3" Asphalt Paving	13,200.000	SF	\$ 1.60	\$21,120.00
750	8" Road Base	13,200.000	SF	\$ 0.90	\$11,880.00
760	12" Subbase	538.000	CY	\$ 26.50	\$14,257.00
770	Striping	1.000	LS	\$1,050.00	\$1,050.00
<b>*** Asphalt Paving Total ***</b>					<b>\$99,149.00</b>

**-Electrical**

810	Light Pole, Trenching, Backfill, Base, Base	4.000	LF	\$22,000.00	\$88,000.00
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**NOTES & EXCLUSIONS:**

Proposal based on plans dated 2.25.20

Earthwork & utilities are bid as a package. We are willing to do the earthwork as a standalone number, but not the utilities.

Excludes the purchase of payment or performance bonds

Earthwork quantities are based on grades as shown on the drawings. If the onsite grades vary from the grades on the plans, we reserve the right to adjust our pricing accordingly

Amount paid to be based on actual field installed quantities

All Utilities are bid to within 5' of the building

Excludes SWPPP plan/NOI permit/erosion control inspections

Excludes engineering & surveying  
Excludes material testing (compaction, concrete, asphalt, etc.)  
Excludes city connection fees  
Excludes monument survey and installation  
Excludes footing overexcavation and backfill  
Excludes removal of undocumented fill, pinhole material and non-engineered fill  
Excludes water loops  
Excludes dewatering  
Imported material will be billed by delivery tickets  
Excludes any demolition of existing homes or structures  
Tree removal to be done by others if required  
Proposal for grading is for ROW only, no lot grading included  
Excludes sweeping for trackout generated by other trades  
Excludes purchase or installation of vapor barrier  
Excludes traffic control  
Excludes bollard excavation and backfill  
Excludes screening and placing of topsoil  
Excludes shoring or bracing of excavation other than trenches  
Excludes signage and striping  
Excludes prime coat, fog coat or seal coat for the asphalt paving  
Sunroc is not responsible for surface drainage issues on grades designed at less than 1.5%  
Proposal for items specifically included as line items above

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**ADDITIONAL TERMS AND CONDITIONS OF AGREEMENT**

1. Purchaser represents to be the record owner or authorized agent of the record owner of the real property that shall be improved pursuant to this Agreement (the "Property") with authority to enter into contractual agreements and to grant SUNROC authority to perform the work identified herein. The Purchaser agrees that all materials in this Agreement will be used in the construction, alteration, or improvement of the Property. Purchaser shall not use this document to acquire financing.
2. This Contract Proposal/Agreement shall only be modified by written change order signed by SUNROC and Purchaser. Oral requests for change shall not be binding on SUNROC unless reduced to writing by change order.
3. Purchaser shall assume full responsibility for the accuracy of all lines, levels, quantities, locations and measurements and their relation to the work to be performed by SUNROC. No representation or warranty, express or implied, is made as to the quantities, sizes, grades, specifications, or other matters relating to the needs of the project. In all cases where dimensions are governed by conditions, already established or otherwise, the responsibility for coordination of such conditions as it relates to SUNROC's work shall rest entirely on the Purchaser. It is the Purchaser's sole responsibility to compare the items on this Contract Proposal/Agreement with plans and specifications for accuracy and completeness. Any variations or modifications from specified lines, grades or dimensions required shall be the responsibility of the Purchaser and subject to a change order should additional work be required of SUNROC.
4. In the event the record owner of the Property sells, mortgages, or otherwise transfers or encumbers the Property, the total amount herein provided shall become immediately due and payable as to any and all amounts then unpaid.
5. Purchaser agrees that all alleged defects in work, material or labor shall be made in writing to SUNROC within ten (10) calendar days of the date of the billing invoice for the work performed. If said writing has not been made within the time period specified herein, Purchaser waives any right to claim defects and/or offsets for these alleged defects. In the event of defective work, SUNROC's sole and exclusive liability shall be to repair or replace defective work at its discretion. In no event shall SUNROC be liable for special, incidental, or consequential damages, including, but not limited to, loss of good will, loss of profits, or loss of use.
6. In the event that material costs on which this Contract Proposal/Agreement is based rise in excess of fifteen percent (15%) during the course of work, Purchaser agrees that these increased costs, in their entirety, shall be billed to Purchaser as an automatic adjustment to the Contract Proposal/Agreement.
7. To the extent that the contracted price is based on a specified unit or square foot price, Purchaser agrees that the number of units or square feet indicated is an approximation, and that SUNROC shall be paid in full for the actual units or square feet completed as determined by field measurement by SUNROC.
8. SUNROC shall not be liable for failure of performance or failure of delay in delivery by reason of any event beyond the control of SUNROC, including, but not limited to, strikes; labor disputes; fire; flood; weather; embargo; war or other hostilities; government authority or regulation; acts of God; shortage of material or fuel; as a result of actions of Purchaser, record owner, or any other person; or as a result of the extension of time granted by Purchaser. Upon the occurrence of such delay, SUNROC shall receive an equitable extension of time for completion of the Agreement. SUNROC shall not be entitled to any damages or compensation as a result of said delay except to the extent that said delay was caused by the Purchaser, record owner, or persons employed by the Purchaser or record owner.
9. SUNROC assumes no risk of non-disclosed or unforeseen conditions of the Property, including, but not limited to, hazardous substances (as defined by applicable law). In the event that hazardous substances are present on the Property (other than hazardous substances introduced by SUNROC), Purchaser agrees to indemnify SUNROC and its officers, directors, employees, agents, representatives, and subcontractors from and against any and all losses, claims, damages, fines, penalties, liabilities, injuries, costs and expenses (including all attorney fees and costs incurred in any civil, criminal, or administrative proceeding) arising from such hazardous substances, including, but not limited to, the presence or use, generation, storage, treatment, containment, release, threatened release, disposal of, exposure, or threatened exposure.
10. Unless otherwise noted, all federal, state, and other taxes of any nature related to this Agreement shall be borne by Purchaser.
11. SUNROC warrants that all materials covered by this Agreement shall conform to industry standards. No implied warranties of fitness or merchantability are given and are expressly disclaimed by SUNROC.
12. The parties agree that the prevailing party in any lawsuit arising from or as a result of this Agreement, whether the action is based on the Agreement's terms and provisions or on any other theory of liability, shall be entitled to an award of attorney fees and costs incurred in said action.
13. This Contract Proposal/Agreement is the total agreement and supersedes all negotiations, representations, prior discussions, and preliminary agreements between the Parties hereto, whether oral or written. This Agreement shall be construed and interpreted as if drafted equally by all Parties hereto.
14. This Agreement shall be governed by the laws of the Local State where the project resides, without regard to its choice of law provisions.

<p><b>ACCEPTED:</b>                  The above prices and specifications are satisfactory and hereby accepted.                  Buyer: _____                  Signature: _____                  Date of Acceptance: _____</p>	<p><b>CONFIRMED:</b>  <b>SUNROC CORPORATION</b>                  Authorized Signature: _____                  Estimator:                  Estimate #: 20UT073A</p>
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# SUNROC CORPORATION

## CONSTRUCTION DIVISION

525 ARROWHEAD TRAIL, SPANISH FORK, UTAH 84660 (801) 722-2100

### CONTRACT PROPOSAL

<b>Customer:</b> Western Paving Inc <b>Address:</b>	<b>Contact:</b> Thomas Lehnardt <b>Phone:</b> <b>Fax:</b>
<b>Project:</b> Saratoga Springs Plat E Rev1 <b>Project Location:</b> Saratoga Springs	<b>Addendum:</b> <b>Date:</b> 7.23.20

SUNROC CORPORATION MAY WITHDRAW THIS PROPOSAL IF WRITTEN ACCEPTANCE IS NOT RECEIVED FROM THE BUYER WITHIN 30 DAYS OF THE PROPOSAL DATE

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
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**-General Conditions**

**-Erosion Control**

**-Earthwork**

210	Sawcutting	62.000	LF	\$ 1.60	\$ 99.20
220	Clear & Grub	773.000	CY	\$ 8.75	\$6,763.75
230	Roadway Ex- Place on Lots	188.000	CY	\$ 6.50	\$1,222.00
240	Imported Fill	1,381.000	CY	\$ 26.00	\$35,906.00
250	Place Trench Spoils on Lot	500.000	CY	\$ 2.75	\$1,375.00
260	Site Grading - Site	41,780.000	SF	\$ 0.10	\$4,178.00
<b>*** Earthwork Total ***</b>					<b>\$49,543.95</b>

**-Storm Drain**

310	15" RCP (5-7' Deep)	422.000	LF	\$ 52.25	\$22,049.50
315	18" ADS (5-7' Deep)	10.000	LF	\$ 72.50	\$ 725.00
320	Combo Box	2.000	EA	\$7,550.00	\$15,100.00
330	Curb Inlet	2.000	EA	\$3,450.00	\$6,900.00
335	5x5 Box w/ Screw Gates	1.000	EA	\$10,875.00	\$10,875.00
340	15" Concrete End Section	1.000	EA	\$ 800.00	\$ 800.00
350	Imported Trench Backfill	325.000	TON	\$ 11.75	\$3,818.75
<b>*** Storm Drain Total ***</b>					<b>\$60,268.25</b>

**-Culinary Water**

ITEM	DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
405	12" C-900	456.000	LF	\$ 39.75	\$18,126.00
410	8" C-900	12.000	LF	\$ 35.00	\$ 420.00
415	6" C-900	89.000	LF	\$ 24.00	\$2,136.00
420	2" Culinary Service	1.000	EA	\$7,875.00	\$7,875.00
425	Misc Valves & Fittings	5.000	EA	\$2,175.00	\$10,875.00
432	Connect to Existing	1.000	EA	\$2,200.00	\$2,200.00
435	12" Blowoff	1.000	EA	\$3,600.00	\$3,600.00
440	8" Blowoff	1.000	EA	\$3,525.00	\$3,525.00
445	12" x 6" Fire Hydrant Saratoga	2.000	EA	\$7,350.00	\$14,700.00
450	Imported Trench Backfill	318.000	TON	\$ 11.75	\$3,736.50
<b>*** Culinary Water Total ***</b>					<b>\$67,193.50</b>

**-Pressurized Irrigation**

510	12" C-909	456.000	LF	\$ 39.75	\$18,126.00
520	2" Secondary Service	1.000	EA	\$3,625.00	\$3,625.00
530	Misc Valves & Fittings	1.000	EA	\$3,575.00	\$3,575.00
540	Connect to Existing	1.000	EA	\$2,200.00	\$2,200.00
550	12" Blowoff	1.000	EA	\$3,600.00	\$3,600.00
560	Imported Trench Backfill	223.000	TON	\$ 11.75	\$2,620.25
570	New Tail Water Ditch	490.000	LF	\$ 21.50	\$10,535.00
580	Reroute Existing Irrigation Ditch	128.000	LF	\$ 7.50	\$ 960.00
<b>*** Secondary Water Total ***</b>					<b>\$45,241.25</b>

**-Sanitary Sewer**

**-Asphalt/Roadbase**

710	30" Curb & Gutter	905.000	LF	\$ 29.75	\$26,923.75
720	5" Thick Sidewalk	4,568.000	SF	\$ 7.00	\$31,976.00
730	Backfill Curb/Subgrade Walk	453.000	LF	\$ 5.50	\$2,491.50
740	4" Asphalt Paving	20,028.000	SF	\$ 2.00	\$40,056.00
750	8" Road Base	20,028.000	SF	\$ 0.90	\$18,025.20
760	12" Subbase	817.000	CY	\$ 26.50	\$21,650.50
770	Striping	1.000	LS	\$1,050.00	\$1,050.00
<b>*** Asphalt Paving Total ***</b>					<b>\$142,172.95</b>

**-Electrical**

**NOTES & EXCLUSIONS:**

Proposal based on plans dated 2.25.20

Earthwork & utilities are bid as a package. We are willing to do the earthwork as a standalone number, but not the utilities. Excludes the purchase of payment or performance bonds

Earthwork quantities are based on grades as shown on the drawings. If the onsite grades vary from the grades on the plans, we reserve the right to adjust our pricing accordingly  
Amount paid to be based on actual field installed quantities  
All Utilities are bid to within 5' of the building  
Excludes SWPPP plan/NOI permit/erosion control inspections  
Excludes engineering & surveying  
Excludes material testing (compaction, concrete, asphalt, etc.)  
Excludes city connection fees  
Excludes monument survey and installation  
Excludes footing overexcavation and backfill  
Excludes removal of undocumented fill, pinhole material and non-engineered fill  
Excludes water loops  
Excludes dewatering  
Imported material will be billed by delivery tickets  
Excludes any demolition of existing homes or structures  
Tree removal to be done by others if required  
Proposal for grading is for ROW only, no lot grading included  
Excludes sweeping for trackout generated by other trades  
Excludes purchase or installation of vapor barrier  
Excludes traffic control  
Excludes bollard excavation and backfill  
Excludes screening and placing of topsoil  
Excludes shoring or bracing of excavation other than trenches  
Excludes signage and striping  
Excludes prime coat, fog coat or seal coat for the asphalt paving  
Sunroc is not responsible for surface drainage issues on grades designed at less than 1.5%  
Proposal for items specifically included as line items above

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**ADDITIONAL TERMS AND CONDITIONS OF AGREEMENT**

1. Purchaser represents to be the record owner or authorized agent of the record owner of the real property that shall be improved pursuant to this Agreement (the "Property") with authority to enter into contractual agreements and to grant SUNROC authority to perform the work identified herein. The Purchaser agrees that all materials in this Agreement will be used in the construction, alteration, or improvement of the Property. Purchaser shall not use this document to acquire financing.
2. This Contract Proposal/Agreement shall only be modified by written change order signed by SUNROC and Purchaser. Oral requests for change shall not be binding on SUNROC unless reduced to writing by change order.
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4. In the event the record owner of the Property sells, mortgages, or otherwise transfers or encumbers the Property, the total amount herein provided shall become immediately due and payable as to any and all amounts then unpaid.
5. Purchaser agrees that all alleged defects in work, material or labor shall be made in writing to SUNROC within ten (10) calendar days of the date of the billing invoice for the work performed. If said writing has not been made within the time period specified herein, Purchaser waives any right to claim defects and/or offsets for these alleged defects. In the event of defective work, SUNROC's sole and exclusive liability shall be to repair or replace defective work at its discretion. In no event shall SUNROC be liable for special, incidental, or consequential damages, including, but not limited to, loss of good will, loss of profits, or loss of use.
6. In the event that material costs on which this Contract Proposal/Agreement is based rise in excess of fifteen percent (15%) during the course of work, Purchaser agrees that these increased costs, in their entirety, shall be billed to Purchaser as an automatic adjustment to the Contract Proposal/Agreement.
7. To the extent that the contracted price is based on a specified unit or square foot price, Purchaser agrees that the number of units or square feet indicated is an approximation, and that SUNROC shall be paid in full for the actual units or square feet completed as determined by field measurement by SUNROC.
8. SUNROC shall not be liable for failure of performance or failure of delay in delivery by reason of any event beyond the control of SUNROC, including, but not limited to, strikes; labor disputes; fire; flood; weather; embargo; war or other hostilities; government authority or regulation; acts of God; shortage of material or fuel; as a result of actions of Purchaser, record owner, or any other person; or as a result of the extension of time granted by Purchaser. Upon the occurrence of such delay, SUNROC shall receive an equitable extension of time for completion of the Agreement. SUNROC shall not be entitled to any damages or compensation as a result of said delay except to the extent that said delay was caused by the Purchaser, record owner, or persons employed by the Purchaser or record owner.
9. SUNROC assumes no risk of non-disclosed or unforeseen conditions of the Property, including, but not limited to, hazardous substances (as defined by applicable law). In the event that hazardous substances are present on the Property (other than hazardous substances introduced by SUNROC), Purchaser agrees to indemnify SUNROC and its officers, directors, employees, agents, representatives, and subcontractors from and against any and all losses, claims, damages, fines, penalties, liabilities, injuries, costs and expenses (including all attorney fees and costs incurred in any civil, criminal, or administrative proceeding) arising from such hazardous substances, including, but not limited to, the presence or use, generation, storage, treatment, containment, release, threatened release, disposal of, exposure, or threatened exposure.
10. Unless otherwise noted, all federal, state, and other taxes of any nature related to this Agreement shall be borne by Purchaser.
11. SUNROC warrants that all materials covered by this Agreement shall conform to industry standards. No implied warranties of fitness or merchantability are given and are expressly disclaimed by SUNROC.
12. The parties agree that the prevailing party in any lawsuit arising from or as a result of this Agreement, whether the action is based on the Agreement's terms and provisions or on any other theory of liability, shall be entitled to an award of attorney fees and costs incurred in said action.
13. This Contract Proposal/Agreement is the total agreement and supersedes all negotiations, representations, prior discussions, and preliminary agreements between the Parties hereto, whether oral or written. This Agreement shall be construed and interpreted as if drafted equally by all Parties hereto.
14. This Agreement shall be governed by the laws of the Local State where the project resides, without regard to its choice of law provisions.

<p><b>ACCEPTED:</b>                  The above prices and specifications are satisfactory and hereby accepted.                  Buyer: _____                  Signature: _____                  Date of Acceptance: _____</p>	<p><b>CONFIRMED:</b>  <b>SUNROC CORPORATION</b>                  Authorized Signature: _____                  Estimator:                  Estimate #: 20UT073B</p>
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**RESOLUTION NO. R20-38 (8-4-20)**

**RESOLUTION OF THE CITY OF SARATOGA SPRINGS,  
UTAH, APPROVING A REIMBURSEMENT AGREEMENT  
WITH WESTLAKE PARTNERS LLC**

**WHEREAS**, Developer is developing a subdivision within the City, which subdivision plats will be recorded as Saratoga Springs Commercial Plat E (“Project”); and

**WHEREAS**, the Project requires certain facilities and improvements including roadway, water, irrigation, sewer, storm drain, and other improvements; and

**WHEREAS**, Developer has agreed to complete certain improvements (“System Improvements”) within the Project above and beyond what is required to service the Project, which are more particularly enumerated in the REIMBURSEMENT AGREEMENT AND RELEASE OF ALL CLAIMS attached hereto and by this reference made a part hereof; and

**WHEREAS**, the System Improvements will provide capacity that benefits neighboring properties and the City; and

**WHEREAS**, the System Improvements will result in additional costs and the City wishes to provide Developer reimbursements as consideration and in satisfaction in whole of any additional expenses incurred by Developer relating to the System Improvements that will benefit other neighboring properties and the City.

**NOW THEREFORE, BE IT RESOLVED** by the City Council of the City of Saratoga Springs, Utah that the REIMBURSEMENT AGREEMENT AND RELEASE OF ALL CLAIMS attached as Exhibit A is approved and the Mayor or City Manager is authorized to sign said Agreement. This resolution shall take effect immediately upon passage.

**PASSED AND APPROVED** this 4<sup>th</sup> day of August, 2020.

City of Saratoga Springs

---

Jim Miller, Mayor

Attest:

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Cind LoPiccolo, City Recorder

**EXHIBIT A**



## STAFF REPORT – CITY COUNCIL MEETING

Author: David Johnson, Economic Development & PR Director  
Department: Communications  
Subject: Communities That Care Annual Contract  
Date: August 4, 2020

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### Introduction:

The following is a renewal of the annual contract for the Communities That Care (CTC) program with Utah County and Eagle Mountain.

### Background:

CTC is a coalition that works to prevent youth problem behaviors in Saratoga Springs and Eagle Mountain. CTC helps strengthen communities, families, and the school system, so that we all do an even better job raising our children and keeping them out of trouble in the first place.

Historically, the City of Saratoga Springs and the City of Eagle Mountain have entered into separate agreements with Utah County to implement the Communities That Care program. The City of Saratoga Springs has also managed and supervised the CTC staff member, as well as the invoicing for all three organizations. In addition, there has been a lack of clarity in the contract on how annual evaluations and raises should be implemented for the CTC staff member.

As such, the primary changes, among other minor corrections, to this year's contract include:

1. One interlocal agreement between Saratoga Springs, Eagle Mountain and Utah County.
2. Clarifications on the obligations of the CTC program and staff members to both cities.
3. How annual evaluations and raises should be implemented for the CTC staff member.
4. Clarifications on compensation to the City of Saratoga Springs for performing additional managerial and administrative tasks related to supervising CTC staff, payroll and account payable.

### Budget Impact:

Total Budget impact is \$5,000 annually. Eagle Mountain contributes \$5,000 and Utah County contributes \$18,000 annually.

### Department Review:

Communications and Attorney's Office

### Alternatives:

1. Approve
2. Approve with Modifications
3. Deny
4. Table

### Recommendation & Alternatives:

Staff recommends approval by the City Council of the annual CTC contract.

**Alternative 1 - Approve**

"I move to approve Resolution XXXXXXXX to renew the annual Communities that Care interlocal agreement with Utah County and Eagle Mountain."

**Alternative 2 – Approve with Modifications**

"I move to approve Resolution XXXXXXXX to renew the annual Communities that Care interlocal agreement with Utah County and Eagle Mountain with direction to the Staff to modify it as follows:"

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

**Alternative 3 – Denial**

"I move to deny Resolution XXXXXXXX to renew the annual Communities that Care interlocal agreement with Utah County and Eagle Mountain with the following direction to the Staff for changes needed for future consideration:"

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_

**Alternative 4 - Table**

"I move to table Resolution XXXXXXXX to renew the annual Communities that Care interlocal agreement with Utah County and Eagle Mountain."

**Attachments:**

- 1. Resolution XXXXXXXX
- 2. Interlocal Agreement

**INTERLOCAL COOPERATION AGREEMENT WITH SARATOGA SPRINGS CITY  
AND EAGLE MOUNTAIN CITY FOR SUBSTANCE MISUSE PREVENTION  
SERVICES AND COMMUNITIES THAT CARE PREVENTION MODEL**

THIS AGREEMENT, made and entered into this \_\_\_\_ day of \_\_\_\_\_ 2020, by and between UTAH COUNTY, UTAH, a body corporate and politic of the State of Utah, by and through the Utah County Health Department, 151 South University Avenue, Suite 3200, Provo, Utah 84601, the municipality of, EAGLE MOUNTAIN, 1650 Stagecoach Run, Eagle Mountain, UT 84005, and the municipality of, SARATOGA SPRINGS CITY, 1307 North Commerce Drive, #200, Saratoga Springs, Utah, 84045, a municipal corporation and a political subdivision of the State of Utah.

WHEREAS, pursuant to the provisions of the Interlocal Cooperation Act, Title 11, Chapter 13, Utah Code Annotated, 1953, as amended, public agencies, including political subdivisions of the State of Utah as therein defined, were authorized to enter into written agreements with one another for joint or cooperative action; and

WHEREAS, all of the parties to this Agreement are public agencies as defined in the Interlocal Cooperation Act; and

WHEREAS, Utah County, Eagle Mountain City, and Saratoga Springs City, within Utah County, through their respective governing bodies, have voluntarily determined that the interests and welfare of the public within their respective jurisdictions will best be served by this Interlocal Cooperative Agreement for joint or cooperative action.

NOW THEREFORE, in consideration of the covenants and promises contained herein and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

**Section 1. Effective Date; Duration.**

This Agreement shall become effective July 1, 2020 and shall enter into force, within the meaning of the Interlocal Cooperation Act, upon the submission of this Interlocal Cooperation Agreement to, and the approval and execution hereof by a majority of the governing bodies of all of the parties to this Agreement. The term of this Interlocal Cooperation Agreement shall be from July 1, 2020 hereof until June 30, 2021. This Interlocal Cooperation Agreement shall not become effective until it has been reviewed and approved as to form and compatibility with the laws of the State of Utah by the Utah County Attorney's Office, the Eagle Mountain City Attorney, and the Saratoga Springs City Attorney. Prior to becoming effective, this Interlocal Cooperation Agreement shall be filed with the person who keeps the records of each of the parties hereto.

**Section 2. Administration of Interlocal Cooperation Agreement.**

The parties to this Agreement do not contemplate nor intend to establish an Interlocal entity under the terms of this Interlocal Cooperation Agreement. The parties do agree that,

pursuant to Section 11-13-207, Utah Code Annotated, 1953 as amended, that Utah County shall act as the administrator responsible for the administration of this Interlocal Cooperation Agreement. The parties further agree that this Interlocal Cooperation Agreement does not anticipate nor provide for any organizational changes in the parties.

### **Section 3. Purposes**

This Agreement is established for the following purposes:

- a. To coordinate with Saratoga Springs City to employ a part-time (20 hours per week, 52 weeks per year) Communities that Care (CTC) Coordinator and provide technical support to maintain the CTC prevention model within Saratoga Springs City and Eagle Mountain City.
- b. To provide funding to Saratoga Springs City to employ a CTC coordinator as follows: Utah County will provide Saratoga Springs City with fourteen thousand dollars (\$14,000.00) for the CTC Coordinator position/costs and four thousand dollars (\$4,000.00) for coalition capacity building for the period of July 1, 2020 through June 30, 2021. Saratoga Springs City will provide a yearly minimum match of five thousand dollars (\$5,000.00) if approved by the annual Saratoga Springs City Council budget process. Eagle Mountain City will provide a yearly minimum match of five thousand dollars (\$5,000.00) if approved by the annual Eagle Mountain City Council budget process.
- c. To maintain and increase capacity of the Communities that Care system within Saratoga Springs City and Eagle Mountain City and to work with Utah County Health Department to ensure the CTC model is being implemented with fidelity through the five phases of CTC as referenced in this hyperlink: <http://www.communitiesthatcare.net/>.
- d. To reduce youth problem behaviors as found in the Hawkins and Catalano Risk and Protective Factor Model.

### **Section 4. Manner of Financing.**

This Interlocal Cooperation Agreement and the joint, cooperative actions contemplated herein shall not receive separate financing, nor shall a separate budget be required. Each party shall be responsible for its own obligations under this Interlocal Cooperation Agreement. The funds provided are primarily to be used for:

1. CTC coordinator position costs/salary.
2. Trainings associated with coalition coordinator and coalition members for approved travel costs.
3. Any additional prevention activities as described in the CTC model or community action plan pending approval from Utah County Health Department.

### **Section 5. Coalition Capacity Building Funding**

The funds appropriated for coalition capacity building can be used for the following:

1. CTC coalition training costs directly related to benchmarks and action plans.
  - a. CTC module trainings
  - b. State CTC trainings
  - c. Food/mileage/supplies
2. Travel/Training, including but not limited to Utah Fall Substance Abuse Conference

and National Prevention Network Conference for coordinator and coalition members  
a. Mileage, airfare, per diem, registration, lodging and transportation

3. Town hall/community education events
  - a. Advertising, food and recognition awards, coalition needs
4. Workgroup activities
  - a. Evaluation contract
  - b. Data collection
  - c. Meeting costs
5. Minor equipment under \$600.00

#### **Section 6. Interlocal Requirements**

1. The liaison for the City of Saratoga Springs shall perform the supervisory role over the CTC Coordinator position.
2. The City of Saratoga Springs shall perform payroll for the CTC Coordinator.
3. The City of Saratoga Springs shall calculate costs and invoice the program for performing managerial and administrative tasks related to payroll and accounts payable.
4. Organize an annual coordination meeting, consisting of the Saratoga Springs and Eagle Mountain liaisons, the County Prevention Coordinator and the CTC Coordinator.
5. Provide annual training resources for the Saratoga Springs and Eagle Mountain liaisons.
6. Complete and provide all meeting minutes, third-party data and program reports related to the CTC program to the Saratoga Springs and Eagle Mountain liaisons.
7. Establish, implement and evaluate a CTC Annual Plan and Goals for Eagle Mountain/Saratoga Springs programs.
8. Present the prior year annual report to the Saratoga Springs and Eagle Mountain City Councils, and obtain approval from both elected bodies of the upcoming year annual plan.
9. Present a mid-year report to the Saratoga Springs and Eagle Mountain City Councils on program progress and completed benchmarks.
10. CTC Coordinator shall attend state/county CTC trainings as prioritized by the Utah County Health Department and Coordinator, and provide the Saratoga Springs and Eagle Mountain liaisons with an annual schedule of conferences and trainings.
11. CTC Coordinator shall attend regular coordination meetings with the Saratoga Springs and Eagle Mountain liaisons, as well as other related coordination meetings.
12. Incorporate CTC benchmarks and phases as foundation of fidelity.
13. Develop and use by-laws and organizational structure to direct coalition.
14. Billings and claims for covered services must be submitted by the **20th of each month**. Billings and claims received by the 20th will reflect requested reimbursements for the previous month. **Final year-end billings must be submitted on or before July 10th**. Billings and claims for final payments received after **July 10, 2021** will not be considered for payment.
15. An annual narrative report (1 page) identifying completed benchmarks and current status of action plan due June 30, 2021, provided to Utah County Health Department, Eagle Mountain and Saratoga Springs cities.

**Section 7. CTC Coordinator Annual Evaluation**

1. The liaison for the City of Saratoga Springs shall conduct an annual review and professional goal setting with the CTC coordinator, adhering to the City of Saratoga Springs’s standardized employee evaluation, after obtaining feedback from the Eagle Mountain liaison and the County liaison.
2. The CTC Coordinator is eligible for up to an annual 5% increase that shall be funded by the annual contributions of each of the respective participating parties.
3. An annual review of the CTC Coordinator position shall be conducted by Saratoga Spring City.

**Section 8. Property Used in Joint and Cooperative Undertaking.**

There will be no real or personal property acquired, held, and used pursuant to this Interlocal Cooperation Agreement.

**Section 8. Methods of Termination.**

This Interlocal Cooperative Agreement shall automatically terminate at the end of its term herein pursuant to the parameters of Section 1 of this Agreement. The parties to this Agreement may also withdraw from participation herein by giving at least thirty days’ notice to each of the other party to this Agreement. Any notice of termination or notice of withdrawal shall be served upon each of the parties to this Agreement.

**Section 9. Indemnification.**

All parties are governmental entities subject to the Governmental Immunity Act of Utah, Utah Code Ann., Section 63G-7-101, et seq., as amended. By entering into this Agreement, neither party waives by this Agreement any defenses or limits of liability available under the Governmental Immunity Act of Utah, or any other applicable federal, state, or common law. Nothing in this Agreement shall be construed as an assumption of any duty for the benefit of any third-party. Subject to, and without waiving any immunities under applicable federal, state, or common law, including those described above, each party shall assume and retain liability and responsibility for the claims, losses, damages, injuries, or other liabilities arising out of the acts, omissions, or negligence of its own officers, employees, agents, and contractors in an amount not to exceed the damage limits in Utah Code Ann., Section 63G-7-604, as amended.

**Section 10. Filing of Interlocal Cooperation Agreement.**

Executed copies of this Interlocal Cooperation Agreement shall be placed on file in the office of the County Clerk/Auditor of Utah County, and with the official keeper of Saratoga Springs City records, and shall remain on file for public inspection during the term of this Interlocal Cooperation Agreement.

**Section 11. Adoption Requirements.**

This Interlocal Cooperation Agreement shall be (a) approved by the executive body or officer of each of the parties, (b) executed by a duly authorized official of each of the parties, (c) submitted to and approved by an authorized attorney of each of the parties, as required by Section 11-13-202.5, Utah Code Annotated, 1953 as amended, and (d) filed in the official records of each party.

**Section 12. Agreements.**

This Interlocal Cooperation Agreement may not be amended, changed, modified or altered except by an instrument in writing which shall be (a) approved by a resolution of the legislative body of each of the parties, (b) executed by a duly authorized official of each of the parties, (c) submitted to and approved by an authorized attorney of each of the parties, as required by Section 11-13-202.5, Utah Code Annotated, 1953 as amended, and (d) filed in the official records of each party.

**Section 13. Severability.**

If any term or provision of this Interlocal Cooperation Agreement or the application thereof shall to any extent be invalid or unenforceable, the remainder of this Interlocal Cooperation Agreement, or the application of such term or provision to circumstances other than those with respect to which it is invalid or unenforceable, shall not be affected thereby, and shall be enforced to the extent permitted by law. To the extent permitted by applicable law, the parties hereby waive any provision of law which would render any of the terms of this Interlocal Cooperation Agreement unenforceable.

**Section 14. Governing Law.**

All questions with respect to the construction of this Interlocal Cooperation Agreement, and the rights and liability of the parties hereto, shall be governed by the laws of the State of Utah.

**Section 15. Committees.**

The parties may establish from time to time such committees as shall be deemed appropriate and necessary.

**Section 16. Headings.**

Section headings are for convenience of reference only and shall not be considered any interpretation of the Interlocal Cooperation Agreement.

**Section 17. Entire Agreement.**

This Interlocal Cooperation Agreement contains the entire agreement of the parties. No promise, representation, warranty, or covenant not included in this Agreement has been or is relied upon by the parties to it.

**Section 18. Execution by Counterparts.**

This Interlocal Cooperation Agreement may be executed in counterparts. The original of each executed Agreement shall be filed with Utah County.

**Section 19. Sub-recipient Requirements.**

By virtue of terms and conditions of the Federal Substance Abuse Prevention and Treatment block grant that funds the services purchased through this Agreement, Saratoga Springs City becomes a sub-recipient of the federal grant.

**CFDA #: 93.959**

As Saratoga Springs City is a Sub-recipient of the grant monies, and as such, shall have no authorization, express or implied, to bind Utah County to any agreements, settlements, liability, or

understanding whatsoever, and agrees not to perform any acts as agent for the County, except as herein expressly set forth. The Sub-recipient shall be responsible for the payment of all income tax and social security amounts due as a result of payments received from the County for these contract services. Persons employed by the County and acting under the direction of the County or shall not be deemed to be employees or agents of Independent Contractor.

- a) All Saratoga Springs City records with respect to any matters covered by this Agreement shall be made available to the County, DSAMH and the Comptroller General of the United States or any of their authorized representatives
- b) Failure of the Saratoga Springs city to comply with the above requirements will constitute a violation of this Agreement and may result in the withholding of future payments.
- c) In accordance with OMB Circular A-133, *Audits of State, Local Governments and Non-Profit Organizations*, state and local governments or non-profit organizations that expend \$500,000 or more in total federal financial assistance (from all sources) in the recipient's fiscal year shall have a Single Audit completed.
- d) All Sub-recipient's, regardless of Single Audit eligibility, will make all pertinent financial records available for review, monitoring or audit, in a timely manner to appropriate officials of the federal granting agency, Utah County, Department of Drug and Alcohol Prevention and Treatment, any pass-thru entity and/or the General Accounting Office

Nothing contained in this Agreement is intended to, nor shall be construed in any manner, as creating or establishing the relationship of employer/employee between the parties. The Sub-recipient shall at all times remain an "independent contractor" with respect to the services to be performed under this Agreement. The County and program administrator shall be exempt from payment of all Unemployment Compensation, FICA, retirement, life and/or medical insurance and Workers' Compensation Insurance, as the Sub-recipient is an independent contractor.

[Signatures on following page]

WITNESS WHEREOF, the parties have signed and executed this Interlocal Cooperation Agreement on the dates listed below:

Utah County Authorized by Resolution No. 2020-\_\_\_\_\_, authorized and passed on the \_\_\_\_ day of \_\_\_\_\_ 2020.

Saratoga Springs City Authorized by Resolution No. \_\_\_\_\_, authorized and passed on the \_\_\_\_ day of \_\_\_\_\_ 2020.

Eagle Mountain City Authorized by Resolution No. \_\_\_\_\_, authorized and passed on the \_\_\_\_ day of \_\_\_\_\_ 2020.

APPROVED AND ADOPTED this \_\_\_\_ day of \_\_\_\_\_ 2020.

BOARD OF COUNTY COMMISSIONERS  
UTAH COUNTY, UTAH

By: \_\_\_\_\_  
Tanner Ainge Chairman Date

ATTEST:  
AMELIA POWERS  
Utah County Clerk/Auditor

SARATOGA SPRINGS CITY

By: \_\_\_\_\_  
Deputy Date

By: \_\_\_\_\_  
Mayor Date

APPROVED AS TO FORM:  
DAVID LEAVITT  
Utah County Attorney

ATTEST:  
By: \_\_\_\_\_  
Saratoga Springs City Recorder Date

By: \_\_\_\_\_  
Deputy County Attorney Date

EAGLE MOUNTAIN CITY

By: \_\_\_\_\_  
Mayor Date

ATTEST:  
By: \_\_\_\_\_  
Eagle Mountain City Recorder Date

**RESOLUTION NO. R20-39 (8-4-20)**

**RESOLUTION OF THE CITY OF SARATOGA SPRINGS,  
UTAH, APPROVING THE INTERLOCAL COOPERATION  
AGREEMENT BETWEEN UTAH COUNTY AND THE  
CITY OF SARATOGA SPRINGS.**

**WHEREAS**, on August 4, 2020, Utah County, the City of Eagle Mountain and the City of Saratoga Springs entered into that Interlocal Cooperation Agreement for Substance Abuse Prevention Services and Communities that Care Prevention Model; and

**WHEREAS**, Utah County and the City of Saratoga Springs wish to continue the interlocal agreement providing for substance abuse prevention services and communities that care prevention model for Fiscal Year 2020-2021.

**NOW THEREFORE, BE IT RESOLVED** by the City Council of the City of Saratoga Springs, Utah that the Interlocal Agreement attached as Exhibit A is approved and the Mayor is authorized to sign said Agreement. This resolution shall take effect immediately upon passage.

**PASSED AND APPROVED** this 4<sup>th</sup> day of August, 2020.

City of Saratoga Springs

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Jim Miller, Mayor

Attest:

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Cindy LoPiccolo, City Recorder

**EXHIBIT A**

**Interlocal Agreement**

**SCHOOL RESOURCE OFFICER**  
**INTERLOCAL COOPERATION AGREEMENT**

This SCHOOL RESOURCE OFFICER INTERLOCAL COOPERATION AGREEMENT (the “Agreement”), is made and entered into by and between the BOARD OF EDUCATION OF JORDAN SCHOOL DISTRICT (the “School District”), a political subdivision of the State of Utah, 7387 South Campus View Drive, West Jordan, Utah, 84084, and SARATOGA SPRINGS (the “City”), a Utah municipality, 367 South Saratoga Road, Saratoga Springs, Utah, 84045.

**WITNESSETH**

WHEREAS, Saratoga Springs (the “City”) has entered into an agreement with Bluffdale City, a Utah municipality, 2222 West 14400 South, Bluffdale, Utah, 84065, wherein the City will provide police services to Bluffdale City;

WHEREAS, pursuant to the provisions of the Utah Interlocal Cooperation Act, Utah Code Annotated, Section 11-13-101, et seq., as amended, public agencies, including political subdivisions of the State of Utah as defined therein, are authorized to enter into mutually advantageous agreements for joint or cooperative action;

WHEREAS, pursuant to the provisions of the Utah Code Annotated, Section 53G-8-703, which provides that the School District may contract with a law enforcement agency to provide school resource officer services at the schools pursuant to Board review and approval of this Agreement;

WHEREAS, the School District and City, through their respective governing bodies, have voluntarily determined that the interests and welfare of the public within their respective jurisdictions will best be served by this Agreement to provide for joint and cooperative action in regards to having a School Resource Officer (“SRO”) to maintain safe schools, improve school climate, and support educational opportunities for students while serving at the following schools in Bluffdale: Hidden Valley Middle School, Bluffdale Elementary School, Mountain Point Elementary and such other schools or locations in Bluffdale as the City and the School District may determine in writing from time to time;

WHEREAS, the City’s School Resource Officer Program will provide the outreach to school administrators, parents, students, businesses and the community for stakeholder involvement in problem solving and solutions and enable the City’s Police Department and School District to form valuable partnerships and promote ongoing continued relationships that will benefit the community, which collective effort will help the City’s Police Department to provide the best public safety services to better protect citizens and support officers in their law enforcement work;

WHEREAS, the governing bodies of the School District and the City have by resolution agreed to adopt this Agreement to provide for the joint and cooperative action contained herein; and

WHEREAS, this Agreement shall replace and supersede any agreements or memoranda of understanding approved and executed previously by the School District and the City regarding school resource officers.

NOW, THEREFORE, be it mutually covenanted and agreed as follows, each of the parties accepting as consideration for this Agreement the mutual promises and agreements of the other:

**SECTION ONE**  
**EFFECTIVE DATE AND DURATION**

This Interlocal Cooperation Agreement shall be effective as of \_\_\_\_\_ and shall continue for a period of up to five (5) years, unless sooner terminated as provided herein. However, should either party encounter budgetary constraints that make the continuation of this agreement impractical, then either party may cancel this agreement upon sixty (60) days' notice to the other, subject to the termination provisions set out in Section 13 below. Following the initial five-year term, this agreement shall be renewed for successive one-year periods upon written agreement by the Parties, with a total term not to exceed 50 years, unless either party requests termination or modification of this agreement.

**SECTION TWO**  
**ADMINISTRATIVE ENTITY**

The City and the School District do not contemplate nor intend to establish a separate legal entity under their terms of this Agreement.

**SECTION THREE**  
**PURPOSE**

This Agreement is established for the purpose of jointly providing for School Resource Officers to serve at schools in Bluffdale, Utah, including the following existing schools: Hidden Valley Middle School, Bluffdale Elementary School, Mountain Point Elementary School as provided in Section Seven II.b. below, or such other school or place in Bluffdale as the City and the School District may determine from time to time.

**SECTION FOUR**  
**MANNER OF FINANCING**

This Agreement and the matters contemplated herein shall not receive separate financing, nor shall a separate budget be required. Each party shall be responsible for its own obligations under this Agreement. The City shall budget and be responsible for all payments related to the employment of the School Resource Officer. The City shall send an invoice to the School District on an annual basis following the completion of the school year for payment of the services of the School Resource Officers as agreed to in writing between the School District and City, which total cost to the School District is forty-five thousand dollars (\$45,000.00) per full-time School Resource Officer. The invoice shall be paid within thirty (30) days of receipt by the School District. If this Agreement is terminated during the budget year, the City and the School District agree to divide the costs associated with the payment of the services of the School Resource Officers as on a pro-rata basis depending upon the length of the year remaining.

**SECTION FIVE**  
**ADMINISTRATOR**

Pursuant to Utah Code Annotated, Section 11-13-101, et seq., the parties agree that the City shall act as administrator responsible for this Agreement. This Agreement does not anticipate nor provide for any organizational changes in the City or the School District.

**SECTION SIX**  
**FILING OF AGREEMENT**

A copy of this Agreement shall be placed on file in the Office of the City Recorder of the City and with the Business Administrator of the School District and shall remain on file for public inspection during the term of this Agreement.

**SECTION SEVEN**  
**DESCRIPTION OF ARRANGEMENT**

**I. Employment of School Resource Officers**

- a. The School Resource Officers shall be employees of the City's Police Department and shall be subject to the administration, supervision and control of the Police Department.
- b. City will furnish any training state law requires and as is needed for the operation of this agreement.
- c. City will provide School Resource Officer with uniforms and equipment.
- d. The School Resource Officers shall be subject to all personnel policies and practices of the City's Police Department except as such policies or practices may be modified by the terms and conditions of this Agreement.
- e. The City's Police Department, in its sole discretion, shall have the power and authority to hire, discharge, and discipline the School Resource Officers; however, the School District and the City's Police Department will jointly discuss School Resource Officer applicants, specifically, the principal primarily working with the School Resource Officer will be given the opportunity to meet with the School Resource Officer candidate prior to the assignment of the School Resource Officer.
- f. As employees of the City's Police Department, School Resource Officers will be subject to the chain of command of the Police Department.
- g. If a principal is dissatisfied with a School Resource Officer who has been assigned to that principal's school, then that principal may request that the Chief of Police or his or her designee assign a different officer as the School Resource Officer for that school. Such a request to the Chief of Police will occur after the principal has met with the School Resource Officer's Supervisor to discuss concerns and allow a reasonable amount of time for the School Resource Officer's Supervisor to remediate the issues unless the concerns are of such a nature, in the opinion of the

principal, to warrant bringing them immediately to the attention of the Chief of Police. The Chief of Police shall make every reasonable effort to expeditiously assign a new School Resource Officer for that school. The City's Police Department reserves the right to remove/re-assign any School Resource Officer at any time and for any reason so long as notification is given to the School District.

- h. The School Resource Officer and the principal (or designee) at the school where a School Resource Officer will be working will jointly complete the School Resource Officer training described in Utah Code Annotated, Section 53G-8-702. If training is required during the school day, the City's Police Department will make a good faith effort to cover the School Resource Officer's classes and responsibilities in the school.
- i. The School District acknowledges and agrees that as law enforcement officers employed by the City, School Resource Officers may be called upon to respond to emergency situations arising in Bluffdale City or Saratoga Springs. This Agreement shall not be interpreted to prevent a School Resource Officer from responding to an emergency where all City police officers are called upon to respond.

## **II. Duties of School Resource Officers**

- a. The mission of the School Resource Officer is to provide for and maintain a safe, healthy and productive learning environment, emphasizing the use of restorative approaches to address negative behavior while acting as a positive role model for students in the School District by working in a cooperative, proactive, problem-solving partnership between the Police Department and the School District.
- b. One School Resource Officer will be assigned to each of the following schools to build partnerships, enhance community-policing activities, identify problems within the schools, develop problem solving strategies with school administrators and staff, and collaboratively develop a comprehensive school safety plan with school administrators, staff, and the District's Risk Management: Hidden Valley Middle School or such other school or place as the City and the School District may determine in writing from time to time after staff from the City and the School District have met and discussed the new or changing circumstances.
- c. Additional School Resource Officer services may be assigned to instruct the D.A.R.E. curriculum at the district's elementary schools in the City including the following existing schools: Bluffdale Elementary School, Mountain Point Elementary School, or such other school or place as the City and the School District may determine from time to time.
- d. School Resource Officers may provide additional presentations to the schools in safety, crime prevention, and bullying. When lawful, permissible, and practical the School Resource Officers should respond to requests for assistance by schools to address problems or meet school needs and they may also provide additional appropriate police services to the School District's Bluffdale schools.
- e. The School Resource Officers and the School Resource Officer's supervisor will meet regularly to identify problem and solve issues at the schools.

- f. The City and School Resource Officers will work closely with the School District to improve the social and behavioral skills of students in order to maximize their ability to achieve academically and become successful, contributing citizens. Issues to be addressed include substance abuse, violence reduction, social skills and other areas of district and community concern.
- g. The City's Police Department and School District understand that the School Resource Officers may use any measures to secure school property as followed through established protocols of the City's Police Department in the event of an emergency situation that requires "lock-down".
- h. The School Resource Officer will be a visible active law enforcement figure dealing with law enforcement matters. The School Resource Officer shall confer with the principal (or designee) to resolve an offense that is a minor violation of the law but would not violate the law if the offense was committed by an adult, which originates or continues on the assigned campus. As to school policy violations, the School Resource Officer will take the student to the principal's office for discipline to be taken by the school officials.
- i. The School Resource Officer will differentiate between disciplinary issues and crime problems and respond appropriately, de-escalating school-based incidents whenever possible.
  - i. School Resource Officers are responsible for criminal law issues, not school discipline issues.
  - ii. Absent a real and immediate threat, School Resource Officer shall refer to school administration any offenses identified by Officer which fall within the scope of Utah Code § 53G-8-211(3); such offenses shall be handled as student discipline matters and not referred to juvenile court or other law enforcement officers.
- j. The School Resource Officer will be involved in school discipline when it pertains to preventing a disruption that would, if ignored, place students, faculty, visitors and staff at risk of harm, so the School Resource Officer will resolve the problem to preserve the safe school climate. In all other cases, disciplining students is a School District responsibility and the School Resource Office will take students who violate school policies or the code of conduct to the principal's office for discipline to be taken by school officials.
- k. The School Resource Officer shall initiate positive interaction with students in the classroom and general areas of the school building to promote the profession of police officers and be a positive role model, while increasing the visibility and accessibility of police to the school community
- l. The School Resource Officer will share information with the school's administrator about persons and conditions pertaining to campus safety concerns.
- m. As partners with the School District, when appropriate, the School Resource Officer may assist with resolving law enforcement issues that affect the School District and the broader community.
- n. The School Resource Officer shall notify school administration upon removing a student from campus.

- o. The School Resource Officer shall notify parents as soon as possible when students are ticketed or arrested.
- p. If a student's arrest is warranted, the School Resource Officer shall use the least disruptive and the least obtrusive manner reasonably available to conduct the arrest of the student. The School Resource Officer will be accompanied by a school principal or vice principal when arresting a student unless emergency circumstances require otherwise for the safety of the student, School Resource Officer, and/or others.
- q. The School Resource Officer shall question students in a manner and a time when it has the least impact on the student's schooling so long as the delay in questioning does not interfere with the effectiveness of an investigation.
- r. School administrators shall handle routine discipline (tardiness, loitering, use of profanity, dress code violations, disruptive or disrespectful behaviors, etc.) within the school and without involving the School Resource Officer in an enforcement capacity (issuing citations) unless it absolutely necessary or required by law.
- s. The School Resource Officer shall become familiar with School District's student discipline policies.
- t. The School Resource Officer will make reasonable efforts to inform the principal when the School Resource Officer will be out of the building due to training, temporary assignments or vacations and will, when possible, not arrange vacations while school is in session.

### **III. Duties of School District Administrators**

- a. Provide the Police Department a School District "point of contact" to facilitate communication.
- b. Provide an office/storage or work space for School Resource Officer's materials and personal effects.
- c. Provide students, classroom, equipment and supplies for classes taught by School Resource Officers.
- d. Differentiate between disciplinary issues and crime problems and respond appropriately.
- e. Facilitate School Resource Officer-initiated investigations and actions.
- f. Provide ongoing feedback to the Police Department designee for evaluation purposes.
- g. Notify School Resource Officers responding to a school-based infraction if any student involved possesses disabilities and/or an Individualized Education Plan ("IEP") and who therefore may require special treatment or accommodations.
- h. The School District acknowledges that School Resource Officers are required by policy and procedures to attend mandatory trainings and/or meetings

#### **IV. Respect for Student's Rights**

- a. A School Resource Officer may conduct or participate in a search of a student's person, possessions, or locker only where there is probable cause to believe that the search will turn up evidence that the child has committed or is committing a criminal offense.
  - i. It is recommended that in addition to having probable cause, a School Resource Officer should follow Federal and Utah state law and City Police Department policy and procedures applicable to conducting searches of persons and property which may require a search warrant to obtain a warrant before conducting the search of a student's property under her or his control.
  - ii. The School Resource Officer shall inform school administrators prior to conducting a probable cause search where practicable.
  - iii. The School Resource Officer shall not ask school officials to search a student's person, possessions, or locker in an effort to circumvent his or her protections.
- b. At the School District's own risk, a school official may conduct a search of a student's person, possessions, or locker where there is a reasonable suspicion to believe that the search will turn up evidence that the student has violated or is violating either that law or the rules of the school, and the search is justified in scope given such suspicion.
  - i. Absent a real and immediate threat to student, teacher, School Resource Officer or public safety, a school official shall not ask a School Resource Officer to be present or participate in such a search. Even if the School Resource Officer is requested to be present, the School Resource Officer retains the complete discretion to not participate in such search without repercussions from the School District other than as provided for under Section Seven I.g.
- c. A School Resource Officer may question a student about criminal conduct that could expose the child to court-involvement or arrest so long as state and federal laws with respect to question of students are followed, including laws with respect to questions of children under the age of 14.
  - i. The School Resource Officer shall inform school administrators prior to questioning the student where practical.
  - ii. The School Resource Officer shall not ask a school official to question a student in an effort to circumvent these protections.
  - iii. Other conversations between School Resource Officers and student will be on the premise of building relationships to help develop a healthy learning environment and promote pro-social behaviors.
- d. Strip searches of children by either school officials or School Resource Officers shall be prohibited.
- e. A School Resource Officer shall not use physical force or restraints on a child,

including handcuffs, Tasers, mace, or other physical or chemical restraints unless a student's actions pose a threat or they are subject to arrest.

#### **V. Access to Education Records**

- a. School officials shall allow School Resource Officers to inspect and copy any public records, including directory information, maintained by the school to the extent allowed by law.
- b. If some information in a student's record is needed in an emergency to protect the health or safety of the student or other individuals, school officials shall disclose to the School Resource Officers that information that is needed to respond to the emergency situation based on the seriousness of the threat to someone's health or safety; the need of the information to meet the emergency situation; and the extent to which time is of the essence.
- c. If a School Resource Officer needs confidential student record information, but no emergency situation exists, the information may be released only as allowed by law.

#### **VI. Law Enforcement Units**

- a. The School District will designate the District's Risk Management as the District's Law Enforcement Unit and School Resource Officers as the School's Law Enforcement Unit as provided under FERPA (Family Education Rights Privacy Act), pursuant to 20 U.S.C. 1232g(a)(4)(ii) and 34 C.F.R. 99.8. Parents shall be notified annually of these designations. All school security equipment shall be the responsibility of the District's law enforcement unit. All school security records, including but not limited to, school security campus videotapes or school bus videotapes, are created and maintained by the District's law enforcement unit. These records are not deemed to be student records or educational records [20 U.S.C. 1232g(a)(4)(ii)]. In addition, records created by the School's Law Enforcement Unit are not deemed to be student records or educational records [20 U.S.C. 1232g(a)(4)(ii)]. If the District's law enforcement unit or School's law enforcement unit provides these records to the School's officials for student disciplinary purposes, the records maintained by the School officials may become student records or educational records.

### **SECTION EIGHT** **NOTICE OF DEFAULT; CORRECTIVE ACTION**

The failure of either party to comply with each and every term and condition of this Agreement shall constitute a breach of this Agreement. Either party shall have thirty (30) days after receipt of written notice from the other of any breach to correct the conditions specified in the notice, or if the corrections cannot be made within the thirty (30) day period, within a reasonable time if corrective action is commenced within ten (10) days after receipt of the notice.

**SECTION NINE**  
**RIGHTS AND REMEDIES**

In the event of any breach hereunder and after the lapse of the cure period as per Section Eight above, the non-breaching party shall have all the rights and remedies available under the laws of the State of Utah in effect. The rights and remedies of the parties hereto shall not be mutually exclusive, but shall be cumulative in all respects. The respective rights and obligations of the parties hereunder shall be enforceable in equity as well as at law or otherwise. In addition, in the event the School District breaches this Agreement and fails to make corrections as set forth in Section Eight above, the City may terminate this Agreement and cease providing a School Resource Officers.

**SECTION TEN**  
**GOVERNING LAW, JURISDICTION, AND VENUE**

All questions with respect to the construction of this Agreement and all right and liability of the parties hereto shall be governed by the laws of the State of Utah. Jurisdiction and venue for the enforcement of this Agreement shall be found in the courts of Salt Lake County State of Utah.

**SECTION ELEVEN**  
**COSTS OF ENFORCEMENT**

In the event of a breach of this Agreement, the non-breaching party shall be entitled to recover from the breaching party all of the non-breaching party's costs (including, but not limited to, courts fees and expert witness costs) and attorneys' fees associated with the enforcement of this Agreement.

**SECTION TWELVE**  
**NOTICE**

Any written notice which must or may be given relating to this Agreement shall be sufficient if mailed postage prepaid, registered or certified mail, in the United States mail addressed to a party at the address given above. In the case of the School District, notice shall be mailed to the attention of the Business Administrator at the above address. In the case of the City, notice shall be mailed to the attention of the City Manager at the above address. Either party may notify the other to designate a different address for mailing.

**SECTION THIRTEEN**  
**TERMINATION**

Either party may terminate this Agreement for any or no reason and at any time by giving the other party at least sixty (60) days prior written notice of the same.

**SECTION FOURTEEN**  
**APPROPRIATION OF FUNDS**

The Parties' obligations under this Agreement are expressly subject to the appropriation of funds by the City Council and/or the School District's Board of Education. Further, in the event that funds are not appropriated in whole or in part sufficient for performance of the obligations under this Agreement, the Parties may terminate this Agreement.

**SECTION FIFTEEN**  
**INDEMNIFICATION**

Both parties are governmental entities under the Governmental Immunity Act of Utah (the "Immunity Act"), Utah Code Annotated Sections 63G-7-101 to -904, as amended. Consistent with the terms of the Immunity Act, it is mutually agreed that each party is responsible and liable for its own wrongful or negligent acts, which it commits or which are committed, by its agents, officials, or employees. Neither Party waives any defenses otherwise available under the Immunity Act nor does any party waive any limits of liability now or hereafter provided by law.

**SECTION SIXTEEN**  
**GENERAL PROVISIONS**

**A. Severability.** In the event that any condition, covenant, or other provision herein contained is held to be invalid or void by any court of competent jurisdiction, the same shall be deemed severable from the remainder of this Agreement and shall in no way affect any other covenant or condition herein contained. If such condition, covenant, or other provision shall be deemed invalid due to its scope or breadth, such provision shall be deemed valid to the extent of the scope or breadth permitted by law.

**B. Entire Agreement.** This Agreement contains the entire agreement between the parties. No promise, representation, warranty, or covenant not included in this Agreement has been or is relied upon by the parties. All prior understandings, negotiations, or agreements are merged herein and superseded hereby.

**C. Amendments.** This Agreement may be modified only by a writing signed by each of the parties hereto.

**D. Covenants and Conditions.** Each provision of this Agreement performable by the City and the School District shall be deemed to be both a covenant and a condition.

**E. Not Assignable.** This Agreement is specific to the parties hereto and is therefore not assignable.

**F. Binding Effect.** This Agreement shall bind the parties and their respective successors and assigns.

**G. Captions.** The captions to the various Sections of this Agreement are for convenience and ease of reference only and do not define, limit, augment, or describe the scope, content, or intent of this Agreement or any part or parts of this Agreement.

**H. Time.** Time is of the essence of each term, provision, and covenant of this Agreement.

**I. Counterparts.** This Agreement may be executed in two or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument.

**J. Gender and Number.** Whenever the context of any provision shall require it, the singular number shall be held to include the plural number, and vice versa, and the use of any gender shall include any other and all genders or other entity or entities or any combination of persons and entities.

**K. Waiver or Forbearance.** No delay or omission in the exercise of any right or remedy by any party hereto shall impair such right or remedy or be construed as a waiver. Any waiver of any breach must be in writing and shall not be a waiver of any other breach concerning the same or any other provision of this Agreement.

**L. No Partnership, Joint Venture, or Third-Party Rights.** Except as specifically set forth herein, nothing in this Agreement shall be construed as creating any partnership, joint venture, or business arrangement among the parties hereto, nor any rights or benefits to third-parties.

IN WITNESS WHEREOF, the parties have signed and executed this SCHOOL RESOURCE OFFICER INTERLOCAL COOPERATION AGREEMENT, after resolutions duly and lawfully passed, on the dates listed below.

DATED this \_\_\_\_ day of \_\_\_\_\_ 2020.

CITY OF SARATOGA SPRINGS

By: \_\_\_\_\_  
Jim Miller, Mayor

ATTEST:

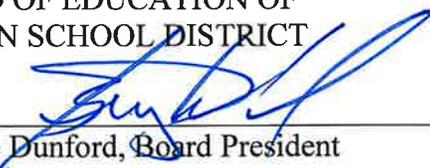
By: \_\_\_\_\_  
Cindy LoPiccolo, City Recorder

APPROVED AS TO FORM:

\_\_\_\_\_  
Saratoga Springs City Attorney

DATED this 28 day of July 2020.

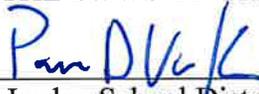
BOARD OF EDUCATION OF  
JORDAN SCHOOL DISTRICT

By:   
Bryce Dunford, Board President

ATTEST:

By:   
John Larsen, Business Administrator

APPROVED AS TO FORM AND COMPATIBILITY  
WITH THE LAWS OF THE STATE OF UTAH:

  
Jordan School District Legal Counsel

**RESOLUTION R20-40 (8-4-20)**

**RESOLUTION OF THE CITY OF SARATOGA SPRINGS, UTAH  
APPROVING AN INTERLOCAL COOPERATION AGREEMENT WITH  
JORDAN SCHOOL DISTRICT FOR A SCHOOL RESOURCE OFFICER  
IN BLUFFDALE CITY**

**WHEREAS**, Bluffdale City contracts with the City of Saratoga Springs and its Police Department for the provision of police protection within the boundaries of Bluffdale City; and

**WHEREAS**, Jordan School District has requested that a Student Resource Officer be provided at certain secondary education schools within Bluffdale City and is willing to contract with the City of Saratoga Springs for the provision of such; and

**WHEREAS**, pursuant to the provisions of the Interlocal Cooperation Act, Title 11, Chapter 13, Utah Code Annotated, 1953, as amended, public agencies, including political subdivisions of the State of Utah and school districts, as therein defined, are authorized to enter into written agreements with one another for joint or cooperative action; and

**WHEREAS**, Saratoga Springs and Jordan School District have drafted an interlocal agreement for the provision of a School Resource Officer at certain secondary education schools in Bluffdale City (“Agreement”), which Agreement is attached as Exhibit A; and

**WHEREAS**, no interlocal entity is being created by the Agreement; and

**WHEREAS**, the Saratoga Springs City Attorney and legal counsel for Jordan School District have reviewed the Agreement and have determined that the Agreement meets the requirements of the Interlocal Cooperation Act; and

**WHEREAS**, the Agreement will further the health, safety, and welfare of City residents by allowing for the joint and cooperative action for these services.

**NOW THEREFORE BE IT RESOLVED** by the City Council of the City of Saratoga Springs, Utah, that the School Resource Officer Interlocal Cooperation Agreement attached as Exhibit “A” is hereby approved. The City Manager or City Mayor is authorized to sign said Agreement. This Resolution shall take effect immediately.

Passed, adopted, and approved this 4<sup>th</sup> day of August, 2020.

City of Saratoga Springs

\_\_\_\_\_  
Mayor or City Manager

Attest:

\_\_\_\_\_  
Cindy LoPiccolo, City Recorder



# MINUTES – CITY COUNCIL

Tuesday, July 21, 2020

City of Saratoga Springs City Offices

1307 North Commerce Drive, Suite 200, Saratoga Springs, Utah 84045

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## City Council Policy Meeting

**Call to Order:** Mayor Jim Miller called the Meeting to order at 6:03 p.m.

### **Roll Call:**

**Pursuant to the COVID-19 Federal Guidelines, this Meeting will be conducted electronically.**

**Present** Mayor Jim Miller, Council Members Christopher Carn, Chris Porter, Michael McOmber, Ryan Poduska, and Stephen Willden.

**Staff Present** City Manager Mark Christensen, Assistant City Manager Owen Jackson, City Engineer Gordon Miner, Planning Director David Stroud, Public Works Director Jeremy Lapin, Senior Planner Sarah Carroll, Assistant City Attorney Maren Barker, and Deputy City Recorder Kayla Moss.

Invocation by Council Member Willden

Pledge of Allegiance by Council Member

**PUBLIC INPUT:** None Submitted

**REPORTS:** Assistant City Manager Owen Jackson advised that Strategic Plan Advisory Committee will be moving forward in the next month or two. They have ways to do zoom meetings and other appropriate ways to meet during COVID.

Council Member Porter advised that he met with MAG and UDOT to see what they can do to get service to the City.

City Manager Christensen gave an update on the knolls fire mitigation process. They are currently working on getting a grant with a 25% match. It is anticipated that it will cost about one million dollars for the project.

### **BUSINESS ITEMS:**

1) **University of Utah Medical Center Community Plan Amendment and Village Plan Amendment, Jonathan Bates University of Utah Applicant, Northeast Corner of Pioneer Crossing and Market Street; Ordinance 20-24 (7-21-20).**

The applicant is asking to increase the acreage and increase the density to meet the district area plan range.

Council Member McOmber wants to make sure that parking needs are being met with how much the density may increase for this project.

Motion by Council Member Willden to approve the University of Utah Medical Center Community Plan Amendment and Village Plan Amendment, Jonathan Bates University of Utah Applicant, Northeast

50 Corner of Pioneer Crossing and Market Street; Ordinance 20-24 (7-21-20) was seconded by Council  
51 Member McOmber.

52 Vote: Council Members Carn, McOmber, Poduska, Porter, and Willden— Aye.

53 Motion carried unanimously.

54  
55 **2) Award of Contracts for 2020 Road Maintenance Project (Seal Coat) as follows: Schedule A Geneva Rock,**  
56 **Schedule B Staker Parson, and Schedule C M&M Asphalt; Resolution R20-31 (7-21-20).**

57 Public Works Director Jeremy Lapin presented this project to the Council. They removed a project on  
58 Harbor Parkway because the numbers didn't come in as expected.

59  
60 Motion by Council Member Carn to approve the Award of Contracts for 2020 Road Maintenance  
61 Project (Seal Coat) as follows: Schedule A Geneva Rock, Schedule B Staker Parson, and Schedule C  
62 M&M Asphalt; Resolution R20-31 (7-21-20) including the amounts that were in the staff report was  
63 seconded by Council Member Porter.

64 Vote: Council Members Carn, McOmber, Poduska, Porter, and Willden— Aye.

65 Motion carried unanimously.

66  
67 **3) Award of Contract for 2020 Manhole Collar Repair Project (Road Maintenance) to Snow Canyon**  
68 **Construction; Resolution R20-32 (7-21-20).**

69 Public Works Director Lapin advised this will repair manhole collars in the Sunrise Meadows subdivision.

70  
71 Motion by Council Member Porter to approve 1) Award of Contract for 2020 Manhole Collar Repair Project  
72 (Road Maintenance) to Snow Canyon Construction in the amount of \$103,120; Resolution R20-32 (7-21-20)  
73 was seconded by Council Member Carn.

74 Vote: Council Members Carn, McOmber, Poduska, Porter, and Willden— Aye.

75 Motion carried unanimously.

76  
77 **4) Code Amendment Title 19.10 Hillside Development; Ordinance 20-25 (7-21-20).**

78 Senior Planner Sarah Carroll advised that this is to repeal and replace the current Title 19.10 in City Code.

79  
80 Council Member Willden thinks he has seen that walls higher than 10 feet aren't allowed. He wondered why  
81 that was.

82  
83 Senior Planner Carroll advised that it can be up to 18 feet if they are stepped; at three steps of 6 feet.

84  
85 Motion by Council Member Willden to approve the Code Amendment Title 19.10 Hillside Development;  
86 Ordinance 20-25 (7-21-20) with all staff findings and conditions was seconded by Council Member McOmber.

87 Vote: Council Members Carn, McOmber, Poduska, Porter, and Willden— Aye.

88 Motion carried unanimously.

89  
90 **5) National Resources Conservation Service (NRCS) Emergency Watershed Protection (EWP) Program Grant**  
91 **Agreement and City Manager Authorization; Resolution R20-33 (7-21-20).**

92 City Manager Christensen advised that this is so that the City Manager can take immediate action as soon as  
93 money becomes available and approval is given from the federal government. This isn't to try and avoid  
94 meetings, it is just to make the process more efficient. This should be the cap of what he can spend without  
95 further City Council discussion.

96  
97 Motion by Council Member Carn to approve the National Resources Conservation Service (NRCS) Emergency  
98 Watershed Protection (EWP) Program Grant Agreement and City Manager Authorization; Resolution R20-33  
99 (7-21-20) was seconded by Council Member Porter.

100 Vote: Council Members Carn, McOmber, Poduska, Porter, and Willden— Aye.

101 Motion carried unanimously.

102  
103 6) Interlocal Cooperation Agreement with Utah County for Disbursement from the Coronavirus Relief Fund,  
104 CARES (Corona Virus Aid and Economic Security) Act; Resolution R20-34 (7-21-20).  
105 City Manager Christensen advised they intended to get this to the Council sooner. The county has made some  
106 minor tweaks but they are not willing to change what they will allow as far as indemnification. The amount will  
107 be \$2.4 million based on population and the amount given to Utah County. The City is recommending approval  
108 of this agreement.

109  
110 Motion by Council Member McOmber to approve Interlocal Cooperation Agreement with Utah County for  
111 Disbursement from the Coronavirus Relief Fund, CARES (Corona Virus Aid and Economic Security) Act;  
112 Resolution R20-34 (7-21-20) with either the Mayor or City Manager signing the agreement was seconded by  
113 Council Member Carn.

114 Vote: Council Members McOmber, Poduska, Porter, and Willden– Aye.  
115 Motion carried unanimously.

116  
117 **MINUTES:**

118  
119 1. June 16, 2020; June 28, 2020; July 7, 2020.

120  
121 Motion by Council Member Willden to approve the Minutes of June 16, 2020, June 28, 2020, and July 7, 2020  
122 with the submitted and posted changes, was seconded by Council Member McOmber.

123 Vote: Council Members McOmber, Poduska, Porter, and Willden– Aye.  
124 Motion carried unanimously.

125  
126 **ADJOURNMENT:**

127  
128 There being no further business, Mayor Miller adjourned the meeting at 6:53 p.m.

129  
130 \_\_\_\_\_  
131 Jim Miller, Mayor

132  
133 Attest:  
134 \_\_\_\_\_  
135 Cindy LoPiccolo, City Recorder  
136 Approved:



# MINUTES – CITY COUNCIL SPECIAL MEETING

Monday, July 27, 2020

City of Saratoga Springs

City of Saratoga Springs City Offices

1307 North Commerce Drive, Suite 200, Saratoga Springs, Utah 84045

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Pursuant to the COVID-19 State and Federal Guidelines, this Meeting was conducted electronically.

## City Council Special Meeting

**Call to Order:** Mayor Jim Miller called the Special Meeting to order at 5:00 p.m.

### **Roll Call:**

**Present** Mayor Jim Miller, Council Members Stephen Willden, Chris Porter, Ryan Poduska, and Christopher Carn. Council Member McOmber was excused.

**Staff Present** City Attorney Kevin Thurman, Assistant City Manager Owen Jackson, Economic Development and Public Relations Director David Johnson, Public Works Director Jeremy Lapin, and City Recorder Cindy LoPiccolo.

### **BUSINESS:**

1. **Code Amendment – Title 2, City-Initiated; Ordinance 20-26 (7-27-20).** City Attorney Kevin Thurman presented amendment to Title 2 to provide for the manner of disposal of real property held by the City, with definition and methods of disposal of significant and non-significant parcels of real property. Council and staff discussed and clarified in regard to sale of non-significant city property to a private entity.

Motion by Council Member Carn to approve amendment to Title 2, Ordinance 20-26 (7-27-20), was seconded by Council Member Willden

Vote: Council Members Willden, Porter, Carn, and Poduska – Aye.

Motion carried 4-0.

2. **UDOT Purchase of City Right-of-Way, SR-68, 1140 North Redwood Road Signal; Resolution R20-35 (7-27-20).** City Manager Christensen presented the staff report and recommendation concerning transfer of City Right-of-Way (approximately 0.3 acres, 12,879 sf) located on the west side of the intersection of Market Street and Redwood Road to the Utah Department of Transportation (UDOT) in order to complete the installation of a traffic signal at that location.

Motion by Council Member Porter to approve UDOT Purchase of City Right-of-Way, at SR-68, 1140 North Redwood Road; Resolution R20-35 (7-27-20), was seconded by Council Member Poduska

Vote: Council Members Willden, Porter, Carn, and Poduska – Aye.

Motion carried 4-0.

### **ADJOURNMENT:**

There being no further business, Mayor Miller adjourned the meeting at 5:18 p.m.

49 \_\_\_\_\_  
50 Jim Miller, Mayor  
51  
52 Attest:  
53  
54 \_\_\_\_\_  
55 Cindy LoPiccolo, City Recorder  
56  
57 Approved:

DRAFT