



Nibley City
Planning Commission Meeting
Thursday, February 3, 2022
455 W. 3200 S.
Nibley, UT

6:30 p.m. Call to Order and Roll Call
 Approval of Agenda
 Approval of Minutes

In accordance with Utah Code Annotated 52-4-207 and Nibley City Resolution 12-04, this meeting may be conducted electronically. The anchor location for the meeting will be Nibley City Hall, 455 West 3200 South, Nibley, Utah. The public may participate in the meeting either in person or via the Zoom meeting link provided at www.nibleycity.com.

1. **Public Hearing:** Heritage Crossing Subdivision, containing 17 single-family residential lots, located at approximately 3100 S 1200 W. (Applicant: Heritage Crossing, LLC)
2. **Discussion and Consideration:** Heritage Crossing Subdivision, containing 17 single-family residential lots, located at approximately 3100 S 1200 W. (Applicant: Heritage Crossing, LLC)
3. **Training:** Planning Commission Rules and Procedures
4. **Workshop:** Planning Commission Goals for 2022
5. Staff Report and Action Items

*Planning Commission agenda items may be tabled or continued if 1) Additional information is needed in order to take action on the item, OR 2) The Planning Commission feels there are unresolved issues that may need further attention before the Commission is ready to make a motion. **No agenda item will begin after 10:00 p.m. without a unanimous vote of the Commission.** The Commission may carry over agenda items, scheduled late in the evening and not heard, to the next regularly scheduled meeting.*

IN COMPLIANCE WITH THE AMERICANS WITH DISABILITIES ACT, REASONABLE ACCOMMODATIONS FOR INDIVIDUALS WITH DISABILITIES WILL BE PROVIDED UPON REQUEST. FOR ASSISTANCE, PLEASE CALL 752-0431 A MINIMUM OF 24 HOURS BEFORE THE MEETING.



**Nibley City Planning
Commission
Agenda Item Report
February 3, 2022**

Agenda Item #1 & #2: Preliminary Plat: Heritage Crossing

Description

Public Hearing: Heritage Crossing Subdivision, containing 17 single-family residential lots, located at approximately 3100 S 1200 W. (Applicant: Heritage Crossing, LLC)

Discussion and Consideration: Heritage Crossing Subdivision, containing 17 single-family residential lots, located at approximately 3100 S 1200 W. (Applicant: Heritage Crossing, LLC)

Department

City Planning

Action Type

Administrative

Recommendation

Approval of Heritage Crossing Preliminary Plat with the conditions noted below

Reviewed By

City Planner, City Engineer, City Manager, Public Works

Background

Heritage Crossing, LLC has applied for Preliminary Plat approval for Heritage Crossing Subdivision. Heritage Crossing is located near 3100 S 1200 W within an R-2A zone. Below is a summary of the development and requirements for the R-PUD:

	NCC Requirements	Heritage Crossing
Listed on R-PUD Application Map	Parcels need to be listed on the map	Yes
Total Gross Acres	N/A	7.7
Total Lots	N/A	17
Total Number of Single Family Lots	20% min	44%
Minimum Lot Size	12,000 sq. ft.	12,000 sq. ft.
Average Lot Size	14,000 sq. ft.	15,525 sq. ft.
Minimum street frontage	100 ft.	100 ft.

Zoning and space requirements

The proposed preliminary plat is located within an R-2A zone. NCC 19.22.010 requires a minimum lot size of 12,000 sq. ft. and an average lot size of 14,000 sq. ft. Each lot has a frontage requirement of 100 ft. As noted above, the application meets each of these standards. The preliminary plat includes a setback detail that meets setback requirements.

Utility Lines, Easements, and Storm Water

The applicant has shown a preliminary plan for connecting utilities to Nibley City's utility system, including locations of sewer, water lines and stormwater management. A diagram of standard public utility easements is also provided. Nibley City engineer and public works director have reviewed the plans to ensure feasibility and compliance with City standards.

Canals

There are no irrigation ditches located on the property. However, there is an affected adjacent canal that the applicant proposes to discharge stormwater into.

NCC 21.08.010 states:

Except as outlined in NCC 21.10.040, prior to approval of the preliminary plat, the subdivider shall provide the City with signed documentation that any affected canal company has had the chance to review plans related to the alteration of affected canals, and further, that the canal company understands they have thirty (30) days from the date of notification to bring any concerns to the City.

The applicant has indicated that he has spoken with the affected canal company but has not provided the required letter. Staff recommends that this letter be provided as a condition of approval.

Transportation

The development is located adjacent to the roundabout project currently under construction on 1200 W and 3200 S. The developer will be responsible for any roadway and landscaping improvements not completed as part of this project on 3200 S and 1200 W. The subdivision will include two access local streets from 1200 W at approximately 3100 S and at 3050 S. 3100 S is proposed to be a 520' long cul-de-sac and 3050 S will stub to the adjacent property to the west. In accordance with NCC 21.12.060, the cul-de-sac does not exceed 1/8 mile in length and an 8' sidewalk with dedicated ROW is proposed to connect to 3200 S. The applicant has also proposed a small curb cut for traffic calming at the entrance of the subdivision, in accordance with NCC 21.12.060(E).

Nibley City's Parks, Trails, Recreation and Open Space Master Plan shows an east/west 8' connecting trail bordering on the northern edge of the development and Stonebridge Subdivision. Land was recently dedicated to the City for this trail, in connection with property transactions associated with the roundabout project. Staff recommends that the applicant be required to pay for half of the improvement cost of this 260 ft long trail segment, estimated at \$18,850 (total cost).

Recommended Conditions of Approval

1. The applicant needs to provide a letter from Blacksmith Fork-Nibley Irrigation Company as provided in 21.08.010.
2. The applicant to contribute half the cost of the master-planned trail at approximately 3000 S, bordering the subdivision.

Agenda Item #3 & #4: Preliminary Plat: Ridgeline Park-East

Description

Public Hearing: Ridgeline Park Phases 4-10 Preliminary Plat, containing 333 residential units (mix of single-family, townhome and condo units), located at approximately 250 W 3200 S. (Applicant: Visionary Homes)

Discussion and Consideration: Recommendation for Ridgeline Park Phases 4-10 Preliminary Plat, containing 333 residential units (mix of single-family, townhome and condo units), located at approximately 250 W 3200 S. (Applicant: Visionary Homes)

Department

City Planning

Action Type

Administrative

Recommendation

Recommend approval of Ridgeline Park East Preliminary Plat with the findings noted below

Reviewed By

City Planner, City Engineer, City Manager, Public Works

Background

Visionary Homes has applied for Preliminary Plat approval for the remaining residential phases of the Ridgeline Park Subdivision. Ridgeline Park is located near 250 W 3200 S within an R-PUD overlay zone, approved by the City Council on April 9. Below is a summary of the development and requirements for the R-PUD:

	R-PUD Requirements*	Ridgeline Park Phase 4-9	Ridgeline Park Phase 1-9 (Total)
Listed on R-PUD Application Map	Parcels need to be listed on the map	Yes	Yes
Total Gross Acres	20	50.53	79.28
Net Developable Acres	N/A	38.69	58.66
Total Open Space Land	35%	42%	42%
Units Per Net Developable Acre	12 Max Units	8.6	7.9
Total Number of Single Family Lots	20% min	17%	28%
Min Lot Size for	4,500 sq. ft.	5,000 sq. ft.	5,000 sq. ft.

Single Family Lots			
Total Lots	N/A	333	461
Total Park Space Required	7.5 acres, 2 pavilions, 2 swing sets, 3 playgrounds, 2 sports court/fields and 2 clubhouse, pool or splashpads	6.44 acres, 2 playgrounds, one swing set, 1 sports court, 1 pavilion, clubhouse and pool, dog park and station	9.77 acres, 3 playgrounds, 2 swing sets, 2 sports courts, 2 pavilions, clubhouse and pool, dog park and station
Parking	2 spaces for each unit (670), and one guest parking for every 3 units (112)	Condos- 1-car garage with 1 driveway space. Townhomes- 2-car garages with 2 spaces in driveways, 111 off-street guest parking spaces	Condos- 1-car garage with 1 driveway space. Townhomes- 2-car garages with 2 spaces in driveways, 130 off-street guest parking spaces

*Based upon ordinance adopted at time of approval

Zoning and Approved Development Plans Concurrence

As part of R-PUD approval, City Council approved amended development plans. This document acts as the zoning document for the development. Staff has determined that this application is supportive of these plans with regards to zoning, density, and layout and that the application meets minimum density requirements of the R-PUD zone, as noted in the chart above.

Utility Lines, Easements, Storm Water, Geotech

The applicant has shown a preliminary plan for connecting utilities to Nibley City's utility system, including locations of sewer, water lines and storm water management. A diagram of standard public utility easements and specific canal easements is also provided. The applicant proposes to provide a private lift station to be maintained by the HOA, which is to be abandoned when gravity sewer becomes available to the north. Nibley City engineer and public works director have reviewed the plans to ensure feasibility and compliance with City standards.

A geotechnical investigation has been provided, which is currently under engineering review.

Canals

Several open ditches are currently located on the site. The applicant proposes to relocate/pipe some of these ditches, while keeping some open, including Clear Creek along the primary trail corridor.

NCC 21.08.010 states:

Except as outlined in NCC 21.10.040, prior to approval of the preliminary plat, the subdivider shall provide the City with signed documentation that any affected canal company has had the chance to review plans related to the alteration of affected canals, and further, that the canal

company understands they have thirty (30) days from the date of notification to bring any concerns to the City.

The applicant has provided signed letters from all 3 affected irrigation companies (Nibley-Blacksmith Fork, College, Clear Creek), as required. No comments have been filed from any of the canal companies.

Transportation

Nibley City's Transportation Master Plan shows a local roadway extension of 2965 South between Elkhorn Subdivision and Hwy 165. A 2900 S connection between Hwy 165 and 250 West is also planned on the north edge of the development. In addition, 250 West is planned to continue northward through this development, between 3200 S and 2900 S.

Regarding the extension of 2965 South, the approved development agreement includes the following:

10. The Developer shall provide a public roadway to Highway 165 through the eastern neighborhood commercial property. This roadway shall be built when the commercial property is developed, or when traffic generated in the development warrants the intersection, as determined by Nibley City, and according to Nibley City traffic and design standards.

- a. This roadway shall have direct east/west alignment with 2965 S intersection on the west side of the development. Meaning, 2965 S shall align with the intersection on Highway 165 without need to turn onto another roadway.*
- b. After 250 West is developed, the public roadway connection to Highway 165 through the eastern neighborhood commercial property shall be brought up for consideration to determine the appropriate stage at which Developer shall be required to construct and improve the roadway.*

The design which the applicant has proposed is a deviation from section a above, as the roadway does require a turn onto 250 W to connect. The proposed roundabout design will help traffic continuously flow through this corridor. Staff believes that connectivity and traffic flow of the proposed design sufficiently serves the development, while making connections to adjacent development. However, an amendment to the development agreement is needed to approve the proposed design. At this time, the applicant does not propose a connection to Hwy 165. Staff has determined that this connection is needed prior to the conclusion of all phases within the proposed preliminary plat. To accommodate anticipated traffic generated by the additional 154 units developed in phases 4-5, Staff recommends that this connection be provided in conjunction with Phase 5. If not required sooner, the connection will be required when the commercial land adjacent to Hwy 165 is development.

Regarding the 2900 South connection, the development agreement states the following:

9. *The Developer shall develop a half road of 2900 S adjacent to Ridgeline Park and also develop and pave the 2900 S right-of-way east of the Development to Highway 165, according to City standards, including curb, gutter, sidewalks and landscaping.*

The applicant has provided an exhibit of this corridor, which shows a 12' unimproved farm lane and a 25-27' gap between deeds. A stamped survey of the property is needed to verify the right-of-way. Currently, the applicant proposes that the 12' farm lane be paved with a gate installed and keys for affected property owners. Another option would be to require a fee-in-lieu of this required improvement that would be applied to the future improvement of this roadway. Another option would be to allow the developer to pave the 12' roadway, with the installation of a gate for property owners. However, this would negate the value of the connection. Staff recommends that a stamped survey be provided with verification about where the ROW exists. Then, the required improvements must be installed or a separate agreement regarding the improvement of this corridor must be reached.

The 250 West connection is provided in support of the Transportation Master Plan and the approved Development Plans. The design of this roadway is a slight deviation from the development agreement, which states the following:

12. *There shall be no residential driveway access or street parking on 250 W.*

The proposed design of 250 W matches the Transportation Master Plan but does include space for street parking. Staff believes that street parking along this roadway is appropriate and should be provided in conjunction with an amendment to the Development Agreement.

The remaining public streets provide further connectivity within the development. To allow for a potential connection of the adjacent parcel, east of the development, the applicant proposes to dedicate a 60' wide parcel, which could be used for a future connection. Staff believes this is necessary to potentially avoid access along Hwy 165, depending upon how this adjacent land develops.

The applicant also proposes private streets to provide access to several of the proposed townhomes, condos and several rear-loaded single-family homes. Each of these units will also be connected via a trail or public street, consistent with City standards.

The Applicant has submitted a Traffic Impact Study (TIS) for the development "to analyze traffic operations at key intersections for existing (2021), future (2026), and future (2040) conditions with and without the proposed project and to recommend mitigation measures as needed." The study concludes that "all intersections are anticipated to continue operating at acceptable levels of service during the evening peak hour in future (2026) plus project conditions." The TIS is currently under review and the Engineer has pending comments that need to be addressed. Staff recommends that all TIS comments be resolved as a condition of approval.

Nibley City's Parks, Trails, Recreation and Open Space Master Plan shows a north/south oriented 8' wide connecting trail through the proposed Ridgeline Park Development along the

Clear Creek alignment. The applicant proposes to build and maintain the 8 foot trail and proposes an easement for this trail on the preliminary plat. A public trail easement will be dedicated along the length of this trail. In addition to this trail, several 5' wide walkways are proposed throughout the development, providing connections to units, open space and amenities.

Parking

NCC 19.32.080-B-5 states:

Parking: Each R-PUD shall provide 2 primary parking spaces for each unit. Primary parking must be contained in a garage, carports, driveway, or parking court. An R-PUD shall provide one guest parking spot for every three units. Guest parking may be located in parking courts or on street parking maintained by the owner association.

The applicant proposes to provide 2-car garages with 2 spaces of driveway parking for each townhome unit and 1-car garage and 1 space of driveway parking for each condo unit. For this portion of the development, 111 guest parking stalls are proposed for a total of 130 guest parking stalls for the entire development. Staff has determined that parking minimums are met with this application.

Open Space and Maintenance Plan

NCC 19.32.050 provides that 7.5 acres, 2 pavilions, 2 swing sets, 3 playgrounds, 2 sports court/fields and 2 clubhouse, pool or splashpads is required for developments of 401-500 acres. In addition, 35% of open space is required per net developable acre. Including previous phases, the applicant proposes 9.77 acres, 3 playgrounds, 2 swing sets, 2 sports courts, 2 pavilions, clubhouse and pool. In total 42% of net developable land is dedicated as open space, meeting both the open space and amenities requirements of Nibley City Code. The applicant also proposes a dog park in phase 5, near the proposed condo units and dog stations along the trail and the dog park, in accordance with the Development Agreement. According to the provided preliminary maintenance plan, all open space and amenities are proposed to be managed and maintained by the HOA.

Within the development are affected wetlands. The applicant has provided a wetland mitigation plan with approval from the Army Corp of Engineers for relocation of affected wetland areas. The mitigation area is located at the intersection of 250 W & 3200 S.

It is important to note in final plat approval there are more landscaping details needed as listed in NCC 19.32.080-B.

Recommended Conditions of Approval

1. Development Agreement must be amended, striking requirement for 2965 S roadway connection to be continuous without need to turn onto another roadway.
2. Development Agreement must be amended to allow on-street parking on 250 W.
3. 2965 S roadway must connect to Hwy 165 in conjunction with Phase 5 improvements of the subdivision.

4. 2900 S right of way needs stamped survey with required improvements shown for the entire right-of-way, as noted on the Development Agreement. Such improvements must be completed in conjunction with Phase 7 of the subdivision.
5. The commercial phase must be included as part of the subdivision by virtue of a portion of the property being subdivided into the residential portion. While it can be considered as part of a separate phase, all improvements associated with the property need to be included as a part of this preliminary plat.
6. Traffic Impact Study, Geotechnical study, sewer study, stormwater study and all other supporting materials must be provided or updated and appropriately addressed, as determined by City Engineer.

Agenda Item #3: Planning Commission Rules and Procedures

Description

Training: Planning Commission Rules and Procedures

Department

City Planning

Background

Cheryl Bodily, City Recorder, will provide a training on general rules and procedures for Planning Commission meetings.

Agenda Item #4: Planning Commission Goals for 2022

Description

Workshop: Planning Commission Goals for 2022

Recommendation

Discuss and formulate goals for the Planning Commission to accomplish in 2022

Department

City Planning

Background

To guide the activities of the Planning Commission and supportive Staff for the year, the Planning Commission should formalize goals. Staff recommends the following goals be considered for 2022:

1. Review and make recommendations to create/update the following ordinances:
 - a. Landscape Ordinance and Standards
 - b. Town Center Commercial Zone and Standards
 - c. Nibley City Design Standards (in coordination with Public Works/Engineering)
 - d. Cluster Subdivisions
 - e. Conditional Uses
 - f. All required ordinance changes from State legislature
2. Create an effective Transfer of Development Rights (TDR) Ordinance and Process
3. Develop more robust and standardized public and stakeholder engagement activities to ensure public buy-in of major code changes and plan updates.

The purpose of this workshop is to discuss these and any other goals the Planning Commission recommends for the coming year.

Diagram illustrating the layout of a 60' Local Public Street, showing setbacks and easements:

- 10' SIDE YARD, INTERIOR**: Indicated by arrows pointing to the interior side yard space.
- 25' REAR YARD**: Indicated by an arrow pointing to the rear yard setback.
- 5' P.U.E.** (Public Utility Easement): Shown as narrow strips along the top and bottom boundaries.
- 10' P.U.E.** (Public Utility Easement): Shown as wider strips along the left and right boundaries.
- 35' SIDE YARD, ARTERIAL STREET**: Indicated by an arrow pointing to the side yard setback adjacent to the arterial street.
- 30' FRONT SETBACK**: Indicated by an arrow pointing to the front yard setback.
- 60' LOCAL PUBLIC STREET**: The main street width.

WEST $\frac{1}{4}$ CORNER OF
SECTION 20, T11N,
R1E, S.L.B. & M.

1. DEVELOPER:
MATTHEW PAYNE
BUILDWITHORCHID@GMAIL.COM
P. 435.770.0809

2. CIVIL ENGINEER:

TYSON GLOVER
498 WEST 100 SOUTH
PROVIDENCE, UT 84332
TGLOVER@CSG.WORK
P. 435.237.2030

3. SURVEYOR:

DENNIS CARLISLE
669 NORTH 1890 WEST SUITE 47B
PROVO, UT 84601
DCARLISLE@CSG.WORK
P. 801.874.4132 EXT. 712

1. NUMBER OF RESIDENTIAL LOTS: 17
2. ZONE: R-2A
3. MINIMUM LOT WIDTH: 100'
4. MINIMUM LOT SIZE: 12,000 SF
5. MIN AVERAGE LOT SIZE: 14,000 SF
6. AVERAGE LOT SIZE PROVIDED: 15,525 SF
7. A 24" TRAIL/SEWER RIGHT OF WAY AT THE CULDESAC END IS PROPOSED TO BE DEDICATED TO THE CITY.
8. PROPOSED NUMBER OF RESIDENTIAL LOTS: 17
9. PROPOSED NUMBER OF PHASES: 1
10. ALL LOTS HAVE AN ADEQUATE BUILDABLE ENVELOPE. THERE ARE NO STEEP SLOPES OR UNDEVELOPABLE SENSITIVE AREAS.
11. SEE PUE AND SETBACK DETAIL FOR SETBACK REQUIREMENTS.

A PORTION OF THE SW1/4 OF SECTION 20, TOWNSHIP 11 NORTH, RANGE 1 EAST, SALT LAKE BASE AND MERIDIAN, LOCATED IN NIBLEY, UTAH, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE NORTHWEST CORNER OF PARCEL 03-07-017-0018 AS DESCRIBED IN THE 3200 SOUTH & 1200 WEST ROUNDABOUT BOUNDARY LINE ADJUSTMENTS AND ROADWAY DEDICATIONS ACCORDING TO THE OFFICIAL RECORDS THEREOF ON FILE IN THE OFFICE OF THE CACHE COUNTY RECORDER, LOCATED S89°51'19"E ALONG THE 1/4 SECTION LINE 2,353.49 FEET AND SOUTH 25.00 FEET FROM THE WEST 1/4 CORNER OF SECTION 20, T11N, R1E, S.L.B.M.; THENCE ALONG SAID BOUNDARY LINE ADJUSTMENTS AND ROADWAY DEDICATIONS THE FOLLOWING FIFTEEN (15) COURSES AND DISTANCES; THENCE S89°51'19"E 259.72; THENCE S0°42'00"W 677.25 FEET; THENCE ALONG THE ARC OF A 1056.00 RADIUS CURVE TO THE RIGHT 164.66 FEET THROUGH A CENTRAL ANGLE OF 8°55'24" (THENCE S5°09'42"W 164.30 FEET); THENCE S9°37'24"W 38.72 FEET; THENCE S10°12'23"W 66.89 FEET; THENCE S9°47'37"E 33.62 FEET; THENCE S10°12'23"W 22.75 FEET; THENCE ALONG THE ARC OF A 88.00 FOOT RADIUS CURVE TO THE RIGHT 73.62 FEET THROUGH A CENTRAL ANGLE OF 47°55'52" (THENCE S34°10'19"W 71.49 FEET); THENCE S58°08'15"W 10.69 FEET; THENCE ALONG THE ARC OF A 185.20 FOOT RADIUS CURVE TO THE RIGHT 61.63 FEET THROUGH A CENTRAL ANGLE OF 19°03'55" (THENCE S67°40'13"W 61.34 FEET); THENCE S68°02'28"W 18.30 FEET; THENCE S88°51'12"W 214.63 FEET; THENCE N0°10'30"E 59.31 FEET; THENCE S88°51'08"E 115.19 FEET; THENCE N0°32'4"E 494.64 FEET TO THE POINT OF BEGINNING.

CONTAINS: 7.73+/- ACRES

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civilsolutionsgroup inc.

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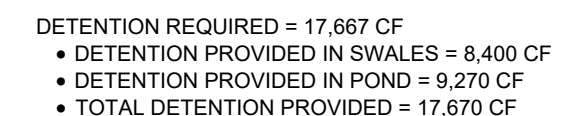
[illegible]

PROJECT #: 21-341
DRAWN BY: T. GLOVER
PROJECT MANAGER: T. GLOVER
ISSUED: 1/25/2022



PRELIMINARY SURVEY PLAN

C100



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ENGINEERING • GEOTECHNICAL • ENVIRONMENTAL (ESA I & II) •
MATERIALS TESTING • SPECIAL INSPECTIONS •
ORGANIC CHEMISTRY • PAVEMENT
DESIGN • GEOLOGY

GEOTECHNICAL ENGINEERING STUDY

Nibley 3200 South Property

1200 West 3200 South
Nibley, Utah
CMT PROJECT NO. 900190

FOR:
CW Urban
1222 West Legacy Crossing Boulevard #6
Centerville, Utah 84014

December 17, 2021

December 17, 2021

Mr. Matthew Payne
CW Urban
1222 West Legacy Crossing Boulevard #6
Centerville, Utah 84014

Subject: Geotechnical Engineering Study
Nibley 3200 South Property
1200 West 3200 South
Nibley, Utah
CMT Project Number 900190

Mr. Payne:

Submitted herewith is the report of our geotechnical engineering study for the subject site. This report contains the results of our findings and an engineering interpretation of the results with respect to the available project characteristics. It also contains recommendations to aid in the design and construction of the earth related phases of this project.

On November 11, 2021, a CMT Engineering Laboratories (CMT) staff professional was on-site and supervised the excavation of 5 test pits extending to a depth of about 6.5 to 7.5 feet below the existing ground surface. Soil samples were obtained during the field operations and subsequently transported to our laboratory for further testing and observation. Groundwater was encountered within the test pits as shallow as 3 feet below the ground surface in test pit TP-2 during the field work. Subsequent static water levels were measured within installed pipes on December 7, 2021 between depths of about 3 to 5 feet below the ground surface.

Conventional spread and/or continuous footings may be utilized to support the proposed structures, provided the recommendations in this report are followed. A detailed discussion of design and construction criteria is presented in this report.

We appreciate the opportunity to work with you at this stage of the project. CMT offers a full range of Geotechnical Engineering, Geological, Material Testing, Special Inspection services, and Phase I and II Environmental Site Assessments. With offices throughout Utah, Idaho and Arizona, our staff is capable of efficiently serving your project needs. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at 801-590-0394.

Sincerely,

CMT Engineering Laboratories



Bryan N. Roberts, P.E.
Senior Geotechnical Engineer



Reviewed by:



Andrew M. Harris, P.E.
Geotechnical Division Manager

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APPENDIX

Figure 1: Site Plan

Figures 2-6: Test Pit Logs

Figure 7: Key to Symbols

1.0 INTRODUCTION

1.1 General

CMT Engineering Laboratories (CMT) was retained to conduct a geotechnical subsurface study for the proposed development of approximately 8 acres as a residential subdivision. The parcel is situated on the west side of 1200 West and on the north side of 3200 South in Nibley, Utah, as shown in the **Vicinity Map** below.



VICINITY MAP

1.2 Objectives, Scope and Authorization

The objectives and scope of our study were planned in discussions between Mr. Matthew Payne of CW Urban, and Mr. Andrew Harris of CMT Engineering Laboratories (CMT). In general, the objectives of this study were to define and evaluate the subsurface soil and groundwater conditions at the site, and provide appropriate foundation, earthwork, pavement and seismic recommendations to be utilized in the design and construction of the proposed development.

In accomplishing these objectives, our scope of work has included performing field exploration, which consisted of the excavating/logging/sampling of 5 test pits, performing laboratory testing on representative

samples of the subsurface soils collected in the test pits, and conducting an office program, which consisted of correlating available data, performing engineering analyses, and preparing this summary report. This scope of work was authorized by returning a signed copy of our proposal dated and executed on November 5, 2021.

1.3 Description of Proposed Construction

We understand that a residential subdivision is planned for the approximately 8-acre site. Structures are likely to 1 to 3 levels above grade and constructed using conventional wood/light metal framing, and founded on spread footings with partial depth basements (if conditions allow). Maximum continuous wall and column loads are anticipated to be 1 to 3 kips per lineal foot and 10 to 50 kips, respectively. If the loading conditions are different than we have projected, please notify us so that any appropriate modifications to our conclusions and recommendations contained herein can be made.

We also understand that pavements at the site will include public light-duty roadways, which we anticipate will utilize asphalt pavement. Traffic is projected to consist of mostly automobiles and light trucks, a few daily medium-weight delivery trucks, a weekly garbage truck, and an occasional fire truck.

Site development will require some earthwork in the form of minor cutting and filling. A site grading plan was not available at the time of this report, but we project that maximum cuts and fills may be on the order of 1 to 3 feet. Where groundwater was encountered at relatively shallow depths, site grading cuts should be kept to the minimum required to remove topsoil and any unsuitable soils. If required site grading fills are larger than about 4 feet CMT must be notified to review settlements.

1.4 Executive Summary

The results of our study show that the projected lightly loaded residential structures may be supported upon conventional spread and continuous wall foundations placed on suitable natural soils or structural fill extending to suitable natural soils utilizing a bearing pressure of 1,500 pounds per square foot.

The most significant geotechnical aspects regarding new site development include the following:

- 1 Moderately thick sequence of surficial topsoil averaging about 1 foot thick with up to about 2.5 feet of topsoil at test pit TP-1.
- 2 Shallow groundwater was encountered across the site. Static water levels were measured on December 7, 2021 ranging from about 3.0 to 5.0 feet below the existing ground surface. It is anticipated that seasonal water level fluctuations would occur with the highest water levels during the spring and early summer months with the lowest levels seen during the late fall season.

Other factors, such as localized irrigation of surrounding properties, and prolonged wet weather would also be expected to contribute to water fluctuations. The shallow groundwater encountered at the site may likely affect the installation of utilities, foundations, and sublevel construction. Further the natural soils which are high in moisture content may require some amount of stabilization prior to placement of structural fill, foundations and pavements/slabs on grade.

All habitable floor slabs are recommended to be established a minimum of 3.0 feet above the measured groundwater level. Sublevels may not be practical/feasible unless extensive land drains are installed and individual foundation drains are installed for each structure tying into the land drain system. If an extensive land drain is constructed within the development, the top of slabs within the lowest habitable level must be at least 1.5 feet above the level controlled by individual foundation subdrains tied into land drains within the development. Another option for constructing sublevels may be to raise the current site grades. If required site grading fills are larger than about 4 feet CMT must be notified to review settlements.

- 3 Some near saturate to saturated fine sandy soils were encountered within test pits TP-1 and TP-2. Where sandy soils are encountered, they will be more susceptible to caving when saturated where excavation is to be completed.
- 4 The surface is moderately to heavily vegetated with varying grasses, weeds. The vegetation and topsoil will need to be stripped in structural areas.

In the following sections, detailed discussions pertaining to the site are provided, including subsurface descriptions, geologic/seismic setting, earthwork, foundations, lateral resistance, lateral pressure, floor slabs, and pavements.

2.0 FIELD EXPLORATION

2.1 General

In order to define and evaluate the subsurface soil and groundwater conditions, 5 test pits were excavated with a backhoe at the site to a depth of approximately 6.5 to 7.5 feet below the existing ground surface. Locations of the test pits are shown on **Figure 1, Site Plan**, included in the Appendix. The field exploration was performed under the supervision of an experienced member of our geotechnical staff.

Representative soil samples were collected by obtaining disturbed "grab" samples and cutting relatively undisturbed "block" samples from within each test pit. The samples were placed in sealed plastic bags and containers prior to transport to the laboratory.

The subsurface soils encountered in the test pits were classified in the field based upon visual and textural examination, logged, and described in general accordance with ASTM¹ D-2488. These field classifications were supplemented by subsequent examination and testing of select samples in our laboratory. Graphical representations of the subsurface conditions encountered are presented on each individual Test Pit Log, **Figures 2 through 6**, included in the Appendix. A Key to Symbols defining the terms and symbols used on the logs, is provided as **Figure 7** in the Appendix.

¹American Society for Testing and Materials

Following completion of excavating operations, 1.25-inch diameter slotted PVC pipe was installed in test pits TP-1 through TP-5 to allow subsequent water level measurements.

Upon completion of logging and sampling, the test pits were backfilled with the excavated soils. When backfilling, minimal to no effort was made to compact the backfill and no compaction testing was performed. Thus, the test pit backfill is considered undocumented/non-engineered fill and settlement of the backfill in the test pits over time should be anticipated.

3.0 LABORATORY TESTING

3.1 General

Selected samples of the subsurface soils were subjected to various laboratory tests to assess pertinent engineering properties, as follows:

1. Moisture Content, ASTM D-2216, Percent moisture representative of field conditions
2. Dry Density, ASTM D-2937, Dry unit weight representing field conditions
3. Atterberg Limits, ASTM D-4318, Plasticity and workability
4. Gradation Analysis, ASTM D-1140/C-117, Grain Size Analysis
5. One Dimension Consolidation, ASTM D-2435, Consolidation properties

3.2 Lab Summary

Laboratory test results are presented on the test pit logs (**Figures 2 through 6**) and in the following Lab Summary table:

LAB SUMMARY TABLE

TEST PIT	DEPTH (feet)	SOIL CLASS	SAMPLE TYPE	MOISTURE CONTENT(%)	DRY DENSITY (pcf)	GRADATION			ATTERBERG LIMITS		
						GRAV.	SAND	FINES	LL	PL	PI
TP-1	4	SM-ML	Bag	23				53		NP	NP
TP-2	2	SM-ML	Bag	31				44		NP	NP
TP-3	2.5	CL	Block	22					31	19	12
TP-5	2	CL	Block	26	94				38	20	18

3.3 One-Dimensional Consolidation Tests

A consolidation test was performed on a near surface clay soil sample from test pit TP-5 at a depth of about 2 below the ground surface. The clay soil sample tested indicate moderate over-consolidation, moderate strength, and moderately high compressibility characteristics. Detailed results of the tests are maintained within our files and can be transmitted to you, upon your request.

4.0 GEOLOGIC & SEISMIC CONDITIONS

4.1 Geologic Setting

The subject site is located in the southeast portion of Cache Valley in northern Utah. The site sits at an elevation of approximately 4,519 feet above sea level. The Cache Valley is a deep, sediment-filled basin that is part of the Middle Rocky Mountain Physiographic Province. The valley is bordered by the Bear River Range on the east and the Wellsville Mountains on the west. The valley is located within the Intermountain Seismic Belt, a zone of ongoing tectonism and seismic activity extending from southwestern Montana to southwestern Utah. The Cache Valley is a fault-block valley (Graben) structurally bound on the east by the west-dipping East Cache Fault Zone and on the west by the east-dipping West Cache Fault Zone. Tectonic displacement along these faults has resulted in the relative down-drop of the valley in relation to the uplift of the bounding mountain ranges on the east and west.

Much of northwestern Utah, including the Cache Valley, was also previously covered by the Pleistocene age Lake Bonneville. The Great Salt Lake, located to the southwest of the valley, is a remnant of this ancient fresh water lake. Lake Bonneville reached a high-stand elevation of between approximately 5,160 and 5,200 feet above sea level at between 18,500 and 17,400 years ago. Approximately 17,400 years ago, the lake breached its basin in southeastern Idaho and dropped relatively fast, by almost 300, feet as water drained into the Snake River. Following this catastrophic release, the lake level continued to drop slowly over time, primarily driven by drier climatic conditions, until reaching the current level of the Great Salt Lake. Shoreline terraces formed at the high-stand elevation of the lake and several subsequent lower lake levels are visible in places on the mountain slopes surrounding the valley. Much of the sediment within the Cache Valley was deposited as lacustrine sediments during both the transgressive (rise) and regressive (fall) phases of Lake Bonneville. These sediments were deposited over thick sequences of older Quaternary and Tertiary age, pre-Lake Bonneville deposits within the valley.

The geology of the USGS Logan, Utah 7.5 Minute Quadrangle, that includes the location of the subject site, has been mapped by Evans and others². The surficial geology at the location of the subject site and adjacent properties is mapped as “Lacustrine sand and silt related to Provo and younger shorelines” (Map Unit Qlps) dated Holocene to upper Pleistocene. Unit Qlps is described in the referenced map as “Lacustrine sand and silt deposits related to Provo and younger shorelines are latest Pleistocene in age and consist of coarse to fine sand, silt, and minor clay that is typically rhythmically bedded. Beds are thin, with common ripple laminations. Original bedding dips range from horizontal to as much as 10 degrees. These fine-grained sediments were deposited in nearshore environments valleyward from Provo-level deltas at Logan and Providence Canyons. Exposed thickness is less than 16 feet «5 m).” Refer to the **Geologic Map**, shown below.

²Evans, J.P., McCalpin, J.P., and Holmes, D.C., 1996, Geologic Map of the Logan Quadrangle, Cache County, Utah; Utah Geological Survey Miscellaneous Publication 96-1, Scale 1:24,000.



GEOLOGIC MAP

4.2 Faulting

No surface fault traces are shown on the referenced geologic map crossing, adjacent to, or projecting toward the subject site. The site is between the East and West Cache fault zones with the central section of the East Cache Fault Zone approximately 3.0 miles to the east. Seismic design issues are addressed in **Section 4.3** below.

4.3 Seismicity

4.3.1 Site Class

Utah has adopted the International Building Code (IBC) 2018, which determines the seismic hazard for a site based upon 2014 mapping of bedrock accelerations prepared by the United States Geologic Survey (USGS) and the soil site class. The USGS values are presented on maps incorporated into the IBC code and are also available based on latitude and longitude coordinates (grid points). For site class definitions, IBC 2018 Section

1613.2.2 refers to Chapter 20, Site Classification Procedure for Seismic Design, of ASCE³ 7-16, which stipulates that the average values of shear wave velocity, blow count and/or shear strength within the upper 100 feet (30 meters) be utilized to determine seismic site class.

Considering our explorations only extended to a depth of about 7.5 feet, it is our opinion the site best fits Site Class D – Stiff Soil Profile (without data, or default), which we recommend for seismic structural design.

4.3.2 Seismic Design Category

The 2014 USGS mapping utilized by the IBC provides values of peak ground, short period and long period spectral accelerations for the Site Class B/C boundary and the Risk-Targeted Maximum Considered Earthquake (MCE_R). This Site Class B/C boundary represents average bedrock values for the Western United States and must be corrected for local soil conditions. The Seismic Design Categories in the International Residential Code (IRC 2018 Table R301.2.2.1.1) are based upon the Site Class as addressed in the previous section. For Site Class D (with data) at site grid coordinates of 41.676746 degrees north latitude and -111.862845 degrees west longitude, S_{DS} is 0.871 and the **Seismic Design Category** is D₂.

4.3.3 Liquefaction

The site is located in an area that has been identified by the Utah Geological Survey Liquefaction Potential Map for Cache Valley Utah (Public Information Series 79 August 2003) having “low to moderate” liquefaction potential. Liquefaction is defined as the condition when saturated, loose, sandy soils lose their support capabilities because of excessive pore water pressure which develops during a seismic event. Clayey soils, even if saturated, will generally not liquefy during a major seismic event.

A special liquefaction study was not performed for this site. Such a study would require either bore holes with down hole SPT sampling or pushing a Cone Penetrometer to depths of 30 to 40 feet below the existing ground surface. However, the majority of the subsurface soils encountered to the full depths penetrated, about 7.5 feet, are primarily clay soils with a plastic limit greater than 7 percent which are unlikely to liquefy during the design seismic event.

4.4 Other Geologic Hazards

No landslide deposits or features, including lateral spread deposits, are mapped on or adjacent to the site. The site is not located within a known or mapped potential debris flow, stream flooding⁴, or rock fall hazard area.

³American Society of Civil Engineers

⁴<https://msc.fema.gov/portal/search?AddressQuery=1200%20West%203200%20South%2C%20Nibley%2C%20#searchresultsanchor>

5.0 SITE CONDITIONS

5.1 Surface Conditions

The roughly 8-acre property consists of 3 separate parcels with the following Cache County Parcel ID Numbers: 03000170018, 0300170003, and 0300170016. The Site property is currently vacant pasture land. Vegetation consisted ankle- to shin-high weeds and grasses. Historical uses of the Subject Property include agricultural use. The Subject Property has been vacant, undeveloped land since prior to 1937. Since then, the Subject Property has remained relatively unchanged.

The current uses of the surrounding, adjacent properties is as follows:

North: Residential Subdivision

East: 1200 West Street followed by residential structures and vacant fields.

South: 3200 South Street followed by residential structures.

West: Residential structures and vacant fields.

(See **Vicinity Map** in **Section 1.1** above).

5.2 Subsurface Soils

Topsoil blankets the surface at the test pit locations averaging in thickness of about 12 inches at test pits TP-2 through TP-5 and as thick as about 2.5 feet at TP-1.

Below the topsoil at test pit TP-1, natural soils encountered consisted of silty fine SAND/fine sandy SILT with trace to some gravel extending to the full depth penetrated, about 6.5 feet.

Similarly, below the topsoil at test pit TP-2 natural silty fine SAND/fine sandy SILT was encountered to a depth of about 5 feet underlain by fine sandy CLAY extending to the full depth penetrated, about 7.5 feet.

Below the topsoil at test pits TP-3 through TP-5, natural soils consisted primarily of silty and fine sandy CLAY extending to the full depth penetrated, about 7.5 feet.

The silt/clay soils were moist to wet, brown and gray in color, and estimated to be medium stiff to soft with depth in consistency. They also exhibited moderate over consolidation and strength characteristics with moderately high compressibility characteristics.

The natural fine silty sandy/sandy silt soils were very moist to wet, brown to gray in color, and estimated to be loose. They will also exhibit moderate strength and moderately low compressibility characteristics.

For a more descriptive interpretation of subsurface conditions, please refer to the test pit logs, **Figures 2 through 6**, which graphically represent the subsurface conditions encountered. The lines designating the interface between soil types on the logs generally represent approximate boundaries - in situ, the transition between soil types may be gradual.

5.3 Groundwater

Groundwater was encountered within the test pits completed at the site. Following the initial field work CMT personnel returned to the site on December 7, 2021 to measure static groundwater levels within installed slotted pipe at each test pit. A summary of the groundwater levels measured is provided in the following table.

Test Pit No.	Static Groundwater Depth Measured on December, 2021
TP-1	About 5 Feet
TP-2	About 4 Feet
TP-3	About 4 Feet
TP-4	About 3 Feet
TP-5	About 4 Feet

Groundwater levels can fluctuate seasonally. Numerous other factors such as heavy precipitation, irrigation of neighboring land, and other unforeseen factors, may also influence ground water elevations at the site. The detailed evaluation of these and other factors, which may be responsible for ground water fluctuations, is beyond the scope of this study.

5.4 Design Groundwater

If a land drain is not constructed within the development, then the lowest habitable floor slab embedment should be kept a minimum of 3.0 feet above measured static groundwater levels. If an extensive land drain is utilized and individual residential drains are constructed which tie to the land drains, floor slabs must be maintained a minimum of 18 inches above levels controlled by subdrains.

5.5 Site Subsurface Variations

Based on the results of the subsurface explorations and our experience, variations in the continuity and nature of subsurface conditions should be anticipated. Due to the heterogeneous characteristics of natural soils, care should be taken in interpolating or extrapolating subsurface conditions between or beyond the exploratory locations.

Also, when logging and sampling of the test pits was completed, the test pits were backfilled with the excavated soils but minimal to no effort was made to compact these soils. Thus, the test pit backfill is considered undocumented fill and settlement of the backfill in the test pits over time should be anticipated.

6.0 SITE PREPARATION AND GRADING

6.1 General

Initial site preparation will consist of the removal of surface vegetation, topsoil, any other deleterious materials, non-engineered fills if encountered, and loose/disturbed surface soils from beneath an area extending out at least 3 feet from the perimeter of the proposed homes buildings and 2 feet beyond pavements and exterior flatwork areas. When stripping and grubbing, topsoil should be distinguished by the apparent organic content and not solely by color; thus, we estimate that topsoil stripping will need to include the upper 6 to 10 inches on average. However, given the past agricultural uses of the site, the upper 12 to 15 inches may have been disturbed during farming.

Due to shallow groundwater conditions, it may be prudent to install major utilities and, if utilized, land drains as far in advance as possible prior to roadway and residential construction. However, if large area site grading fills will exceed about 4 feet in thickness then utility installation may need to be started after area site grading fill placement for settlement purposes. Further it is recommended that site grading cuts be kept to the minimum to remove vegetation, topsoil, disturbed soils, non-engineered fills, if encountered, and any other unsuitable soils. Ideally roadway structural sections would be designed at least two and one half to three feet above the groundwater level to reduce potential subgrade stabilization needs. All habitable floor slabs are recommended to be established a minimum 3.0 feet above encountered groundwater or a minimum of 1.5 feet above groundwater controlled by an adequate subdrain system if installed.

The earthwork contractor must be prepared to dewater and likely begin dewatering prior to major excavating. The potential need for stabilizing the natural fine-grained soil subgrade with high moisture content, especially near or below groundwater or following precipitation events, and prior to the placement of utilities, structural fills, or structural elements must be anticipated. Stabilization recommendations are provided later in this report.

Subsequent to stripping and prior to the placement of structural site grading fill, pavements, floor slabs, or footings, the exposed subgrade shall be proofrolled by running moderate-weight rubber tire-mounted construction equipment uniformly over the surface at least three times. An exception to this would be where the exposed subgrade is within 2 feet of groundwater. If excessively soft or otherwise unsuitable soils are encountered beneath footings, they must be totally removed and/or stabilized. If removal depth required is more than 2 feet or at groundwater level, CMT must be notified to provide additional recommendations. In pavement, outside flatwork areas, and in most cases below floor slab, unsuitable natural soils shall be removed to a maximum depth of 2 feet and replaced with compacted granular structural fill. Additional removal below floor slabs may be required depending on conditions encountered.

Surface vegetation and other deleterious materials should generally be removed from the site. Topsoil, although unsuitable for utilization as structural fill, may be stockpiled for subsequent landscaping purposes.

A representative of CMT must verify that suitable natural soils and/or proper preparation of existing soils have been encountered/met prior to placing site grading fills, footings, slabs, and pavements.

Fill placed over large areas to raise overall site grades can induce settlements in the underlying natural soils. If more than 4 feet of site grading fill is anticipated over the natural ground surface, we should be notified to assess potential settlements and provide additional recommendations as needed. These recommendations may include placement of the site grading fill far in advance to allow potential settlements to occur prior to construction.

6.2 Temporary Excavations

Groundwater was observed at the test pit and bore hole locations between about 3.0 and 5.0 feet below the existing ground surface (averaging about 4 feet below the surface). We anticipate that utility and possible foundation excavations will encounter groundwater, and dewatering of such excavations will likely be required.

In cohesive (clayey) soils, temporary construction excavations not exceeding 4 feet in depth may be constructed with near-vertical side slopes. Temporary excavations up to 8 feet deep, above or below groundwater, may be constructed with side slopes no steeper than one-half horizontal to one vertical (0.5H:1V). Excavations deeper than 8 feet are not anticipated at the site.

For granular (cohesionless) soils, construction excavations above the water table, not exceeding 4 feet, should be no steeper than one-half horizontal to one vertical (0.5H:1V).

Excavations encountering saturated cohesionless soils will be very difficult and will require very flat sideslopes and/or shoring, bracing and dewatering as these soils will tend to flow into the excavation. Where excavations are known to extend below groundwater it is recommended that dewatering begin as far in advance and reasonably possible to help facilitate the excavation process. Even with dewatering, adjacent saturated clean sand soils, if encountered, may flow into the excavation. Under such cases, temporary shoring of excavations must be anticipated.

To reduce disturbance of the natural soils during excavation, we recommend that smooth edge buckets/blades be utilized.

All excavations must be inspected periodically by qualified personnel. If any signs of instability or excessive sloughing are noted, immediate remedial action must be initiated. All excavations should be made following OSHA safety guidelines.

6.3 Fill Material

Structural fill is defined as all fill which will ultimately be subjected to structural loadings, such as imposed by footings, floor slabs, pavements, etc. Structural fill will be required as backfill over foundations and utilities, as site grading fill, and possibly as replacement fill below footings. All structural fill must be free of sod, rubbish, topsoil, frozen soil, and other deleterious materials.

Following are our recommendations for the various fill types we anticipate will be used at this site:

Fill Material Type	Description/Recommended Specification
Select Structural Fill/Replacement Fill	Placed below structures, flatwork and pavement. Well-graded sand/gravel mixture, with maximum particle size of 4 inches, a minimum 70% passing 3/4-inch sieve, a maximum 20% passing the No. 200 sieve, and a maximum Plasticity Index of 10.
General Site Grading Fill	Placed over larger areas to raise the site grade. Sandy to gravelly soil, with a maximum particle size of 6 inches, a minimum 70% passing 3/4-inch sieve, and a maximum 30% passing No. 200 sieve.
Non-Structural Fill	Placed below non-structural areas, such as landscaping. On-site soils or imported soils, with a maximum particle size of 8 inches, including silt/clay soils not containing excessive amounts of degradable/organic material (see discussion below).
Stabilization Fill	Placed to stabilize soft areas prior to placing structural fill and/or site grading fill. Coarse angular gravels and cobbles 1 inch to 8 inches in size. May also use 1.5- to 2.0-inch gravel placed on stabilization fabric, such as Mirafi RS280i or equivalent (see Section 6.6).

On-site soils may be used as general site grading fill and as non-structural fill if free of deleterious material. Please note, that the existing fine grained (clayey) soils, from a handling and compaction standpoint, are inherently more difficult to rework and are very sensitive to changes in moisture content requiring very close moisture control during placement and compaction. This will be very difficult, if not impossible, during wet and cold periods of the year to properly rework. Additionally, the onsite soils are likely well above optimum moisture content for compacting at present and would require some drying prior to recompacting. Therefore, re-utilization of the onsite fine-grained natural soils as structural site grading fill may not be economical or project schedule friendly but may be best utilized in landscape areas.

All fill material should be approved by a CMT geotechnical engineer prior to placement.

6.4 Fill Placement and Compaction

The various types of compaction equipment available have their limitations as to the maximum lift thickness that can be compacted. For example, hand operated equipment is limited to lifts of about 4 inches and most “trench compactors” have a maximum, consistent compaction depth of about 6 inches. Large rollers, depending on soil and moisture conditions, can achieve compaction at 8 to 12 inches. The full thickness of each lift should be compacted to at least the following percentages of the maximum dry density as determined by ASTM D-1557 (or AASHTO⁵ T-180) in accordance with the following recommendations:

⁵ American Association of State Highway and Transportation Officials

Location	Total Fill Thickness (feet)	Minimum Percentage of Maximum Dry Density
Beneath an area extending at least 3 feet beyond the perimeter of structures, and below flatwork and pavement (applies to structural fill and site grading fill)	0 to 5	95
	5 to 8	98
Site grading fill outside area defined above	0 to 5	92
	5 to 8	95
Utility trenches within structural areas	--	96
Roadbase and subbase	-	96
Non-structural fill	0 to 5	90
	5 to 8	92

Structural fills greater than 8 feet thick (thicker fill sequence up to 8 feet anticipated for trench backfill) are not anticipated at the site. If required site grading fills to raise the site are greater than 3 feet, CMT must be notified to review settlement calculations.

For best compaction results, we recommend that the moisture content for structural fill/backfill be within 2% of optimum. Field density tests should be performed on each 12-inch lift as necessary to verify that proper compaction is being achieved.

6.5 Utility Trenches

All utility trench backfill material below structurally loaded facilities (flatwork, floor slabs, roads, etc.) shall be placed at the same density requirements established for structural fill. If the surface of the backfill becomes disturbed during the course of construction, the backfill shall be proofrolled and/or properly compacted prior to the construction of any exterior flatwork over a backfilled trench. Proofrolling shall be performed by passing moderately loaded rubber tire-mounted construction equipment uniformly over the surface at least twice. If excessively loose or soft areas are encountered during proofrolling, they shall be removed to a maximum depth of 2 feet below design finish grade and replaced with structural fill.

Most utility companies and City-County governments are now requiring that Type A-1a or A-1b (AASHTO Designation – basically granular soils with limited fines) soils be used as backfill over utilities within public right away. These organizations are also requiring that in public roadways the backfill over major utilities be compacted over the full depth of fill to at least 96 percent of the maximum dry density as determined by the AASHTO T-180 (ASTM D-1557) method of compaction.

In private non-structural areas, natural soils may be re-utilized as trench backfill over the bedding layer provided that they are properly moisture prepared and compacted to the minimum requirements stated in section **6.4 Fill Placement and Compaction** above.

Where the groundwater is shallow the utility installation contractor must be prepared to dewater and consider possible other measures to maintain the required excavation.

6.6 Stabilization

The natural clay/silt soils at this site will likely be susceptible to rutting and pumping. The likelihood of disturbance or rutting and/or pumping of the existing natural soils is a function of the soil moisture content, the load applied to the surface, as well as the frequency of the load. Rubber-tired equipment particularly, because of high pressures, promotes instability in moist/wet, soft soils.

To stabilize soft soil conditions, coarse angular gravel and cobble mixtures (stabilizing fill) may be utilize and spread to a maximum loose lift thickness of 15 inches, and compacted by dropping a backhoe bucket onto the surface continuously at least twice. As an alternative, the stabilizing fill may be compacted by passing moderately heavy construction equipment or large self-propelled compaction equipment across the surface at least twice. Subsequent fill material placed over the coarse gravels and cobbles shall be adequately compacted so that the “fines” are “worked into” the voids in the underlying coarser gravels and cobbles.

Often the amount of gravelly material can be reduced with the use of a geotextile fabric such as Mirafi RS280i or equivalent. Its use will also help avoid mixing of the subgrade soils with the gravelly material. After excavating the soft/disturbed soils, the fabric should be spread across the bottom of the excavation and up the sides a minimum of 18 inches. Otherwise, it should be placed in accordance with the manufacturer’s recommendation, including proper overlaps. The gravel material can then be placed over the fabric in compacted lifts as described above.

7.0 FOUNDATION RECOMMENDATIONS

The following recommendations have been developed on the basis of the previously described project characteristics, including the maximum loads discussed in **Section 1.3**, the subsurface conditions observed in the field and the laboratory test data, and standard geotechnical engineering practice.

7.1 Foundation Recommendations

Based on our geotechnical engineering analyses, the currently projected residential type structures may be supported upon conventional spread and/or continuous wall foundations placed on suitable, stable, and undisturbed natural soils and/or on structural fill extending to suitable natural soils. Footings may be designed using a net bearing pressure of 1,500 psf if placed on suitable, undisturbed, stable, natural soils or structural fill extending to suitable natural soil. At this time, without additional site grading fills, and/or dewatering, it is anticipated that some of the footing excavations may extend below groundwater. Some dewatering and stabilization of saturated fine-grained soils may therefore be required.

The term “net bearing pressure” refers to the pressure imposed by the portion of the structure located above lowest adjacent final grade, thus the weight of the footing and backfill to lowest adjacent final grade need not be

considered. The allowable bearing pressure may be increased by 1/3 for temporary loads such as wind and seismic forces.

We also recommend the following:

1. Exterior footings subject to frost should be placed at least 30 inches below final grade.
2. Interior footings not subject to frost should be placed at least 16 inches below grade.
3. Continuous footing widths should be maintained at a minimum of 18 inches.
4. Spot footings should be a minimum of 24 inches wide.

7.2 Installation

Under no circumstances shall the footings be established upon non-engineered fills, loose or disturbed soils, soft soils, topsoil, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water. If unsuitable soils are encountered, they must be completely removed and replaced with compacted structural fill.

Excavations should be examined by a geotechnical engineer from CMT to confirm that suitable bearing materials soils have been exposed.

The width of select structural replacement fill below footings should be equal to the width of the footing plus one foot for each foot of fill thickness. For instance, if the footing width is 2 feet and the structural fill depth beneath the footing is 2 feet, the fill replacement width should be 4 feet, centered beneath the footing.

Due to high moisture content within the natural clay/silt soils at relatively shallow depths, some stabilization may be required prior to placement of structural fill and/or concrete foundations.

7.3 Estimated Settlement

Foundations designed and constructed in accordance with our recommendations could experience some settlement, but we anticipate that total settlements of footings founded as recommended above will not exceed 1 inch. We project that approximately 40% of the total settlement will initially take place during construction.

If site grading fills are required in greater thickness than 4.0 feet CMT must be notified to review settlements.

7.4 Lateral Resistance

Lateral loads imposed upon foundations due to wind or seismic forces may be resisted by the development of passive earth pressures and friction between the base of the footings and the supporting soils. In determining frictional resistance, a coefficient of 0.30 should be utilized for natural soils and 0.40 for granular structural fills. Passive resistance provided by properly placed and compacted granular structural fill above the water table may be considered equivalent to a fluid with a density of 250 pounds per cubic foot.

A combination of passive earth resistance and friction may be utilized provided that the passive component of the total is divided by 1.5.

8.0 LATERAL EARTH PRESSURES

Buildings may or may not include sublevels. For subgrade levels and retaining walls up to approximately 6 feet, the following discussion is provided. The lateral pressure parameters, as presented within this section, are for backfills which will consist of drained on-site soil, placed and compacted in accordance with the recommendations presented herein.

The lateral pressures imposed upon subgrade facilities will depend upon the relative rigidity and movement of the backfilled structure. Following are the recommended lateral pressure values, which also assume that the soil surface behind the wall is horizontal and that the backfill within 3 feet of the wall will be compacted with hand-operated compacting equipment.

CONDITION	STATIC (psf/ft)*	SEISMIC (psf)*
Active Pressure (wall is allowed to yield, i.e. move away from the soil, with a minimum 0.001H movement/rotation at the top of the wall, where "H" is the total height of the wall)	41	29
At-Rest Pressure (wall is not allowed to yield)	61	N/A
Passive Pressure (wall moves into the soil)	325	135

*Equivalent Fluid Pressure (applied at 1/3 Height of Wall)

*Equivalent Fluid Pressure (added to static and applied at 1/3 Height of Wall)

9.0 FLOOR SLABS

Floor slabs may be established upon suitable natural soils and/or upon structural fill extending to suitable natural soils. Under no circumstances shall floor slabs be established directly over non-engineered fills, loose or disturbed soils, soft soils, sod, rubbish, construction debris, other deleterious materials, frozen soils, or within ponded water.

The tops of all floor slabs in habitable areas must be established at least 3 feet above the measured static water level or a minimum 18 inches above levels controlled by subdrains.

In order to facilitate curing of the concrete, it is recommended that floor slabs be directly underlain by at least 4 inches of "free-draining" fill, such as "pea" gravel or three-quarters to one-inch minus clean gap-graded gravel. To help control normal shrinkage and stress cracking, the floor slabs may include the following features:

1. Adequate reinforcement for the anticipated floor loads with the reinforcement continuous through interior floor joints;

2. Frequent crack control joints; and
3. Non-rigid attachment of the slabs to foundation walls and bearing slabs.

10.0 DRAINAGE RECOMMENDATIONS

10.1 General Drainage Recommendations

It is important to the long-term performance of foundations and floor slabs that water not be allowed to collect near the foundation walls and infiltrate into the underlying soils. We recommend the following:

1. All areas around structures should be sloped to provide drainage away from the foundations. Where possible we recommend a minimum slope of 6 inches in the first 10 feet away from the structure.
2. All roof drainage should be collected in rain gutters with downspouts designed to discharge at least 10 feet from the foundation walls or well beyond the backfill limits, whichever is greater.
3. Adequate compaction of the foundation backfill should be provided. We suggest a minimum of 90% of the maximum laboratory density as determined by ASTM D-1557. Water consolidation methods should not be used under any circumstances.
4. Sprinklers should be aimed away from the foundation walls. The sprinkling systems should be designed with proper drainage and be well-maintained. Over watering should be avoided.
5. Other precautions may become evident during construction.

10.2 Subdrains

10.2.1 General

Groundwater at this site is shallow and slightly variable across the site. If habitable floor slabs are to be placed less than 3.0 feet above measured groundwater then a foundation drain tied to a suitable down gradient land drain or another disposal system must be installed. If a land drain system is installed some form of temporary dewatering of each excavation may still be necessary prior to installing the perimeter foundation drain.

10.2.2 Foundation Subdrains

Foundation subdrains shall at a minimum consist of a 4-inch diameter perforated or slotted plastic or PVC pipe enclosed in clean gravel surrounding the home foundation. The invert of the subdrain should be at least 18 inches below the top of the lowest adjacent floor slab. The gravel portion of the drain should extend 2 inches laterally and below the perforated pipe and at least 1 foot above the top of the lowest adjacent floor slab. The gravel zone must be installed immediately adjacent to the perimeter footings and the foundation walls. To reduce the possibility of plugging, the gravel with drain pipe must be wrapped with a geotextile, such as Mirafi

140N or equivalent. Above the subdrain, a minimum 12-inch-wide zone of “free-draining” sand/gravel should be placed adjacent to the foundation walls and extend to within 2 feet of final grade and similarly separated from adjacent soils with a geotextile such as Mirafi 140N or equivalent. The upper 18 inches of soils should consist of a compacted low permeable soil where possible to reduce surface water infiltration into the drain. As an alternative to the zone of permeable sand/gravel, a prefabricated “drainage board,” such as Miradrain or equivalent, may be placed adjacent to the exterior below-grade walls. Prior to the installation of the footing subdrain, the below-grade walls should be waterproofed/heavily dampproofed. The slope of the subdrain should be at least 0.3 percent. The gravel placed around the drain pipe should be clean 0.75-inch to 1.0-inch minus gap-graded gravel and/or “pea” gravel. The foundation subdrains can be discharged into the area subdrains or other suitable down-gradient location. Further it is recommended that a minimum 8 inches of gravel be placed below the floor slab which is hydraulically tied to the perimeter foundation drain through either drain pipes or a minimum 4-inch gravel layer extending out and below the foundation and connecting to the perimeter drain.

Proper grading shall be completed around the home with a minimum 5 percent drop within the first 10 feet away from the home.

11.0 PAVEMENTS

In roadway areas, subsequent to stripping and prior to the placement of pavement materials, the exposed subgrade must be proof rolled by passing moderate-weight rubber tire-mounted construction equipment over the surface at least twice. If excessively soft or otherwise unsuitable soils are encountered, we recommend they be removed to a minimum of 18 inches below the subgrade level and replaced with structural fill.

We anticipate the natural silt/clay soils will exhibit poor pavement support characteristics when saturated or nearly saturated. Based on our laboratory testing experience with similar soils, our pavement design is based upon a California Bearing Ratio (CBR) of 3 for the natural silt/clay soils. Given the projected traffic as discussed above in **Section 1.3**, the following pavement sections are recommended for the given ESAL's (18-kip equivalent single-axle loads) per day:

Residential Asphalt Roadways

Material	Pavement Section Thickness (inches)	
	Roadway (7 ESAL's per day)	
Asphalt	3.5	3.5
Road-Base	12	6
Subbase	0	7
Total Thickness	15.5	16.5

*Subgrade should be stable

Untreated base course (UTBC) should conform to city specifications, or to 1-inch-minus UDOT specifications for A-1-a/NP, and have a minimum CBR value of 70%. Subbase shall have a minimum CBR of 30%. Roadbase and subbase material should be compacted as recommended above in **Section 6.4**. Asphalt material generally should conform to APWA requirements, having a ½-inch maximum aggregate size, a 75-gradation Superpave mix containing no more than 15% of recycled asphalt (RAP) and a PG58-28 binder.

Rigid concrete should be designed in accordance with the American Concrete Institute (ACI) and joint details should conform to the Portland Cement Association (PCA) guidelines. The concrete should have a minimum 28-day unconfined compressive strength of 4,000 pounds per square inch and contain 6 percent ± 1 percent air-entrainment.

12.0 QUALITY CONTROL

We recommend that CMT be retained as part of a comprehensive quality control testing and observation program. With CMT on-site we can help facilitate implementation of our recommendations and address, in a timely manner, any subsurface conditions encountered which vary from those described in this report. Without such a program CMT cannot be responsible for application of our recommendations to subsurface conditions which may vary from those described herein. This program may include, but not necessarily be limited to, the following:

12.1 Field Observations

Observations should be completed during all phases of construction such as site preparation, foundation excavation, structural fill placement and concrete placement.

12.2 Fill Compaction

Compaction testing by CMT is required for all structural supporting fill materials. Maximum Dry Density (Modified Proctor, ASTM D-1557) tests should be requested by the contractor immediately after delivery of any fill materials. The maximum density information should then be used for field density tests on each lift as necessary to ensure that the required compaction is being achieved.

12.3 Excavations

All excavation procedures and processes should be observed by a geotechnical engineer from CMT or their representative. In addition, for the recommendations in this report to be valid, all backfill and structural fill placed in trenches and all pavements should be density tested by CMT.

13.0 LIMITATIONS

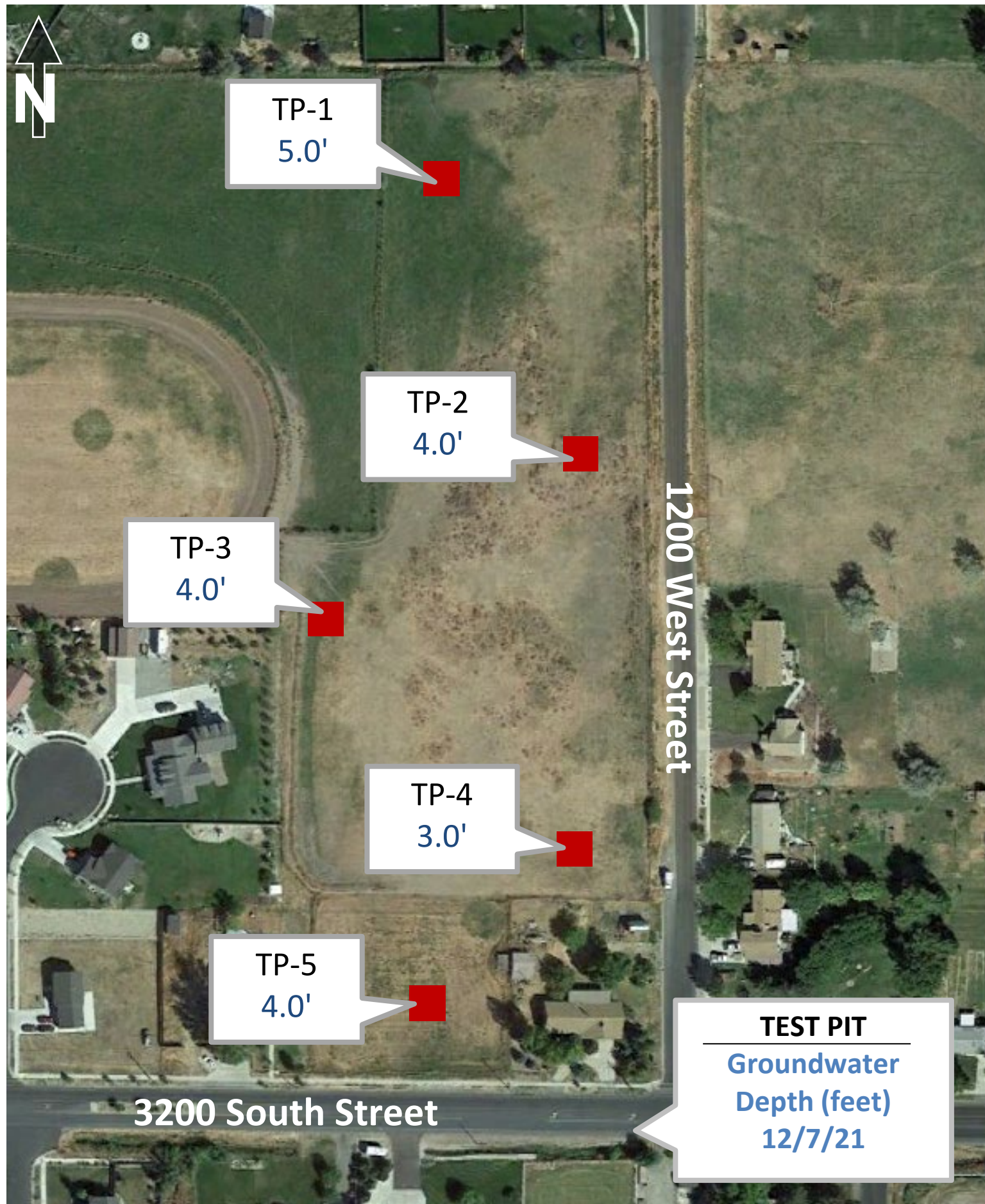
The recommendations provided herein were developed by evaluating the information obtained from the subsurface explorations and soils encountered therein. The exploration logs reflect the subsurface conditions only at the specific location at the particular time designated on the logs. Soil and ground water conditions may differ from conditions encountered at the actual exploration locations. The nature and extent of any variation in the explorations may not become evident until during the course of construction. If variations do appear, it may become necessary to re-evaluate the recommendations of this report after we have observed the variation.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. This warranty is in lieu of all other warranties, either expressed or implied.

We appreciate the opportunity to be of service to you on this project. If we can be of further assistance or if you have any questions regarding this project, please do not hesitate to contact us at (801) 590-0394. To schedule materials testing, please call (801) 381-5141.

APPENDIX

SUPPORTING DOCUMENTATION



Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

CMTENGINEERING
LABORATORIES

Site Map

Date:	22-Nov-21
Job #	900190

Figure:

1

Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

Test Pit Log

TP-1

Total Depth: 6.5'
Water Depth: 6', 5'

Date: 11/15/21
Job #: 900190

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density (pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil										
1												
2												
3		Gray Brown Silty Sand/Sandy Silt (SM-ML) with some gravel very moist, loose		1								
4				2	23				53		NP	NP
5		grades with brown clay and some gravel										
6		wet		3								
7		END AT 6.5'										
8												
9												
10												
11												
12												
13												
14												

Remarks: Groundwater encountered during excavation at depth of 6 feet and measured on 12/7/21 at depth of 5 feet.

Slotted PVC pipe installed to depth of 6.5 feet to facilitate water level measurements.

Coordinates: 41.677228°, -111.862679°

Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe

Excavated By: CMT Engineering

Logged By: Christine & Steve

Figure:

2

Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

Test Pit Log

TP-2

Total Depth: 7.5'
Water Depth: 3', 4'

Date: 11/15/21
Job #: 900190

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil with roots										
1		Gray Brown Silty Sand/Sandy Silt (SM-ML) very moist, medium stiff/loose										
2				4	31				44		NP	NP
3		grades with clay	wet									
4												
5		Brown Fine Sandy CLAY (CL) wet, soft										
6				5								
7												
8		END AT 7.5'										
9												
10												
11												
12												
13												
14												

Remarks: Groundwater encountered during excavation at depth of 3 feet and measured on 12/7/21 at depth of 4 feet.

Slotted PVC pipe installed to depth of 7.5 feet to facilitate water level measurements.

Coordinates: 41.676866°, -111.862712°

Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe

Excavated By: CMT Engineering

Logged By: Christine & Steve

Figure:

3

Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

Test Pit Log

TP-3

Total Depth: 7.5'
Water Depth: 6', 4'

Date: 11/15/21
Job #: 900190

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density (pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil										
1		Light Brown Silty CLAY (CL)										
2		moist, medium stiff										
3				6	22					31	19	12
4												
5				7								
6		wet soft										
7				8								
8		END AT 7.5'										
9												
10												
11												
12												
13												
14												

Remarks: Groundwater encountered during excavation at depth of 6 feet and measured on 12/7/21 at depth of 4 feet.

Slotted PVC pipe installed to depth of 7.5 feet to facilitate water level measurements.

Coordinates: °, °

Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe

Excavated By: CMT Engineering

Logged By: Christine & Steve

Figure:

4

Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

Test Pit Log

TP-4

Total Depth: 7.5'
Water Depth: 4', 3'

Date: 11/15/21
Job #: 900190

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil; dark brown clay with organics and roots										
1		Light Brown Silty CLAY (CL)										
2		moist, medium stiff										
3				9								
4		wet soft										
5												
6												
7				10								
8		END AT 7.5'										
9												
10												
11												
12												
13												
14												

Remarks: Groundwater encountered during excavation at depth of 4 feet and measured on 12/7/21 at depth of 3 feet.

Slotted PVC pipe installed to depth of 7.5 feet to facilitate water level measurements.

Coordinates: 41.675681°, -111.675681°

Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe

Excavated By: CMT Engineering

Logged By: Christine & Steve

Figure:

5

Nibley 3200 South Property

1200 West 3200 South, Nibley, Utah

Test Pit Log

TP-5

Total Depth: 7.5'
Water Depth: 5', 4'

Date: 11/15/21
Job #: 900190

Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density (pcf)	Gradation			Atterberg		
							Gravel %	Sand %	Fines %	LL	PL	PI
0		Topsoil; dark brown clay with organics and roots										
1		Light Brown to Red Brown Silty CLAY (CL)										
2		moist, stiff										
3												
4				11	26	94				38	20	18
5												
6												
7												
8		END AT 7.5'										
9												
10												
11												
12												
13												
14												

Remarks: Groundwater encountered during excavation at depth of 5 feet and measured on 12/7/21 at depth of 4 feet.

Slotted PVC pipe installed to depth of 7.5 feet to facilitate water level measurements.

Coordinates: 41.675441°, -111.863°

Surface Elev. (approx): Not Given

Equipment: Rubber Tire Backhoe

Excavated By: CMT Engineering

Logged By: Christine & Steve

Figure:

6

Nibley 3200 South Property

Key to Symbols

1200 West 3200 South, Nibley, Utah

Date: 11/15/21

Job #: 900190

①	②	③	④	⑤	⑥	⑦	⑧	⑨
Depth (ft)	GRAPHIC LOG	Soil Description	Sample Type	Sample #	Moisture (%)	Dry Density(pcf)	Grav %	Atterberg
								LL PL PI

COLUMN DESCRIPTIONS

Depth (ft.): Depth (feet) below the ground surface (including groundwater depth - see water symbol below).

Graphic Log: Graphic depicting type of soil encountered (see below).

Soil Description: Description of soils encountered, including Unified Soil Classification Symbol (see below).

Sample Type: Type of soil sample collected at depth interval shown; sampler symbols are explained below-right.

Sample #: Consecutive numbering of soil samples collected during field exploration.

Moisture (%): Water content of soil sample measured in laboratory (percentage of dry weight of sample).

Dry Density (pcf): The dry density of a soil measured in laboratory (pounds per cubic foot).

Gradation: Percentages of Gravel, Sand and Fines (Silt/Clay), obtained from lab test results of soil passing the No. 4 and No. 200 sieves.

Atterberg: Individual descriptions of Atterberg Tests are as follows:

LL = Liquid Limit (%): Water content at which a soil changes from plastic to liquid behavior.

PL = Plastic Limit (%): Water content at which a soil changes from liquid to plastic behavior.

PI = Plasticity Index (%): Range of water content at which a soil exhibits plastic properties (= Liquid Limit - Plastic Limit).

STRATIFICATION		MODIFIERS	MOISTURE CONTENT
Description	Thickness	Trace	Dry: Absence of moisture, dusty, dry to the touch.
Seam	Up to ½ inch	<5%	
Lense	Up to 12 inches	Some	
Layer	Greater than 12 in.	5-12%	Moist: Damp / moist to the touch, but no visible water.
Occasional	1 or less per foot	With	
Frequent	More than 1 per foot	> 12%	Wet: Visible water, usually soil below groundwater.

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS SYMBOLS		TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS More than 50% of material is larger than No. 200 sieve size.	GRAVELS The coarse fraction retained on No. 4 sieve.	CLEAN GRAVELS (< 5% fines)	GW		Well-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
			GP		Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or No Fines
		GRAVELS WITH FINES (≥ 12% fines)	GM		Silty Gravels, Gravel-Sand-Silt Mixtures
			GC		Clayey Gravels, Gravel-Sand-Clay Mixtures
	SANDS The coarse fraction passing through No. 4 sieve.	CLEAN SANDS (< 5% fines)	SW		Well-Graded Sands, Gravelly Sands, Little or No Fines
			SP		Poorly-Graded Sands, Gravelly Sands, Little or No Fines
		SANDS WITH FINES (≥ 12% fines)	SM		Silty Sands, Sand-Silt Mixtures
			SC		Clayey Sands, Sand-Clay Mixtures
FINE-GRAINED SOILS More than 50% of material is smaller than No. 200 sieve size.	SILTS AND CLAYS Liquid Limit less than 50%		ML		Inorganic Silts and Sandy Silts with No Plasticity or Clayey Silts with Slight Plasticity
			CL		Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
			OL		Organic Silts and Organic Silty Clays of Low Plasticity
	SILTS AND CLAYS Liquid Limit greater than 50%		MH		Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
			CH		Inorganic Clays of High Plasticity, Fat Clays
			OH		Organic Silts and Organic Clays of Medium to High Plasticity
	HIGHLY ORGANIC SOILS			PT	

SAMPLER SYMBOLS

	Block Sample
	Bulk/Bag Sample
	Modified California Sampler
	3.5" OD, 2.42" ID D&M Sampler
	Rock Core
	Standard Penetration Split Spoon Sampler
	Thin Wall (Shelby Tube)

WATER SYMBOL

	Encountered Water Level
	Measured Water Level

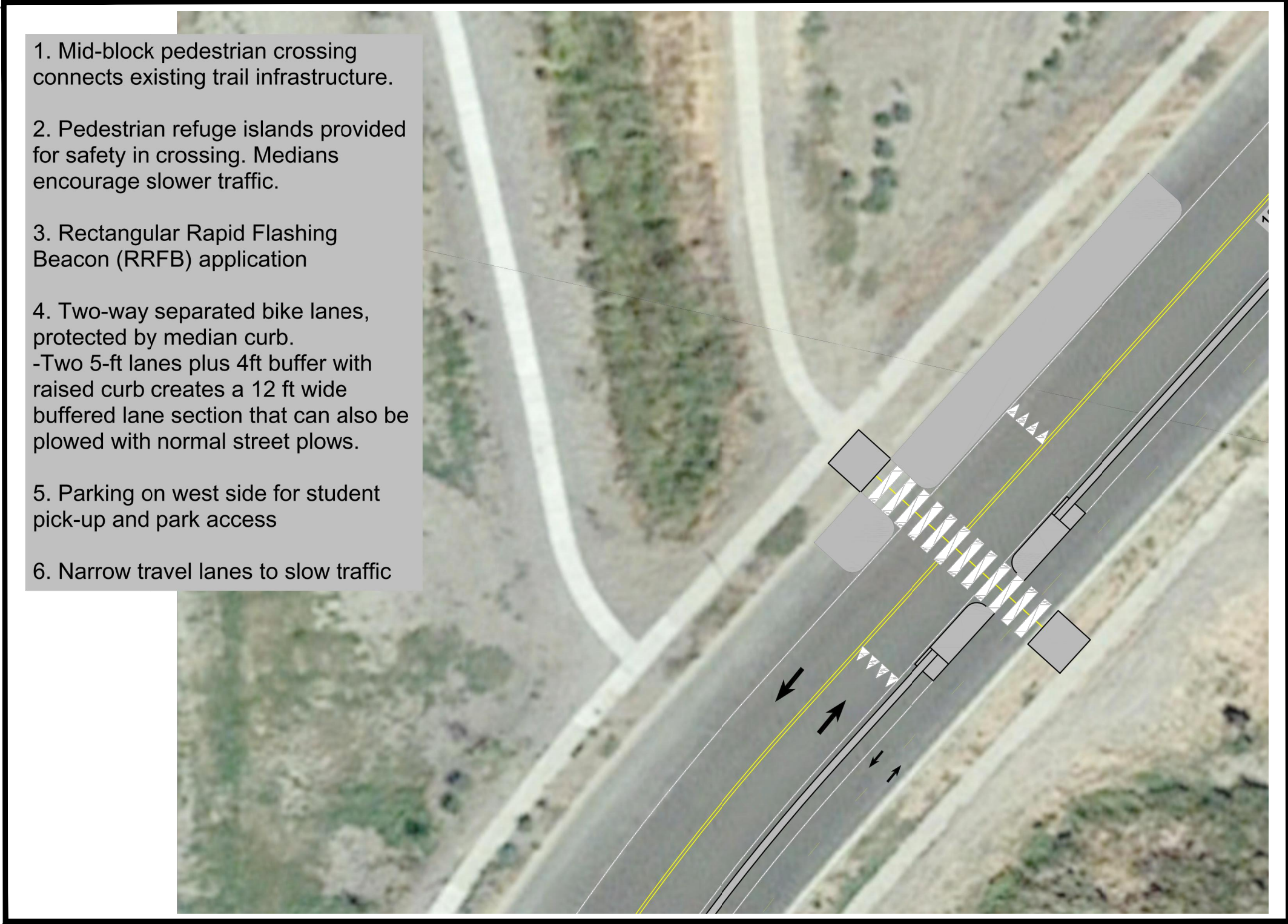
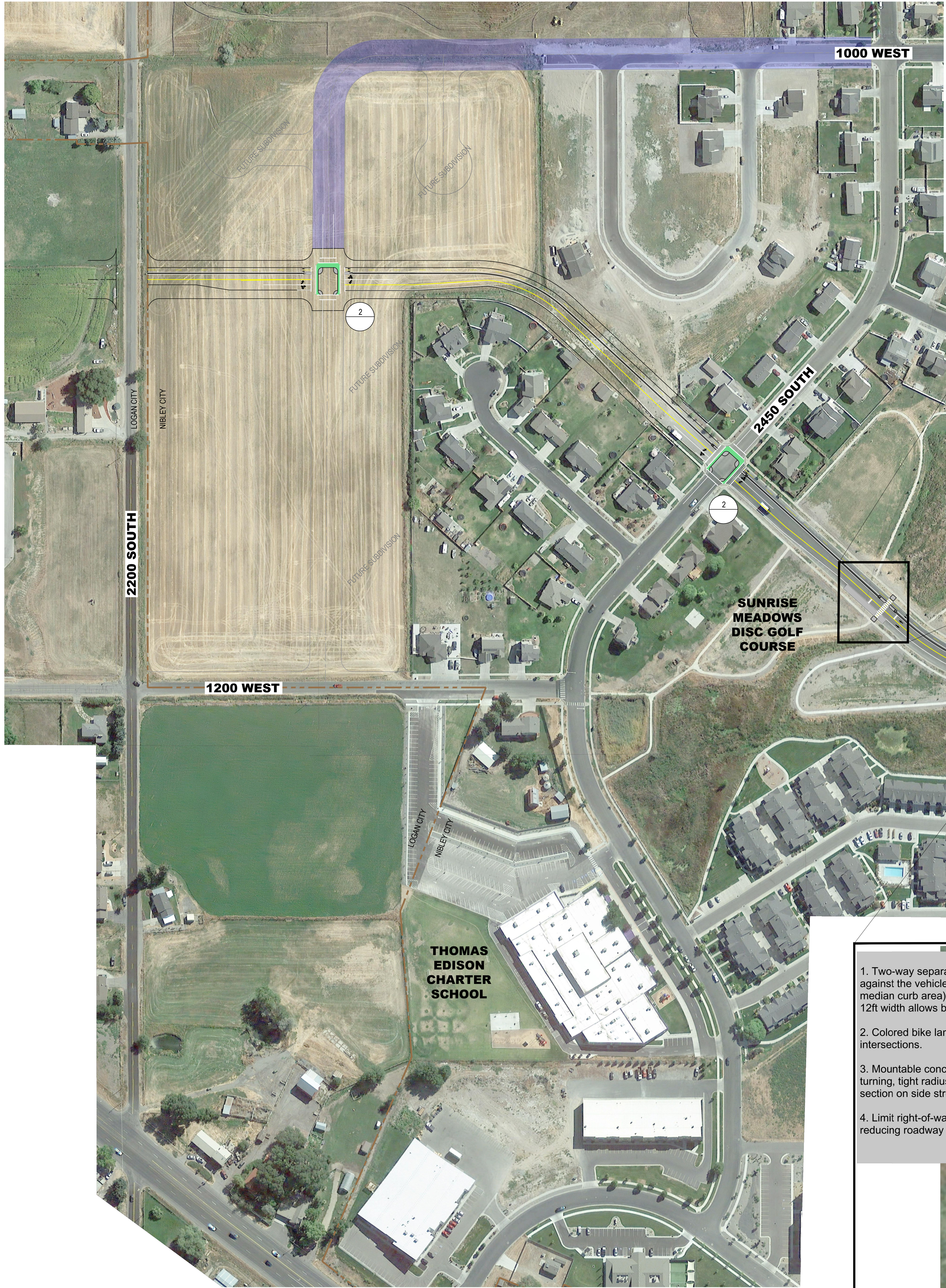
(see Remarks on Logs)

Note: Dual Symbols are used to indicate borderline soil classifications (i.e. GP-GM, SC-SM, etc.).

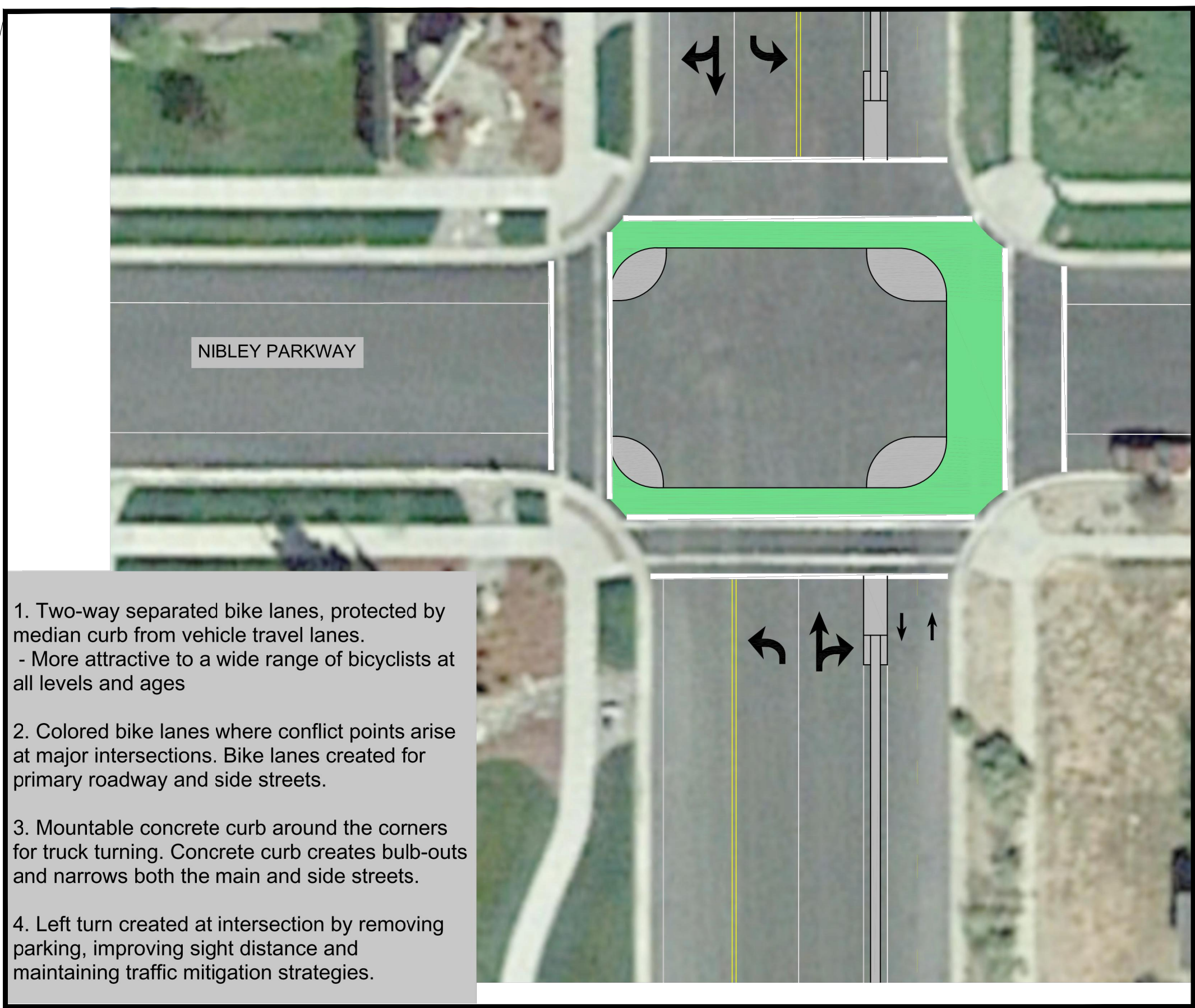
- The results of laboratory tests on the samples collected are shown on the logs at the respective sample depths.
- The subsurface conditions represented on the logs are for the locations specified. Caution should be exercised if interpolating between or extrapolating beyond the exploration locations.
- The information presented on each log is subject to the limitations, conclusions, and recommendations presented in this report.

Figure:

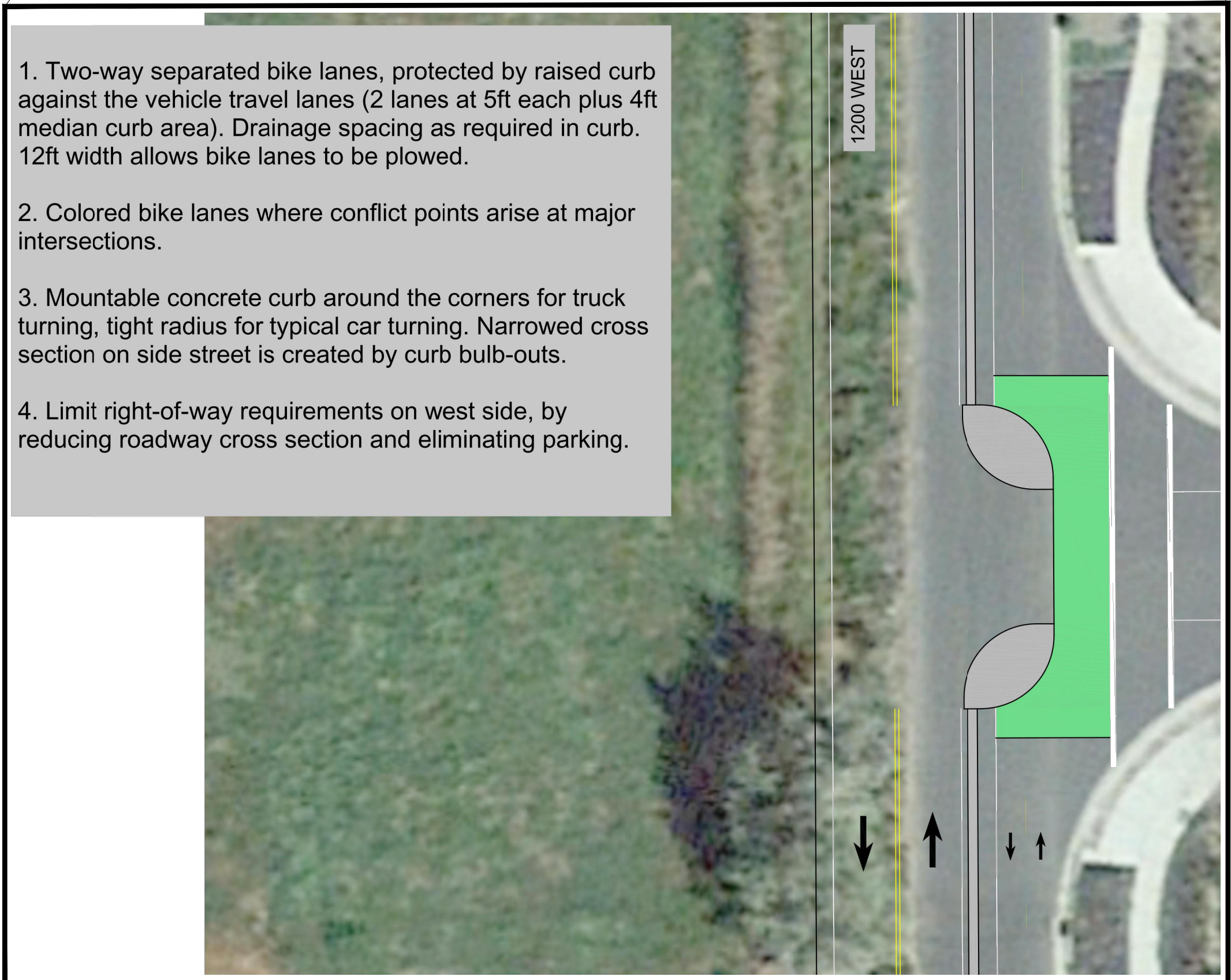
7



1 MIDBLOCK CROSSWALK
SCALE: NONE

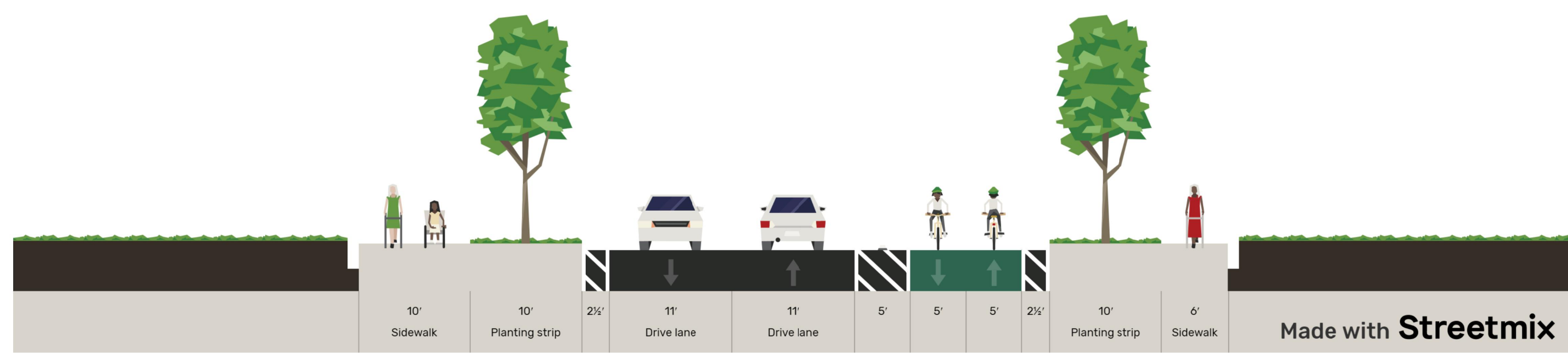


2 BIKE LANE INTERSECTION
SCALE: NONE



3 BIKE LANE TEE INTERSECTION
SCALE: NONE

BIKE LANE ROUNDABOUT ROUTES



4 PROPOSED CROSS SECTION
SCALE: NONE

C

R

S

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