STORMWATER MANAGEMENT PLAN

For the

4-WAY RANCH METROPOLITAN DISTRICT

Lift Station

June 2019

Prepared By:

PCD File No. PPR-18-051

JDS-HYDRO CONSULTANTS, INC.

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STORMWATER MANAGEMENT PLAN
4-Way Ranch Metropolitan District
Lift Station

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CONTACT INFORMATION

Applicant/Owner Information

Name:	4-Way Ranch Metropolitan District
Address:	PO Box 50223, Colorado Springs, CO 80949
Contact:	Peter Martz, Board Chairman
Telephone:	719-447-8773

Prepared by

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Address:	5540 Tech Center Dr., Suite 100, Colorado Springs, CO 80919
Contact:	Ryan Mangino, P.E.
Telephone:	719-227-0072 ext. 103
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Designated Operator

Name:	Woodmen Hills Metropolitan District
Address:	8046 Eastonville Rd, Peyton, CO 80831
Contact:	Jerry Jacobson, Operator in Responsible Charge
Telephone:	719-495-2500

Contractor

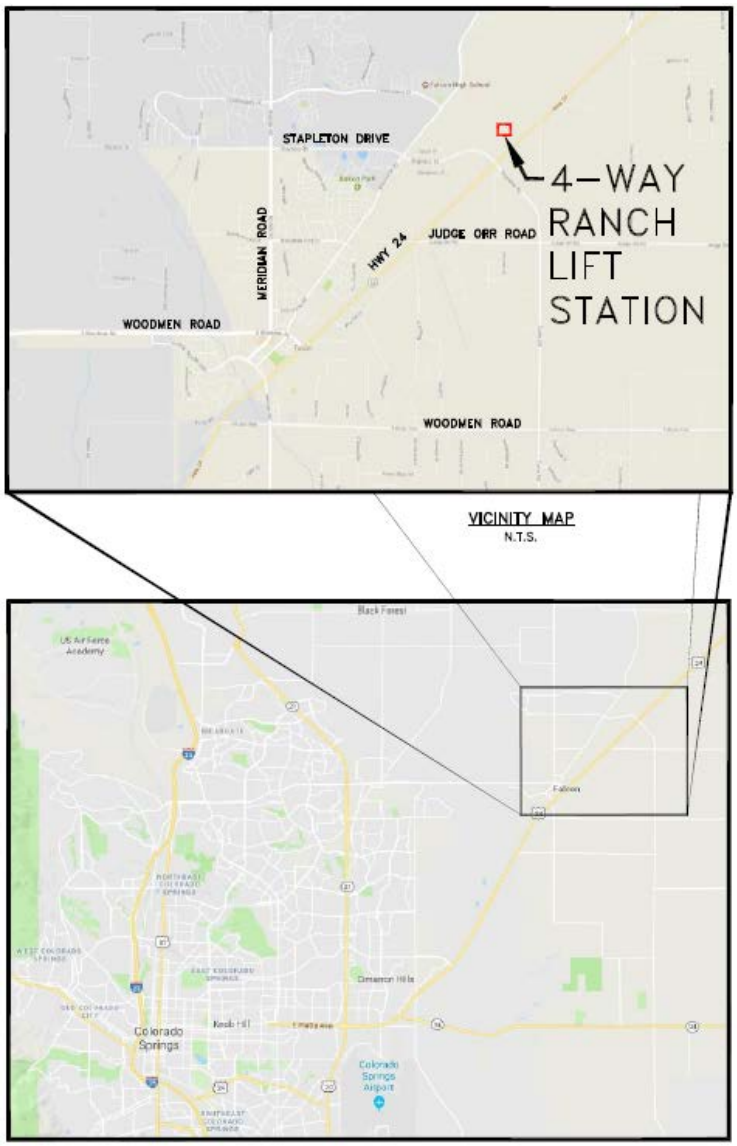
Name:	TBD
Address:	TBD
Contact:	TBD
Telephone:	TBD

1.0 SITE LOCATION AND DESCRIPTION

1.1 Site Location

The subject facility is a proposed wastewater pump station (lift station) to serve approximately 500 single family equivalents (SFE) proposed in the 4-Way Ranch Metropolitan District. The lift station is owned by 4-Way Ranch Metropolitan District. 4-Way Ranch Metropolitan District plans to enter into an Intergovernmental Agreement (IGA) with Woodman Hills Metropolitan District to operate the proposed lift station, similar to the current IGA where Woodman Hills operates 4-Way's existing water system.

The site is located approximately 16 miles northeast of downtown Colorado Springs, and roughly 0.28 miles north of the intersection of Stapleton Drive and Highway 24 in Peyton, Colorado, in Sections 28 & 33, Township 12 South, Range 64 West of the 6th Principle Meridian, El Paso County, Colorado (El Paso County Parcel #: 4200000366). The vicinity map below shows the proposed lift station site location:



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1.2 Description of Construction

The proposed lift station includes below-grade concrete structures, process pumps and piping, an above-grave building housing electrical/control equipment and bathroom, and back-up generator. Additionally, onsite parking and driveways will be constructed from permeable pavers.

1.3 Steps for Construction

- Erosion Control BMP's
- Mobilization
- Construction Staking
- Clearing and Grubbing
- Road Grading
- Excavation
- Concrete forming and placement
- Backfill and grading
- Utility installation
- Building erection
- Process piping
- Interior building finish
- Final grading and revegetation

1.4 Estimates of Excavation

The total acreage of disturbed land for the construction of the facility is approximately 0.63 acres. All disturbance and grading will take place on the proposed lift station site and within the access road easement off of Stapleton Drive.

Cut – 1,165 cu. yds.
Fill – 1,013 (*1.15 for fluff) = 1,165 cu. yds.
Net – 0 cu. yds. Cut/Fill

1.5 Drainage Characteristics

The land on which this project is proposed is currently undeveloped and consists of native vegetation. The major drainage characteristics include the conveyance of water (via sheet-flow) south and west across the site, and eventually into an existing drainage way approximately 200 feet south of the lift station. There are no existing drainage facilities (storm pipes, inlets, culverts, etc.) on the site. The site is entirely outside the 100-year floodplain.

Proposed drainage will generally remain the same as the existing drainage. The addition of a gravel driveway, above-grade building, back-up generator, bioxide storage pad, and door landing pad will add 7,140 square-feet of new impervious area to the site. However, detention facilities are not proposed for this project as a future detention facility will be built (and is planned) for the surrounding subdivision (Waterbury). The future detention pond will account for the lift station in its storage capacity. Regional detention facilities rather than numerous smaller detention ponds is in accordance with the El Paso County Drainage Criteria Manual (DCM).

In order to offset the additional impervious area and avoid detention facilities prior to the proposed future detention facility, we are proposing to install permeable material adjacent to the building in lieu of the typical gravel driveway.

The permeable material will consist of over 5,026 square feet of 5-inch thick gravel, and a 1-inch "permeable paver" with 3/8-inch gravel at finished grade. This system will allow storm water to infiltrate almost immediately and filter into the soils beneath instead of flowing immediately offsite. The volume of the permeable material at an assumed 40% void ratio is roughly 5,010 gallons, or 670 cubic feet.

1.6 Soils Description

Soils near the surface of the site are mostly silty sand overlying sandstone with underlying claystone bedrock. Sandstone bedrock underlays the surface soils and was encountered between 4 and 14 feet below existing grade. Claystone bedrock was encountered between 7 and 19 feet below existing grade, extending up to depths of 15 feet or the depths explored (20 feet). The soils are generally very permeable due to the relatively high sand content. ***Appendix B*** contains a geotechnical Soils Report for the project area.

None of the existing or proposed slopes will be 3H:1V or steeper.

1.7 Vegetation

Existing vegetation consists primarily of native grasses and weeds (approximately 50% ground cover).

1.8 Pollutants

During construction, the largest possible source of non-storm water pollution would be leakage of oils and other fluids from construction equipment and vehicles. Refueling of equipment will occur within the staging area.

The contractor will also be responsible for cleanup of any off-site vehicle tracking on paved roads. No other sources of pollution such as vehicle washing, chemical storage or waste disposal are anticipated. Portable restroom facilities will be used by the construction crew during the construction phase.

The contractor shall be responsible for any spill cleanup from construction equipment, in accordance with applicable local, county, and state regulations.

1.9 Discharge

Dewatering will be necessary for the excavation. The contractor shall obtain a Construction Dewatering Permit from CDPHE and shall comply with all conditions of that permit.

1.10 Receiving Waters

Drainage generally flows northeast to southwest into an adjacent drainage way, an unnamed tributary to West Fork of Squirrel Creek. There are no existing drainage facilities (storm pipes, inlets, culverts, etc.) on the site.

2.0 EROSION CONTROL PLAN

This Stormwater Management Plan contains a Grading & Erosion Control Plan in ***Appendix D*** and should be used in conjunction with the design drawings. There will be no anticipated storage of wastes, nor will there be any asphalt or concrete batch plants located on the site. Location of erosion control facilities are shown on the plans.

3.0 BEST MANAGEMENT PRACTICES

3.1 Erosion and Sediment Controls

All erosion and sediment control will be installed immediately before any excavation. Silt fencing will be placed at areas shown on the construction drawings. Check dams will be installed every 300 ft in the roadside ditches of the temporary access road for sediment control.

Non-structure practices to control erosion and sedimentation will incorporate reseeding of ground cover in disturbed areas in accordance with the project specifications as soon as possible, or at least during the same season. Additional methods will include brooms and shovels to relocate small amounts of soil erosion.

3.2 Material Handling and Spill Prevention

The most probable sources of non-storm water pollution are daily maintenance operations. If mobile fuel trucks are used to service equipment, absorbent materials and containers for the storage of used absorbent material will be nearby. Place debris, overburden, soil stockpiles and waste materials away from areas of runoff.

3.3 Final Stabilization and Long-Term Storm Water Management

Soil erosion control measures for all slopes, channels, ditches, or any disturbed land area shall be completed within twenty-one (21) calendar days after final grading, or final earth disturbance, has been completed. Disturbed areas and stockpiles which are not at final grade, but will remain dormant for longer than 30 days, shall also be mulched within 21 days after interim grading. An area that is going to remain in an interim state for more than 60 days shall also be seeded. All temporary soil erosion control measures and BMPs shall be maintained until permanent soil erosion control measures are implemented.

Vegetative cover density shall be a minimum of seventy percent (70%) of pre-disturbed levels to be considered stabilized.

3.4 Other Controls

There are several Best Management Practices than can be employed to prevent or mitigate the source of pollutants and contamination of storm water runoff. Some of these are:

- All refuse dumpsters and receptacles shall be equipped with functional lids to prevent rain and snow from entering. Lids must be closed when dumpsters and receptacles are not actively in use.
- Storage containers, drums, and bags shall be stored away from direct traffic routes to prevent accidental spills. Ensure packages and containers are intact.
- Empty drums shall be covered to prevent collection of precipitation.
- Containers shall be stored on pallets to prevent corrosion of containers, which can result when containers come in contact with moisture on the ground.
- Regularly scheduled removal of construction trash and debris.
- Tracking control must be implemented by the contractor to prevent unnecessary soil from entering paved surfaces. The measures to be used will be preventing equipment in the construction area from moving off-site. If the contractor cannot do this, then a vehicle tracking pad will be required according to El Paso County specifications. Brooms and shovels may be required for tracking control.

The contractor is certainly not limited to these measures which may require adjusting the BMP's as the project progresses and implement further controls as prudence and good judgment deem necessary.

3.5 Inspection and Maintenance

A thorough inspection of the storm water management system shall be performed every 14 days as well as after any rain or snowmelt event that causes surface erosion.

- Erosion of side slopes shall be repaired.
- Silt fences shall be cleaned whenever sediment has reached a depth of six (6) inches at the fence, and broken wooden parts or torn fabric shall be repaired or replaced.
- Any accumulated trash or debris shall be removed from these protected areas.
- In the case where additional BMP's are required in areas later determined as a risk but not included in the drawings, contractor will be required to install BMP's at these locations. These areas may include: excavated dirt piles, protection of existing drainage systems, and roadway drainage.

An Inspection and Maintenance Log is attached to this Storm Water Management Plan.

A copy of this SWMP is to be located at all times with the Foreman/Superintendant responsible for maintaining conditions set forth in this document. Said copy should be contained in a lockbox in the "Staging/Stockpile Area" noted on the plans.

This SWMP shall be revised by informing Engineer of deviations to original plan. Engineer will then update this report and all applicable drawings, forms, tables, etc. as deemed necessary.

4.0 INSPECTION AND MAINTENANCE LOG

4-WAY RANCH METROPOLITAN DISTRICT
LIFT STATION
STORM WATER MANAGEMENT PLAN
INSPECTION AND MAINTENANCE LOG

(Record inspections, items found, maintenance, and corrective actions taken. Also record any training received by Contractor personnel with regard to erosion control, materials handling, and any inspections by outside agencies.)

DATE	ITEM	SIGNATURE OF PERSON MAKING ENTRY

APPENDIX A

EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP)
EL PASO COUNTY DEPARTMENT OF TRANSPORTATION
APPLICATION AND PERMIT

PERMIT NUMBER _DOT2009-XX_____

APPLICANT INFORMATION

Applicant Contact Information	
Owner	4-Way Ranch Metropolitan District
Name (person of responsibility)	Peter Martz
Company/Agency	4-Way Ranch Metropolitan District
Position of Applicant	Board Chairman
Address (physical address, not PO Box)	PO Box 50223
City	Colorado Springs
State	Colorado
Zip Code	80949
Mailing address, if different from above	N/A
Telephone	719-447-8773
FAX number	N/A
Email Address	pmartzlrg@comcast.net
Cellular Phone number	N/A

CONTRACTOR INFORMATION

Contractor	
Name (person of responsibility)	TBD
Company	TBD
Address (physical address, not PO Box)	TBD
City	TBD
State	TBD
Zip Code	TBD
Mailing address, if different from above	N/A
Telephone	TBD
FAX number	TBD
Email Address	TBD
Cellular Phone number	TBD
Erosion Control Supervisor (ECS)*	TBD
ECS Phone number*	TBD
ECS Cellular Phone number*	TBD

*Required for El Paso County Depart of Transportation Projects. Recommended for others.

PROJECT INFORMATION

Project Specifications	
Project Name	4-Way Ranch Lift Station
Legal Description	Enclosed
Address (or nearest major cross streets)	Highway 24 and Stapleton Drive
Acreage (total and disturbed)	131.5-Acre Parcel 1.05-Acre Easement 0.97 Acres Disturbed
Schedule	Construction Start: Summer 2020 Construction Completion: End of 2020
Project Purpose	The purpose of the project is to construct a wastewater pump station to support future development within 4-Way Ranch.
Description of Project	The proposed project includes construction of a buried concrete structure, buried pipelines, pumping equipment and an above-grade building containing electrical and control equipment. On-site and off-site access roads will be constructed from aggregate base course.
Tax Schedule Number	4200000366

FOR OFFICE USE ONLY

The following signature from the ECM Administrator signifies the approval of this ESQCP. All work shall be performed in accordance with the permit, the El Paso County Engineering Criteria Manual (ECM) Standards, City of Colorado Springs Drainage Criteria Manual, Volume 2 (DCM2) as adopted by El Paso County Addendum, approved plans, and any attached conditions. The approved plans are an enforceable part of the ESQCP. Construction activity, except for the installation of initial construction BMPs is not permitted until issuance of a Construction permit and Notice to Proceed.

Signature of ECM Administrator: _____ Date _____

1.1 REQUIRED SUBMISSIONS

In addition to this completed and signed application, the following items must be submitted to obtain an ESQCP:

- Permit fees
- Stormwater Management Plan (SWMP) meeting the requirements of DCM2 and ECM either as part of the plan set or as a separate document;
- Cost estimates of construction and maintenance of construction and permanent stormwater control measures (Cost estimates shall be provided on a unit cost basis for all stormwater BMPs);
- Financial surety in an amount agreeable to the ECM Administrator based on the cost estimates of the stormwater quality protection measures provided. The financial surety shall be provided in the form of a Letter of Credit, Surety with a Bonding Company, <u>or other forms acceptable to El Paso County</u>;
- Operation and Maintenance Plan for any proposed permanent BMPs; and
- Signed Private Stormwater Quality Structural Best Management Practices Agreement and Easement, if any private permanent BMPs are proposed.

1.2 RESPONSIBILITY FOR DAMAGE

The County and its officers and employees, including but not limited to the ECM Administrator, shall not be answerable or accountable in any manner, for injury to or death of any person, including but not limited to a permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder, or for damage to property resulting from any activities undertaken by a permit holder or under the direction of a permit holder. The permit holder shall be responsible for any liability imposed by law and for injuries to or death of any person, including but not limited to the permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder, or damage to property arising out of work or other activity permitted and done by the permit holder under a permit, or arising out of the failure on the permit holder's part to perform the obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity, or at any subsequent time work or other activity is being performed under the obligations provided by and contemplated by the permit.

To the extent allowed by law, the permit holder shall indemnify, save, and hold harmless the County and its officers and employees, including but not limited to the BOCC and ECM Administrator, from all claims, suits or actions of every name, kind and description brought for or on account of injuries to or death of any person, including but not limited to the permit holder, persons employed by the permit holder, persons acting in behalf of the permit holder and the public, or damage to property resulting from the performance of work or other activity under the permit, or arising out of the failure on the permit holder's part to perform his obligations under any permit in respect to maintenance or any other obligations, or resulting from defects or obstructions, or from any cause whatsoever during the progress of the work, or other activity or at any subsequent time work or other activity is being performed under the obligations provided by and contemplated by the permit, except as otherwise provided by state law. The permit holder waives any and all rights to any type of expressed or implied indemnity against the County, its officers or employees.

1.3 APPLICATION CERTIFICATION

I, as the Applicant or the representative of the Applicant, hereby certify that this application is correct and complete as per the requirements presented in this application and the El Paso County Engineering Criteria Manual and Drainage Criteria Manual, Volume 2 and El Paso County Addendum.

I, as the Applicant or the representative of the Applicant, have read and will comply with all of the requirements of the specified Stormwater Management Plan and any other documents specifying stormwater best management practices to be used on the site including permit conditions that may be required by the ECM Administrator. I understand that the Best Management Practices are to be maintained on the site and revised as necessary to protect stormwater quality as the project progresses. I further understand that a Construction Permit must be obtained and all necessary stormwater quality control BMPs are to be installed in accordance with the SWMP and the El Paso County Engineering Criteria Manual and Drainage Criteria Manual, Volume 2 and El Paso County Addendum before land disturbance begins and that failure to comply will result in a Stop Work Order and may result in other penalties as allowed by law. I further understand and agree to indemnify, save, and hold harmless the County and its officers and employees, including but not limited to the BOCC and ECM Administrator, from all claims, suits or actions of every name, kind and description as outlined in Section 1.2 Responsibility for Damage.

_____ Date:__06/27/19_

Signature of Applicant or Representative

_____Ryan Mangino_____

Print Name of Applicant or Representative

Permit Fee

Surcharge

Financial Surety _____ Type of Surety _____

Total $_____

APPENDIX B

ENTECH
ENGINEERING, INC.

505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907
PHONE (719) 531-5599
FAX (719) 531-5238

SUBSURFACE SOIL INVESTIGATION
WATERBURY LIFT STATION/ SEWER ALIGNMENT
EL PASO COUNTY, COLORADO

Prepared for:

Four Way Ranch Metro District
P.O. Box 50223
Colorado Springs, Colorado 80949

Attn: Peter Martz

December 28, 2015

Respectfully Submitted,

ENTECH ENGINEERING, INC.

Mark H. Hauschild, P.E.
Senior Engineer

COLORADO LICENSED
MARK HOWARD HAUSCHILD
35140
6 JAN 2016
PROFESSIONAL ENGINEER

MHH/rm

Encl.

Entech Job No. 152161
AAprojects/2015/152161 ssi

Reviewed by:

Joseph C. Goode, Jr., P.E.
President

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SUBSURFACE SOIL INVESTIGATION
WATERBURY LIFT STATION/ SEWER ALIGNMENT
EL PASO COUNTY, COLORADO

1.0 INTRODUCTION

The project is to consist of the construction of new sewer lift station structures with a force main and gravity sanitary sewer line north of Stapleton Drive and west of proposed Dumont Drive in El Paso County, Colorado. The improvements will collect gravity sewer flows from commercial and residential properties into a new sewer lift station site with a force main that conveys the collected sewage to a wastewater treatment facility. The approximate location of the project site is shown on the Vicinity Map, Figure 1. The planned layout of the proposed site is shown on Figure 2, Site Plan/Test Boring Location Map.

This report describes the subsurface investigation conducted for the planned improvements and provides recommendations for foundation design and construction. The subsurface soil investigation included drilling 8 test borings along the proposed pipe alignments and within the footprint of the planned facilities, collecting samples of soil, and conducting a geotechnical evaluation of the investigation findings. All drilling and subsurface investigation activities were performed by Entech Engineering, Inc. (Entech). The contents of this report, including the geotechnical evaluation and recommendations, are subject to the limitations and assumptions presented in Section 6.0.

2.0 PROJECT AND SITE DESCRIPTION

It is Entech's understanding that the project will consist of constructing a new sewer lift station along with gravity sewer and force main alignments and associated site improvements. The plan provided to us was preliminary and did not incude details of anticipated floor elevations or structure configurations. The site is north of Stapleton Drive and proposed Dumont Drive in El Paso County, Colorado. The site is vacant. Surrounding properties consist of some existing residential development. The site topography generally slopes to the south. Vegetation consists of grasses and weeds. A small drainage was noted on the site.

3.0 SUBSURFACE EXPLORATIONS AND LABORATORY TESTING

The subsurface conditions were investigated by drilling 8 exploratory test borings in the proposed facility footprints and pipe alignments. The approximate locations of the test borings are indicated on Figure 2. Test boring locations and numbers were staked by others prior to the drilling program.

Soil samples were obtained from the borings utilizing the Standard Penetration Test (ASTM D-1586) using a 2-inch O.D. split-barrel sampler and California sampler. Results of the Standard Penetration Test (SPT) are included on the boring logs in terms of N-values expressed in blows per foot (bpf). Soil samples recovered from the borings were visually classified and recorded on the Test Boring Logs. The soil classifications were later verified utilizing laboratory testing and grouped by soil type. The soil type numbers are included on the Test Boring Logs. It should be understood that the soil descriptions shown on the Test Boring Logs may vary between boring location and sample depth. It should also be noted that the lines of stratigraphic separation shown on the Test Boring Logs represent approximate boundaries between soil types and the actual stratagraphic transitions may be more gradual and vary with location. The Test Boring Logs are presented in Appendix A.

Moisture Content, ASTM D-2216, was obtained in the laboratory for all recovered samples. Grain-Size, ASTM D-422, and Atterberg Limits, ASTM D-4318, were determined for various samples for the purpose of classification and to obtain pertinent engineering characteristics. FHA Swell Testing and Swell/Consolidation Testing were performed on selected samples to evaluate the expansion and consolidation characteristics of the soils. Sulfate testing was performed to evaluate the soils corrosive characteristics. A Summary of Laboratory Test Results is presented in Table 1 and included in Appendix B.

4.0 SUBSURFACE CONDITIONS

Four primary soil types and two bedrock types were encountered in the borings drilled for the subsurface investigation: Type 1: slightly silty to silty to clayey sand (SM-SW, SM, SC); Type 2: very sandy clay (CL); Type 3: clean to silty to clayey sandstone (SP, SW-SM, SM, SC); and Type 4: sandy claystone (CL). Each soil type was classified in accordance with the Unified Soil Classification System (USCS) using the laboratory testing results and the observations made during drilling.

4.1 Soil

Soil Type 1 is a slightly silty to silty to clayey sand (SM-SW, SM, SC). The sand was encountered in 6 of the 8 test borings at the existing ground surface extending to depths of 4 to 14 below ground surface (bgs). Standard Penetration Testing conducted on the sand resulted in SPT N-values of 10 to 35 bpf, which indicates medium dense to dense states. The majority of the sands were encountered at medium dense states. Moisture content and grain size testing resulted in moisture contents of 2 to 21 percent with approximately 8 to 30 percent of the soil size particles passing the No. 200 seive. Atterberg Limits testing was performed on samples of silty sand resulted in liquid limits of no value and plastic indexes of non-plastic.

Soil Type 2 is a very sandy clay (CL). The clay was encountered in 2 of the 8 test borings at the existing ground surface extending to depths of 8 to 9 feet bgs. Standard Penetration Testing conducted on the clay resulted in SPT-N values of 8 to 34 bpf, which indicates firm to hard consistencies. Moisture content and grain size testing resulted in moisture contents ranging

between 17 to 20 percent with approximately 52 to 53 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits testing resulted in liquid limit of 43 and plasticity index of 21. FHA Swell Testing performed resulted in pressures ranging between 1030 psf indicating a moderate swell potential. Swell/Consolidation Testing resulted in volume change of -0.5 indicating low potential for consolidation.

Soil Type 3 is a clean to silty to clayey sandstone (SP, SW-SM, SM, SC). The sandstone was encountered in 7 of the 8 test borings beginning at 4 to 14 bgs, extending up to the depths explored (20 to 40 feet). Standard Penetration Testing conducted on the sandstone resulted in SPT N-values of 44 to greater than 50 bpf, which indicates dense to very dense consistencies. Moisture content and grain size testing resulted in moisture contents of 9 to 20 percent with approximately 4 to 29 percent of the soil size particles passing the No. 200 sieve. Atterberg Limits testing resulted in liquid limit of 25 and plastic index of zero. FHA Swell Testing resulted in a swell pressure ranging between 320 to 480 psf indicating low swell potential.

Soil Type 4 is a sandy claystone (CL). The claystone was encountered in 5 of the 8 test borings at 7 to 19 feet below bgs, extending up to depths of 15 feet or the depths explored (20 feet). Standard Penetration Testing conducted on the claystone resulted in SPT N-values greater than 50 bpf, which indicates hard to very hard consistencies. Moisture content testing resulted in moisture contents of 12 to 16 percent. Swell/Consolidation Testing resulted in volume change of 0.8% indicating a low potential for expansion.

Sulfate testing on various soil types across the site resulted in soluble sulfate percent by weight levels ranging between less than 0.01 to 0.01, indicating low potential for below grade concrete degradation due to sulfate attack. The majority of the soils are expected to have low potential sulfate attack on concrete.

Additional descriptions and engineering properties of the soil encountered during drilling are included on the boring logs on Appendix A. Laboratory testing results are summarized on Table 1 and presented in Appendix B. It should be understood that the soil descriptions reported on the boring logs may vary between boring locations and sampling depths. Similarly, the lines of

stratigraphic separation shown on the boring logs represent approximate boundaries between soil types and the actual transitions between types may be more gradual or variable.

4.2 Groundwater

Groundwater was encountered in all of the 8 test borings, ranging from depths of 2.5 to 8 feet below the existing ground surfaces. Groundwater is expected to affect the planned construction, especially as depth of excavations increases. Perched groundwater conditions are known to exist in the area where water flows through more permeable materials (generally granular) overlying less permeable material (generally cohesive). Unstable conditions should be anticipated where excavations approach groundwater levels in soils. The bedrock will likely remain stable where groundwater is encountered. Stabilization consisting of geotextile or shot rock may be necessary. Removal of water by pumping may be necessary. Pumps and cofferdams or other equipment and procedures may be necessary for controlling groundwater, especially for deeper excavations. Table 2 presents the test borings depth to groundwater and depth to bedrock. Development of this improvement project along with the associated surface improvements, and development of adjacent properties, as well as seasonal precipitation changes, and changes in runoff may affect groundwater elevations.

5.0 GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

The following discussion is based on the subsurface conditions encountered in the borings drilled in the planned improvement areas. If subsurface conditions different from those described herein are encountered during construction or if the project elements change from those described, Entech Engineering, Inc. should be notified so that the evaluation and recommendations presented can be reviewed and revised if necessary.

The site will be developed by constructing a sewer lift station structures with gravity sewer and force main alignments. Given the subsurface conditions encountered at the time of drilling and the site development as described, it is anticipated that structure foundations resting on native sands, sandstone or structural fill will be utilized. Claystone was encountered at the sewer lift

station structure site. The claystone exhibits low expansive characteristics. The claystone and sandstone will likely be difficult to excavate with rubber tired equipment and may require track equipment. The structure excavations will very likely encounter groundwater during construction. Expansive soils encountered beneath the planned structures at the sewer lift station area will require removal and replacement with compacted structural fill.

Materials encountered along the gravity sewer and force main alignment (Test Boring Nos. 4 through 8) consisted of sand, clay, claystone, and sandstone. Groundwater is expected to be encountered in the trench excavations. Appropriate equipment and procedures should be used to control groundwater. Unstable conditions may occur in trenches. Track equipment may be required for excavation.

Fill may be encountered on the site. Any uncontrolled fill encountered beneath the proposed improvements will require removal and recompaction according to the "Structural Fill" paragraph. Any loose or collapsible soils encountered during construction should be removed and recompacted according to the "Structural Fill" paragraph. Shotrock or geosynthtic materials may be necessary to achieve stability. Design considerations are discussed in the following sections.

Groundwater was encountered in all of the test borings. Groundwater depths are indicated on Table 2. Procedures and equipment for controlling groundwater should be anticipated. In areas where groundwater is encountered, structures should be designed to account for buoyant forces based on the depth of the structure below water table.

5.1 Subgrade Improvements and Bearing Capacity

The medium dense sands are adequate to support shallow structure foundations. Any loose or soft soils will require removal and recompaction. Expansive claystone was encountered in Test Boring Nos. 1 and 2 at the lift station site. Expansive soils are not suitable for direct bearing of foundations, components, vaults, floor slabs, or any structures. Where overexcavation due to expansive clay and claystone is required, an overexcavation depth on the order of 4 feet deep is recommended. Structural fill should be granular material placed according to the "Structural Fill" paragraph. An overexcavation drain may be required depending on fill materials used. A

typical overexcavation drain detail is presented in Figure 3. Excavated subgrade and overexcavated areas should be observed by a representative of Entech Engineering, Inc. prior to fill placement. Site granular soils may be suitable for structural fill. The structural fill should be approved by Entech prior to hauling to the site, and the first density test should be conducted at overexcavation subgrade and when each 12 inches of fill has been placed. The fill should be placed in maximum 6-inch compacted lifts. Density tests should be performed to verify compaction with the first density test performed at the scarified overexcavation subgrade and when each 12 inches of fill has been placed.

The plans provided to us were preliminary. Depths of excavations were not indicated on the plans. Provided the above recommendations are followed the following design parameters are anticipated for the proposed structures.

An allowable bearing capacity of 2400 psf is anticipated for structural fill or medium dense to dense native sands. Bearing capacity of 3500 psf is anticipated for undisturbed sandstone. Foundation walls should be designed to resist lateral pressures generated by the soils and water. For submerged conditions, an equivalent fluid pressure (EFP) of 85 pcf is recommended for the active state and EFP of 100 pcf is recommended for at rest conditions. For conditions above the water table an EFP for the active state of 45 pcf is recommended and an EFP of 70 pcf is recommended for at rest conditions. Water was encountered at depths of 5 to 8 feet in Test Borings 1 through 3. It should be noted that the above values apply to level and drained backfill conditions. If sloping backfill conditions exist, pressures will increase substantially depending on the conditions adjacent to the walls. Surcharge loading should also be considered in wall designs.

Suitable site materials as approved by Entech can be used for backfill using the above-referenced equivalent hydrostatic fluid pressures. The fill should be granular in nature and non-expansive. Clay or claystone materials could be stock piled separately from the granular soils and used on the upper 2 feet of the lift station structures foundation wall backfill.

For final design, continuous spread footings are recommended to have a minimum width of 16 inches, and individual column footing should have minimum plan dimensions of 24 inches on each side in order to avoid punching failure into the supporting subgrade soils unless designed

as a structural monolithic system. Exterior footings should extend a minimum of 30 inches below the adjacent exterior site grade for frost protection or as required by local jurisdictions. Following the above foundation subgrade preparation recommendations, and adhering to the recommended maximum allowable bearing pressure, it is expected to result in foundation designs which should limit total and differential vertical movement up to 1 and ½ inches respectively.

Drilled pier foundations can be considered due to the presence of claystone and sandstone materials. Although consideration must be given to groundwater conditions, design recommendations can be developed. Floor systems can be structurally supported or placed on overexcavated structural fill. Foundation excavations are recommended to extend at least 4 feet horizontally beyond the foundation wall limits (inside and outside) in order to provide adequate space for installation of drain materials (if necessary) and placement of structural fill. All foundation excavation side slopes should be inclined at angles of $1^1/_2$ horizontal to 1 vertical or flatter, as necessary, to provide for excavation sidewall stability during construction or as required by OSHA regulations. Steeper angles may be appropriate for excavations into bedrock. Entech should observe overexcavated subgrades as well as the overall foundation excavation subgrade and evaluate if the exposed conditions are consistent with those described in this report. Entech should also provide recommendations for overexcavation depth, if necessary, and the need for drain systems based on the excavation conditions observed at that time.

5.2 Site Seismic Classification

Based on the subsurface conditions encountered at the site and in accordance with Section 1613 of the 2009 International Building Code (IBC), the site meets the conditions of a Site Class C.

5.3 On-Grade Floor Slabs

The floor slabs may be supported by native medium dense sands, sandstone, or non-expansive structural fill. Overexcavation where expansive materials are present at or within 4 feet of slab grade will be determined at the time of excavation observations. Expansive soils encountered

fill. Backfill placed below floor slabs should be non-expansive granular soils and be compacted to a minimum of 98 percent of maximum Modified Proctor Dry Density (ASTM D- 1557).

Grade supported floor slabs above existing grade should be separated from other building structural components and utility penetrations to allow for possible future vertical movement unless they are designed as part of the foundation system. Control joints in grade-supported slabs are recommended and should be placed according to ACI Guidelines. Slabs below grade must be designed to resist the bouyant uplift forces.

5.4 Surface and Subsurface Drainage

Positive surface drainage must be maintained around the structures to minimize infiltration of surface water. A minimum gradient of 5 percent in the first 10 feet adjacent to foundation walls is recommended. A minimum gradient of 2 percent is recommended for paved areas. All grades should be directed away from the structure. All downspouts should be extended to discharge well beyond the backfill zone of the structures.

A subsurface perimeter drain is not required providing the slab is located above exterior grade, interior and exterior backfill is properly compacted, surface grading is maintained and irrigation is minimized. A subsurface perimeter drain is recommended for useable space below finished grade for buildings. A typical drain detail is shown in Figure 4. The drain should be provided with a free gravity outlet or be connected to a sewer underdrain. If such an outlet or connection is not available within a reasonable distance from the structure, a sump and pump system would be required. Perimeter drains daylighting into a nearby lower area could be a design consideration for the structures.

Water tight construction will be required for the lift station. Perimeter drains are not required for structures below the water table if they are designed for the submerged pressures described above.

To help minimize infiltration of water into the foundation zone, vegetative plantings placed close to foundation walls should be limited to those species having low watering requirements and irrigated grass should not be located within 5 feet of the foundation. Similarly, sprinklers are not

5.5 Concrete

Sulfate solubility testing was conducted on the soil and bedrock samples recovered from the test borings to evaluate the potential for sulfate attack on concrete placed below surface grade. Test results indicated a range less than 0.01 to 0.01 percent soluble sulfate by weight (Table 1). The test results indicate the sulfate component of the in-place soils presents a negligible threat to concrete placed below the site grade depending on the soil type. Type II cement is recommended for the soils which pose a negligible threat, which is anticipated to include imported structural fill materials. High strength concrete (4500 psi) should be considered. To further avoid concrete degradation during construction it is recommended that concrete not be placed on frozen or wet ground.

Care should be taken to prevent the accumulation or ponding of water in the foundation excavation prior to the placement of concrete. If standing water is present in the foundation excavation, it should be removed by ditching to sumps and pumping the water away from the foundation area prior to concrete placement. If concrete is placed during periods of cold temperatures, the concrete must be kept from freezing. This may require covering the concrete with insulated blankets and adding heat to prohibit freezing.

5.6 Foundation Excavation Observation

Subgrade preparation for the building foundation should be observed by Entech Engineering prior to construction of the footings and floor slab in order to verify that (1) no anomalies are present, (2) materials of the proper bearing capacity have been encountered or placed, and (3) no soft, loose, uncontrolled fill material, expansive soil or debris are present in the foundation area prior to concrete placement or backfilling. Entech should make final recommendations for overexcavation, if required, and foundation drainage at the time of excavation observation, if necessary.

5.7 Structural Fill

Areas to receive fill should have all topsoil, organic material or debris removed. Fill must be properly benched and should consist of granular, non-expansive soils. The fill receiving surface should be scarified and moisture conditioned to within 0 to +2 percent of its optimum moisture content and compacted to 98 percent of its maximum Standard Proctor Dry Density (ASTM D-698) beneath structures prior to placing new fill. New fill beneath footings should be non-expansive and be placed in thin lifts not to exceed 6 inches after compaction while maintaining at least 98 percent of its maximum Modified Proctor Dry Density (ASTM D-1557) for granular soils placed for the structures. These materials should be placed at a moisture content conducive to compaction, usually ±2 percent of Proctor optimum moisture content. The placement and compaction of fill should be observed and tested by Entech Engineering, Inc. All imported soils and on-site granular soils should be approved by Entech Engineering, Inc. prior to being hauled to the site or placed.

Fill material placed beneath floor slabs should be compacted to a minimum of 98 percent of its maximum Modified Proctor Dry Density, ASTM D-1557. Fill material should be placed in horizontal lifts such that each finished lift has a compacted thickness of six inches or less. Fill should be placed at water contents conducive to achieving adequate compaction, usually within ±2 percent of the optimum water content as determined by ASTM D-1557.

Mechanical methods can be used for placement and compaction of fill; however, heavy equipment should be kept at distance from foundation walls and below slab infrastructure to avoid overstressing. No water flooding techniques of any type should be used for compaction or placement of foundation or floor slab fill material.

5.8 Utility Trench Backfill

Fill placed in utility trenches should be compacted to a minimum of 95 percent of its maximum dry density as determined by the Standard Proctor Test (ASTM D-698) for cohesive soils and 95 percent as determined by the Modified Proctor Test (ASTM D-1557) for cohesionless soils. Fill should be placed in horizontal lifts having a compacted thickness of six inches or less and at a water content conducive to adequate compaction, within ±2 percent of the optimum water

content. Mechanical methods should be used for fill placement; however, heavy equipment should be kept at a distance from foundation walls. No water flooding techniques of any type should be used for compaction or placement of utility trench fill.

Based on the gradation of the soils encountered within the pipeline alignment, large materials were not encountered, however loose and soft soils may be encountered that may not adequately support the pipe. Groundwater is expected to be encountered in trenches. Groundwater may need to be controlled by cofferdams, pumping, or other appropriate methods. Stabilization of trench excavation may be required. Pipeline construction specifications should consider pipe bedding requirements where added protection or support is required. Class B bedding should be considered in these pipeline sensitive areas.

Trench backfill placement should be performed in accordance with the El Paso County specifications. All excavation and excavation shoring/bracing should be performed in accordance with OSHA guidelines. Track excavator constraints include: depth and reach of equipment, potential support requirements in loose or soft soils in areas of shallow groundwater, and side offset requirements between the tracks and bucket. Very hard material may require rock buckets.

5.9 General Backfill

Any areas to receive fill outside the foundation limits should have all topsoil, organic material, and debris removed. Fill must be properly benched into existing slopes in order to be adequately compacted. The fill receiving surface should be scarified to a depth of 12-inches and moisture conditioned to ± 2 percent of the optimum water content, and compacted to a minimum of 95 percent of the ASTM D-698 maximum dry density for cohesive soils and compacted to a minimum of 95 percent D-1557 for cohesionless soils. Fill should be placed in thin lifts not to exceed 6 inches in thickness after compaction. Fill material should be free of vegetation and other unsuitable material and shall not contain rocks or fragments greater than 3-inches. Topsoil and strippings should be segregated from all other fill sources on the site. Fill placement and compaction beneath and around foundations, in utility trenches, beneath roadways or other structural features of the project should be observed and tested by Entech during construction.

5.10 Excavation Stability

Excavation sidewalls must be properly sloped, benched and/or otherwise supported in order to maintain stable conditions. All excavation openings and work completed therein shall conform to OSHA Standards as put forward in CFR 29, Part 1926.650-652, (Subpart P).

5.11 Winter Construction

In the event construction of the planned facility occurs during winter, foundations and subgrades should be protected from freezing conditions. Concrete should not be placed on frozen soil and once concrete has been placed, it should not be allowed to freeze. Similarly, once exposed, the foundation subgrade should not be allowed to freeze. During site grading and subgrade preparation, care should be taken to avoid burial of snow, ice or frozen material within the planned construction area.

5.12 Construction Observations

It is recommended that Entech observe and document the following activities during construction of the building foundations.

- Excavated subgrades and subgrade preparation.
- Placement of drains (if installed).
- Placement/compaction of fill material for the foundation components and floor slab.
- Placement/compaction of utility bedding trench backfill, and bore pit backfill.

6.0 CLOSURE

The subsurface investigation, geotechnical evaluation and recommendations presented in this report are intended for use by Four Way Ranch Metro District with application to the Waterbury Lift Station Project located in El Paso County. In conducting the subsurface investigation, laboratory testing, engineering evaluation and reporting, Entech Engineering, Inc. endeavored to work in accordance with generally accepted professional geotechnical and geologic practices and principles consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in same locality and under similar conditions. No other warranty, expressed or implied is made. During final design and/or construction, if conditions are encountered which appear different from those described in this report, Entech Engineering, Inc. requests that it be notified so that the evaluation and recommendations presented herein can be reviewed and modified as appropriate.

If there are any questions regarding the information provided herein or if Entech Engineering, Inc. can be of further assistance, please do not hesitate to contact us.

TABLE

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT FOUR WAY RANCH
PROJECT WATERBURY LIFT STATION
JOB NO. 152161

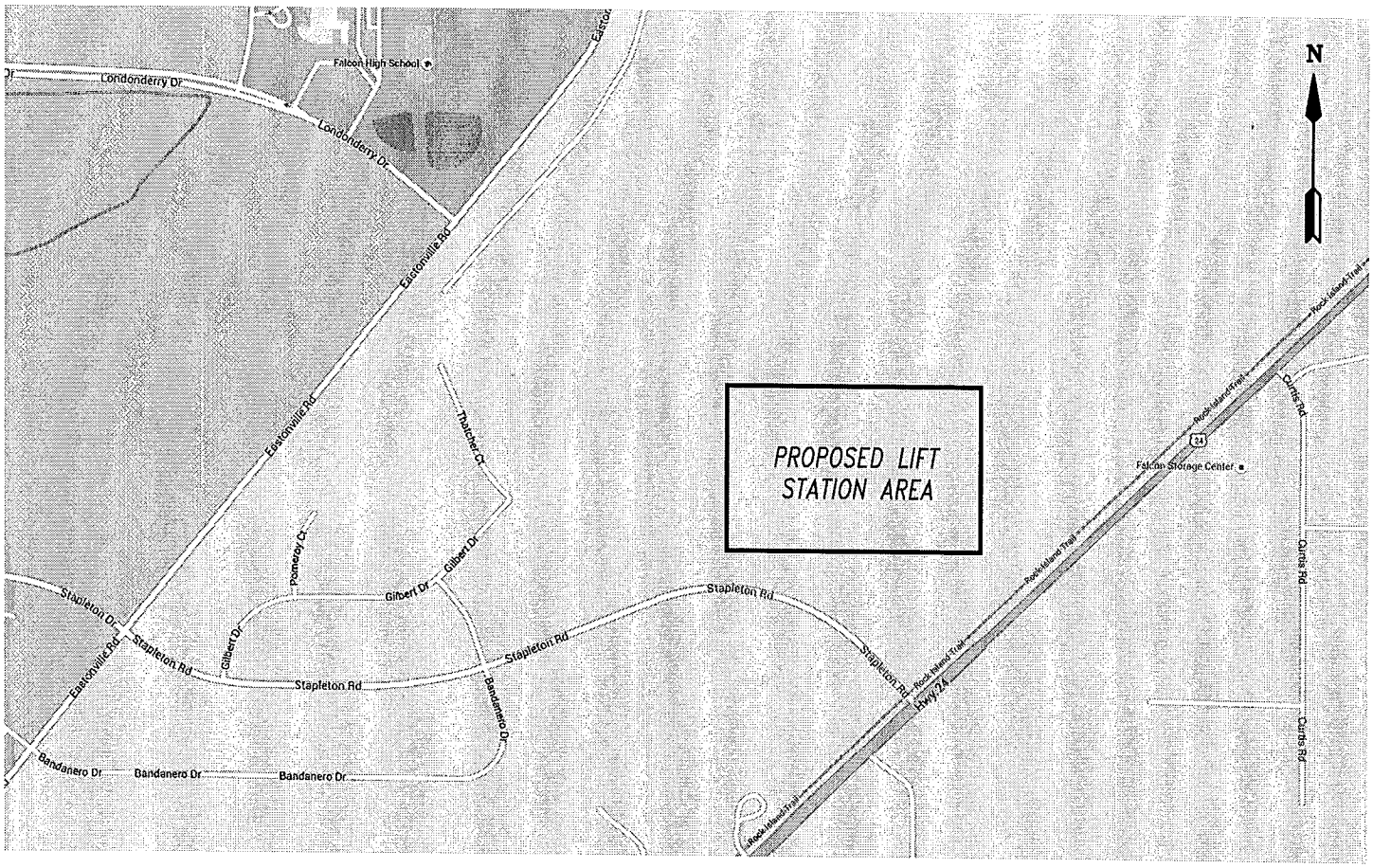
SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	1	2-3			15.3	NV	NP	0.01			SM	SAND, SILTY
1	2	2-3			30.0						SM	SAND, SILTY
1	5	5			11.0	NV	NP				SM-SW	SAND, SLIGHTLY SILTY
1	8	2-3			8.2						SM-SW	SAND, SLIGHTLY SILTY
2	4	2-3	18.2	107.9	52.1	43	21	<0.01		-0.5	CL	CLAY, VERY SANDY
2	6	2-3			53.2				1030		CL	CLAY, VERY SANDY
3	1	10			27.6						SM	SANDSTONE, SILTY
3	2	15			4.4	NV	NP				SP	SANDSTONE
3	2	20			17.1						SM	SANDSTONE, SILTY
3	3	15			12.9				320		SM	SANDSTONE, SILTY
3	3	25			23.5	25	0	0.01	480		SM	SANDSTONE, SILTY
3	7	15			7.4						SM-SW	SANDSTONE, SLIGHTLY SILTY
3	8	15			28.6			0.01	430		SC	SANDSTONE, CLAYEY
4	4	10	11.2	115.3						0.8	CL	CLAYSTONE, SANDY

TABLE 2

Depth to Bedrock and Groundwater
WATERBURY LIFT STATION
152161

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	4	5
2	4	8
3	4	6.5
4	8	2.5
5	8	4.5
6	9	2.5
7	14	7
8	13	6.5

FIGURES



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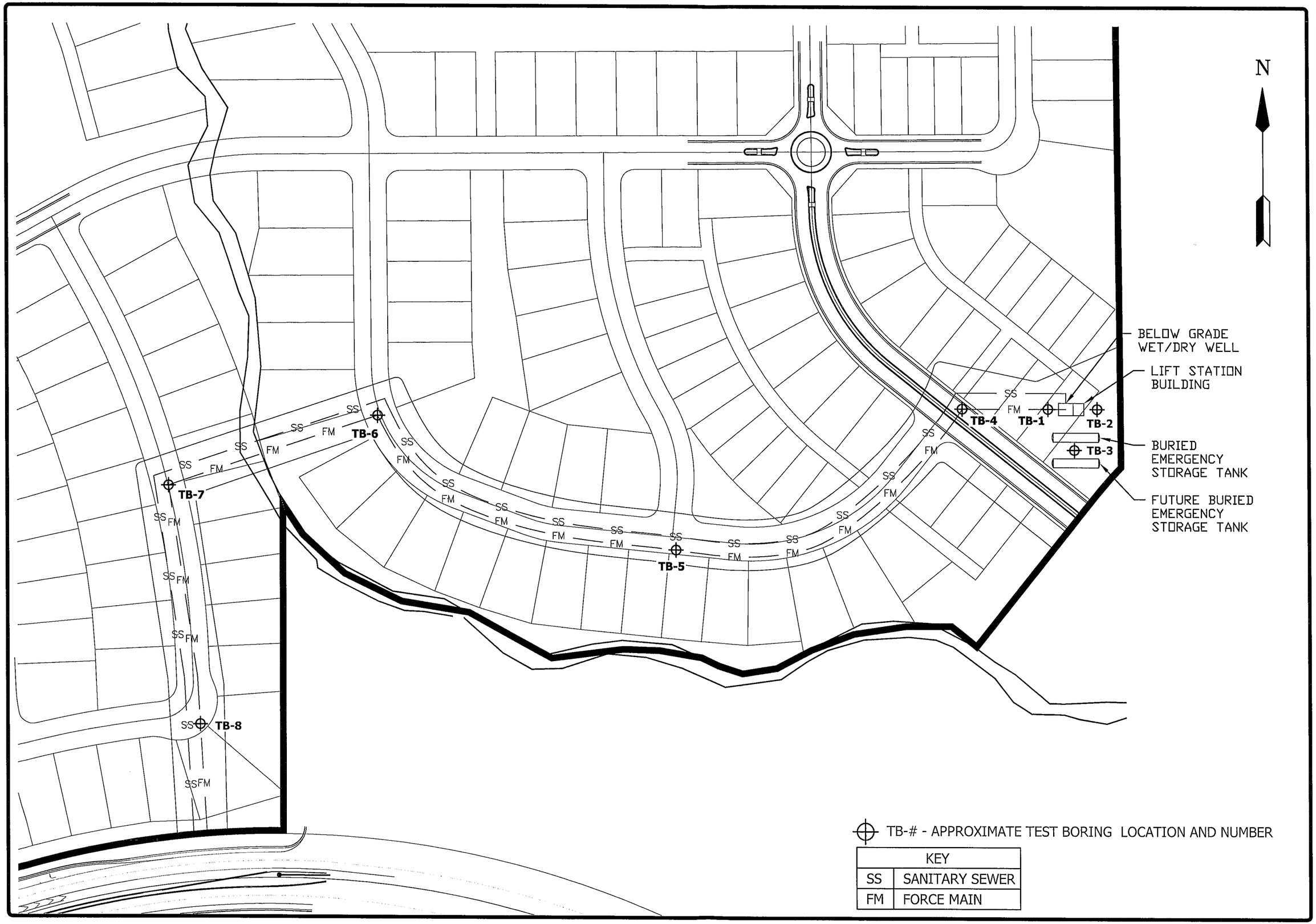
APPROX. SITE VICINITY MAP
FOUR WAY RANCH METRO DISTRICT
FALCON, CO
FOR: WATERBURY LIFT STATION

DRAWN BY:	DATE DRAWN:	DESIGNED BY:	CHECKED:
JW	12/28/15	MH	

JOB NO.: 152161

FIG. NO.: 1



REVISIONS BY:

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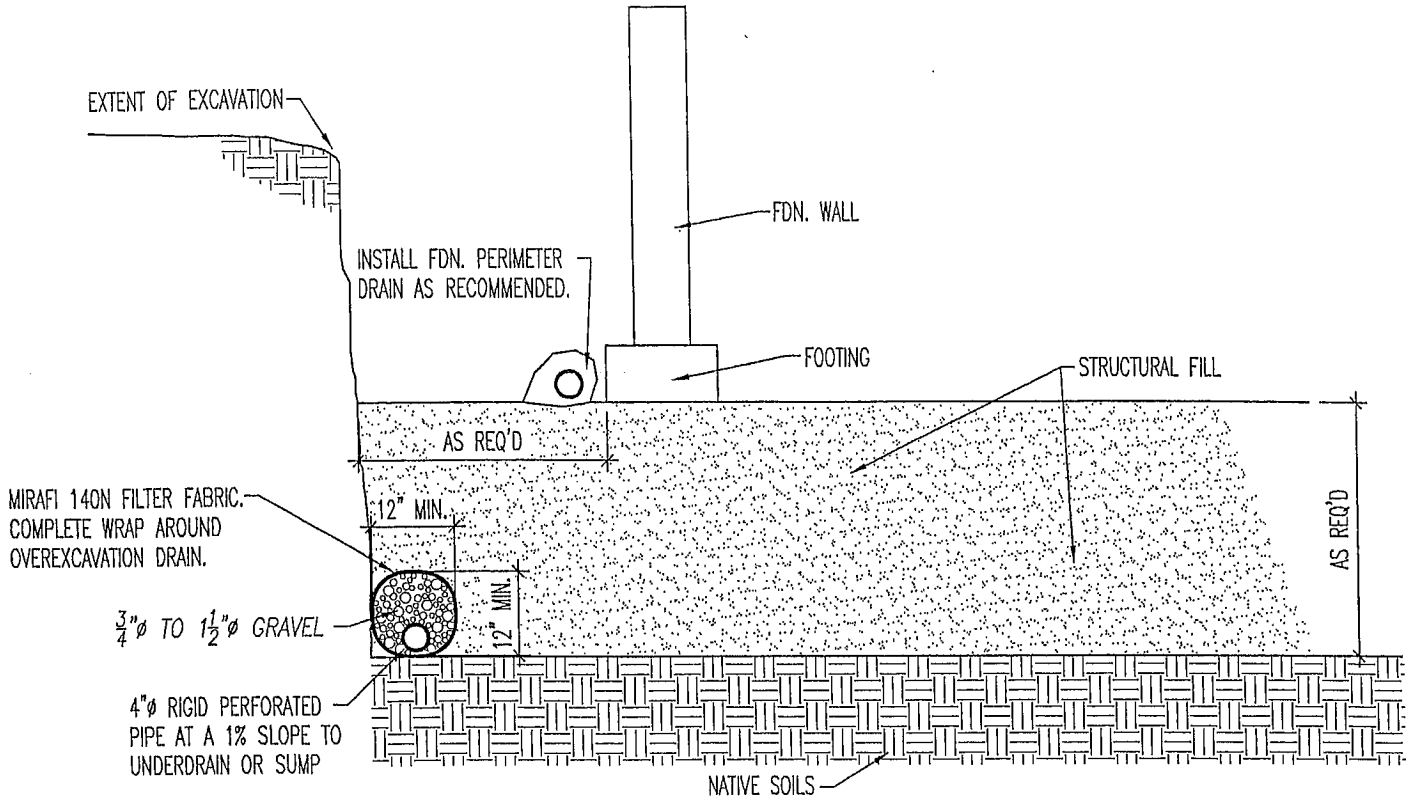
SITE PLAN/TEST BORING LOCATION MAP
FOUR WAY RANCH METRO DISTRICT
FALCON, CO
FOR: WATURBURY LIFT STATION

DRAWN BY: X. JW
DESIGNED BY: MH
CHECKED BY:
DATE: 12/28/15
SCALE: AS SHOWN
JOB NO.: 152161
SHEET NO.:
FIG. 2



OVEREXCAVATION DRAIN DETAIL

N.T.S.

NOTE:

EXTEND DRAIN TO SUMP AS REQ'D.

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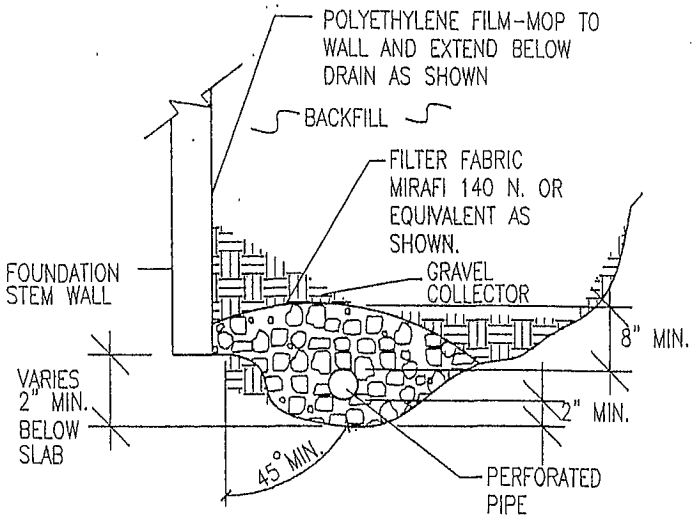
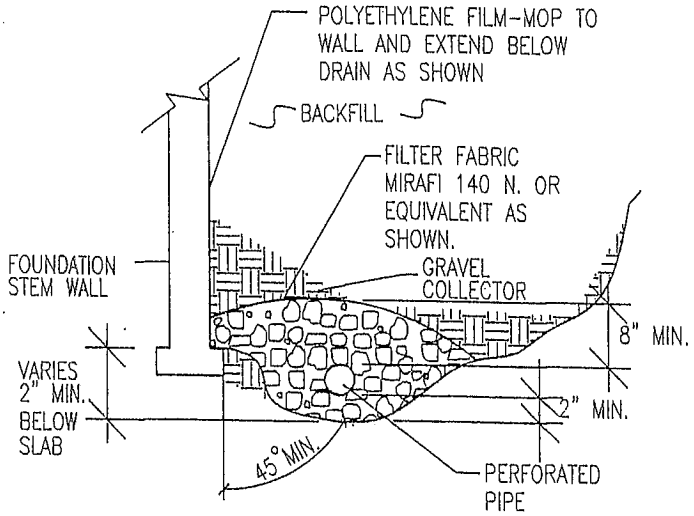
OVEREXCAVATION DRAIN DETAIL			
DRAWN BY: R.J. OLSON	DATE DRAWN: 22NOV11	DESIGNED BY: D. STEGMAN	CHECKED:

JOB NO.:

FIG. NO.: 3





NOTES:

-GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS-85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

-PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4-INCH DIAMETER IS MOST OFTEN USED.

-ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON-PERFORATED PIPE.

-FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

-MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

-DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

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EXTERIOR PERIMETER DRAIN DETAIL

DRAWN:	DATE:	DESIGNED:	CHECKED:
M. VAN KAMPEN			

JOB NO.: 152161

FIG NO.: 4

APPENDIX A: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 11/25/2015
Job # 152161

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 5', 11/28/15						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				27	12.5	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST TO WET	5			50 / 11"	10.0	2
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	10			50 / 7"	19.2	2
SANDSTONE, CLAYEY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	15			50 / 6"	16.1	4
	20			50 / 6"	16.6	2
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, WET	25			50 / 5"	12.5	2
SANDSTONE, CLAYEY, FINE GRAINED, GRAY BROWN, VERY DENSE, WET	30			50 / 9"	17.1	2
	35			50 / 4"	13.2	2
	40			50 / 1"		2
	45					
	50					

TEST BORING NO. 2
DATE DRILLED 11/25/2015
CLIENT FOUR WAY RANCH
LOCATION WATERBURY LIFT STATION

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 8', 11/28/15						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST				14	12.3	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST	5			50	11.5	2
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	10			50 / 10"	14.8	4
SANDSTONE, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST	15			50 / 7"	11.9	2
SANDSTONE, SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	20			50 / 7"	14.2	2
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, WET	25			50 / 6"	12.7	2
	30			50 / 6"	12.5	2
SANDSTONE, CLAYEY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	35			50 / 9"	19.9	2
	40			50 / 7"	17.2	2
	45					
	50					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161
FIG NO.: A-1

TEST BORING NO. 3
DATE DRILLED 11/25/2015
Job # 152161

TEST BORING NO.
DATE DRILLED
CLIENT FOUR WAY RANCH
LOCATION WATERBURY LIFT STATION

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 6.5', 11/28/15						
SAND, SILTY, FINE TO COARSE GRAINED, TAN, DENSE, MOIST				35	5.0	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST TO WET	5			50 / 11"	8.7	1
WEATHERED ZONE AT 5-10'	10			44	15.3	1
	15			47	15.1	1
	20			50 / 9"	14.9	2
SANDSTONE, SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	25			50 / 7"	13.6	2
	30			50 / 8"	12.6	2
	35					
	40					
	45					
	50					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	5					
	10					
	15					
	20					
	25					
	30					
	35					
	40					
	45					
	50					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161
FIG NO.: A-2

TEST BORING NO. 4
DATE DRILLED 11/25/2015
Job # 152161

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 2.5', 12/4/15						
CLAY, VERY SANDY, BROWN, FIRM TO VERY STIFF, MOIST				9	16.6	2
	5			34	18.2	2
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	10			50/6"	13.5	4
	15			50/5"	15.1	4
	20			50/7"	14.3	4

TEST BORING NO. 5
DATE DRILLED 12/4/2015
CLIENT FOUR WAY RANCH
LOCATION WATERBURY LIFT STATION

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 4.5', 12/7/15						
SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO WET				10	13.2	1
	5			11	20.5	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY STIFF, WET	10			50/9"	15.2	3
	15			50	14.3	3
	20			50/3"	14.4	3

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
.			12/22/15

JOB NO.: 152161
FIG NO.: A-3

TEST BORING NO. 6
DATE DRILLED 12/4/2015
Job # 152161

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 2.5', 12/7/15						
CLAY, VERY SANDY, GRAY BROWN, FIRM, MOIST TO WET						
				8	20.2	2
	5			9	19.3	2
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, WET	10			50/6"	13.9	3
	15			50/9"	13.2	3
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	20			50/7"	12.1	4

TEST BORING NO. 7
DATE DRILLED 12/4/2015
CLIENT FOUR WAY RANCH
LOCATION WATERBURY LIFT STATION

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 7', 12/7/15						
SAND, SLIGHTLY SILTY TO SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO WET				14	2.5	1
	5			18	6.0	1
SAND, CLAYEY, FINE GRAINED, BROWN, DENSE, MOIST	10			30	16.0	1
SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, WET	15			50/7"	15.6	3
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST	20			50/8"	15.0	4

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 12/22/15

JOB NO.: 152161
FIG NO.: A-4

TEST BORING NO. 8
DATE DRILLED 12/4/2015
Job # 152161

TEST BORING NO.
DATE DRILLED
CLIENT FOUR WAY RANCH
LOCATION WATERBURY LIFT STATION

REMARKS

WATER @ 6.5', 12/7/15

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	REMARKS
	SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO WET					
		■	13	1.8	1	
5		■	15	5.3	1	
10		■	12	12.3	1	
	SANDSTONE, CLAYEY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST					
15		■	50 / 9"	15.1	3	
20		■	50 / 7"	11.4	3	

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
5					
10					
15					
20					

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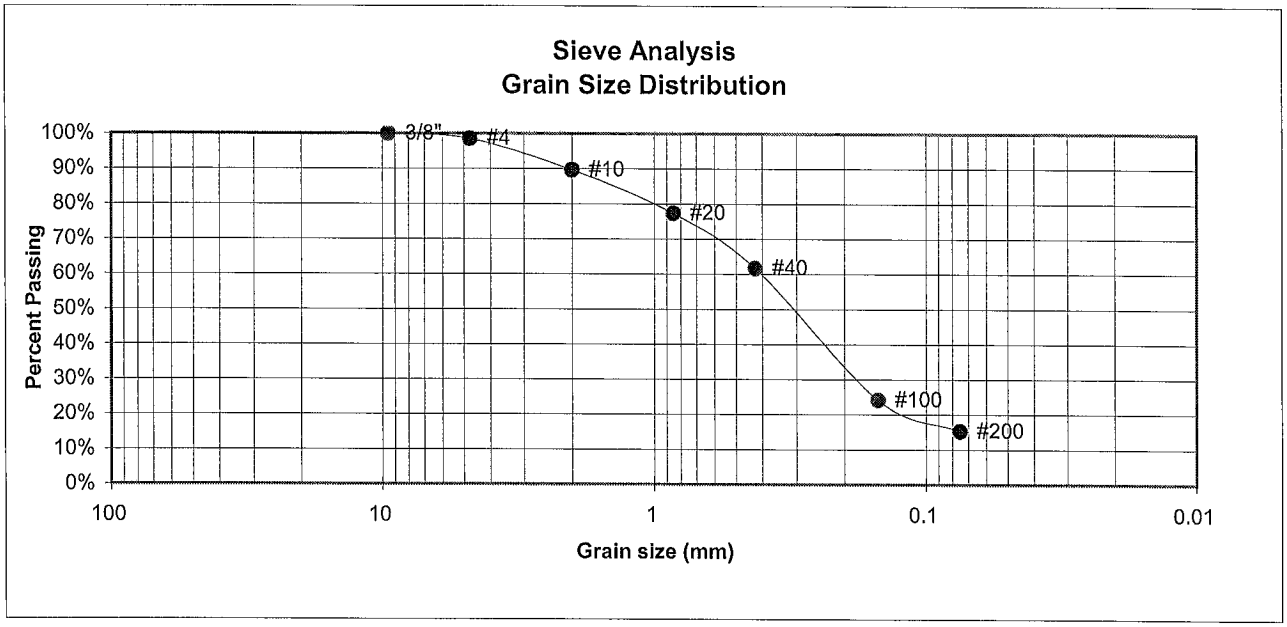
TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 12/22/15

JOB NO.: 152161
FIG NO.: A-5

APPENDIX B: Laboratory Test Results

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	1	PROJECT	WATERBURY LIFT STATION
TEST BORING #	1	JOB NO.	152161
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.6%
10	89.7%
20	77.3%
40	61.7%
100	24.2%
200	15.3%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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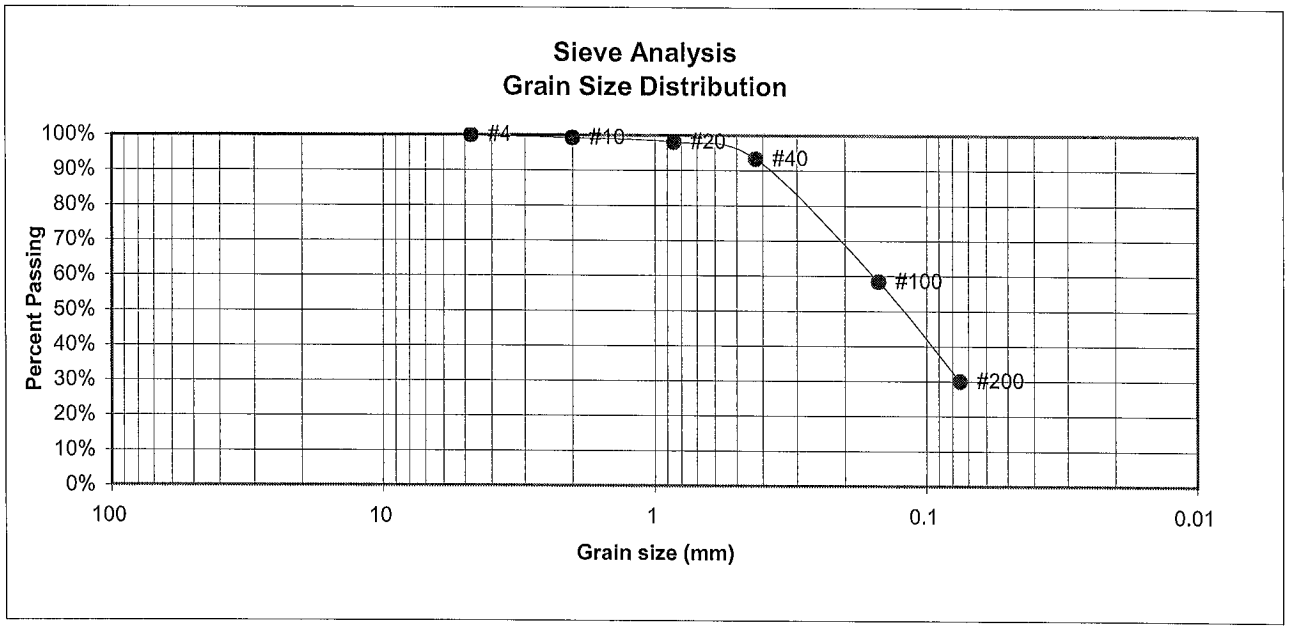
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/18

JOB NO.: 152161
FIG NO.: B-1

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	1	PROJECT	WATERBURY LIFT STATION
TEST BORING #	2	JOB NO.	152161
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.3%
20	98.1%
40	93.3%
100	58.4%
200	30.0%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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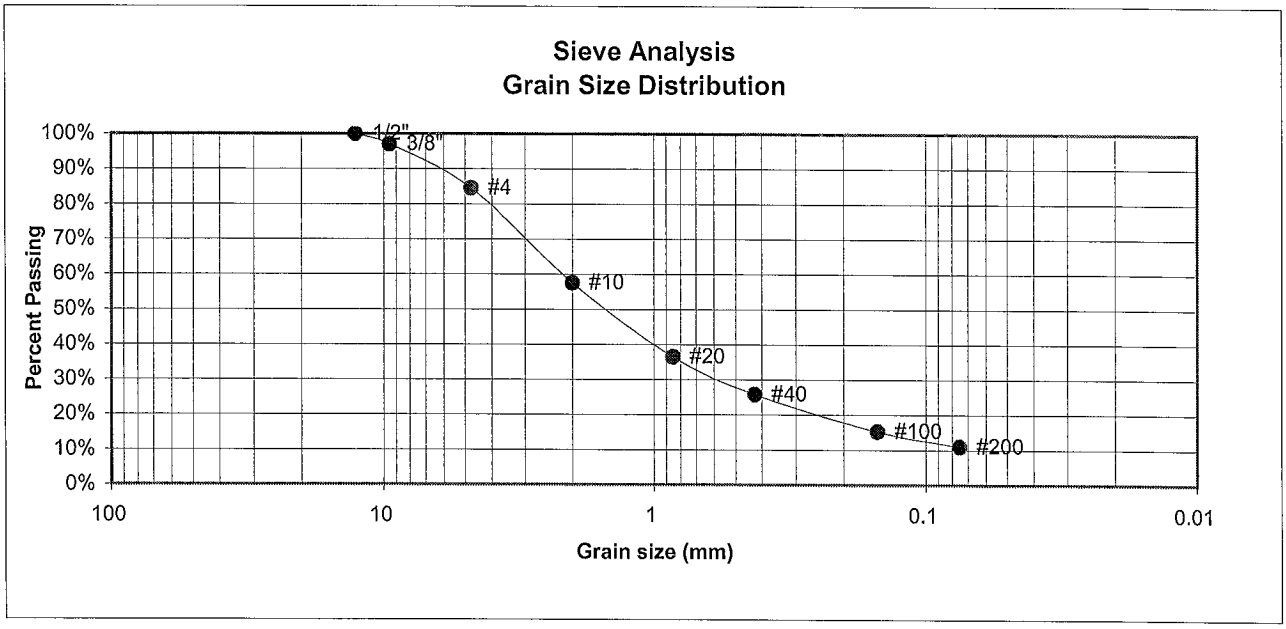
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161

FIG NO.: B-2

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FOUR WAY RANCH
SOIL TYPE #	1	PROJECT	WATERBURY LIFT STATION
TEST BORING #	5	JOB NO.	152161
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.0%
4	84.5%
10	57.5%
20	36.5%
40	25.8%
100	15.3%
200	11.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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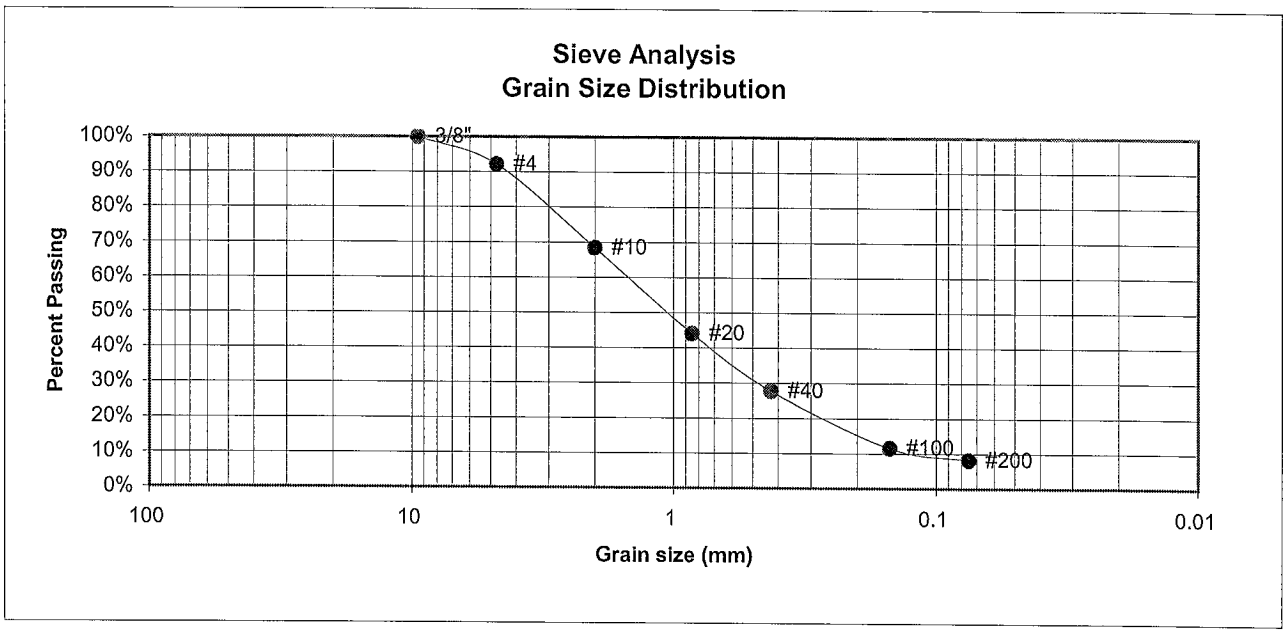
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161
FIG NO.: B-3

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FOUR WAY RANCH
SOIL TYPE #	1	PROJECT	WATERBURY LIFT STATION
TEST BORING #	8	JOB NO.	152161
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.1%
10	68.4%
20	44.1%
40	27.8%
100	11.5%
200	8.2%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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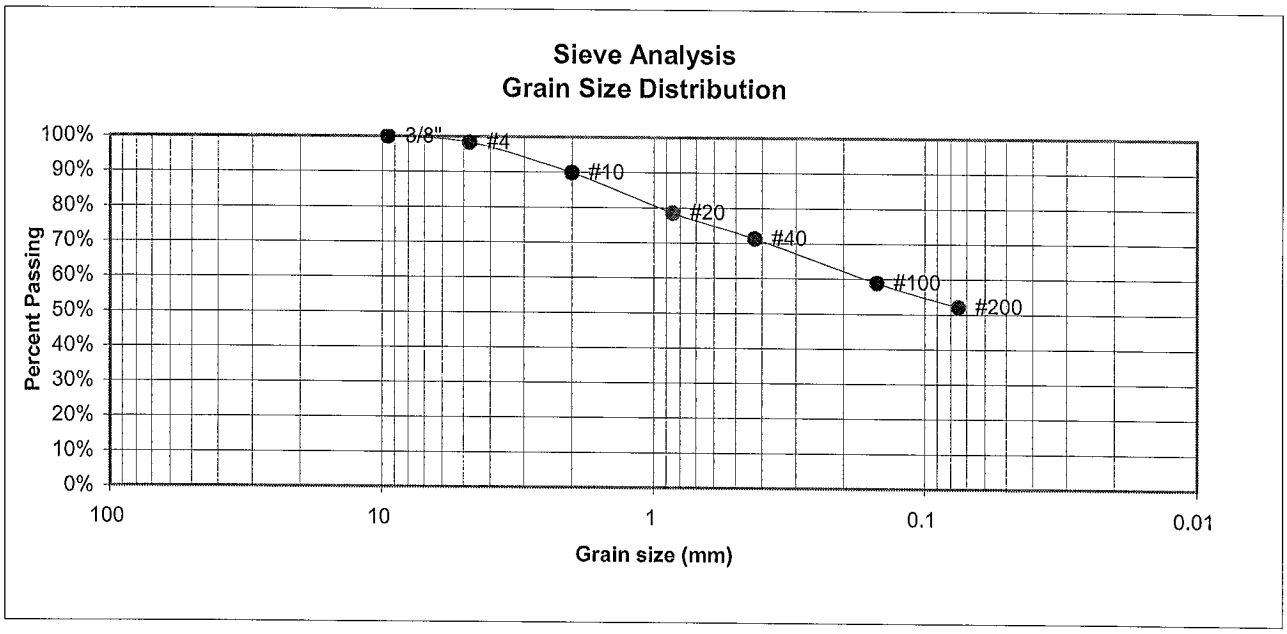
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/08

JOB NO.: 152161

FIG NO.: B-4

UNIFIED CLASSIFICATION	CL	CLIENT	FOUR WAY RANCH
SOIL TYPE #	2	PROJECT	WATERBURY LIFT STATION
TEST BORING #	4	JOB NO.	152161
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.3%
10	89.9%
20	78.5%
40	71.3%
100	58.9%
200	52.1%

Atterberg Limits	
Plastic Limit	22
Liquid Limit	43
Plastic Index	21

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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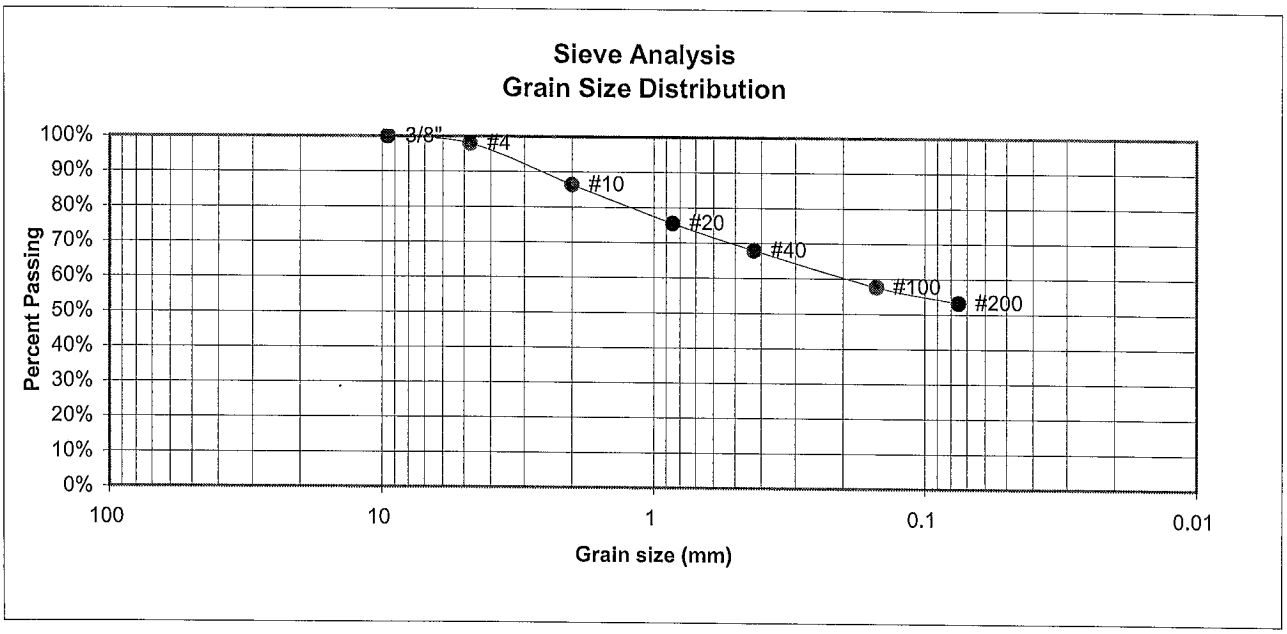
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:

JOB NO.: 152161
FIG NO.: B-5

UNIFIED CLASSIFICATION	CL	CLIENT	FOUR WAY RANCH
SOIL TYPE #	2	PROJECT	WATERBURY LIFT STATION
TEST BORING #	6	JOB NO.	152161
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.0%
10	86.4%
20	75.5%
40	67.9%
100	57.7%
200	53.2%

Atterberg Limits

Plastic Limit	
Liquid Limit	
Plastic Index	

Swell

Moisture at start	10.1%
Moisture at finish	22.1%
Moisture increase	11.9%
Initial dry density (pcf)	97
Swell (psf)	1030

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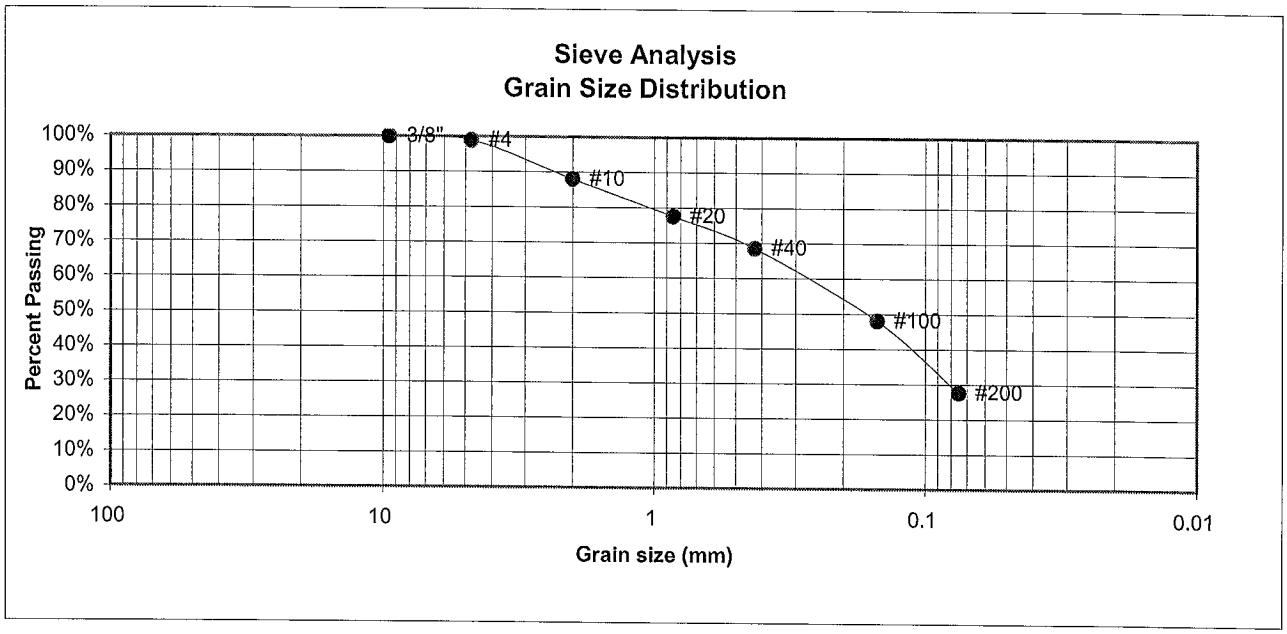
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161
FIG NO.: B-6

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	1	JOB NO.	152161
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.9%
10	88.0%
20	77.5%
40	68.5%
100	48.1%
200	27.6%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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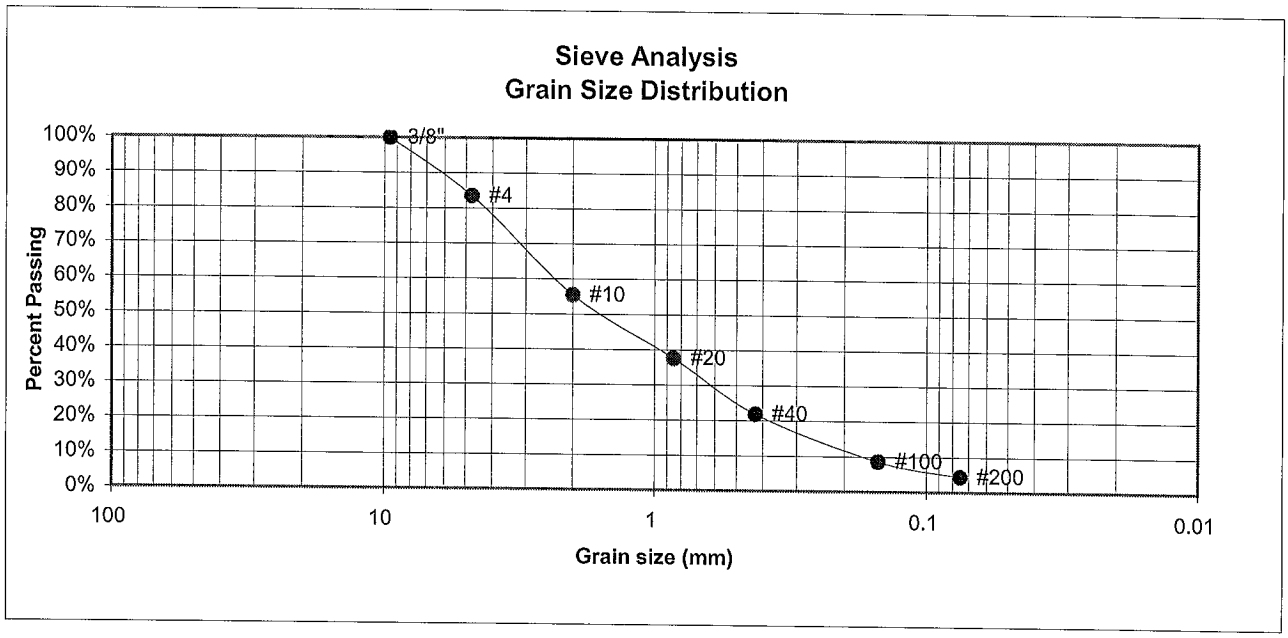
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		W	12/22/15

JOB NO.: 152161

FIG NO.: B-7

UNIFIED CLASSIFICATION	SP	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	2	JOB NO.	152161
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	83.4%
10	55.4%
20	37.6%
40	21.9%
100	8.6%
200	4.4%

Atterberg Limits

Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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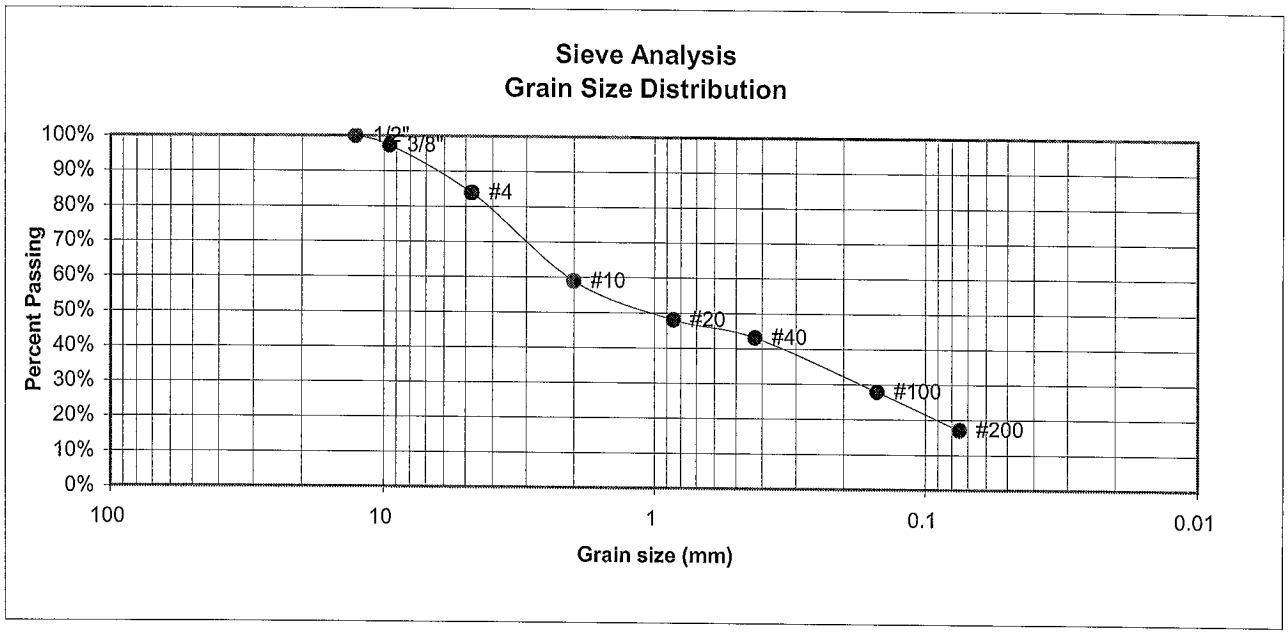
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 12/22/95

JOB NO.: 152161

FIG NO.: B-8

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	2	JOB NO.	152161
DEPTH (FT)	20	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	97.3%
4	83.9%
10	58.9%
20	48.0%
40	43.1%
100	27.9%
200	17.1%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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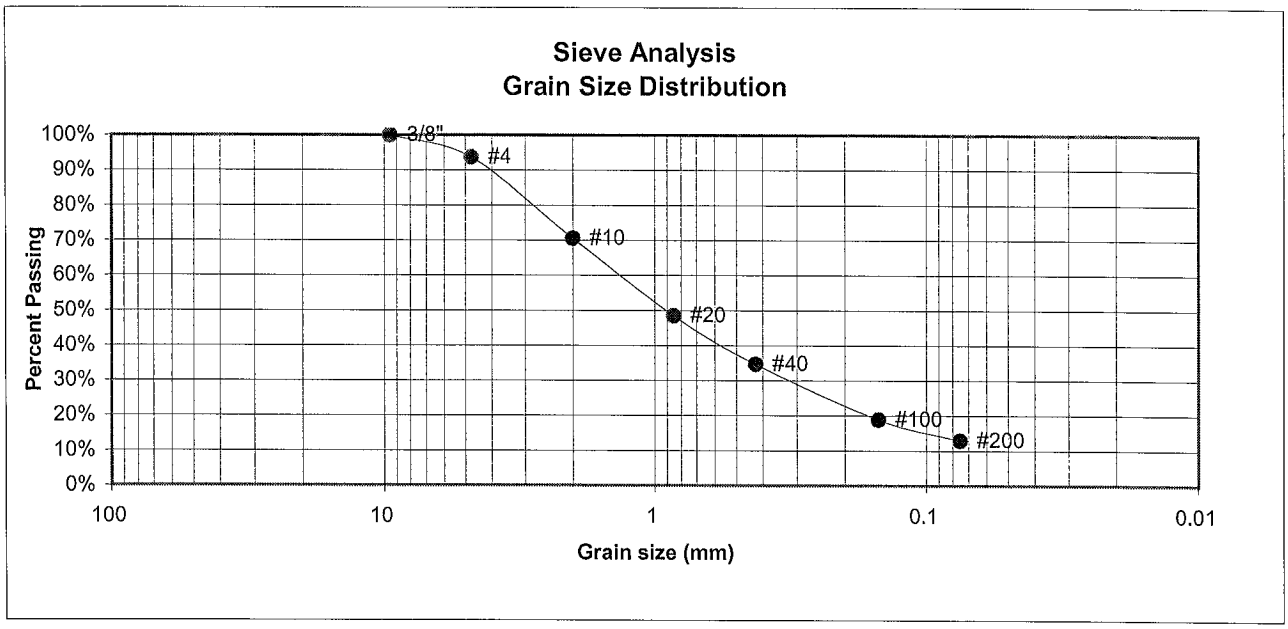
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161

FIG NO.: B-9

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	3	JOB NO.	152161
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.7%
10	70.6%
20	48.4%
40	34.7%
100	18.8%
200	12.9%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	11.3%
Moisture at finish	19.5%
Moisture increase	8.2%
Initial dry density (pcf)	100
Swell (psf)	320

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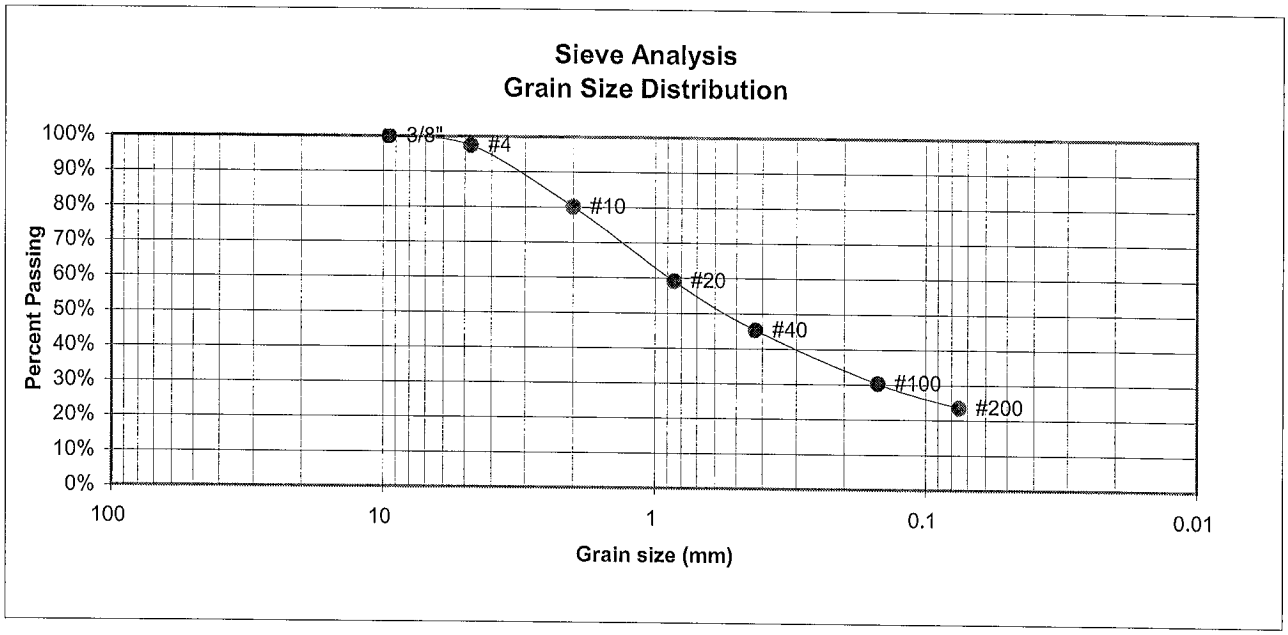
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:

JOB NO.: 152161
FIG NO.: B-10

UNIFIED CLASSIFICATION	SM	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	3	JOB NO.	152161
DEPTH (FT)	25	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.4%
10	80.0%
20	59.1%
40	45.3%
100	30.3%
200	23.5%

Atterberg Limits	
Plastic Limit	25
Liquid Limit	25
Plastic Index	0

Swell	
Moisture at start	12.8%
Moisture at finish	17.6%
Moisture increase	4.8%
Initial dry density (pcf)	105
Swell (psf)	480

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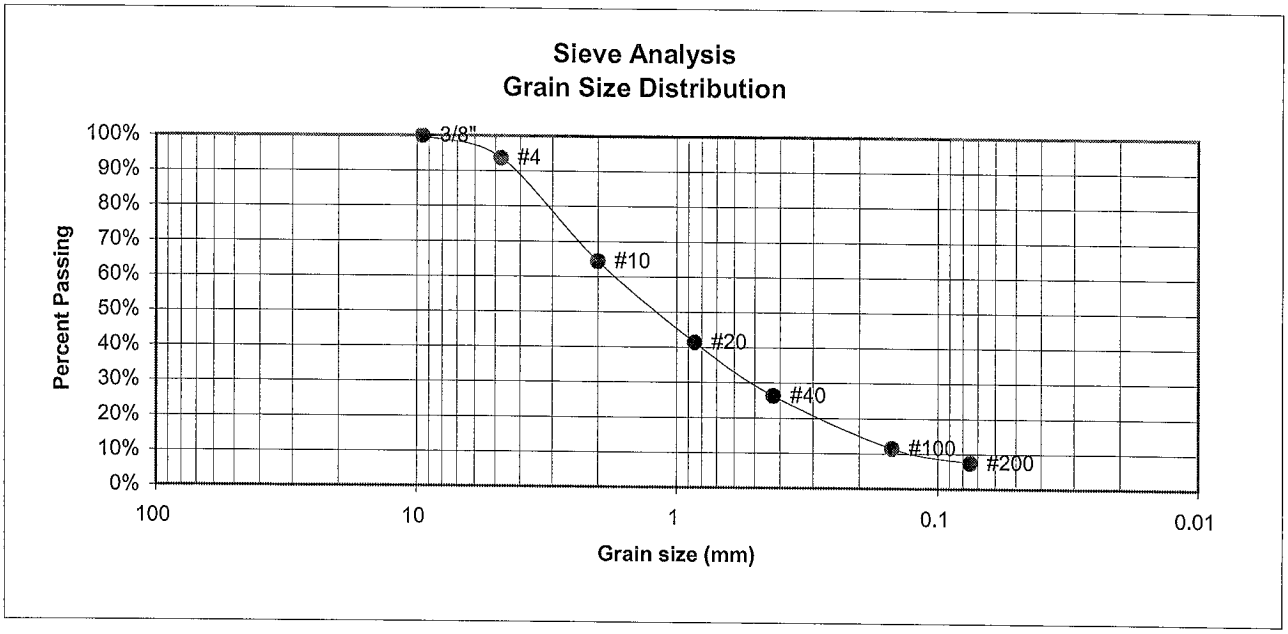
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:

JOB NO.: 152161
FIG NO.: B-11

UNIFIED CLASSIFICATION	SM-SW	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	7	JOB NO.	152161
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	93.7%
10	64.4%
20	41.4%
40	26.3%
100	11.5%
200	7.4%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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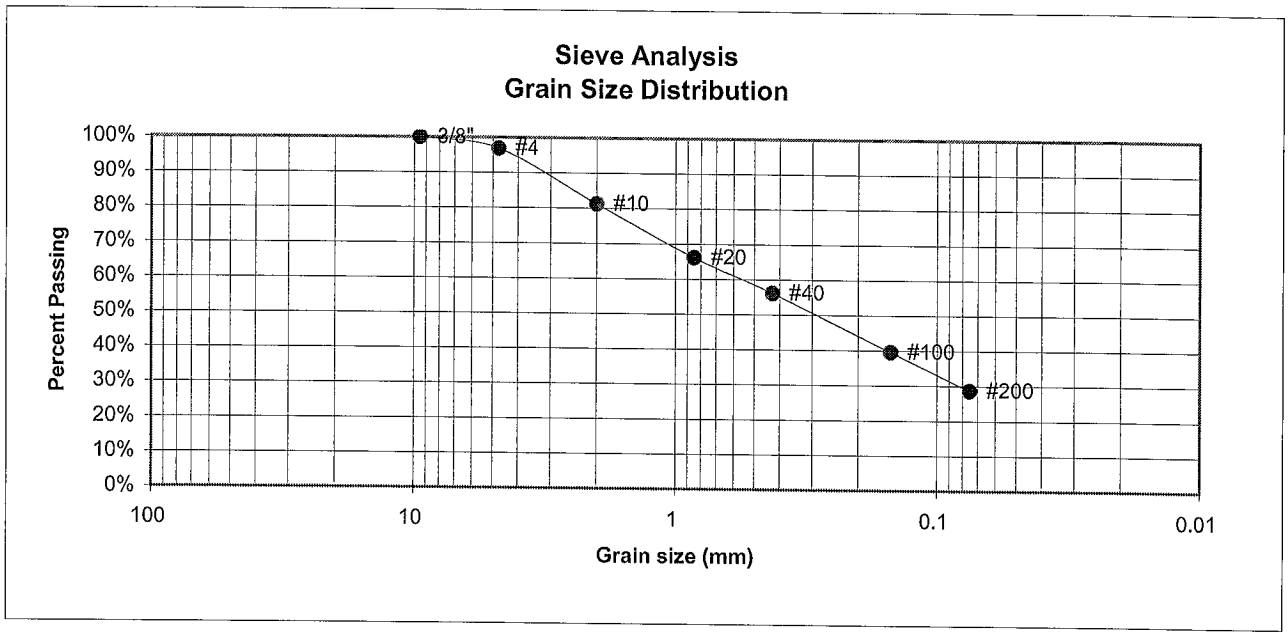
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161

FIG NO.: B-12

UNIFIED CLASSIFICATION	SC	CLIENT	FOUR WAY RANCH
SOIL TYPE #	3	PROJECT	WATERBURY LIFT STATION
TEST BORING #	8	JOB NO.	152161
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	96.9%
10	81.2%
20	66.2%
40	56.1%
100	39.6%
200	28.6%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	6.3%
Moisture at finish	19.8%
Moisture increase	13.4%
Initial dry density (pcf)	103
Swell (psf)	430

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LABORATORY TEST RESULTS

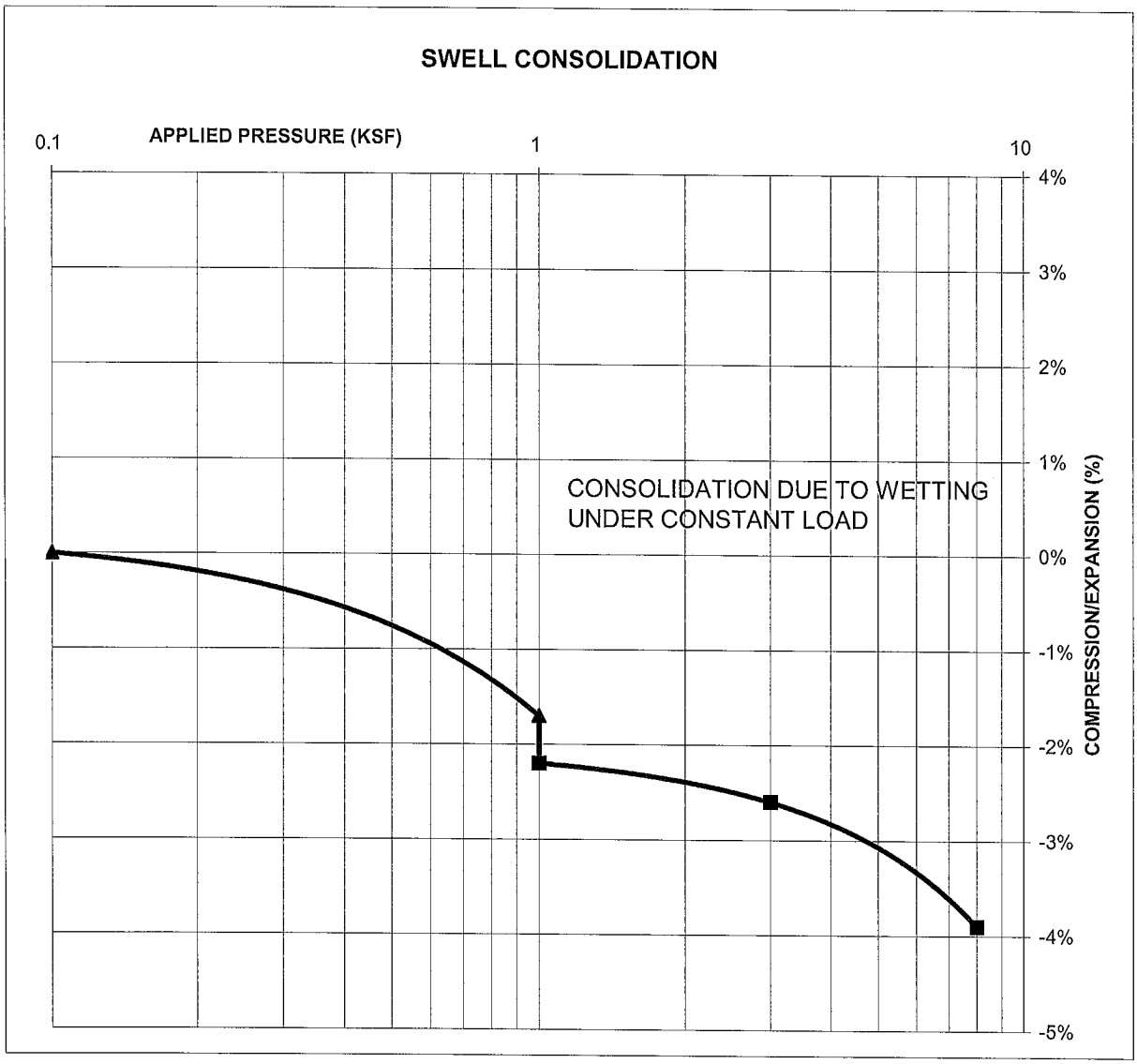
DRAWN:	DATE:	CHECKED:	DATE: 12/22/15

JOB NO.: 152161
FIG NO.: B-13

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	2-3
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			108
NATURAL MOISTURE CONTENT			18.2%
SWELL/CONSOLIDATION (%)			-0.5%

JOB NO. 152161
CLIENT FOUR WAY RANCH
PROJECT WATERBURY LIFT STATION



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SWELL CONSOLIDATION
TEST RESULTS

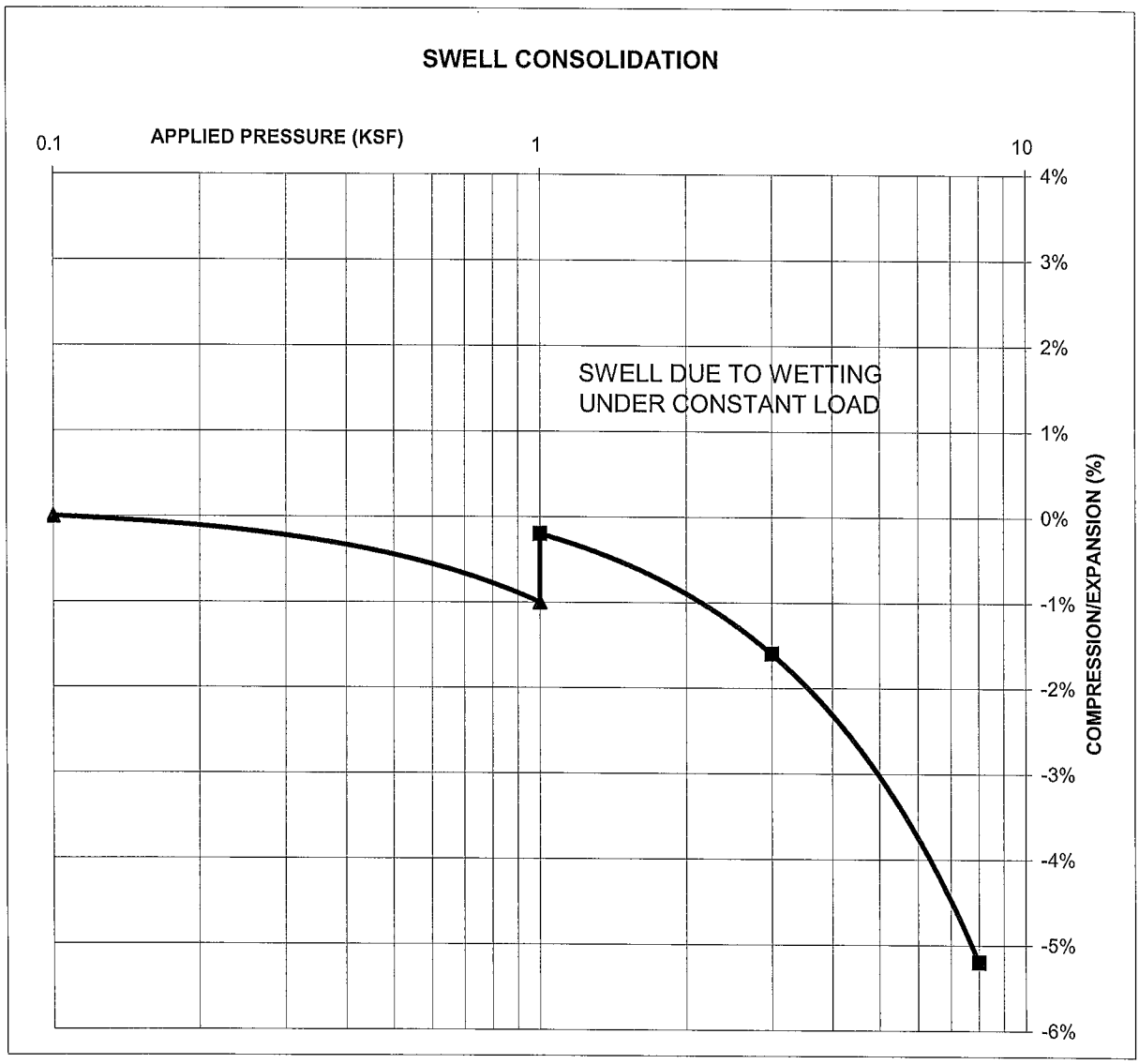
DRAWN:	DATE:	CHECKED:	DATE:
			12/22/15

JOB NO.: 152161
FIG NO.: B-14

CONSOLIDATION TEST RESULTS

TEST BORING #	4	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			115
NATURAL MOISTURE CONTENT			11.2%
SWELL/CONSOLIDATION (%)			0.8%

JOB NO. 152161
CLIENT FOUR WAY RANCH
PROJECT WATERBURY LIFT STATION



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE: 12/22/14

JOB NO.: 152161
FIG NO.: B-15

CLIENT	FOUR WAY RANCH	JOB NO.	152161
PROJECT	WATERBURY LIFT STATION	DATE	12/9/2015
LOCATION	WATERBURY LIFT STATION	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-1	2-3	1	SM	0.01
TB-3	25	3	SM	0.01
TB-4	2-3	2	CL	<0.01
TB-8	15	3	SC	0.01

QC BLANK PASS

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LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:

JOB NO.: 152161
FIG NO.: B-16

APPENDIX C

2019 Financial Assurance Estimate Form
(with pre-plat construction)

Updated: 6/7/2019

PROJECT INFORMATION		
4-Way Ranch Metro District - Lift Station	6/28/2019	PPR-18-051
	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
SECTION 1 - GRADING AND EROSION CONTROL (Construction and Permanent BMPs)								
* Earthwork								*
less than 1,000; $5,300 min		CY	$ 8.00	=	$ -		$ -	*
1,000-5,000; $8,000 min		CY	$ 6.00	=	$ -		$ -	*
5,001-20,000; $30,000 min	7,032	CY	$ 5.00	=	$ 35,160.00		$ 35,160.00	*
20,001-50,000; $100,000 min		CY	$ 3.50	=	$ -		$ -	*
50,001-200,000; $175,000 min		CY	$ 2.50	=	$ -		$ -	*
greater than 200,000; $500,000 min		CY	$ 2.00	=	$ -		$ -	*
* Permanent Seeding (inc. noxious weed mgmnt.)	0.39	AC	$ 800.00	=	$ 312.00		$ 312.00	*
* Mulching	0.39	AC	$ 750.00	=	$ 292.50		$ 292.50	*
* Permanent Erosion Control Blanket		SY	$ 6.00	=	$ -		$ -	*
* Permanent Pond/BMP Construction		CY	$ 20.00	=	$ -		$ -	*
* Permanent Pond/BMP (Spillway)		EA		=	$ -		$ -	*
* Permanent Pond/BMP (Outlet Structure)		EA		=	$ -		$ -	
Safety Fence		LF	$ 3.00	=	$ -		$ -	
Temporary Erosion Control Blanket		SY	$ 3.00	=	$ -		$ -	
Vehicle Tracking Control	1	EA	$ 2,370.00	=	$ 2,370.00		$ 2,370.00	
Silt Fence	550	LF	$ 2.50	=	$ 1,375.00		$ 1,375.00	
Temporary Seeding		AC	$ 628.00	=	$ -		$ -	
Temporary Mulch		AC	$ 750.00	=	$ -		$ -	
Erosion Bales		EA	$ 25.00	=	$ -		$ -	
Erosion Logs/Straw Waddle	2,300	LF	$ 5.00	=	$ 11,500.00		$ 11,500.00	
Rock Check Dams		EA	$ 500.00	=	$ -		$ -	
Inlet Protection		EA	$ 167.00	=	$ -		$ -	
Sediment Basin		EA	$ 1,762.00	=	$ -		$ -	
Concrete Washout Basin	1	EA	$ 900.00	=	$ 900.00		$ 900.00	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
MAINTENANCE (35% of Construction BMPs)				=	$ 5,650.75		$ 5,650.75	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 1 Subtotal**		**=**	**$ 57,560.25**		**$ 57,560.25**	
SECTION 2 - PUBLIC IMPROVEMENTS *								
ROADWAY IMPROVEMENTS								*
Construction Traffic Control	1	LS	$ 2,000.00	=	$ 2,000.00		$ 2,000.00	*
Aggregate Base Course (135 lbs/cf)		Tons	$ 28.00	=	$ -		$ -	*
Aggregate Base Course (135 lbs/cf)		CY	$ 50.00		$ -		$ -	*
Asphalt Pavement (3" thick)		SY	$ 14.00		$ -		$ -	*
Asphalt Pavement (4" thick)		SY	$ 19.00		$ -		$ -	*
Asphalt Pavement (6" thick)		SY	$ 29.00		$ -		$ -	*
Asphalt Pavement (147 lbs/cf) _" thick		Tons	$ 88.00	=	$ -		$ -	*
Raised Median, Paved		SF	$ 8.00	=	$ -		$ -	*
Regulatory Sign/Advisory Sign		EA	$ 300.00	=	$ -		$ -	*
Guide/Street Name Sign		EA		=	$ -		$ -	*
Epoxy Pavement Marking		SF	$ 13.00	=	$ -		$ -	*
Thermoplastic Pavement Marking		SF	$ 23.00	=	$ -		$ -	*
Barricade - Type 3		EA	$ 200.00	=	$ -		$ -	*
Delineator - Type I		EA	$ 24.00	=	$ -		$ -	*
Curb and Gutter, Type A (6" Vertical)		LF	$ 30.00	=	$ -		$ -	*
Curb and Gutter, Type B (Median)		LF	$ 30.00	=	$ -		$ -	*
Curb and Gutter, Type C (Ramp)		LF	$ 30.00	=	$ -		$ -	*
4" Sidewalk (common areas only)		SY	$ 48.00	=	$ -		$ -	*
5" Sidewalk		SY	$ 60.00	=	$ -		$ -	*
6" Sidewalk		SY	$ 72.00	=	$ -		$ -	*
8" Sidewalk		SY	$ 96.00		$ -		$ -	*
Pedestrian Ramp		EA	$ 1,150.00	=	$ -		$ -	*
Cross Pan, local (8" thick, 6' wide to include return)		LF	$ 61.00	=	$ -		$ -	*
Cross Pan, collector (9" thick, 8' wide to include return)		LF	$ 92.00		$ -		$ -	*
Curb Chase		EA	$ 1,480.00	=	$ -		$ -	*
Guardrail Type 3 (W-Beam)		LF	$ 49.00	=	$ -		$ -	*
Guardrail Type 7 (Concrete)		LF	$ 72.00	=	$ -		$ -	*
Guardrail End Anchorage		EA	$ 2,098.00	=	$ -		$ -	*
Guardrail Impact Attenuator		EA	$ 3,767.00	=	$ -		$ -	*
Sound Barrier Fence (CMU block, 6' high)		LF	$ 78.00		$ -		$ -	*
Sound Barrier Fence (panels, 6' high)		LF	$ 80.00	=	$ -		$ -	*
Electrical Conduit, Size =		LF	$ 16.00	=	$ -		$ -	*
Traffic Signal, complete intersection		EA	$ 425,000	=	$ -		$ -	*

PROJECT INFORMATION		
4-Way Ranch Metro District - Lift Station	6/28/2019	PPR-18-051
	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining	
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	*
STORM DRAIN IMPROVEMENTS								*
Concrete Box Culvert (M Standard), Size (W x H)		LF		=	$ -		$ -	*
18" Reinforced Concrete Pipe		LF	$ 65.00	=	$ -		$ -	*
24" Reinforced Concrete Pipe		LF	$ 78.00	=	$ -		$ -	*
30" Reinforced Concrete Pipe		LF	$ 97.00	=	$ -		$ -	*
36" Reinforced Concrete Pipe		LF	$ 120.00	=	$ -		$ -	*
42" Reinforced Concrete Pipe		LF	$ 160.00	=	$ -		$ -	*
48" Reinforced Concrete Pipe		LF	$ 195.00	=	$ -		$ -	*
54" Reinforced Concrete Pipe		LF	$ 245.00	=	$ -		$ -	*
60" Reinforced Concrete Pipe		LF	$ 288.00	=	$ -		$ -	*
66" Reinforced Concrete Pipe		LF	$ 332.00	=	$ -		$ -	*
72" Reinforced Concrete Pipe		LF	$ 380.00	=	$ -		$ -	*
18" Corrugated Steel Pipe		LF	$ 84.00	=	$ -		$ -	*
24" Corrugated Steel Pipe		LF	$ 96.00	=	$ -		$ -	*
30" Corrugated Steel Pipe		LF	$ 122.00	=	$ -		$ -	*
36" Corrugated Steel Pipe		LF	$ 147.00	=	$ -		$ -	*
42" Corrugated Steel Pipe		LF	$ 168.00	=	$ -		$ -	*
48" Corrugated Steel Pipe		LF	$ 178.00	=	$ -		$ -	*
54" Corrugated Steel Pipe		LF	$ 260.00	=	$ -		$ -	*
60" Corrugated Steel Pipe		LF	$ 280.00	=	$ -		$ -	*
66" Corrugated Steel Pipe		LF	$ 340.00	=	$ -		$ -	*
72" Corrugated Steel Pipe		LF	$ 400.00	=	$ -		$ -	*
78" Corrugated Steel Pipe		LF	$ 460.00	=	$ -		$ -	*
84" Corrugated Steel Pipe		LF	$ 550.00	=	$ -		$ -	*
Flared End Section (FES) RCP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
Flared End Section (FES) CSP Size = (unit cost = 6x pipe unit cost)		EA		=	$ -		$ -	*
End Treatment- Headwall		EA		=	$ -		$ -	*
End Treatment- Wingwall		EA		=	$ -		$ -	*
End Treatment - Cutoff Wall		EA		=	$ -		$ -	*
Curb Inlet (Type R) L=5', Depth < 5'		EA	$ 5,542.00	=	$ -		$ -	*
Curb Inlet (Type R) L=5', 5' ≤ Depth < 10'		EA	$ 7,188.00	=	$ -		$ -	*
Curb Inlet (Type R) L =5', 10' ≤ Depth < 15'		EA	$ 8,345.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', Depth < 5'		EA	$ 7,627.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 5' ≤ Depth < 10'		EA	$ 7,861.00	=	$ -		$ -	*
Curb Inlet (Type R) L =10', 10' ≤ Depth < 15'		EA	$ 9,841.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', Depth < 5'		EA	$ 9,918.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 5' ≤ Depth < 10'		EA	$ 10,633.00	=	$ -		$ -	*
Curb Inlet (Type R) L =15', 10' ≤ Depth < 15'		EA	$ 11,627.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', Depth < 5'		EA	$ 10,570.00	=	$ -		$ -	*
Curb Inlet (Type R) L =20', 5' ≤ Depth < 10'		EA	$ 11,667.00	=	$ -		$ -	*
Grated Inlet (Type C), Depth < 5'		EA	$ 4,640.00	=	$ -		$ -	*
Grated Inlet (Type D), Depth < 5'		EA	$ 5,731.00	=	$ -		$ -	*
Storm Sewer Manhole, Box Base		EA	$ 11,627.00	=	$ -		$ -	*
Storm Sewer Manhole, Slab Base		EA	$ 6,395.00	=	$ -		$ -	*
Geotextile (Erosion Control)		SY	$ 6.00	=	$ -		$ -	*
Rip Rap, d50 size from 6" to 24"		Tons	$ 80.00	=	$ -		$ -	*
Rip Rap, Grouted		Tons	$ 95.00	=	$ -		$ -	*
Drainage Channel Construction, Size (W x H)		LF		=	$ -		$ -	*
Drainage Channel Lining, Concrete		CY	$ 570.00	=	$ -		$ -	*
Drainage Channel Lining, Rip Rap		CY	$ 112.00	=	$ -		$ -	*
Drainage Channel Lining, Grass		AC	$ 1,469.00	=	$ -		$ -	
Drainage Channel Lining, Other Stabilization				=	$ -		$ -	*
				=	$ -		$ -	
[insert items not listed but part of construction plans]				=	$ -		$ -	
* - Subject to defect warranty financial assurance. A minimum of 20% shall be retained until final acceptance (MAXIMUM OF 80% COMPLETE ALLOWED)		**Section 2 Subtotal**		**=**	**$ 2,000.00**		**$ 2,000.00**	

PROJECT INFORMATION		
	6/28/2019	PPR-18-051
4-Way Ranch Metro District - Lift Station	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining
SECTION 3 - COMMON DEVELOPMENT IMPROVEMENTS (Private or District and NOT Maintained by EPC)**							
ROADWAY IMPROVEMENTS							
Aggregate Base Course (135 lbs/cf)	206	Tons	$ 20.00	=	$ 4,120.00		$ 4,120.00
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
STORM DRAIN IMPROVEMENTS	(Exception: Permanent Pond/BMP shall be itemized under Section 1)						
18" Corrugated Steel Pipe	40	LF	$ 66.00	=	$ 2,640.00		$ 2,640.00
36" Corrugated Steel Pipe	100	LF	$ 147.00	=	$ 14,700.00		$ 14,700.00
Permeable Paving System	5,026	SF	$ 1.25	=	$ 6,282.50		$ 6,282.50
				=	$ -		$ -
				=	$ -		$ -
				=	$ -		$ -
WATER SYSTEM IMPROVEMENTS							
Water Main Pipe (PVC), Size 8"		LF	$ 64.00	=	$ -		$ -
Water Main Pipe (Ductile Iron), Size 8"		LF	$ 75.00	=	$ -		$ -
Gate Valves, 8"		EA	$ 1,858.00	=	$ -		$ -
Fire Hydrant Assembly, w/ all valves		EA	$ 6,597.00	=	$ -		$ -
Water Service Line Installation, inc. tap and valves		EA	$ 1,324.00	=	$ -		$ -
Fire Cistern Installation, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
SANITARY SEWER IMPROVEMENTS							
Sewer Main Pipe (PVC), Size 8"		LF	$ 64.00	=	$ -		$ -
Sanitary Sewer Manhole, Depth < 15 feet		EA	$ 4,386.00	=	$ -		$ -
Sanitary Service Line Installation, complete		EA	$ 1,402.00	=	$ -		$ -
Sanitary Sewer Lift Station, complete		EA		=	$ -		$ -
				=	$ -		$ -
[insert items not listed but part of construction plans]				=	$ -		$ -
LANDSCAPING IMPROVEMENTS	(For subdivision specific condition of approval, or PUD)						
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
		EA		=	$ -		$ -
** - Section 3 is not subject to defect warranty requirements		**Section 3 Subtotal**		**=**	**$ 27,742.50**		**$ 27,742.50**

PROJECT INFORMATION		
	6/28/2019	PPR-18-051
4-Way Ranch Metro District - Lift Station	Date	PCD File No.

Description	Quantity	Units	Unit Cost		Total	(with Pre-Plat Construction) % Complete	Remaining
AS-BUILT PLANS (Public Improvements inc. Permanent WQCV BMPs)		LS		=	$ -		$ -
POND/BMP CERTIFICATION (inc. elevations and volume calculations)		LS		=	$ -		$ -

Total Construction Financial Assurance $ **87,302.75**
(Sum of all section subtotals plus as-builts and pond/BMP certification)

Total Remaining Construction Financial Assurance (with Pre-Plat Construction) $ **87,302.75**
(Sum of all section totals less credit for items complete plus as-builts and pond/BMP certification)

Total Defect Warranty Financial Assurance $ **7,552.90**
(20% of all items identified as (*). To be collateralized at time of preliminary acceptance)

Approvals

I hereby certify that this is an accurate and complete estimate of costs for the work as shown on the Grading and Erosion Control Plan and Construction Drawings associated with the Project.

COLORADO LICENSED
RYAN M. MANGINO
43304
11/12/19
PROFESSIONAL ENGINEER

Engineer (P.E. Seal Required)

Approved by Owner / Applicant — Date 11/11/19

Approved by El Paso County Engineer / ECM Administrator — Date

APPENDIX D

4-WAY RANCH METROPOLITAN DISTRICT
LIFT STATION – GRADING & EROSION CONTROL PLAN

SHEET INDEX

LEGEND

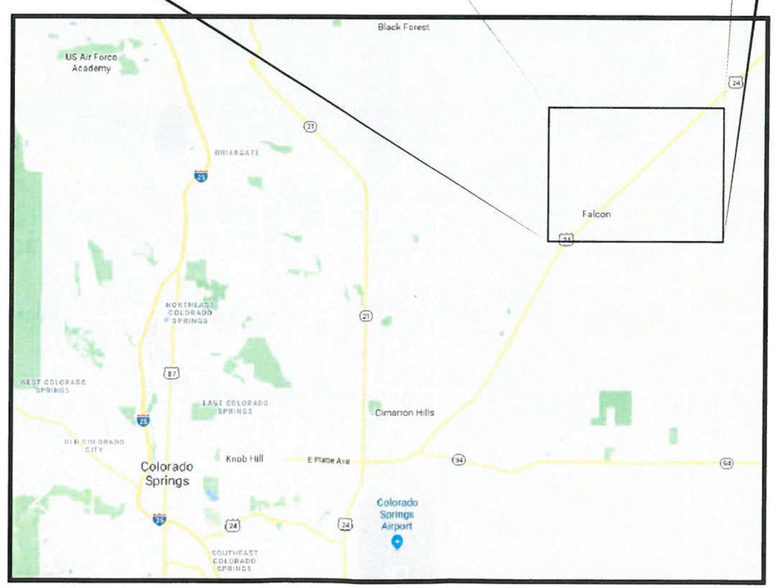
	BOUNDARY / RIGHT-OF-WAY
	EXISTING FENCE
	PROPOSED FENCE
W	EXISTING WATER LINE (W)
RAW	EXISTING RAW WATER LINE
SS	EXISTING SANITARY SEWER LINE
	EXISTING ON-SITE SEWER LINE
	EXISTING STORM SEWER
UGE	EXISTING UNDERGROUND ELECTRIC
OHE	EXISTING OVERHEAD ELECTRIC
GAS	EXISTING GAS LINE
FOP	EXISTING FIBER OPTIC LINE
	EXISTING VALVE
7270	EXISTING CONTOURS
7270	PROPOSED CONTOURS
	PROPOSED PIPELINE

PREPARED BY

JDS-HYDRO CONSULTANTS, INC.
5540 TECH CENTER DR., Suite 100
Colorado Springs, Colorado 80919
(719) 227-0072

LOCATION & VICINITY MAPS

VICINITY MAP
N.T.S.



LOCATION MAP
N.T.S.

SIGNATURES

ENGINEER'S STATEMENT:

THIS GRADING AND EROSION CONTROL PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. SAID PLAN HAS BEEN PREPARED ACCORDING TO THE CRITERIA ESTABLISHED BY THE COUNTY FOR GRADING AND EROSION CONTROL PLANS. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR OMISSIONS ON MY PART IN PREPARING THIS PLAN.

RYAN M. MANGINO, PE #43304

COLORADO LICENSED RYAN M. MANGINO 43304 PROFESSIONAL ENGINEER

OWNER'S STATEMENT:

THE OWNER WILL COMPLY WITH THE REQUIREMENTS OF THE GRADING & EROSION CONTROL PLAN.

DATE

EL PASO COUNTY:

COUNTY PLAN REVIEW IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH COUNTY DESIGN CRITERIA. THE COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/ OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. THE COUNTY THROUGH THE APPROVAL OF THIS DOCUMENT ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/ OR ACCURACY OF THIS DOCUMENT.

FILED IN ACCORDANCE WITH THE REQUIREMENTS OF THE EL PASO COUNTY LAND DEVELOPMENT CODE, DRAINAGE CRITERIA VOLUMES 1 AND 2, AND ENGINEERING CRITERIA MANUAL AS AMENDED.

IN ACCORDANCE WITH ECM SECTION 1.12, THESE CONSTRUCTION DOCUMENTS WILL BE VALID FOR CONSTRUCTION FOR A PERIOD OF 2 YEARS FROM THE DATE SIGNED BY THE EL PASO COUNTY ENGINEER. IF CONSTRUCTION HAS NOT STARTED WITHIN THOSE 2 YEARS, THE PLANS WILL NEED TO BE RESUBMITTED FOR APPROVAL, INCLUDING PAYMENT OF REVIEW FEES AT THE PLANNING AND COMMUNITY DEVELOPMENT DIRECTOR'S DISCRETION.

JENNIFER IRVINE, P.E
COUNTY ENGINEER/ECM ADMINISTRATOR

DATE

PCD FILE NO.: PPR-18-051

EROSION CONTROL NOTES:

1. CONSTRUCTION MAY NOT COMMENCE UNTIL A CONSTRUCTION PERMIT IS OBTAINED FROM THE PLANNING & COMMUNITY DEVELOPMENT DEPARTMENT AND A PRE-CONSTRUCTION CONFERENCE IS HELD WITH PCD INSPECTIONS.

2. STORMWATER DISCHARGES FROM CONSTRUCTION SITES SHALL NOT CAUSE OR THREATEN TO CAUSE POLLUTION, CONTAMINATION, OR DEGRADATION OF STATE WATERS. ALL WORK AND EARTH DISTURBANCE SHALL BE DONE IN A MANNER THAT MINIMIZES POLLUTION OF ANY ON-SITE OR OFF SITE WATERS, INCLUDING WETLANDS.

3. NOTWITHSTANDING ANYTHING DEPICTED IN THESE PLANS IN WORDS OR GRAPHIC REPRESENTATION, ALL DESIGN AND CONSTRUCTION RELATED TO ROADS, STORM DRAINAGE AND EROSION CONTROL SHALL CONFORM TO THE STANDARDS AND REQUIREMENTS OF THE MOST RECENT VERSION OF THE RELEVANT ADOPTED EL PASO COUNTY STANDARDS, INCLUDING THE LAND DEVELOPMENT CODE, THE ENGINEERING CRITERIA MANUAL, THE DRAINAGE CRITERIA MANUAL, AND THE DRAINAGE CRITERIA MANUAL VOLUME 2. ANY DEVIATIONS TO REGULATIONS AND STANDARDS MUST BE REQUESTED, AND APPROVED, IN WRITING.

4. A SEPARATE STORMWATER MANAGEMENT PLAN (SWMP) FOR THIS PROJECT SHALL BE COMPLETED AND AN EROSION AND STORMWATER QUALITY CONTROL PERMIT (ESQCP) ISSUED PRIOR TO COMMENCING CONSTRUCTION. DURING CONSTRUCTION THE SWMP IS THE RESPONSIBILITY OF THE DESIGNATED STORMWATER MANAGER, SHALL BE LOCATED ON SITE AT ALL TIMES AND SHALL BE KEPT UP TO DATE WITH WORK PROGRESS AND CHANGES IN THE FIELD.

5. ONCE THE ESQCP HAS BEEN ISSUED, THE CONTRACTOR MAY INSTALL THE INITIAL STAGE EROSION AND SEDIMENT CONTROL BMPS AS INDICATED ON THE GEC. A PRECONSTRUCTION MEETING BETWEEN THE CONTRACTOR, ENGINEER, AND EL PASO COUNTY WILL BE HELD PRIOR TO ANY CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE APPLICANT TO COORDINATE THE MEETING TIME AND PLACE WITH COUNTY PCD INSPECTIONS STAFF.

6. SOIL EROSION CONTROL MEASURES FOR ALL SLOPES, CHANNELS, DITCHES, OR ANY DISTURBED LAND AREA SHALL BE COMPLETED WITHIN 21 CALENDAR DAYS AFTER FINAL GRADING, OR FINAL EARTH DISTURBANCE, HAS BEEN COMPLETED. DISTURBED AREAS AND STOCKPILES WHICH ARE NOT AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 30 DAYS SHALL ALSO BE MULCHED WITHIN 21 DAYS AFTER INTERIM GRADING. AN AREA THAT IS GOING TO REMAIN IN AN INTERIM STATE FOR MORE THAN 60 DAYS SHALL ALSO BE SEEDED. ALL TEMPORARY SOIL EROSION CONTROL MEASURES AND BMPS SHALL BE MAINTAINED UNTIL PERMANENT SOIL EROSION CONTROL MEASURES ARE IMPLEMENTED AND ESTABLISHED.

7. TEMPORARY SOIL EROSION CONTROL FACILITIES SHALL BE REMOVED AND EARTH DISTURBANCE AREAS GRADED AND STABILIZED WITH PERMANENT SOIL EROSION CONTROL MEASURES PURSUANT TO STANDARDS AND SPECIFICATION PRESCRIBED IN THE DCM VOLUME II AND THE ENGINEERING CRITERIA MANUAL (ECM) APPENDIX I.

8. ALL PERSONS ENGAGED IN EARTH DISTURBANCE SHALL IMPLEMENT AND MAINTAIN ACCEPTABLE SOIL EROSION AND SEDIMENT CONTROL MEASURES INCLUDING BMPS IN CONFORMANCE WITH THE EROSION CONTROL TECHNICAL STANDARDS OF THE DRAINAGE CRITERIA MANUAL (DCM) VOLUME II AND IN ACCORDANCE WITH THE STORMWATER MANAGEMENT PLAN (SWMP).

9. ALL TEMPORARY EROSION CONTROL FACILITIES INCLUDING BMPS AND ALL PERMANENT FACILITIES INTENDED TO CONTROL EROSION OF ANY EARTH DISTURBANCE OPERATIONS, SHALL BE INSTALLED AS DEFINED IN THE APPROVED PLANS, THESWMP AND THE DCM VOLUME II AND MAINTAINED THROUGHOUT THE DURATION OF THE EARTH DISTURBANCE OPERATION.

10. ANY EARTH DISTURBANCE SHALL BE CONDUCTED IN SUCH A MANNER SO AS TO EFFECTIVELY REDUCE ACCELERATED SOIL EROSION AND RESULTING SEDIMENTATION. ALL DISTURBANCES SHALL BE DESIGNED, CONSTRUCTED, AND COMPLETED SO THAT THE EXPOSED AREA OF ANY DISTURBED LAND SHALL BE LIMITED TO THE SHORTEST PRACTICAL PERIOD OF TIME.

11. ANY TEMPORARY OR PERMANENT FACILITY DESIGNED AND CONSTRUCTED FOR THE CONVEYANCE OF STORMWATER AROUND, THROUGH, OR FROM THE EARTH DISTURBANCE AREA SHALL BE DESIGNED TO LIMIT THE DISCHARGE TO A NON-EROSIVE VELOCITY.

12. CONCRETE WASH WATER SHALL BE CONTAINED AND DISPOSED OF IN ACCORDANCE WITH THE SWMP. NO WASH WATER SHALL BE DISCHARGED TO OR ALLOWED TO RUNOFF TO STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES.

13. EROSION CONTROL BLANKETING IS TO BE USED ON SLOPES STEEPER THAN 3:1.

14. BUILDING, CONSTRUCTION, EXCAVATION, OR OTHER WASTE MATERIALS SHALL NOT BE TEMPORARILY PLACED OR STORED IN THE STREET, ALLEY, OR OTHER PUBLIC WAY, UNLESS IN ACCORDANCE WITH AN APPROVED TRAFFIC CONTROL PLAN. BMP'S MAY BE REQUIRED BY EL PASO COUNTY ENGINEERING IF DEEMED NECESSARY, BASED ON SPECIFIC CONDITIONS AND CIRCUMSTANCES.

15. VEHICLE TRACKING OF SOILS AND CONSTRUCTION DEBRIS OFF-SITE SHALL BE MINIMIZED. MATERIALS TRACKED OFFSITE SHALL BE CLEANED UP AND PROPERLY DISPOSED OF IMMEDIATELY.

16. CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL WASTES FROM THE CONSTRUCTION SITE FOR DISPOSAL IN ACCORDANCE WITH LOCAL AND STATE REGULATORY REQUIREMENTS. NO CONSTRUCTION DEBRIS, TREE SLASH, BUILDING MATERIAL WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURIED, DUMPED, OR DISCHARGED AT THE SITE.

17. THE OWNER, SITE DEVELOPER, CONTRACTOR, AND/OR THEIR AUTHORIZED AGENTS SHALL BE RESPONSIBLE FOR THE REMOVAL OF ALL CONSTRUCTION DEBRIS, DIRT, TRASH, ROCK, SEDIMENT, AND SAND THAT MAY ACCUMULATE IN THE STORM SEWER OR OTHER DRAINAGE CONVEYANCE SYSTEM AND STORMWATER APPURTENANCES AS A RESULT OF SITE DEVELOPMENT.

18. THE QUANTITY OF MATERIALS STORED ON THE PROJECT SITE SHALL BE LIMITED, AS MUCH AS PRACTICAL, TO THAT QUANTITY REQUIRED TO PERFORM THE WORK IN AN ORDERLY SEQUENCE. ALL MATERIALS STORED ON-SITE SHALL BE STORED IN A NEAT, ORDERLY MANNER, IN THEIR ORIGINAL CONTAINERS, WITH ORIGINAL MANUFACTURER'S LABELS.

19. NO CHEMICALS ARE TO BE USED BY THE CONTRACTOR, WHICH HAVE THE POTENTIAL TO BE RELEASED IN STORMWATER UNLESS PERMISSION FOR THE USE OF A SPECIFIC CHEMICAL IS GRANTED IN WRITING BY THE ECM ADMINISTRATOR. IN GRANTING THE USE OF SUCH CHEMICALS, SPECIAL CONDITIONS AND MONITORING MAY BE REQUIRED.

20. BULK STORAGE STRUCTURES FOR PETROLEUM PRODUCTS AND OTHER CHEMICALS SHALL HAVE ADEQUATE PROTECTION SO AS TO CONTAIN ALL SPILLS AND PREVENT ANY SPILLED MATERIAL FROM ENTERING STATE WATERS, INCLUDING ANY SURFACE OR SUBSURFACE STORM DRAINAGE SYSTEM OR FACILITIES.

21. NO PERSON SHALL CAUSE THE IMPEDIMENT OF STORMWATER FLOW IN THE FLOW LINE OF THE CURB AND GUTTER OR IN THE DITCHLINE.

22. INDIVIDUALS SHALL COMPLY WITH THE "COLORADO WATER QUALITY CONTROL ACT" (TITLE 25, ARTICLE 8, CRS), AND THE "CLEAN WATER ACT" (33 USC 1344), IN ADDITION TO THE REQUIREMENTS INCLUDED IN THE DCM VOLUME II AND THE ECM APPENDIX I. ALL APPROPRIATE PERMITS MUST BE OBTAINED BY THE CONTRACTOR PRIOR TO CONSTRUCTION (NPDES, FLOODPLAIN, 404, FUGITIVE DUST, ETC.). IN THE EVENT OF CONFLICTS BETWEEN THESE REQUIREMENTS AND LAWS, RULES, OR REGULATIONS OF OTHER FEDERAL, STATE, OR COUNTY AGENCIES, THE MORE RESTRICTIVE LAWS, RULES, OR REGULATIONS SHALL APPLY.

23. ALL CONSTRUCTION TRAFFIC MUST ENTER/EXIT THE SITE AT APPROVED CONSTRUCTION ACCESS POINTS.

24. PRIOR TO ACTUAL CONSTRUCTION THE PERMITEE SHALL VERIFY THE LOCATION OF EXISTING UTILITIES.

25. A WATER SOURCE SHALL BE AVAILABLE ON SITE DURING EARTHWORK OPERATIONS AND UTILIZED AS REQUIRED TO MINIMIZE DUST FROM EARTHWORK EQUIPMENT AND WIND.

26. THE SOILS REPORT FOR THIS SITE HAS BEEN PREPARED BY ENTECH ENGINEERING, INC., DATED DECEMBER 28, 2015, AND SHALL BE CONSIDERED A PART OF THESE PLANS.

27. AT LEAST TEN DAYS PRIOR TO THE ANTICIPATED START OF CONSTRUCTION, FOR PROJECTS THAT WILL DISTURB 1 ACRE OR MORE, THE OWNER OR OPERATOR OF CONSTRUCTION ACTIVITY SHALL SUBMIT A PERMIT APPLICATION FOR STORMWATER DISCHARGE TO THE COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT, WATER QUALITY DIVISION. THE APPLICATION CONTAINS CERTIFICATION OF COMPLETION OF A STORMWATER MANAGEMENT PLAN (SWMP), OF WHICH THIS GRADING AND EROSION CONTROL PLAN MAY BE A PART. FOR INFORMATION OR APPLICATION MATERIALS CONTACT:

COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT
WATER QUALITY CONTROL DIVISION
WQCD - PERMITS
4300 CHERRY CREEK DRIVE SOUTH
DENVER, CO 80246-1530
ATTN: PERMITS UNIT

28. ALL AREAS NOTED TO BE RE-SEEDED SHALL BE SEEDED WITH A NATIVE AND INTRODUCED GRASS MIXTURE. THE SEED WILL BE APPLIED USING MECHANICAL TYPE DRILLS AT 0.25"-0.5" INTO TOPSOIL. AREA NOT ACCESSIBLE TO A DRILL SEEDER AND SLOPES STEEPER THAN 2:1 SHALL BE HAND BROADCAST AT DOUBLE THE ABOVE SEED RATE AND RAKED AT 1/4 TO 1/2 INTO THE TOPSOIL. ALL SEEDED AREAS WILL BE MULCHED: 1-1/2 TONS CERTIFIED WEED FREE NATIVE HAY PER ACRE MECHANICALLY CRIMPED IN TOPSOIL IN COMBINATION WITH AN ORGANIC MULCH TACKIFIER. MAINTENANCE OF ANY SWALES WILL INCLUDE EROSION CONTROL AND PREVENTION, DEBRIS REMOVAL AND OCCASIONAL MOWING. CARE SHALL BE USED DURING THE REMOVAL OF SEDIMENT FROM ANY DRAINAGE WAYS. ANY SEEDING OR EROSION CONTROL MEASURE THAT IS DISTURBED DURING MAINTENANCE SHALL BE IMMEDIATELY REPAIRED. EXISTING VEGETATIVE COVER WHERE DISTURBANCE IS TO TAKE PLACE IS ROUGHLY 80%. THE SEED MIX SHALL BE MADE UP OF THE FOLLOWING AS PER THE EL PASO COUNTY CONSERVATION DISTRICT (RECOMMENDATION OBTAINED APRIL 2015):

TIMING, CONSTRUCTION STAGING AND SEQUENCING:

EXPECTED START DATE: JUNE 2019
INSTALL TEMPORARY EROSION CONTROL - 2 DAYS
- PERIMETER SILT FENCING
- VEHICLE TRACKING CONTROL PAD

ROUGH GRADING - 2 DAYS
INSTALL FINAL SITE IMPROVEMENTS - 7 MONTHS
REMOVE TEMPORARY EROSION CONTROL - 2 DAYS

MINIMUM BEST MANAGEMENT PRACTICES ELEMENTS:

STEP 1- EROSION AND SEDIMENT CONTROL
INSTALL SEDIMENT TRAPPING DEVICES (PERIMETER CONTROLS) PRIOR TO THE START OF CONSTRUCTION.
STEP 2- SPILL PREVENTION AND RESPONSE
STEP 3- MATERIAL MANAGEMENT
MATERIAL AND EQUIPMENT STORAGE AREAS SHALL BE SECURE AND CONTAINED TO PREVENT DISCHARGE OF ANY MATERIAL IN RUNOFF. WASTE SHALL BE CONTAINED AND DISPOSED OF PROPERLY. MAINTAIN BMP'S DURING BUILDING AND UTILITY CONSTRUCTION.
STEP 4- INSPECTION AND MAINTENANCE
(SEE EROSION CONTROL NOTES)
STEP 5- INSTALL FINAL STABILIZATION - BASE COURSE, LANDSCAPING, EROSION CONTROL BLANKETS, AND SEEDING.
STEP 6- REMOVE TEMPORARY CONTROLS - SILT FENCING AFTER PERMANENT FEATURES ARE INSTALLED.

FINAL STABILIZATION AND LONG-TERM STORMWATER MANAGEMENT:

FINAL STABILIZATION MEASURES INCLUDE BASE COURSE, PARTIAL LANDSCAPE, AND REVEGETATION

EARTHWORK SUMMARY:

PROPOSED LIFT STATION SITE:
CUT - 1,165 CY (INCLUDES EM TANK, GRAVEL FOR TANK, BASE COURSE, & MANHOLES STRUCTURAL EXCAVATION)
FILL - 1013 (*1.15) = 1,165 CY
NET - 0 CY CUT/FILL

DISTURBED AREA - 0.63 AC

EROSION CONTROL FACILITIES:

SILT FENCE (SF) - 550 LF
VEHICLE TRACKING PAD (VT) - 1

COMMON NAME (N=NATIVE, I=INTRODUCED)		SCIENTIFIC NAME	LBS PLS/ACRE
WHEATGRASS, SIBERIAN	I	AGROPYRON FRAGILE	2.04
WHEATGRASS, SLENDER	N	ELYMUS TRACHYCAULUS	10.90
WHEATGRASS, INTERMEDIATE	I	THINOPYRUM INTERMEDIUM	3.00
WILDRYE, RUSSIAN	I	PSATHYROSTACHYS JUNCEA	2.04
WHEATGRASS, WESTERN	N	PASCOPYRUM SMITHII	3.20
CLOVER, RED	I	TRIFOLIUM PRATENSE	0.40
FLAX, BLUE-APPAR	I	LINUM PERENNE	0.41
SULPHUR-FLOWER BUCKWHEAT	N	ERIOGONUM UMBELLATUM	0.55
TOTAL/POUNDS/ACRE			22.54

PCD FILE NO. PPR-18-051

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545 EAST PIKES PEAK AVENUE, SUITE 300
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4-WAY RANCH METROPOLITAN DISTRICT

LIFT STATION SITE DEVELOPMENT PLAN

GRADING & EROSION CONTROL PLAN

GENERAL NOTES

REVISIONS

NO.	DESCRIPTION	BY	APP.	DATE
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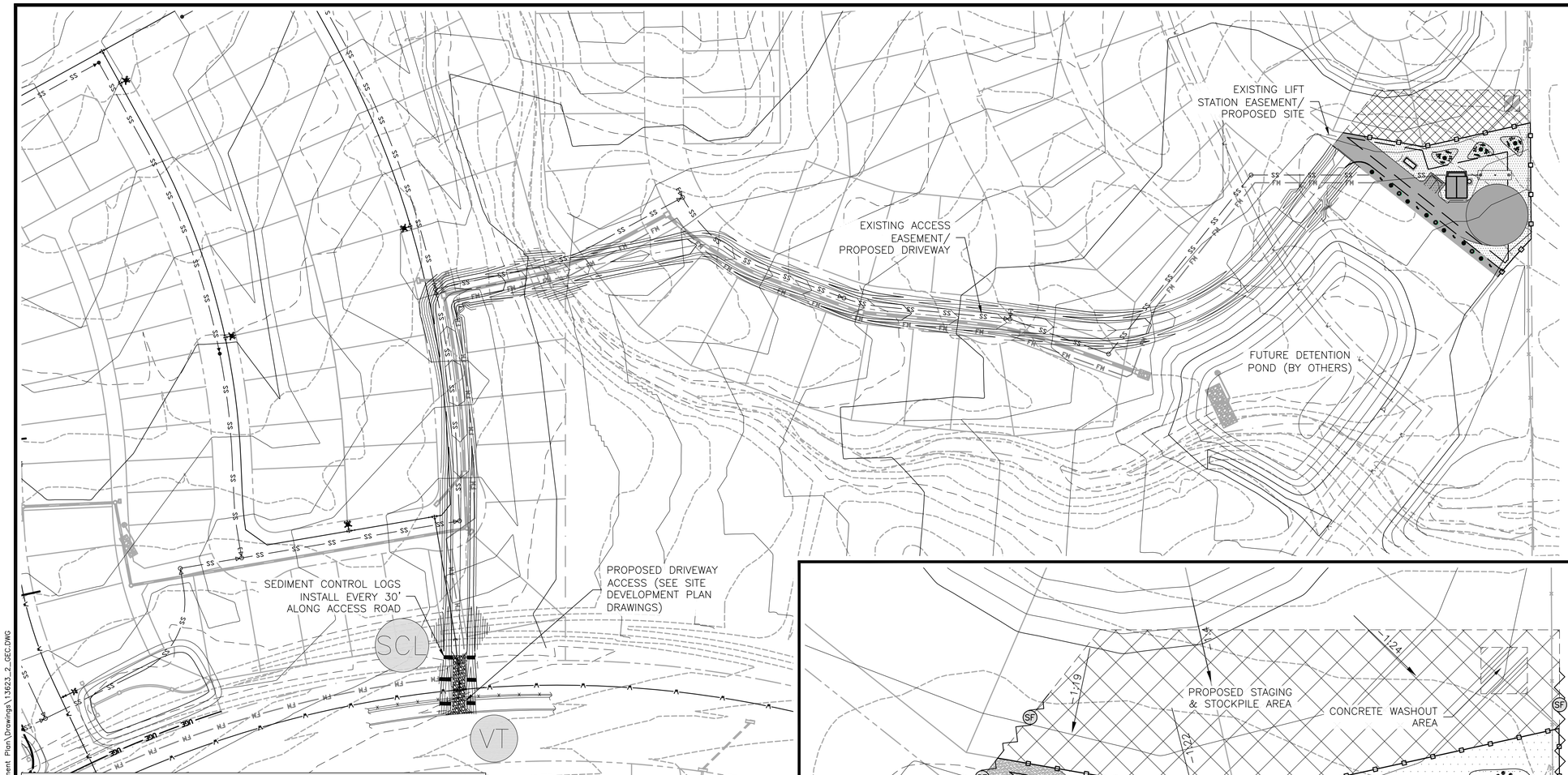
100% DESIGN DRAWINGS

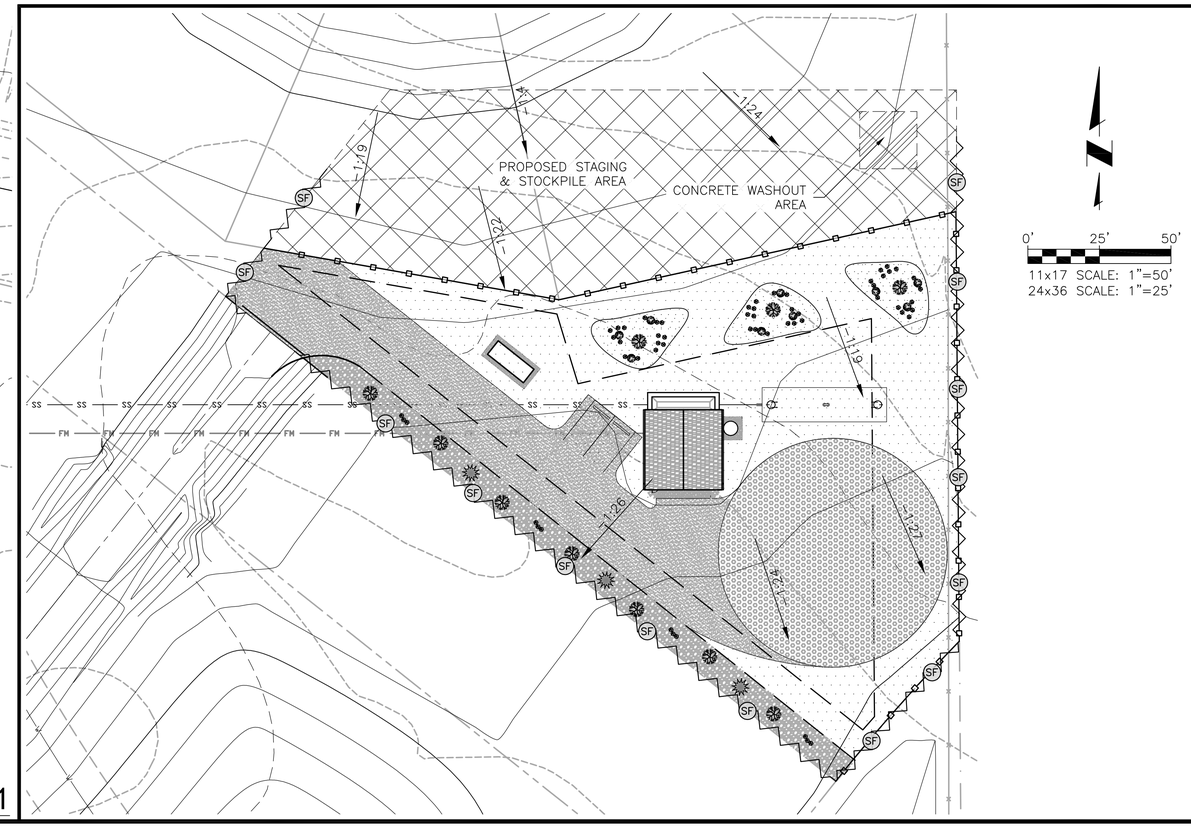
COLORADO LICENSED
RYAN M. MARONO
43304
PROFESSIONAL ENGINEER
10/25/18

Project No.: 136.23
Date: 10/25/18
Design: RMM
Drawn: GGM/RMM
Check: JPM

EC1

SHEET 1 OF 5





LOT (EASEMENT) COVERAGE	
AREA OF EASEMENT	45,733 S.F.
GROSS FLOOR AREA OF BUILDING	600 S.F.
% EASEMENT COVERAGE WITH BUILDING	1.3%
AREA OF DRIVEWAY & PARKING	8,184 S.F.
% EASEMENT COVERAGE WITH DRIVEWAY & PARKING	18%

SF — PROPOSED SILT FENCE
VT — PROPOSED VEHICLE TRACKING PAD
SCL — PROPOSED SEDIMENT CONTROL LOG

NOTES:
1. SEED AND MULCH ALL DISTURBED AREAS.

NOTES:

1. ACCESS POINTS AND SITE NOT ACCESSIBLE TO PUBLIC.
2. THE PARTIES RESPONSIBLE FOR THIS PLAN HAVE FAMILIARIZED THEMSELVES WITH ALL CURRENT ACCESSIBILITY CRITERIA AND SPECIFICATIONS AND THE PROPOSED PLAN REFLECTS ALL SITE ELEMENTS REQUIRED BY THE APPLICABLE ADA DESIGN STANDARDS AND GUIDELINES AS PUBLISHED BY THE UNITED STATES DEPARTMENT OF JUSTICE. APPROVAL OF THIS PLAN BY EL PASO COUNTY DOES NOT ASSURE COMPLIANCE WITH THE ADA OR ANY REGULATIONS OR GUIDELINES ENACTED OR PROMULGATED UNDER OR WITH RESPECT TO SUCH LAWS.
3. SITE DRIVEWAY TO BE CONSTRUCTED WITH PERMEABLE PAVERS.

PCD FILE NO. PPR-18-051

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5540 TECH CENTER DR., SUITE 100
COLORADO SPRINGS, COLORADO 80919
(719) 227-0072

4-WAY RANCH METROPOLITAN DISTRICT

LIFT STATION SITE DEVELOPMENT PLAN

GRADING & EROSION CONTROL PLAN

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Project No.: 136.23
Date: 06/28/19
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Drawn: GGM/RMM
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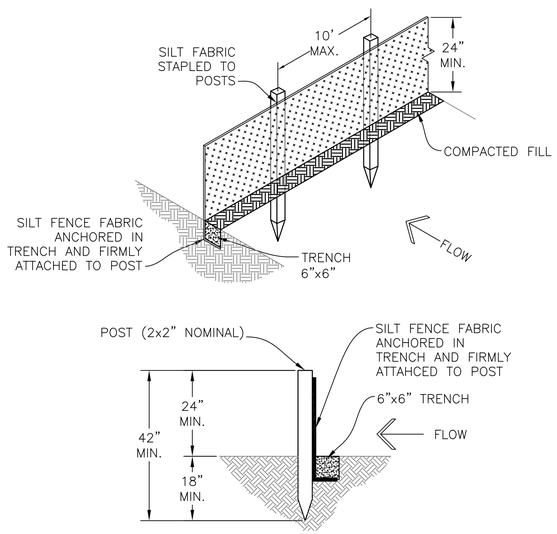
EC2

SHEET 2 OF 5



SILT FENCE DETAIL

N.T.S.

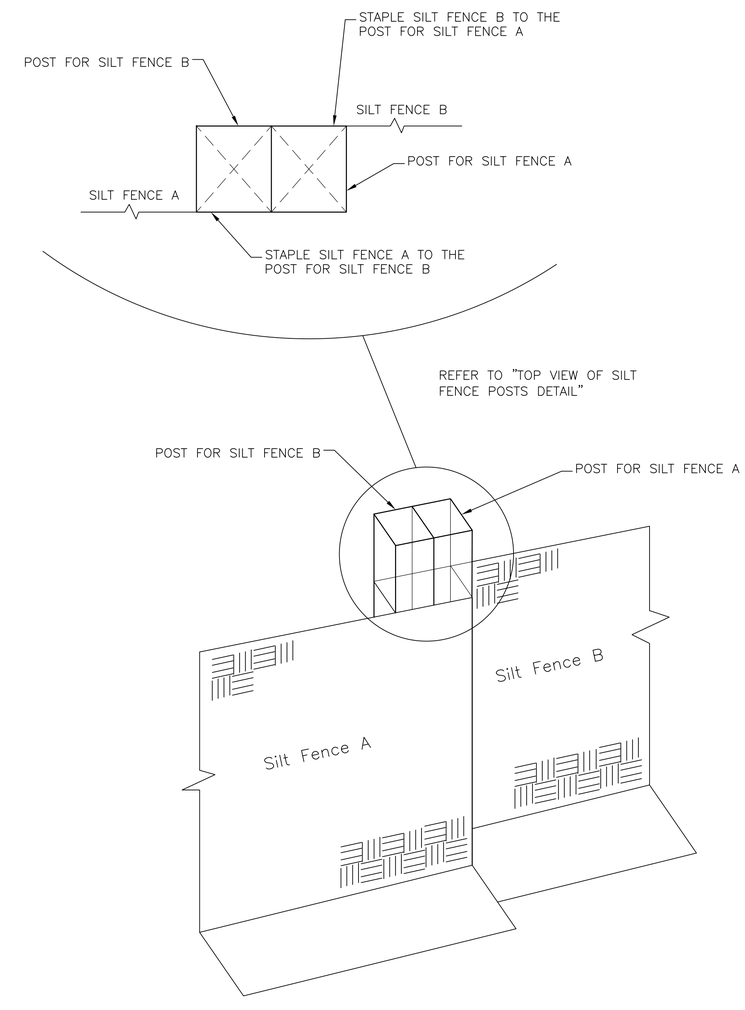
INSTALLATION REQUIREMENTS:

1. SILT FENCES SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.
2. WHEN JOINTS ARE NECESSARY, SILT FENCE GEOTEXTILE SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POST AND SECURELY SEALED.
3. METAL POSTS SHALL BE "STUDDED TEE" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD POSTS SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.
4. THE FILTER MATERIAL SHALL BE FASTENED SECURELY TO METAL POSTS USING WIRE TIES, OR TO WOOD POSTS WITH 3/4" LONG #9 HEAVY-DUTY STAPLES. THE SILT FENCE GEOTEXTILE SHALL NOT BE STAPLED TO EXISTING TREES.
5. WHILE NOT REQUIRED, WIRE MESH FENCE MAY BE USED TO SUPPORT THE GEOTEXTILE. WIRE FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY-DUTY WIRE STAPLES AT LEAST 3/4" LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 6 INCHES AND SHALL NOT EXTEND MORE THAN 3 FEET ABOVE THE ORIGINAL GROUND SURFACE.
6. ALONG THE TOE OF FILLS, INSTALL THE SILT FENCE ALONG A LEVEL CONTOUR AND PROVIDE AN AREA BEHIND THE FENCE FOR RUNOFF TO POND AND SEDIMENT TO SETTLE. A MINIMUM DISTANCE OF 5 FEET FROM THE TOE OF THE FILL IS RECOMMENDED.
7. THE HEIGHT OF THE SILT FENCE FROM THE GROUND SURFACE SHALL BE MINIMUM OF 24 INCHES AND SHALL NOT EXCEED 36 INCHES. HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE.

MAINTENANCE REQUIREMENTS:

1. CONTRACTOR SHALL INSPECT SILT FENCES IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS OF NO RAINFALL. DAMAGED, COLLAPSED, UNENTRENCHED OR INEFFECTIVE SILT FENCES SHALL BE PROMPTLY REPAIRED OR REPLACED.
2. SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO HALF THE EXPOSED GEOTEXTILE HEIGHT.
3. SILT FENCES SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED.

TOP VIEW OF SILT FENCE POSTS DETAIL



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4-WAY RANCH METROPOLITAN DISTRICT

LIFT STATION SITE DEVELOPMENT PLAN

GRADING & EROSION CONTROL PLAN

EROSION CONTROL DETAILS 1

REVISIONS

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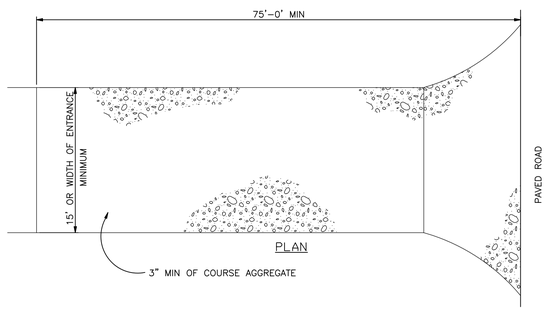
COLORADO LICENSED
RYAN M. MANCINO
43304
PROFESSIONAL ENGINEER

Project No.: 136.23
Date: 10/25/18
Design: RMM
Drawn: GGM/RMM
Check: JPM

EC3

SHEET 3 OF 5



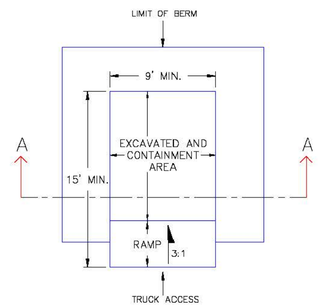
VEHICLE TRACKING PAD DETAIL
N.T.S.

INSTALLATION REQUIREMENTS:

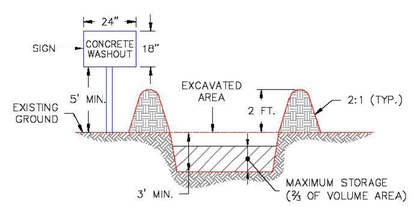
1. ALL ENTRANCES TO THE CONSTRUCTION SITE ARE TO BE STABILIZED PRIOR TO COMMENCEMENT OF CONSTRUCTION.
2. CONSTRUCTION ENTRANCES ARE TO BE BUILT WITH AN APRON TO ALLOW FOR TURNING TRAFFIC, BUT SHOULD NOT BE BUILT OVER EXISTING PAVEMENT EXCEPT FOR A SLIGHT OVERLAP.
3. AREAS TO BE STABILIZED ARE TO BE PROPERLY GRADED AND COMPACTED.
4. CONSTRUCTION ROADS, PARKING AREAS, LOADING/UNLOADING ZONES, STORAGE AREAS, AND STAGING AREAS ARE TO BE STABILIZED.
5. CONSTRUCTION ROADS ARE TO BE BUILT TO CONFORM TO SITE GRADES, BUT SHOULD NOT HAVE SIDE SLOPES OR ROAD GRADES THAT ARE EXCESSIVELY STEEP.

MAINTENANCE REQUIREMENTS

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL STABILIZED AREAS, ESPECIALLY AFTER STORM EVENTS.
2. STONES ARE TO BE REAPPLIED PERIODICALLY AND WHEN REPAIR IS NECESSARY.
3. SEDIMENT TRACKED ONTO PAVED ROADS IS TO BE REMOVED DAILY BY SHOVELING OR SWEEPING. SEDIMENT IS NOT TO BE WASHED DOWN STORM SEWER DRAINS.
4. OTHER ASSOCIATED SEDIMENT CONTROL MEASURES ARE TO BE INSPECTED TO ENSURE GOOD WORKING CONDITION.
5. TO BE REMOVED JUST PRIOR TO FINAL SURFACING AND STABILIZATION.



PLAN VIEW



SECTION A–A

NOTES:
1. SIGN MATERIAL, EXCAVATION, AND RESTORATION ARE INCLUDED IN THE COST OF THE CONCRETE WASHOUT STRUCTURE.
2. EROSION BALES MAY BE USED AS AN ALTERNATIVE FOR THE BERM.

1/1/08 DATE APPROVED: John A. McCarty DEPARTMENT OF TRANSPORTATION	Concrete Washout Structure Standard Drawing REVISION DATE: 7/17/07 FILE NAME: SD_3-84	EL PASO COUNTY DEPARTMENT OF TRANSPORTATION

MULCHING NOTES

INSTALLATION REQUIREMENTS

1. ALL DISTURBED AREAS MUST BE MULCHED WITHIN 21 DAYS AFTER FINAL GRADE AND SEEDED AREAS ARE TO BE MULCHED WITHIN 24 HOURS AFTER SEEDING.
2. MATERIAL USED FOR MULCH CAN BE CERTIFIED CLEAN, WEED- AND SEED-FREE LONG STEMMED FIELD OR MARSH HAY, OR STRAW OF OATS, BARLEY, WHEAT, RYE, OR TRITICALE CERTIFIED BY THE COLORADO DEPARTMENT OF AGRICULTURE WEED FREE FORAGE CERTIFICATION PROGRAM.
3. HYDRAULIC MULCHING MATERIAL SHALL CONSIST OF VIRGIN WOOD FIBER MANUFACTURED FROM CLEAN WHOLE WOOD CHIPS. WOOD CHIPS CANNOT CONTAIN ANY GROWTH OR GERMINATION INHIBITORS OR BE PRODUCED FROM RECYCLED MATERIAL. GRAVEL CAN ALSO BE USED.
4. MULCH IS TO BE APPLIED EVENLY AT A RATE OF 2 TONS PER ACRE.
5. MULCH IS TO BE ANCHORED EITHER BY CRIMPING (TUCKING MULCH FIBERS 4 INCHES INTO THE SOIL), USING NETTING (USED ON SMALL AREAS WITH STEEP SLOPES), OR WITH A TACKIFIER.
6. HYDRAULIC MULCHING AND TACKIFIERS ARE NOT TO BE USED IN THE PRESENCE OF FREE SURFACE WATER.

MAINTENANCE REQUIREMENTS

1. REGULAR INSPECTIONS ARE TO BE MADE OF ALL MULCHED AREAS.
2. MULCH IS TO BE REPLACED IMMEDIATELY IN THOSE AREAS IT HAS BEEN REMOVED, AND IF NECESSARY THE AREA SHOULD BE RESEEDED.

City of Colorado Springs Stormwater Quality	Figure MU-1 Mulching Construction Detail and Maintenance Requirements

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4-WAY RANCH METROPOLITAN DISTRICT
LIFT STATION SITE DEVELOPMENT PLAN
GRADING & EROSION CONTROL PLAN
EROSION CONTROL DETAILS 2

REVISIONS

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COLORADO LICENSED
RYAN M. MARCINO
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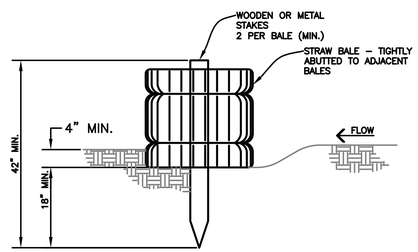
SHEET 4 OF 5



STRAW BALE BARRIER (SB)
N.T.S.

STRAW BALE BARRIER NOTES

INSTALLATION REQUIREMENTS

1. STRAW BALE BARRIERS SHALL BE INSTALLED PRIOR TO ANY LAND DISTURBING ACTIVITIES.

2. BALES SHALL CONSIST OF APPROXIMATELY 5 CUBIC FEET OF CERTIFIED WEED FREE HAY OR STRAW AND WEIGH NOT LESS THAN 35 POUNDS.

3. BALES ARE TO BE PLACED IN A SINGLE ROW WITH THE END OF THE BALES TIGHTLY ABUTTING ONE ANOTHER.

4. EACH BALE IS TO BE SECURELY ANCHORED WITH AT LEAST TWO STAKES AND THE FIRST STAKE IS TO BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE TO FORCE THE BALES TOGETHER.

5. STAKES ARE TO BE A MINIMUM OF 42 INCHES LONG. METAL STAKES SHALL BE STANDARD "T" OR "U" TYPE WITH MINIMUM WEIGHT OF 1.33 POUNDS PER LINEAR FOOT. WOOD STAKES SHALL HAVE A MINIMUM DIAMETER OR CROSS SECTION DIMENSION OF 2 INCHES.

6. BALES ARE TO BE BOUND WITH EITHER WIRE OR STRING AND ORIENTED SUCH THAT THE BINDINGS ARE AROUND THE SIDES AND NOT ALONG THE TOPS AND BOTTOMS OF THE BALE.

7. GAPS BETWEEN BALES ARE TO BE CHINKED (FILLED BY WEDGING) WITH STRAW OR THE SAME MATERIAL OF THE BALE.

8. END BALES ARE TO EXTEND UPSLOPE SO THE TRAPPED RUNOFF CANNOT FLOW AROUND THE ENDS OF THE BARRIER.

MAINTENANCE REQUIREMENTS

1. CONTRACTOR SHALL INSPECT STRAW BALE BARRIERS IMMEDIATELY AFTER EACH RAINFALL, AT LEAST DAILY DURING PROLONGED RAINFALL, AND WEEKLY DURING PERIODS NO RAINFALL.

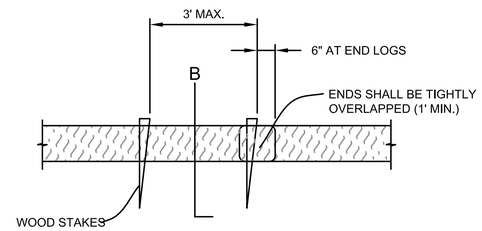
2. DAMAGED OR INEFFECTIVE BARRIERS SHALL PROMPTLY BE REPAIRED, REPLACING BALES IF NECESSARY, AND UNENTRENCHED BALES NEED TO BE REPAIRED WITH COMPACTED BACKFILL MATERIAL.

3. SEDIMENT SHALL BE REMOVED FROM BEHIND STRAW BALE BARRIERS WHEN IT ACCUMULATES TO APPROXIMATELY 1/2 THE HEIGHT OF THE BARRIER.

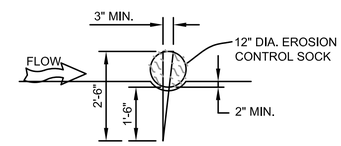
4. STRAW BALE BARRIERS SHALL BE REMOVED WHEN ADEQUATE VEGETATIVE COVER IS ATTAINED

HAY BALE SPACING REQUIREMENTS

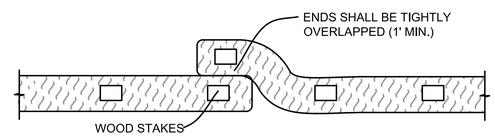
SLOPE	SPACING
0.5%	300'
1.0%	150'
2.0%	75'
3.0%	50'



DETAIL A
SCALE: NTS



SECTION B
SCALE: NTS



PLAN VIEW
SCALE: NTS

SEDIMENT CONTROL LOG INSTALLATION NOTES

1. SEE PLAN VIEW FOR THE LOCATION AND LENGTH OF EROSION CONTROL SOCK.
2. EROSION CONTROL SOCKS INDICATED ON THE PLANS SHALL BE INSTALLED AFTER ANY LAND–DISTURBING ACTIVITIES OCCUR.
3. EROSION CONTROL SOCKS SHALL CONSIST OF STRAW, COMPOST, EXCELSIOR, OR COCONUT FIBER.
4. NOT FOR USE IN CONCENTRATED FLOW AREAS.
5. THE EROSION CONTROL SOCK SHALL BE TRENCHED INTO THE GROUND A MINIMUM OF ⅓ OF THE DIAMETER OF THE ECS.

SEDIMENT CONTROL LOG MAINTENANCE NOTES

1. CONTRACTOR SHALL INSPECT EROSION CONTROL SOCKS DAILY, DURING AND AFTER ANY STORM EVENT AND MAKE REPAIRS OR CLEAN OUT UPSTREAM SEDIMENT AS NECESSARY.
2. SEDIMENT ACCUMULATED UPSTREAM OF EROSION CONTROL SOCKS SHALL BE REMOVED WHEN THE UPSTREAM SEDIMENT DEPTH IS WITHIN ½ THE HEIGHT OF THE CREST OF LOG.
3. EROSION CONTROL SOCKS SHALL BE REMOVED AT THE END OF CONSTRUCTION. IF ANY DISTURBED AREA EXISTS AFTER REMOVAL, IT SHALL BE DRILL SEEDED AND CRIMP MULCHED OR OTHERWISE STABILIZED IN A MANNER APPROVED BY THE OWNER.

B / C22 **SEDIMENT CONTROL LOG**
SCALE: N.T.S.

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4–WAY RANCH METROPOLITAN DISTRICT

LIFT STATION SITE DEVELOPMENT PLAN

GRADING & EROSION CONTROL PLAN

EROSION CONTROL DETAILS 3

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COLORADO LICENSED PERSON No. 43304 PROFESSIONAL ENGINEER

Project No.: 136.23
Date: 10/25/18
Design: RMM
Drawn: GGM/RMM
Check: JPM

EC5

SHEET 5 OF 5

2019/06/28 12:46 PM By: Tisha J:\JDS-Hydro\Project Files\136 4-Way Ranch\136.23 LS Site Development Plan\Drawings\13623_2_GEC.DWG