City of Elko Clerk's Department
1751 College Avenue
Elko, NV 89801
(775) 777-7126
FAX (775) 777-7129

ADDENDUM NUMBER TWO
EXIT 298 LIFT STATION & FORCE MAIN

Please confirm receipt of ADDENDUM NUMBER TWO AND FAX BACK TO (775) 777-7129 or email to cityclerk@elkocitynv.gov.

Dated the 14th day of September, 2023

SIGNATURE

COMPANY NAME

DATE

Elko City Clerk
Kelly Wooldridge

***** PLEASE NOTE RECEIPT OF ADDENDUM NUMBER TWO ON APPLICABLE LINE ON SUBMITTED BID PROPOSAL***

LUMOS & ASSOCIATES

Carson City • El Dorado Hills • Fallon • Lake Tahoe • Reno www.LumosInc.com

Carson City
308 N. Curry Street, Suite 200
Carson City, Nevada 89703
775.883.7077

September 14th, 2023

Ms. Kelly Wooldridge
Elko City Clerk
1751 College Avenue
Elko, Nevada 89801

Subject: Addendum No. 2 to the Bid Form and Plans for the City of Elko Exit 298 Lift Station and Force Main Project

Dear Ms. Wooldridge:

This addendum is intended to address the questions that were presented to the City of Elko during the Pre-Bid Conference and Site Visit that took place on September 6th, 2023 at 2PM. Included below is a list of the questions presented and responses from the City of Elko and the design team.

Q. When do we expect to have a Notice to Proceed?

A. The City will work with the awarding Contractor to determine the best time to initiate the Notice to Proceed while working on equipment lead times and the required NDOT/UPRR permits.

Q. Will UPRR require flaggers, and other requirements.

A. It is not expected that flaggers will be needed given that the proposed sewer force mains are only located within UPRR's ROW and they do not cross UPRR's railroad tracks. It should be noted that UPRR has not yet responded to our permit submittal. The UPRR ROW limit is approximately 140 feet from the railroad tracks.

Q. Is there an area identified for groundwater discharge?

A. The location of groundwater discharge is to be determined by the contractor. Contractors should expect groundwater intrusion during construction of the lift station. See notes on the plans on Sheet PP1.0.

A. Class C Bedding material can be used (Clean Drain Rock). This should help with water issues in the area. See D1.5.

Q. Is the QA/QC being provided by the City?

A. The City will provide the QA/QC and construction surveying. The City may assign QA/QC to a consultant if the funding for this becomes available prior to construction.

Q. Will the Geotechnical Report be available?

A. Yes, the Geotechnical Report is available to plan holders and is provided with this Addendum as Attachment A.

Q. Is de-beading required on the HDPE pipes?

A. De-beading is not required on the internal walls of the HDPE force main.

A. De-beading is required on the outside of the HDPE that will be placed inside the jack and bore pipe.

A. Weld beads will not be allowed on the interior of steel casing pipe.

A. Please see plan notes as this is discussed in detail on Sheet D1.5.

Q. Is grout required at the casing and bores?

A. Please see the details in the plans as this has been explained in detail.

A. Casing ends can use AVANT AV 219 OAKUM or AV-LO2 Multifarious or Approved Equal.

A. An approved equal could be rubber boots for the casings.

A. Spacers are required.

A. See detail page D1.5.

Q. Will the sign called for removal on the plans need to be disposed of or replaced?

A. The City will determine who owns the sign and will determine if it can be removed and disposed of or if the contractor will need to work around it during construction.

Q. Will AIS and Buy America be required for this project?

A. No, according to the City we do not have to comply with AIS or Buy America for this project.

Q. What are the work times? Can contractors work through Saturday?

A. Regular business hours should be maintained, please notify and request any Saturday work so the City is aware of planned activities.

Q. Will the utilities be marked out?

A. Water, Sewer, Effluent and Storm Drains will be marked out by the City. Call 811 as required to have all utilities located within the construction area. It will be the contractor's responsibility to keep an active dig ticket during construction. Gas lines will be marked out in the field, the utilities are also noted and shown on the plans.

Q. How close is the gas high pressure line?

A. The proposed force main is at least 10 feet away from the gas line along the proposed alignment.

A. The Force main should be placed on the South side of the 10" high pressure gas line. There is also an abandoned 6" gas line on the South side of the 10" high pressure gas main. Please avoid this line as well. Anytime the excavation is within 5' of the 10" high pressure

gas main, Southwest Gas will be required to be onsite. It is expected that the force main should be 10-15' from the gas main in the UPRR ROW.

Q. Is it possible to install the sewer force main deeper at the jack and bore location if utility conflicts are encountered?

A. High Desert Engineering will verify if a deeper sewer depth is possible if a conflict is presented that requires a revised vertical design.

Q. What type of bore is expected?

A. We are anticipating a standard Jack and Bore.

A. Awarding contractor can submit a request to NDOT for permitting for directional bore. The outside of the bore may be required to be filled with grout. The City would accept this as an equal to the Jack and Bore. The permitting process could take up to two months.

Q. Where will the drainage from the dewatering operations go? Is there drainage by the railroad tracks?

A. It is expected that drainage cannot go into the adjacent infiltration system due to recirculation of groundwater into the wet well excavation area. Drainage may be directed to the East of the project. Additionally, it may be possible that drainage could go into the existing dry sewer line per City of Elko Utilities Department, we will discuss this in more detail prior to project start.

A. Dewatering is to be determined by the contractor, but the City will work with the contractor on a solution. See notes on Sheet PP1.0.

Q. How will Prevailing Wage Rates be determined if they expire soon?

A. According the Labor Commissioner website, the wages published at the time of bid opening will be in effect for up to 36 months after the bid opening. If time exceeds 36 months, new wage rates may apply. (see below snip, and/ or link). Per Addendum No. 1, the bid date has been extended to October 5th, 2023, therefore new prevailing wage rates should be available prior to the bid due date.

https://labor.nv.gov/uploadedFiles/labornvgov/content/PrevailingWage/4.%20Northern%20Nevada%20Rural%20Region%202023(8).pdf.

2023 PREVAILING WAGE RATES
NORTHERN NEVADA RURAL COUNTIES

(Carson City, Churchill, Douglas, Elko, Eureka, Humboldt, Lander, Lyon, Mineral, Pershing, Storey and White Pine)

DATE OF DETERMINATION: October 1, 2022

APPLICABLE FOR PUBLIC WORKS PROJECTS OVER $100,000 BID/AWARDED
OCTOBER 1, 2022 THROUGH SEPTEMBER 30, 2023

Pursuant to Nevada Revised Statutes (NRS) section 338.030(9)(a), "If the contract for a public work: (a) Is to be awarded pursuant to a competitive bidding process, the prevailing wages in effect at the time of the opening of the bids for a contract for a public work must be paid until the completion or termination of the contract or for the 36 months immediately following the date on which the bids were opened, whichever is earlier." For contracts not awarded pursuant to competitive bidding, please see NRS section 338.030(9)(b). However, if a project exceeds 36 months new wage rates may apply pursuant to NRS section 338.030(9)(10). Prevailing Wage Rates may be adjusted based on Collective Bargaining Agreements (CBA's) and adjustments to those agreements. (See NRS 338.030)

Q. What is the "P" line on PP 1.0?

A. The black line on page PP1.01 appears to be a power line that serves and existing lighted sign.

A. NV Energy will be contacted to verify that power is not in the way of the proposed area of disturbance. It is believed that the jack and bore construction will be below the power line.

Q: Will the tie-in point be shut down at the City Sewer main on the south side.

A. No, a cast-in-place manhole should be utilized at the tie in point near Gateway RV. Cast-in-place manhole details have been provided as Attachment B to this Addendum.

A. Concrete pipe may need to be cut out.

Q. Where will Construction Staging be?

A. The City will work with the awarding contractor on construction staging. We will discuss options with NDOT, Golden Gate, and adjacent property owners for options.

Q. Will the replacement of the 96' LF of water line affect and customers and can it be shut down for removal and replacement?

A. The water line can be isolated and no customers will be affected. Coordinate with Water Department at the City of Elko.

Q. Is there a conflict with the new force main and effluent line near the sewer main tie in near Gateway RV?

A. A conflict may be present. The Effluent line can be isolated and rerouted if necessary. Contractor expected to work with the WRF staff if required.

Q. What are the force main installation requirements?

A. Please see force main installation notes PP1.0.

Q. NDOT Requirements?

A. See note 2 on Sheet PP1.0 for force main installation and NDOT Requirements.

NDOT has only approved a disturbance to the ROW at the bore location. See PP1.0 for additional instructions for force main installation.

NDOT has stated that we have responded to all comments on the plans prior to approval. The Emergency Action Plan in Attachment C was submitted to NDOT on 9/5/23, and we have not yet received final confirmation that it is approved.

If you have any questions, please do not hesitate to contact me at 916-980-8228.

Sincerely,

Cami L. Jackson, P.E.
Project Manager

CC: Dale Johnson, City of Elko Utilities Director
Jonathan Lesperance, P.E., Group Manager
Mara Quiroga, P.E., Senior Engineer

Attachments:

Attachment A – Geotechnical Report

Attachment B – Cast In Place Sewer Manhole Details

Attachment C – NDOT Emergency Repair Plan

Attachment A – Geotechnical Report

GEOTECHNICAL INVESTIGATION REPORT

for

WRF – EXIT 298 LIFT STATION AND FORCE MAIN

Elko, Nevada

Prepared for:

City of Elko
1751 College Avenue
Elko, NV 89801

Prepared by:

LUMOS & ASSOCIATES, INC.
808 E. College Parkway, Suite 101
Carson City, Nevada 89706
Tel: (775) 883-7077
Fax: (775) 883-7114

June, 2019

JN: 9718.000

GEOTECHNICAL INVESTIGATION REPORT

WRF – EXIT 298 LIFT STATION AND FORCE MAIN

Elko, Nevada

TABLE OF CONTENTS

GEOTECHNICAL INVESTIGATION REPORT
for
WRF – EXIT 298 LIFT STATION AND FORCE MAIN
Elko, Nevada

INTRODUCTION

This report presents the results of Lumos & Associates, Inc.'s Geotechnical Analysis for the proposed construction of a lift station and a sewer force main Elko, Nevada. We understand the project begins just east of the Interstate 80 and West Idaho Street interchange at exit 298 with the construction of a lift station. The accompanying force main will then run approximately twelve-thousand (12,000) feet east along southern side of West Idaho Street. A vicinity map is included as Plate 1 and a site map is included as Plate 2.

It is our understanding that the proposed project will consist of the construction of a lift station and sewer force main. We have assumed that final grades at the site will be approximately the same as the existing grades.

The purpose of our investigation was to characterize the site geology and soil conditions, describe the native soils and determine their engineering properties as they relate to the proposed construction. The investigation was also intended to identify possible adverse geologic, soil, and/or water table conditions. However, this study did not include an environmental assessment or an evaluation for soil and/or groundwater contamination at the site.

This report concludes with recommendations for site grading, foundations, footing area preparation, utility installation, asphalt concrete and Portland cement concrete. In

addition, information such as logs of all borings, and allowable bearing capacities, estimated total and differential settlement, moisture and drainage protection, and International Building Code (IBC) seismic class designation are provided in this report.

The recommendations contained herein have been prepared based on our understanding and assumptions of proposed construction, as outlined above. Re-evaluation of the recommendations presented in this report should be conducted after the final site grading and construction plans are completed, if there are any variations from the assumptions described herein.

It is possible that subsurface discontinuities may exist between and beyond exploration points. Such discontinuities are beyond the evaluation of the Engineer at this time. No guarantee of the consistency of the geology and sub-surface conditions is implied or intended.

GEOLOGIC SETTING

Elko is located at the extreme eastern portion of the Great Basin geomorphic province. The Great Basin is characterized by large normal fault-bounded valleys (grabens) that are separated by large mountain ranges (horst).

The geologic evolution of the region involves uplift, volcanism, extension, and sedimentation. All these factors have contributed to the current "Basin and Range" physiography.

Specifically, Elko is located in a faulted sub-basin bounded by the Adobe Range to the north, and the Elko Hills to the south. Elko is located in the upper Humboldt River basin. Sediments vary from alluvial cobble bearing sandy gravels to lacustrine silt, sand and clay deposits. Sediment depths in the Elko area are reported to be hundreds of feet deep.

Specifically, the site is located in the western portion of the City of Elko. The surface geology of the project has been mapped by Crafford (2010). The mapping indicates the predominant geologic formation is Alluvium. This map is presented on plate 3.

SEISMIC CONSIDERATIONS

Elko, similar to many areas in Nevada, is located near active faults that are capable of producing significant earthquakes. We reviewed the Quaternary Fault Map of Nevada's interactive map (https://gisweb.unr.edu/Quaternary/Faults). It shows the nearest active fault of Holocene age (<15,000 years) is located fifteen (15) miles to the southeast along the base of the Ruby Mountains. Refer to Plate 4.

Liquefaction is the phenomena where more commonly loose saturated relatively clean nonplastic sands (less than 35% minus the 200 sieve) lose their shear strength when subjected to cyclic loading, and become unstable. Large earthquakes, as described above, may provide that type of cyclic loading. During our field investigation loose, saturated, relatively clean nonplastic sands (less than 35% minus the 200 sieve) were not encountered. Our observations and tests performed during our investigation indicate that liquefaction of the site soils is not likely to occur.

2018 IBC Design: The mapped maximum considered earthquake spectral response acceleration at short periods (S_S) is 0.486g corresponding to a 0.2 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1613.2.1(1)). The mapped maximum considered earthquake spectral response acceleration at a 1-second period (S_1) is 0.161 corresponding to a 1.0 second spectral response acceleration at five percent (5%) of critical damping and for a Site Class B (IBC Figure 1613.2.1(2). At this time, the soil conditions are not known in sufficient detail to a depth of 100 feet, thus, a Site Class D may be assumed per the IBC. These spectral response accelerations are adjusted for site class effects because Site Class D is assumed instead of Site Class B. The site coefficient for spectral response accelerations adjustment at short periods (F_a) is 1.4 (IBC Table 1613.2.2(1) and Section 1613.2.3). The site class effect for spectral response acceleration adjustment at 1-second periods (F_v) is 2.2 (IBC Table 1613.2.3(2)). The maximum

considered earthquake spectral response acceleration parameter for short period (S_{MS}) is 0.686g and for 1-second period (S_{M1}) is 0.366g. This corresponds to design spectral response acceleration parameters of 0.244g for short period (S_{DS}) and of 0.244g for 1-second period (S_{D1}). Refer to Appendix C.

It is emphasized that the above values are the minimum requirements intended to maintain public safety during strong ground shaking. These minimum requirements are meant to safeguard against loss of life and major structural failures. However, they are not intended to prevent damage or insure the functionality of the structure during and/or after a large seismic event.

In conclusion, seismic concerns for this site are not unlike other sites in the City of Elko area. However, due to the proximity of the site to a number of faults that are considered active, as noted above, strong seismic shaking should be anticipated during the life of any structures.

SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation the lift station site had been previously graded with approximately three (3) feet of fill and currently is moderately vegetated with weeds and grass. The actual alignment of the force main was unknown at the time of this investigation. For convenience and accessibility, we performed our borings within the southern shoulder of the existing roadway (West Idaho Street). The area investigated along the roadway shoulder was graded and unpaved with 0-1.5' of roadway shoulder gravel (pulverized asphalt mixture). Fill was encountered below the pulverized asphalt mixture down to five (5) below existing grade (b.e.g.) in every boring along the roadway shoulder except borings 1, 3, and 6. Fill soils below the pulverized asphalt mixture consisted of clayey sands (SC) and lean clays (CL). The fill soils were underlain, primarily by, lean clays (CL) and clayey sands (SC). These soils were underlain by coarse grained sands and gravels. In boring 10, a silt (ML) layer was encountered beneath the coarse grained soils.

The current field investigation included a site reconnaissance and subsurface exploration. During the site reconnaissance, surface conditions were noted and the location of the exploratory borings were determined by using existing features at the site. Therefore, the approximate location of the explorations should be considered accurate only to the degree implied by the methods used.

One (1) exploratory boring was investigated with a CME 75 drill rig within the proposed lift station site to a to a maximum depth of forty-one and one-half (41.5) feet below-existing-grade. Eight (8) borings along the roadway shoulder of West Idaho Street were investigated to a maximum depth of sixteen and one-half (16.5) feet below-existing-grade. Boring 4 was not explored due to existing utility proximity to proposed exploration site. The locations of the exploratory borings are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnical Engineer in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected at regular intervals within each exploration and subsequently

transported to our Carson City geotechnical laboratory for testing and additional analysis.

The subsurface soils encountered consisted generally of clays (CL and CL-ML), silts (ML), sands (SC, SC-SM, SP-SM and SW-SM) and gravel (GP) in varying arrangements. Groundwater was encountered in all borings at the time of our investigation. Seasonal fluctuations in the groundwater table should be anticipated and may impact construction.

At the lift station site the lean clay (CL) fill soils will require removal below structural areas. The site sandy silt clay soils (CL-ML) encountered in boring 10 at the lift station site have a moderate collapse potential and will require some mitigation. Scarification, moisture conditioning, and recompaction, as well as reduced bearing capacity are proposed and discussed later in this report.

FIELD AND LABORATORY TEST DATA

Laboratory tests performed on representative samples included sieve analysis (including fines), Atterberg limits, modified proctor, R-value, in situ moisture/density, hydro collapse potential, and soluble sulfate/pH/resistivity. Much of this data is displayed on the "logs" of the explorations to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the borings are included in Appendix A of this report as Plates A-1 through A-10. A key to the logs is included as Plate A-11.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-6. Laboratory testing was performed per ASTM standards, except when test procedures are briefly described and no ASTM standard is specifically referenced in the report. Atterberg limits were determined using the dry method of preparation.

Analytical Testing: Silver State Analytical Laboratories, Reno, Nevada, conducted this testing. The testing included soluble sulfates, pH, and resistivity. Test results are included (on Silver State letterhead) in Plate B-6.

The soil samples obtained during this investigation will be held in our laboratory for 30 days from the date of this report. The samples may be retained longer at an additional cost to the client or obtained from this office upon request.

DISCUSSION AND RECOMMENDATIONS

General

The following recommendations are based upon the construction and our understanding and assumptions of the proposed improvements, as outlined in the introduction of this report, and based on our findings during the field exploration phase of this project. If changes in the construction project are proposed, they should be presented to Lumos & Associates, Inc. Geotechnical Department, so that the recommendations provided herein can be reviewed and modified as necessary. As a minimum, final construction drawings should be submitted to the Lumos Geotechnical Department for review prior to actual construction and verification that our geotechnical design recommendations have been implemented.

General Site Grading

Prior to placement of fill and/or the proposed improvements, the areas to receive fill and/or improvements shall be cleared and grubbed. Clearing and grubbing is anticipated to be as much as twelve (12) inches or more where thicker vegetation/roots are present.

Root- or organic-laden soils encountered during excavations, should be stockpiled in a designated area on site for later use in landscaping, or removed off site as directed by the owner. Excavated soils free from any organics, debris or otherwise unsuitable material and with particles no larger than four (4) inches in maximum dimension may be stockpiled and moisture conditioned for later use as compacted fill provided it meets the criteria for structural fill/trench backfill soils.

Exposed excavation surfaces to support any of the proposed improvements should be

observed and approved by a Lumos representative. Upon re-compaction and prior to placing any fill and/or base, the re-compacted surface should be proof-rolled to identify any possible yielding surfaces. Proof-rolling should be conducted with a heavy rubber-tire loader with a fully loaded bucket, or a fully loaded water truck, and observed and approved by a Lumos representative.

Unstable conditions due to yielding and/or pumping soils may be encountered on site. Additionally, the exposed soils may yield or pump under heavy equipment loads or where vibratory equipment draws up water. If yielding or pumping conditions are encountered, the soils should be scarified in place, allowed to dry as necessary and re-compacted, where applicable. Alternatively, unsuitable or saturated soil should be removed, the exposed surface leveled and compacted/tamped as much as practical without causing further pumping, and covered (including the sides) with geotextile stabilizing fabric (Mirafi HP370 or other equivalent). The fabric should then be covered with at least 12 inches of 4 to 8 inch **angular rock fill** with enough fines to fill the inter-rock pore spaces. Placement should be by end dumping. No traffic or other action should be allowed over the fabric, which may cause it to deflect/deform prior to cobble placement. Test sections should be used to determine the minimum thickness and/or number of layers required for stabilization.

Stabilization should be evaluated by proof-rolling standards commensurate with the equipment used, and approved by a Lumos representative. The placement of the stabilizing rock-fill may require additional over-excavation to maintain appropriate grading elevations. A filter fabric (Mirafi 180N or equal) should also be placed over the cobble rock fill to prevent piping of fines from covering soils into the stabilizing rock matrix.

Properly compacted structural fill and trench backfill soils to be used on site should consist of non-expansive materials [LL less than thirty-five (35) and/or a PI less than twelve (12) and/or Expansion Index less than twenty (20)], should be free of

contaminants, organics [less than three percent (3%)], rubble, or natural rock larger than four (4) inches in largest dimension and have a minimum R-Value of forty-five (45). All structural fill and trench backfill soils shall also be non-corrosive and have a water soluble sulfate content of less than one-tenth (0.1) percent. Structural fill and trench backfill soils shall also meet the following gradation requirements.

TABLE 1

STRUCTURAL FILL/TRENCH BACKFILL GRADATION

Sieve Size	% Passing
4″	100
¾″	70 - 100
#40	15 - 65
#200	5 - 35

Structural fill and trench backfill soils that do not meet the above requirements may be approved at the discretion of the Geotechnical Engineer. It is anticipated that the sands (SC-SM, SP-SM, and SW-SM) and gravel (GP) encountered during the exploration will be suitable for reuse as structural fill and trench backfill. For the purpose of this report we will define fine grained soils as having greater than thirty-five percent (35%) material finer that the #200 sieve. Fine grained soils are relatively weak. The fine grained clays (CL and CL-ML), silts (ML), and clayey sands (SC) encountered during the investigation do not meet the requirements for structural fill/trench backfill and should be removed completely from within one (1) foot vertically and laterally from structural sections and a minimum of one (1) foot below and laterally any foundations. These fine grained soils may be used as trench backfill provided they are separated from within one (1) foot vertically and laterally from structural sections by material meeting the requirements of structural fill/trench backfill defined in this section. Undocumented fill shall be completely removed from below foundations and pavement structural section, however,

it may be replaced provided it meets the structural fill/trench backfill criteria noted above. Import structural fill and trench backfill soils should be tested and approved prior to being placed or delivered on-site (**seven day advanced notice**).

Prior to placement of structural fill, the site subgrade shall be scarified to a depth of twelve (12) inches, moisture conditioned to within two percent (2%) of optimum, and recompacted to a minimum of ninety percent (90%) as determined by the ASTM D1557 Standard.

Structural fill and trench backfill should be placed only on compacted sub-grade or on compacted fill in loose lifts not exceeding eight (8) inches, moisture conditioned to within two percent (2%) of optimum, and compacted to at least **ninety percent (90%)** relative compaction as determined by the ASTM D1557 Standard. Lift thickness may be increased, at the discretion of the Geotechnical Engineer, provided the contractor can demonstrate that adequate compaction is being achieved.

Fill material should not be placed, spread or compacted while the ground is frozen or during unfavorable weather conditions. When site grading is interrupted by heavy rain or snow, grading or filling operations should not resume until a Lumos representative approves the moisture content and density conditions of the subgrade or previously placed fill. When fill is placed on existing slopes steeper than 5:1, the existing slope shall be horizontally benched.

Landscape areas should be cleared of all objectionable material. In cut areas, no other work is necessary except grading to proper elevation. In landscape areas, fill should be placed in loose lifts not exceeding eight inches and compacted to at least ninety percent (90%) relative compaction to prevent erosion.

Water should not be allowed to pond on pavements or adjacent to structures, and measures should be taken to reduce surface water infiltration into the subgrade soils. A

representative of Lumos should be present during site grading operations to ensure any unforeseen or concealed conditions within the site are identified and properly mitigated, and to test and observe earthwork construction. This testing and observation is an integral part of our service as acceptance of earthwork construction and is dependent upon compaction and stability of the subgrade soils. The soils engineer may reject any material that does not meet engineering characteristics, compaction, and stability requirements. Further, recommendations of this report are based upon the assumption that earthwork construction will conform to recommendations set forth in this section of the report.

FOUNDATION DESIGN CRITERIA

Conventional spread footings founded on a minimum of twelve (12) inches of properly prepared structural fill, as discussed earlier in the report, may be used to support the proposed foundations within the lift station site.

Spread footings: Footings should have a minimum embedment of 30 inches below lowest adjacent grade for frost protection. Footings founded on a minimum of twelve (12) inches properly prepared structural fill may be designed for a net allowable bearing pressure of 1,500 pounds-per-square-foot (psf).

Footing Settlements: The maximum anticipated settlement for continuous spread footings bearing on properly prepared structural fill (as discussed above and documented by Lumos) over properly prepared native subgrade soils, and designed for a 1,500 psf bearing pressure, is estimated to be one (1) inch or less. Differential settlements are generally expected to be half of the total settlements.

Lateral Loading: Resistance to lateral loads can be provided by friction acting at the base of conventional foundations and by passive earth resistance. A coefficient of friction of 0.4 may be assumed at the base of footings founded on a minimum of twelve (12) inches of properly prepared structural fill (as discussed above and documented by Lumos). An allowable passive earth resistance of 200 psf per foot of depth starting six (6) inches below lowest adjacent grade may be used for the sides of footings poured against properly compacted structural fill. Passive resistance should not exceed 1,500 psf. The at-rest pressure can be calculated utilizing an equivalent fluid pressure of 70 pcf.

Dynamic Factors: Vertical and lateral bearing values indicated above are for total dead load and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing values and passive resistance for conventional foundations may be increased by thirty three percent (33%) for short duration loading due to wind or seismic

forces. The additional dynamic lateral earth pressure can be calculated utilizing the following:

Dynamic Lateral Force = $23H^2$ (non-yielding walls)

Dynamic Lateral Force = $9H^2$ (yielding walls)

This force should be assumed to act at a height of 0.6H above the bottom of the wall.

RETAINING WALLS

Retaining structures over four (4) feet in height, if used, will require local code compliance and shall be engineered based on parameters described in this section of the report. Retaining structures should be designed to resist the appropriate lateral earth pressures. Cantilevered walls, which are able to deflect at least 0.01 radians, can be designed using an equivalent fluid (backfill) unit weight of 45 pounds-per-cubic-foot (pcf). However, if the wall is fixed against rotation, the wall should be designed using an equivalent fluid (backfill) unit weight of 70 pcf. These design parameters are based upon the assumption that walls will retain only level backfill and no hydrostatic pressure will be present. Any other surcharge pressures (such as sloped backfill) should be added to the above recommended lateral earth pressures. Retaining walls should be backfilled with free draining granular material that extends vertically to the bottom of the stem and laterally at least six (6) inches beyond the face of the stem (wall) and wrapped with a Mirafi 180 N or equivalent non-woven filter fabric. Weep holes should be provided on the walls at regular intervals, or a slotted drainpipe placed at the bottom of the wall (bottom of granular material) to relieve any possible build-up of hydrostatic pressure. Backfill material within two (2) feet of the wall should be compacted with hand-held equipment only, to at least ninety percent (90%) of the maximum ASTM D1557 standard. A brow ditch shall be constructed in the pre-retained earth parallel to the retaining wall to divert surface runoff.

CONCRETE SLAB DESIGN

Interior concrete slabs should be underlain with at least six (6) inches of Type 2, Class B Aggregate Base, compacted to a minimum of ninety-five percent (95%) and supported on a minimum of twelve (12) inches of properly compacted structural fill as recommended previously. We recommend the aggregate base be placed after utility trenches are excavated and backfilled. A vapor barrier should be provided for all interior concrete slabs where floor moisture is undesirable. The vapor barrier should be a synthetic plastic sheeting at least ten (10) mils thick and meet the requirements of ASTM E1745 for Class A vapor retarder materials. The vapor barrier shall be installed per the manufacturer's recommendations.

Slab thickness design should be based on a Modulus of Subgrade Reaction equal to two hundred (200) pounds-per-cubic-inch (pci) for construction on a minimum of twelve (12) inches of properly compacted structural fill as recommended previously. Reinforcement of concrete slabs should be as specified by the Project Structural Engineer.

Exterior concrete slabs on grade should be underlain with at least six (6) inches of Type 2, Class B aggregate base and on a minimum of twelve (12) inches of properly compacted structural fill as recommended previously. All subgrade and fill should be prepared and placed as described in the grading section of this report, while the aggregate base material should be compacted to at least ninety-five percent (95%) relative compaction as determined by the ASTM D1557 standard.

PAVEMENT DESIGN

Areas to be paved shall be scarified in place to a depth of at least 12 inches, moisture conditioned to within two percent (2%) of optimum, and compacted to at least ninety percent (90%) of the laboratory maximum dry density determined by the ASTM D1557 standard. We understand the sewer main will be constructed utilizing jack and bore techniques to pass under West Idaho Street and, therefore, no pavement patching recommendations are given. Pavement structural sections for the lift station parking lot utilizing an R-value of 20 (laboratory test results) are provided in Table 2, "Recommended Asphalt Pavement Sections". A Traffic Index (TI) value of 5 was assumed for areas to receive car traffic and a TI of 6 was assumed for areas to receive truck traffic. Aggregate base should consist of Type II, Class B material and meet the requirements of the Standard Specifications for Public Works Construction (SPPWC). Aggregate base material should be compacted to at least ninety-five percent (95%) of the laboratory maximum density, as determined by the ASTM D1557 standard.

TABLE 2
RECOMMENDED LIFT STATION PARKING LOT ASPHALT PAVEMENT SECTIONS

	Minimum Asphalt Pavement (inches)	Minimum Aggregate Base (inches)	Properly Compacted Structural Fill (inches)
Car Traffic TI = 5	3	4	12
Truck Traffic TI = 6	4	6	12

Calculations Included in Appendix D.

In all areas of the project, the asphalt concrete mix design should be 50 blow Marshall mix with PG64-28NV with four percent (4%) air voids and Type III asphalt aggregate per the standard specification. Asphalt concrete, in any case, should be compacted to

between ninety-three percent (92%) and ninety-eight percent (98%) of the Rice theoretical maximum density. A mix design shall be submitted to the Geotechnical Engineer for review and **approval seven (7) days prior to paving**.

CORROSION AND CHEMICAL ATTACK

Four (4) representative site soils samples were tested and all have a negligible water soluble sulfate content of less the 0.01%. However, Type II cement is recommended for concrete in direct contact with site soils.

All exterior concrete should have between 4.5 and 7.5 percent entrained air, a maximum water-cement ratio of 0.45, and comply with all other ACI recommendations for concrete placed in areas subject to freezing. A minimum compression strength of 4,000 psi is recommended for all external concrete.

Native soils from boring 3 at 6' had a pH of 9.41 and a resistivity of 1800 ohm-cm under saturated conditions. This indicates a highly corrosive potential for ferrous metals in contact with these soils. Native soils from boring 6 at 10.5' had a pH of 8.33 and a resistivity of 2500 ohm-cm under saturated conditions. This indicates a highly corrosive potential for ferrous metals in contact with these soils. Native soils from boring 9 at 6.5' had a pH of 9.41 and a resistivity of 820 ohm-cm under saturated conditions. This indicates an extremely corrosive potential for ferrous metals in contact with these soils. Native soils from boring 10 at 11' had a pH of 9.01 and a resistivity of 680 ohm-cm under saturated conditions. This indicates an extremely corrosive potential for ferrous metals in contact with these soils. Corrosion mitigation measures, such as protective coatings, wrappings, and cathodic protection are therefore recommended. If protective coatings are used, the type and quantity will depend on the kind of steel and specific construction application. Steel and wire concrete reinforcement cover of at least three (3) inches where cast against soil, unformed, is recommended.

UTILITY EXCAVATIONS

On-site soils are anticipated to be excavatable with conventional construction equipment. Compliance with OSHA regulations should be enforced for Type C soils. Native coarse grained sands (SC-SM, SW-SM, and SP-SM) and gravel (GP) as define as having less than thirty-five percent (35%) pass the #200 sieve may be suitable for backfill of utility trenches, provided soils meet the requirements of structural fill/trench backfill as mentioned earlier in this report. The native fine grained silt (ML), Clays (CL and CL-ML) and clayey sand (SC) with more than thirty-five percent (35%) passing the #200 may be utilized as trench backfill provided they are separated from any structural improvements by at least one (1) foot of material meeting the criteria of structural fill/trench backfill outline earlier in this report. Structural fill/trench backfill shall be moisture conditioned, placed and compacted as previously discussed in the grading and filling section. On-site soils encountered during our field exploration do not meet the minimum requirements for bedding sand (Class A Backfill). Therefore, import of Class A Bedding materials should be anticipated. Bedding sand shall be placed in eight (8) inch maximum loose lifts and compacted to a minimum of ninety percent (90%) of the ASTM D1557 Standard. Groundwater was encountered in all borings during our field investigation. Where groundwater is encountered we recommend "burrito wrapped" Class C Drain Rock be utilized as bedding to an elevation of at least one (1) foot above groundwater. Class C material shall meet the requirements in the Standard Specifications. The Class C Drain Rock shall be placed in one (1) foot lifts and compacted with a vibra plate to the satisfaction of the geotechnical engineer.

MOISTURE PROTECTION, EROSION AND DRAINAGE

The finish surfaces around all structures should slope away from the foundations and toward appropriate drop inlets or other surface drainage devices. It is recommended that within ten feet of any structure a minimum slope of five percent (5%) be used for soil subgrade and a minimum of one percent (1%) be used for pavement. These grades should be maintained for the life of the structures.

CONSTRUCTION SPECIFICATIONS

All work shall be governed by the Standard Specifications and Standard Details for Public Works Construction (SSPWC), as distributed by City of Elko Public Works, except as modified herein.

LIMITATIONS

This report has been prepared in accordance with the currently accepted engineering practices in Northern Nevada and Northern California. The analysis and recommendations in this report are based upon exploration performed at the locations shown on the site plan, the proposed improvements as described in the Introduction section of this report and upon the property in its condition as of the date of this report. Lumos makes no guarantee as to the continuity of conditions as subsurface variations may occur between or beyond exploration points and over time. Any subsurface variations encountered during construction should be immediately reported to Lumos so that, if necessary, Lumos' recommendations may be modified.

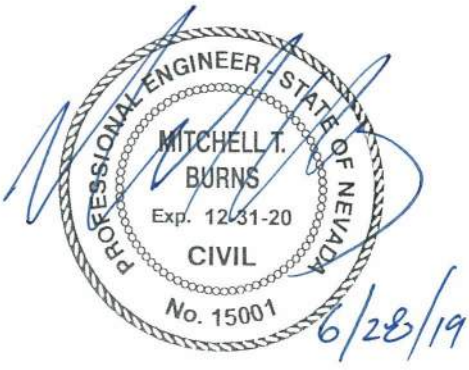
This report has been prepared for and provided directly to City of Elko Public Works ("The Client"), and any and all use of this report is expressly limited to the exclusive use of the Client. The Client is responsible for determining who, if anyone, shall be provided this report, including any designers and subcontractors whose work is related to this project. Should the Client decide to provide this report to any other individual or entity, Lumos shall not be held liable for any use by those individuals or entities to whom this report is provided. The Client agrees to indemnify, defend and hold harmless Lumos, its agents and employees from any claims resulting from unauthorized users.

If this report is utilized in the preparation of an Engineer's Estimate of Probable Construction Costs, then the preparer of the estimate acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The preparer of the estimate agrees to indemnify, defend and hold harmless Lumos & Associates, its agents and employees from any and all claims, causes of action or liability arising from any claims resulting

from the use of the report in the preparation of an Engineer's Cost Estimate.

This report is not intended for, nor should be utilized for, bidding purposes. If it is utilized for bidding purposes, Client acknowledges that the report recommendations are based on the subsurface conditions found at the specific locations investigated on site; that subsurface conditions may vary outside these locations; and that no guaranty or warranty, express or implied, is made that the conditions encountered are representative of the entire site. The Client agrees to indemnify, defend and hold harmless Lumos & Associates, Inc., its agents and employees from any and all claims, causes or action or liability arising from any claims resulting from the use of the report for bidding purposes.

As explained above, subsurface variations may exist and as such, beyond the express findings located in this report, no warranties express, or implied, are made by this report. No affirmation of fact, including but not limited to statements regarding suitability for use of performance shall be deemed to be a warranty or guaranty for any purpose.



Christopher "Pete" McCreary, E.I.
Geotechnician
Lumos & Associates, Inc.

Mitch Burns, P.E., C.E.M.
Materials Engineering Manager
Lumos & Associates, Inc.

References

American Society for Testing and Materials (ASTM), 2016, Annual Book of ASTM Standards, West Conshohoken

Crafford, A. Elizabeth Jones, Geologic Terrane map of Nevada, Plate 1 of 1, 2010, Nevada Bureau of Mines and Geology, Washoe County, Nevada

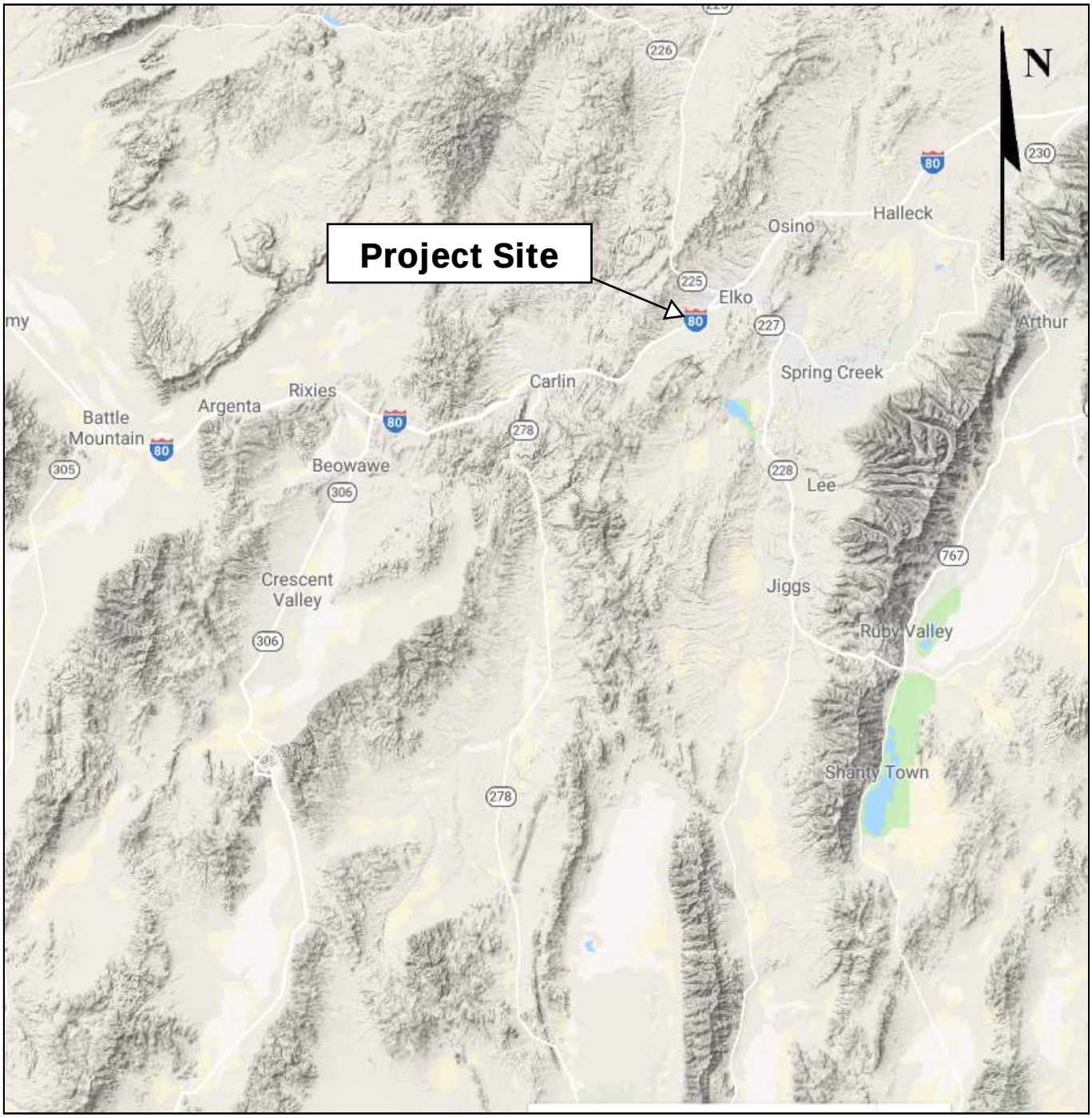
Naval Facilities Engineering Command, 1986, Design Manual 7.01

Naval Facilities Engineering Command, 1986, Design Manual 7.02

Occupational Safety and Health Administration (OSHA), 1995, Occupational Safety and Health Standards for the Construction Industry, Commerce Clearing House, Inc.

Standard Specifications for Public Works Construction, "Orange Book", Elko County, NV

Quaternary Faults on Nevada
https://gisweb.unr.edu/QuaternaryFaults/



Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

VICINITY MAP

Job Number: 9718.000

Date: June 2019

PLATE

1

Approximate Boring Locations: ⌖ Project Site: ▮▮▮▮▮▮▮

LUMOS & ASSOCIATES

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

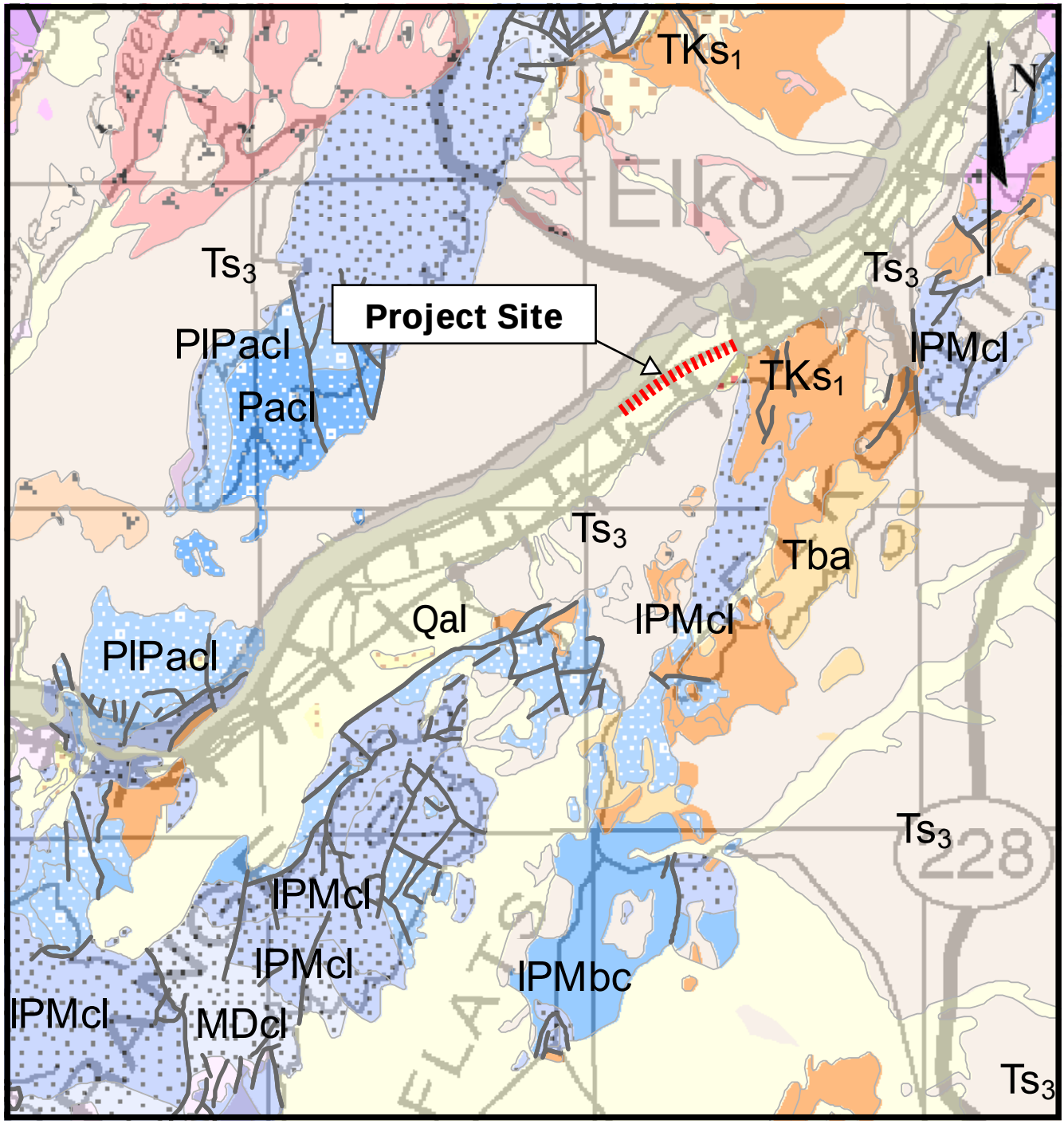
WRF - Exit 298 Lift Station and Force Main

SITE MAP

Job Number: 9718.000 Date: June 2019

PLATE

2



Qal **Alluvium, undifferentiated**

Project Site: ||||||

LUMOS & ASSOCIATES

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

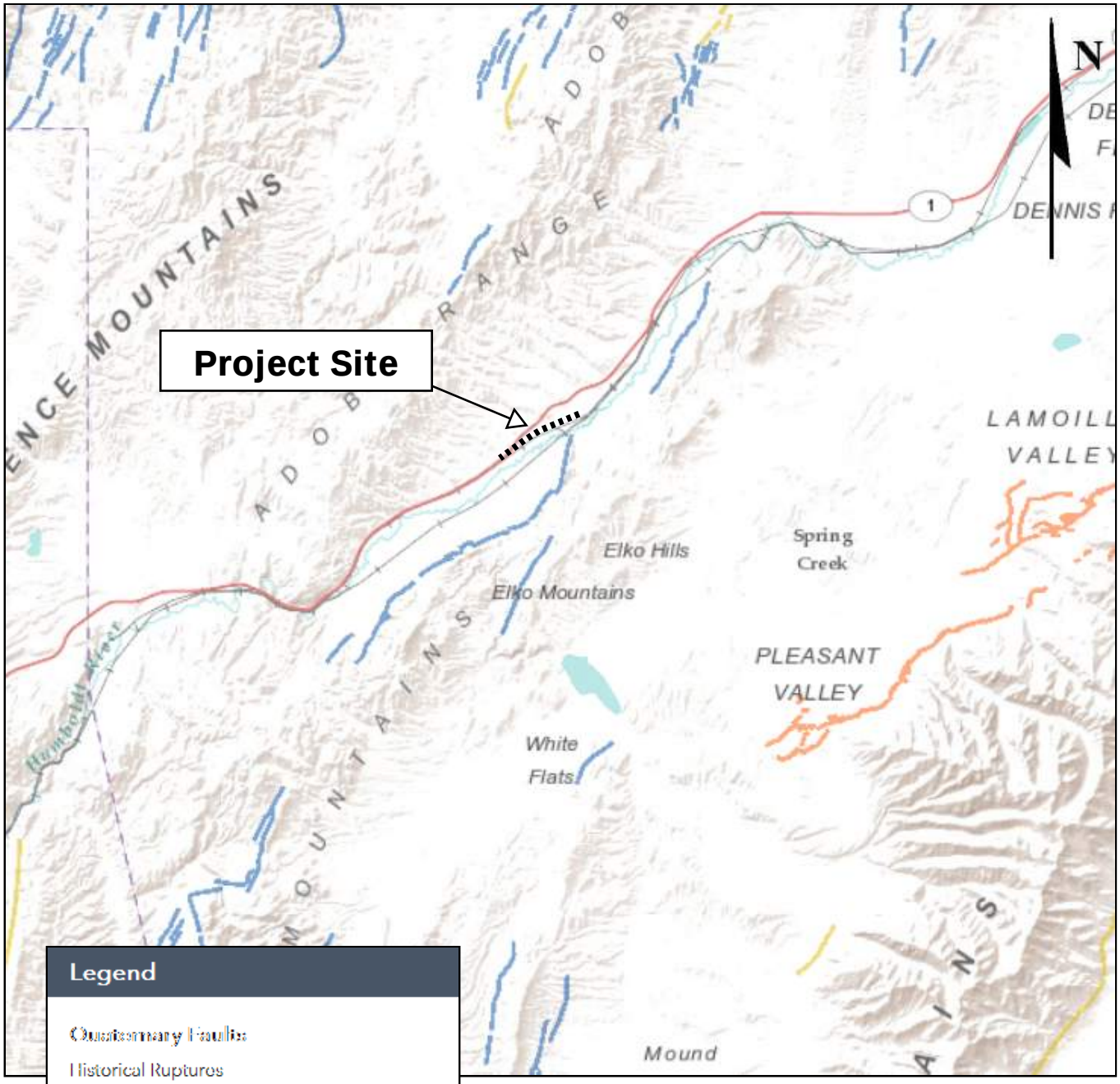
WRF - Exit 298 Lift Station and Force Main

GEOLOGIC MAP

Job Number: 9718.000 Date: June 2019

PLATE

3



Project Site: .....

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

FAULT MAP

Job Number: 9718.000 Date: June 2019

PLATE

4

APPENDIX A

LUMOS & ASSOCIATES

Sheet **1** of **1**

BOREHOLE No. 01

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **5.5 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Fill, Pulverized Asphalt, Sandy LEAN CLAY (CL) Slighty Moist and Stiff.				25	8	12.5	28.4	59.1		
			1.5										
		B	**Reddish Brown Sandy LEAN CLAY (CL)** Moist to Wet and Medium Stiff. Estimated Trace Subrounded Gravel to 1/2", 20% Medium to Fine Sand, and 80% Moderatley Plastic Clay.										
5			Ground Water Level Rose to 5.5' B.E.G.	11*									
10			Becomes Stiff.	15*									
15			Ground Water at 15' B.E.G. No Sample Recovery.	20*									
			16.5										

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000
Date: June 2019

PLATE
A-1

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

Sheet **1** of **1**

BOREHOLE No. 02

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **15 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
		B	**Fill, Reddish Brown Sandy LEAN CLAY (CL)** **Pulverized Asphlt Near the Suface.** Moist and Hard. Estimated Trace Subrounded Cobble to 6", Trace Subrounded Gravel to 3", 20% Medium to Fine Sand, and 80% Moderatley Plastic Clay.										
			5.0										
5			**Reddish Brown Clayey SAND (SC)** Moist to Wet and Dense.	28*									
10			Becomes Loose.	9*	15.2	108.0	31	16	12.3	43.9	43.7		
15													
			16.5	9*									

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000

Date: June 2019

PLATE

A-2

Sheet **1** of **1**

BOREHOLE No. 03

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **10 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Reddish/Medium Brown Sandy LEAN CLAY (CL) Moist and Stiff. Estimated Trace Subrounded Gravel to 1/2", 20% Medium to Fine Sand, and 80% Moderately Plastic Clay.										
			Very Easy Drilling to 5'.										
5				12*									
			10.0										
10			Groundwater at 10' B.E.G. No Sample Recovery.	7*									
			Dark Brown, Well-Graded SAND with Silt and Gravel (SW-SM) Wet and Loose.										
15			Becomes Very Dense.										
			16.5	56*	11.1	114.7	NP	NP	39.5	53.9	6.5		

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000
Date: June 2019

PLATE
A-3

Sheet **1** of **1**

BOREHOLE No. 04

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **0 feet**
Water Depth: **No groundwater encountered**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Utility Conflict - Location Not Explored										

Boring terminated at 0 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000 Date: June 2019

PLATE A-4

Sheet **1** of **1**

BOREHOLE No. 05

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **7.5 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
		B	**Fill, Medium Brown Silty, Clayey SAND with Gravel (SC-SM)** Silghtly Moist and Dense.		5.6		26	8	37.7	39.5	22.8		
5			5.0										
			Medium/Dark Brown Sandy LEAN CLAY (CL) Moist to Wet and Very Stiff. Estimated 20% Medium to Fine Sand and 80% Moderately Plastic Clay.	26*									
			Water Table at 7.5' B.E.G.										
10			Becomes Medium Stiff and Percent Sand Increases.	9*									
15			16.0										
			Grey, Well-Graded SAND with Silt and Gravel (SW-SM) Wet and Dense. Estimated 30% Subrounded Gravel to 1/2", 60% Coarse to Fine Sand, and 10% Non-Plastic Silt.	25*									
			16.5										

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000
Date: June 2019

PLATE
A-5

Sheet **1** of **1**

BOREHOLE No. 06

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16 feet**
Water Depth: **6 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
0			**Reddish Brown Sandy LEAN CLAY (CL)** Wet and Soft. Estimated Trace Gravel to 1/2", 20% Medium to Fine Sand, and 80% Moderately Plastic Lean Clay.										
5			Water Table at 6' B.E.G. No Sample Recovery. Color Change to Dark Brown and Incerease in Percent Sand.	6*									
10			11.3	18*									
			Grey Poorly GRADED SAND (SP) Wet and Medium Dense. Estimated 95% Coarse to Fine Sand and 5% Non-Plastic Silt.										
15			Heaving Sands 5' of heave at 15' Depth B.E.G. Becomes Very Dense.										
			16.5	100+ * **									
			Boring terminated at 16 feet. Boring backfilled with excavated soils without compaction verification *Blows/Foot - Modified California Sampler										

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

LUMOS & ASSOCIATES

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000

Date: June 2019

PLATE

A-6

Sheet **1** of **1**

BOREHOLE No. 07

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **5 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Fill, Pulverized Asphalt, Sandy LEAN CLAY (CL) Slighty Moist and Stiff.										
			1.5										
		B	**Fill, Medium Brown Clayey SAND (SC)** Moist to Wet and Loose. Estimated 25% Subrounded Gravel to 1", 50% Coarse to Fine Sand, and 25% Moderately Plastic Clay.										
5			Water table at 5' B.E.G.										
			6.0										
			Brown Sandy LEAN CLAY Wet and Medium Stiff. Estimated 20% Medium to Fine Sand and 80% Moderately Plastic Lean Clay.	11*									
10			11.5	7*									
			Grey Brown POORLY-GRADED GRAVEL with Sand (GP) Wet and Loose.										
15			Becomes Very Dense.				NP	NP	53.8	43.3	2.9		
			16.5	37*									

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000

Date: June 2019

PLATE

A-7

Sheet **1** of **1**

BOREHOLE No. 08

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **6 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Fill, Pulverized Asphalt, Sandy LEAN CLAY (CL) Slighty Moist and Stiff. 1.5										
		B	**Fill, Medium Brown Clayey SAND with Gravel(SC)** Moist and Medium Dense. Estimated 25% Subrounded Gravel to 2", 50% Coarse to Fine Sand, and 25% Moderately Plastic Lean Clay. 5.0										
5			**Brown Sandy LEAN CLAY (CL)** Moist to Wet and Very Stiff. Water Table at 6' B.E.G. Boring Heaved from 10' to 7' B.E.G. 10.0	24*	27.0	91.1	33	10	0.8	23.7	75.5		
10			**Grey Brown POORLY-GRADED SAND with Gravel (SP)** Wet and Loose. Estimated 30% Subrounded Gravel to 1", 70% Coarse to Fine Sand, and Trace Non-Plastic Silt.	6*									
15			No Sample Recovery. Becomes Very Dense. 16.5	100+ *									

Boring terminated at 16.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000

Date: June 2019

PLATE

A-8

Sheet **1** of **1**

BOREHOLE No. 09

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **16.5 feet**
Water Depth: **8 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Fill, Pulverized Asphalt, Sandy LEAN CLAY (CL) Slighty Moist and Stiff.										
			1.5										
		B	**Fill, Medium Brown Clayey SAND with Gravel(SC)** Moist and Medium Dense. Estimated 25% Subrounded Gravel to 2", 50% Coarse to Fine Sand, and 25% Moderately Plastic Lean Clay.										
5			6.0										
			Reddish Brown Sandy LEAN CLAY (CL) Moist to Wet and Medium Stiff. Estimated 40% Medium to Fine Sand and 60% Moderately Plastic Lean Clay.	9*									
			▼ Water Table Rose from 13' to 8' B.E.G.										
10			Becomes Cemented and very Stiff.	35*									
			13.0										
			Grey POORLY-GRADED GRAVEL (GP) Wet and Very Dense. 50% Subrounded Gravel to 2", 50% Coarse to Fine Sand, and Trace Non-Plastic Silt. Water Table at 13'.										
15			16.5	73*									
			Boring terminated at 16.5 feet. Boring backfilled with excavated soils without compaction verification *Blows/Foot - Modified California Sampler										

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

LUMOS & ASSOCIATES

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000

Date: June 2019

PLATE

A-9

Sheet 1 of 1

BOREHOLE No. 10

Logged By: **P. McCreary**
Date Logged: **6-3-19**
Drill Type: **CME 75**

Total Depth: **41.5 feet**
Water Depth: **15 feet ±**
Ground Elev.: **EXISTING**

Ziplock Sample | Standard Split Spoon (SPT) | Cuttings Sample | Modified California | Bag Sample | Static Water Table

Depth in Feet	Graphic Log	Sample Type	SOIL DESCRIPTION	Blows/Foot	Moisture Content, %	Dry Unit Weight, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value
			Fill, Brown Sandy LEAN CLAY (CL) Moist and Stiff. Estimated Trace Gravel to 11", 20% Medium to Fine Sand, and 80% Moderately Plastic Lean Clay. 3.0										
5			**Reddish Brown Sandy Silty CLAY (CL-ML)** Moist and Stiff.	24*	17.0	102.7	25	6	3.7	39.7	56.6	12	20
				18*									
10				15*									
				25*									
15			▼ Hole Heave From 15' to 14' B.E.G. 15.0 Perched Water Table Encountered at 15' to 25' B.E.G. No Sample Recovery.	22*									
20			**Grey POORLY-GRADED SAND with Silt (SP-SM)** Wet and Medium Dense to Very Dense.	50			NP	NP	0.2	92.9	6.9		
25			25.0 **Reddish Brown Sandy Silt (ML)** Moist and Hard.	36									
30				36			30	5	0.7	49.1	50.2		
35				26									
40			41.5	50									

Boring terminated at 41.5 feet.
Boring backfilled with excavated soils without compaction verification
*Blows/Foot - Modified California Sampler

LUMOS_LOG_ST_BORE_GINT 9718.GPJ US_LAB.GDT 6/28/19

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

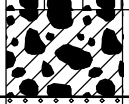
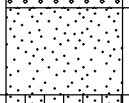
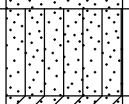
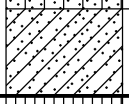
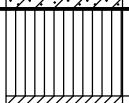
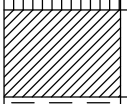
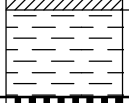
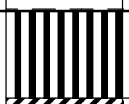
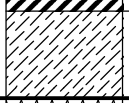
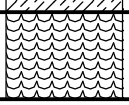
WRF - Exit 298 Lift Station and Force Main

LOG OF EXPLORATORY BORING

Job Number: 9718.000
Date: June 2019

PLATE
A-10

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

Other Tests

AN	ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)
C	CONSOLIDATION TEST
DS	DIRECT SHEAR TEST
MD	MOISTURE DENSITY CURVE

LUMOS & ASSOCIATES

Lumos & Associates

808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

LEGEND

Job Number: 9718.000

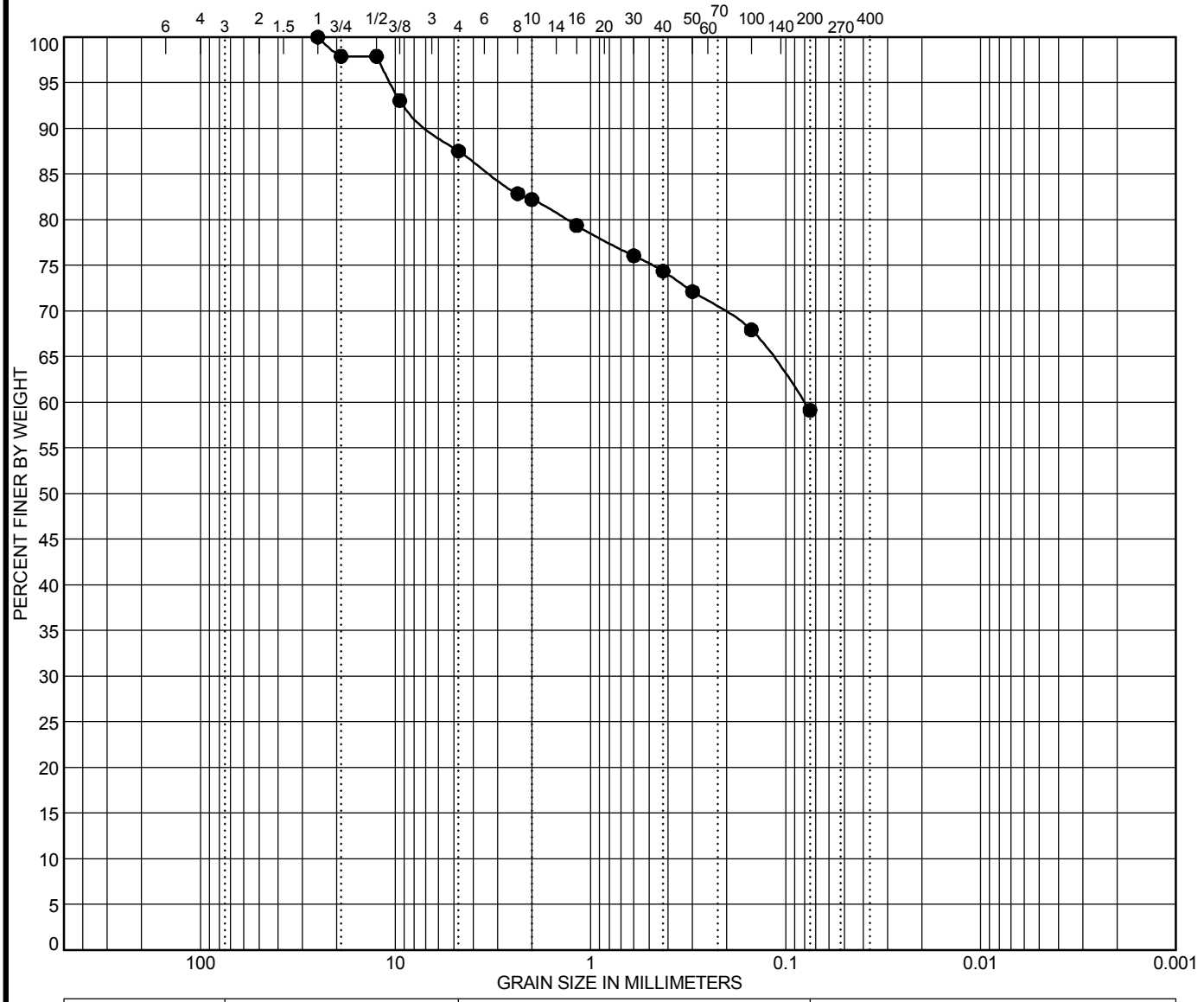
Date: June 2019

PLATE

A-11

APPENDIX B

LUMOS & ASSOCIATES



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019					
●	**01**	Classification	LL	PL	PI	Cc	Cu
	Depth: 0	Sandy LEAN CLAY (CL)	25	16	9		
	Sample Location	B-1 at 0-1.5'					
	USCS	CL					
	AASHTO						

	Specimen Identification								
●	**01**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 0	25	0.08			12.5	28.4	59.1	

Natural Moisture	9.9 %		**S.E.**		**Absorption %**	
R-Value			**Durability Index**		**Soundness**	
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**	

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

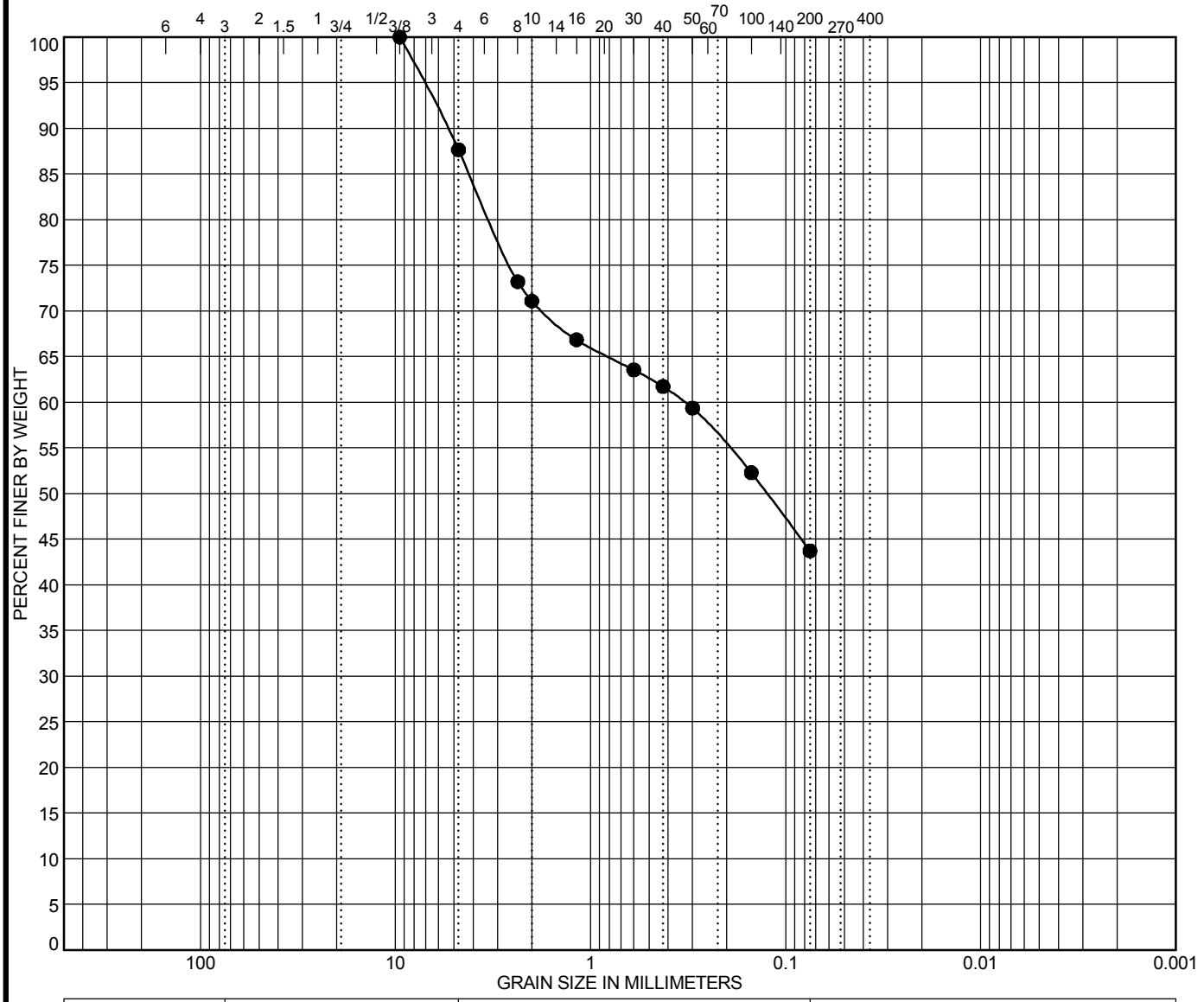
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.1



Specimen Identification	Date: 6-6-19							
● **02**	Classification				LL	PL	PI	Cc	Cu
Depth: 11	Clayey SAND (SC)				31	15	16		
Sample Location	B-2 at 11-11.5'								
USCS	SC								
AASHTO									

Specimen Identification								
● **02**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 11	9.5	0.33			12.3	43.9	43.7	

Natural Moisture	15.2 %		**S.E.**		**Absorption %**	
R-Value			**Durability Index**		**Soundness**	
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**	

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

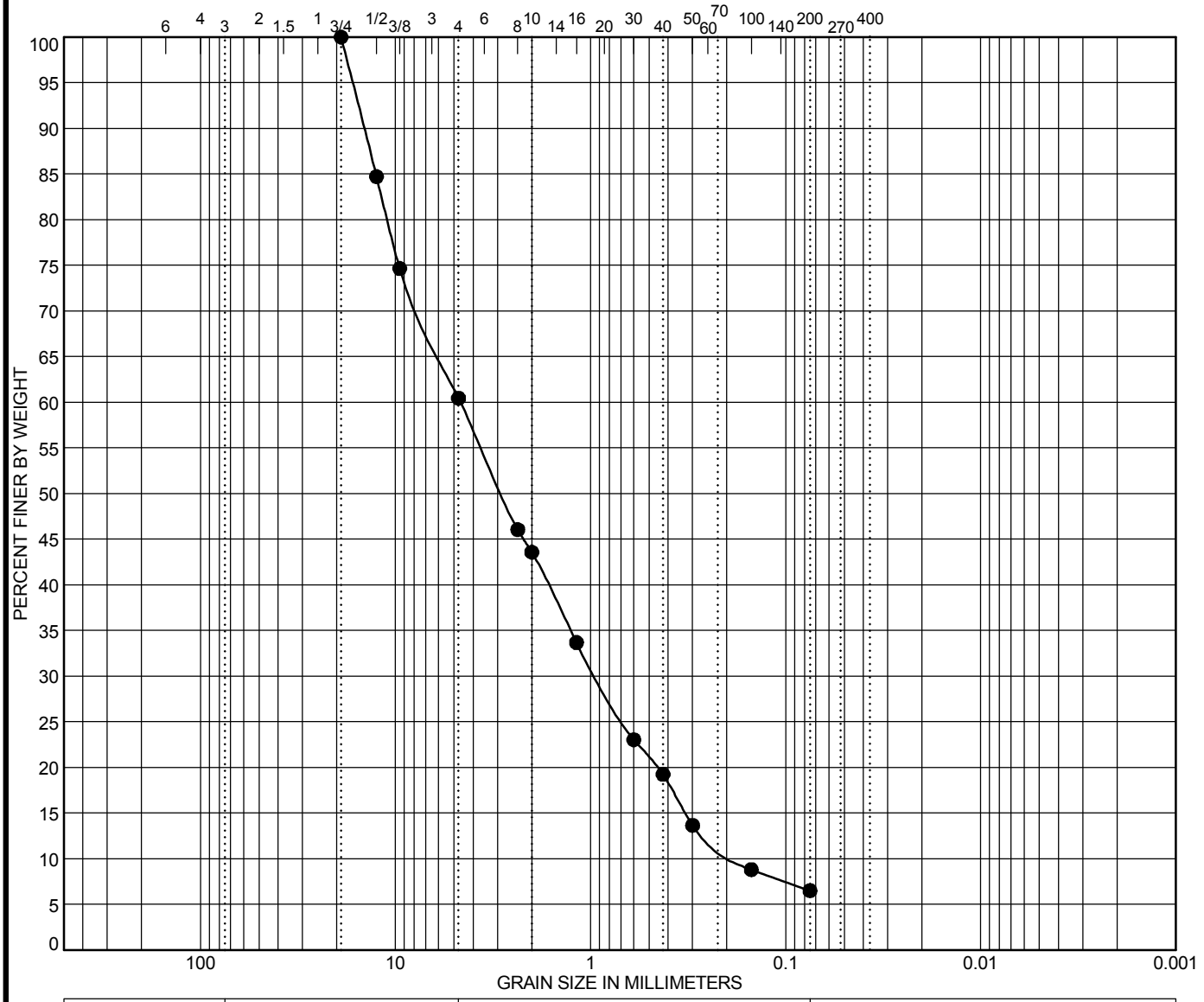
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.2



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification	Date: 6-6-19					
● **03**	Classification	LL	PL	PI	Cc	Cu
Depth: 16	WELL- GRADED SAND with Silt and Gravel (SW-SM)	NP	NP	NP	1.1	26.1
Sample Location	B-3 at 16-16.5'					
USCS	SW-SM					
AASHTO						

Specimen Identification								
● **03**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
Depth: 16	19	4.646	0.934	0.178	39.5	53.9	6.5	
Natural Moisture	11.1 %		**S.E.**		**Absorption %**			
R-Value			**Durability Index**		**Soundness**			
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**			

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

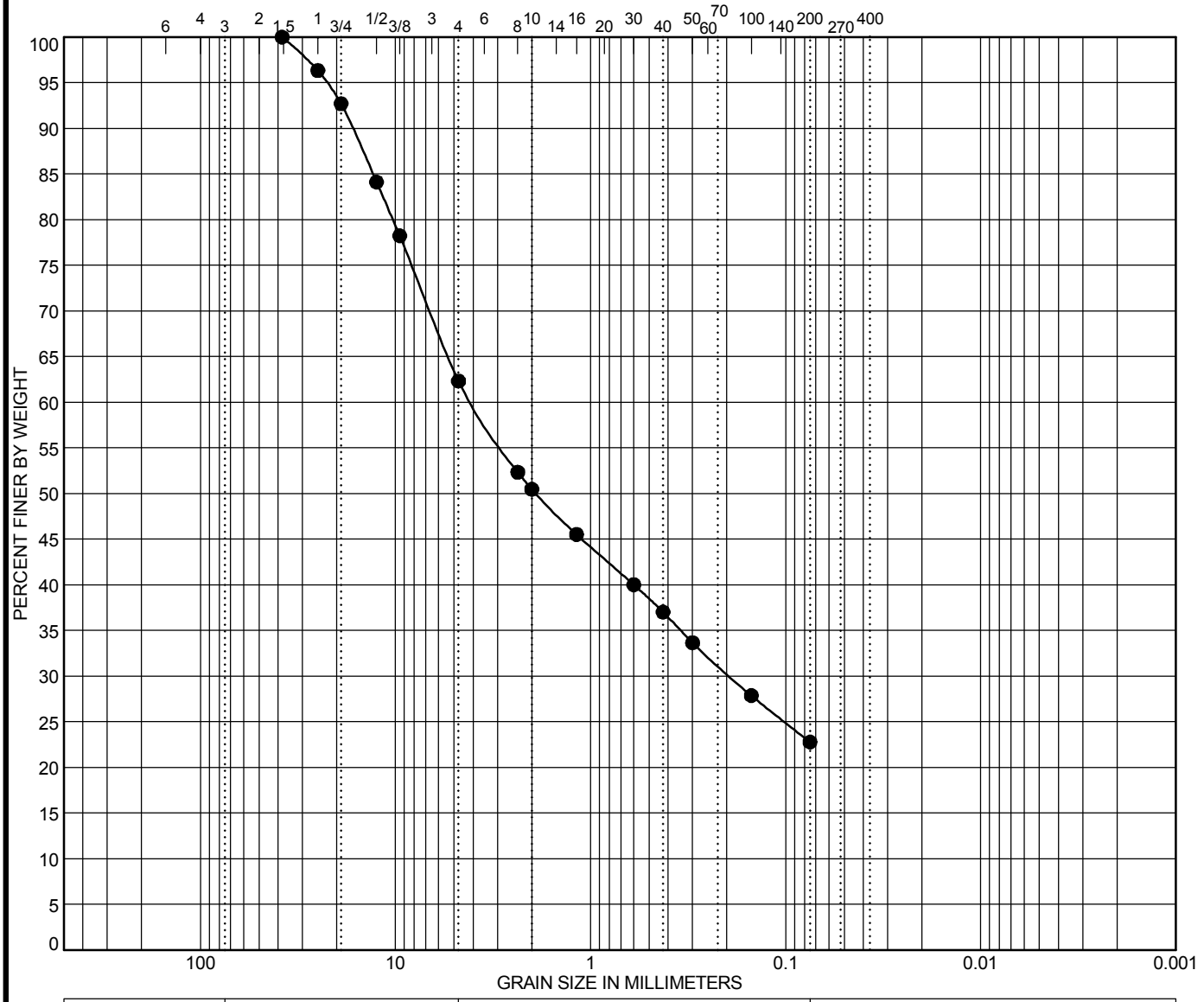
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.3



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019						
●	**05**	Classification	LL	PL	PI	Cc	Cu	
	Depth: 0	Silty, Clayey SAND with Gravel (SC-SM)	26	19	7			
	Sample Location	B-5 at 0-5'						
	USCS	SC-SM						
	AASHTO							

	Specimen Identification								
●	**05**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 0	38.1	4.034	0.193		37.7	39.5	22.8	

Natural Moisture	5.6 %		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

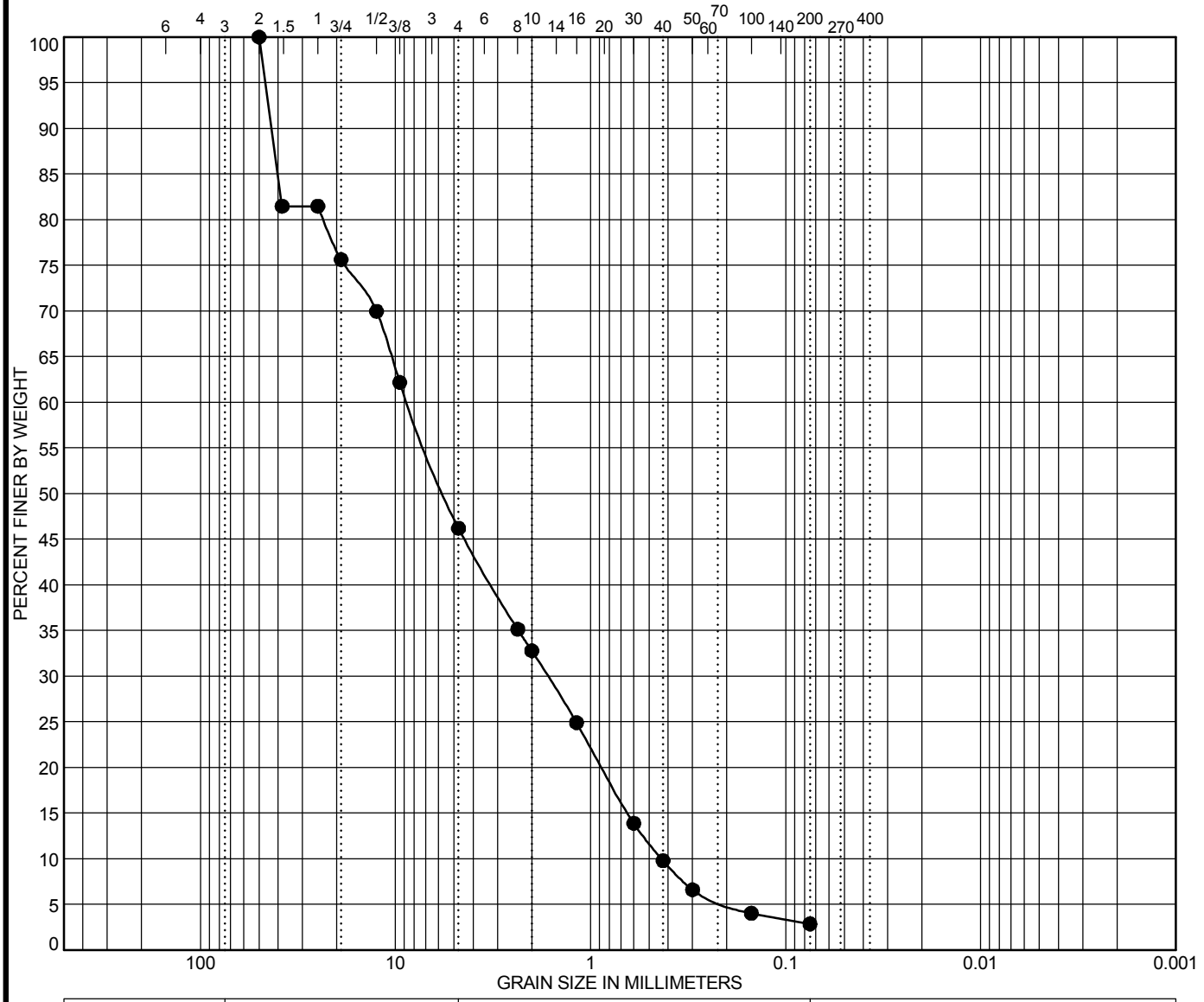
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.4



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019						
●	**07**	Classification	LL	PL	PI	Cc	Cu
	Depth: 15	POORLY-GRADED GRAVEL with Sand (GP)	NP	NP	NP	0.7	20.0
	Sample Location	B-7 at 15-16.5'					
	USCS	GP					
	AASHTO						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**07**								
	Depth: 15	50	8.643	1.66	0.432	53.8	43.3	2.9	

Natural Moisture	8.3 %		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

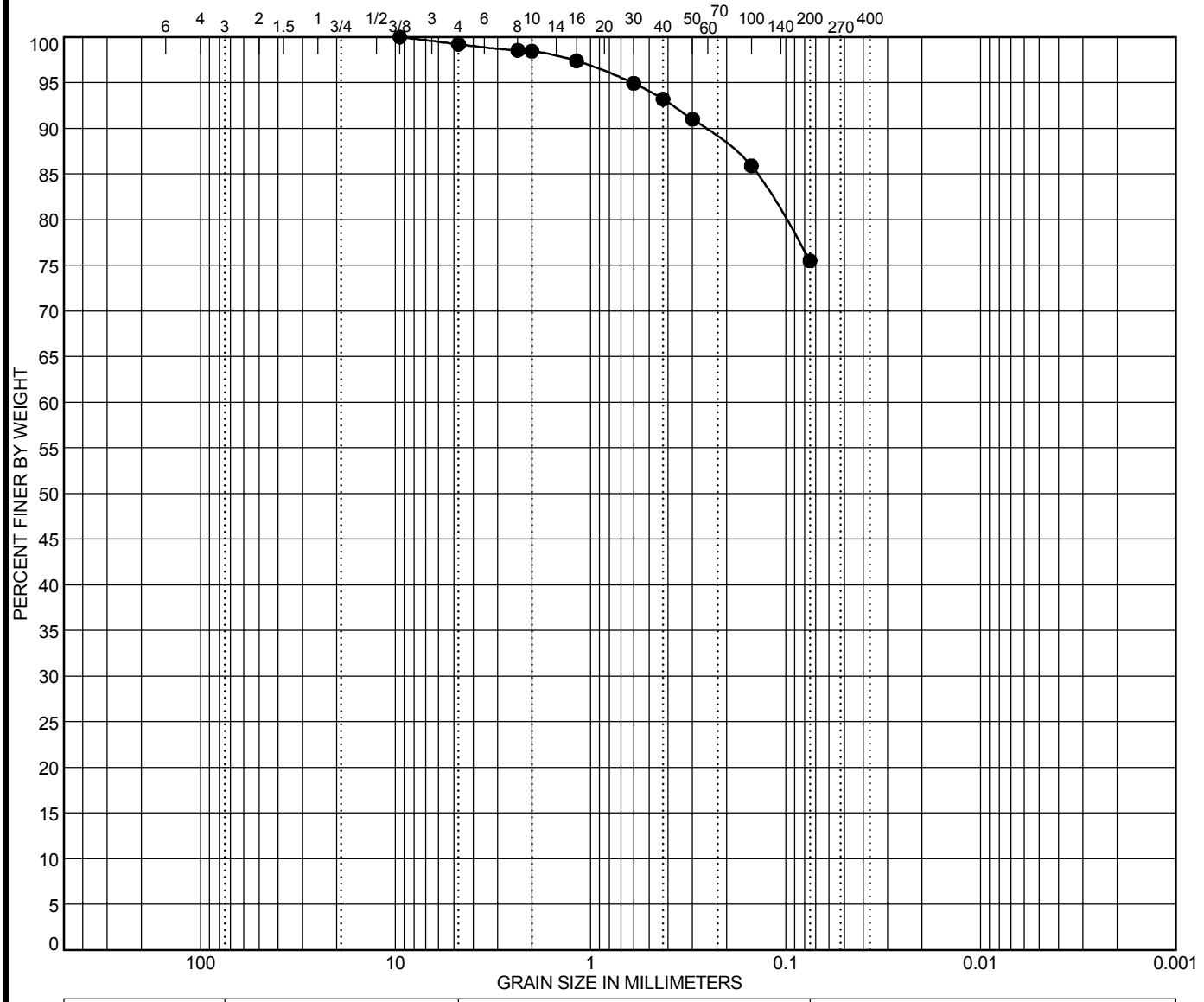
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.5



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019					
●	**08**	Classification	LL	PL	PI	Cc	Cu
	Depth: 6	LEAN CLAY with Sand (CL)	33	23	10		
	Sample Location	B-8 at 6-6.5'					
	USCS	CL					
	AASHTO						

	Specimen Identification								
●	**08**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 6	9.5				0.8	23.7	75.5	

Natural Moisture	27.6 %		**S.E.**		**Absorption %**	
R-Value			**Durability Index**		**Soundness**	
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**	

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

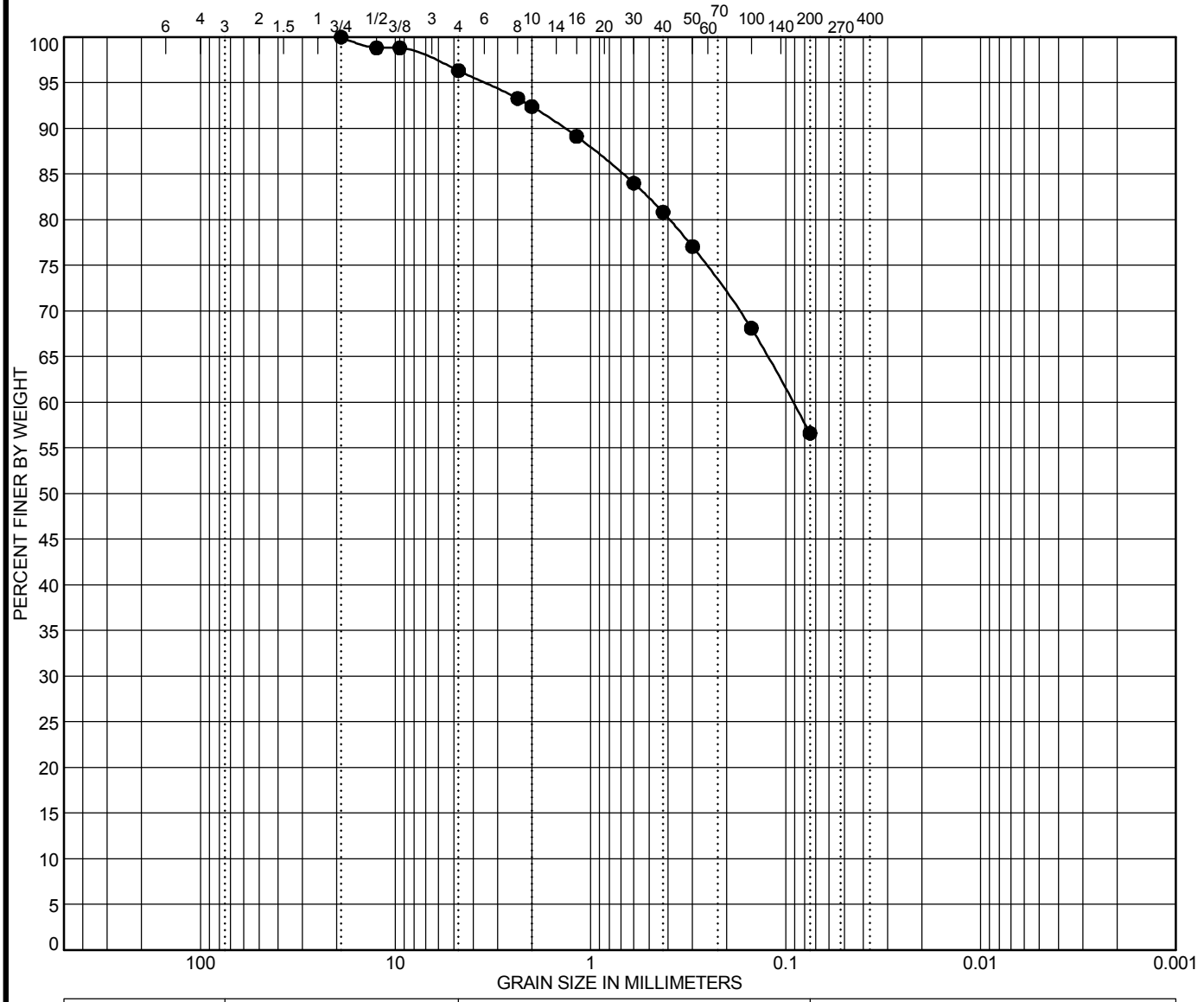
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.6



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019					
●	**10**	Classification	LL	PL	PI	Cc	Cu
	Depth: 3.5	Sandy Silty CLAY (CL-ML)	25	19	6		
	Sample Location	B-10 at 3.5-4'					
	USCS	CL-ML					
	AASHTO						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10**								
	Depth: 3.5	19	0.092			3.7	39.7	56.6	

Natural Moisture	17.0 %		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

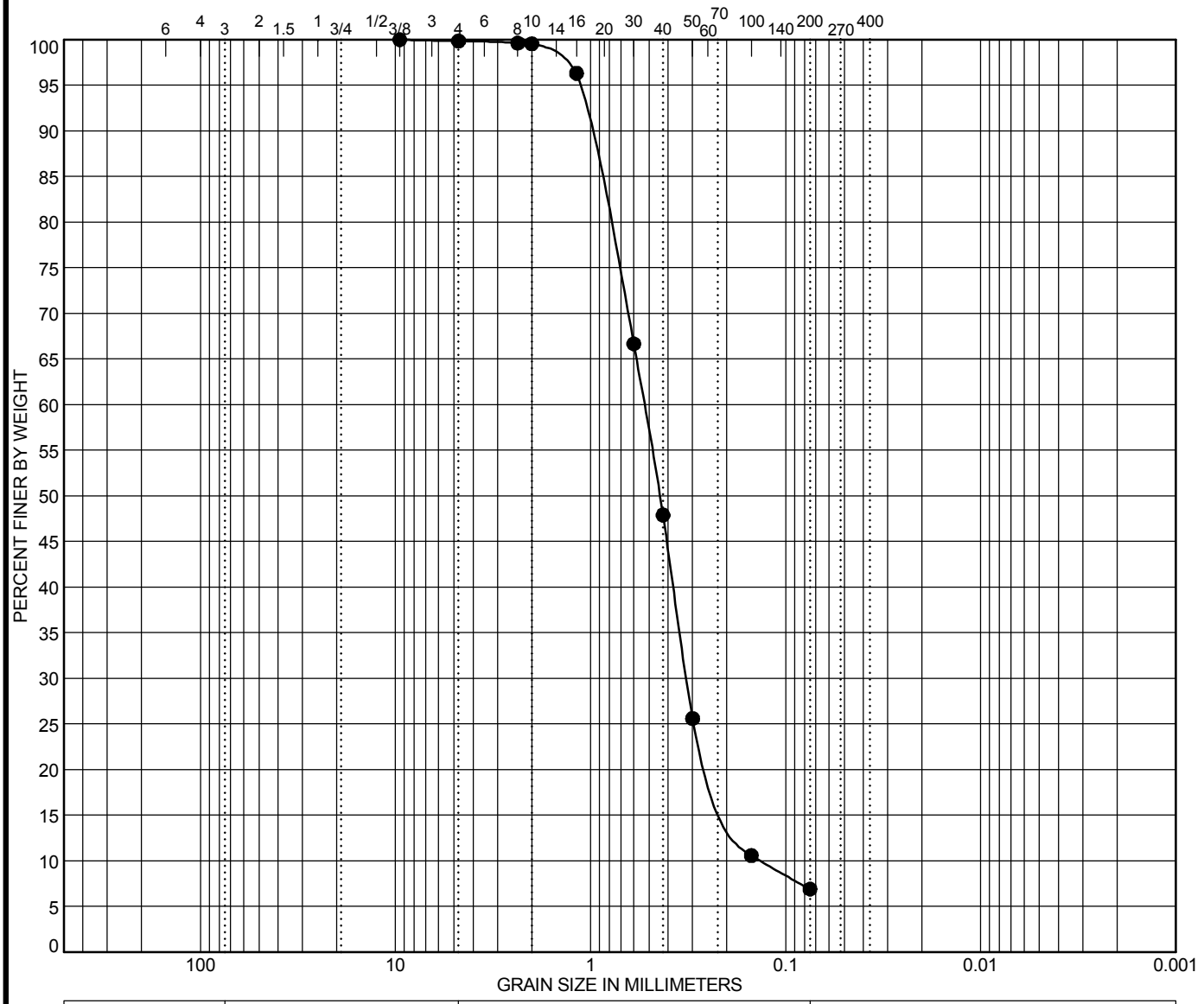
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.7



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019						
●	**10**	Classification	LL	PL	PI	Cc	Cu
	Depth: 20	POORLY-GRADED SAND with Silt (SP-SM)	NP	NP	NP	1.4	4.0
	Sample Location	B-10 at 20-21.5'					
	USCS	SP-SM					
	AASHTO						

	Specimen Identification	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**10**								
	Depth: 20	9.5	0.531	0.321	0.134	0.2	92.9	6.9	

Natural Moisture	27.4 %		**S.E.**		**Absorption %**		
R-Value			**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%		**Specific Gravity**		**Direct Shear**		

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

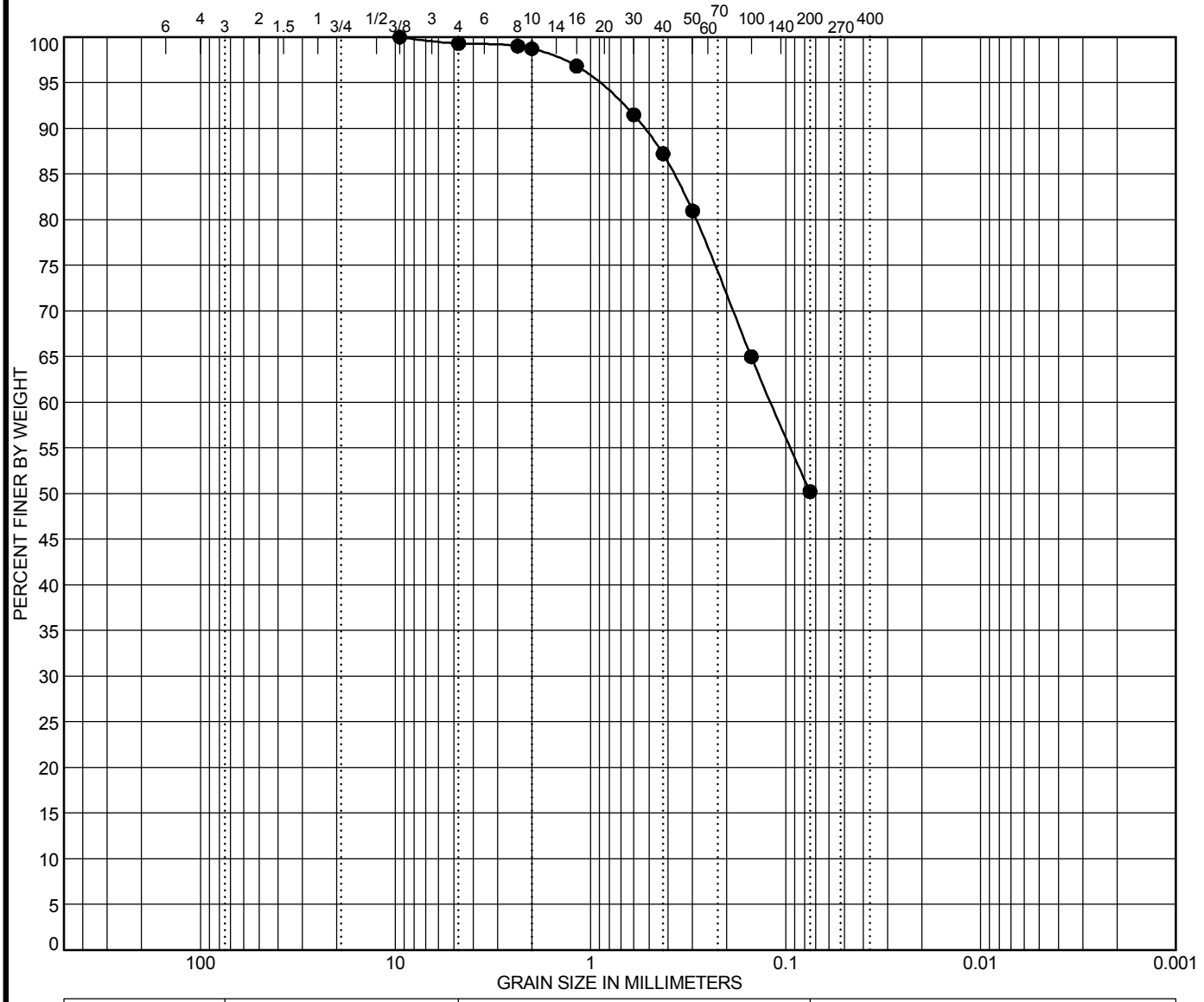
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.8



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Date: 6-6-2019					
●	**10**	Classification	LL	PL	PI	Cc	Cu
	Depth: 30	Sandy SILT (ML)	30	25	5		
	Sample Location	B-10 at 30-31.5'					
	USCS	ML					
	AASHTO						

	Specimen Identification								
●	**10**	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
	Depth: 30	9.5	0.119			0.7	49.1	50.2	

Natural Moisture	23.7 %	**S.E.**		**Absorption %**		
R-Value		**Durability Index**		**Soundness**		
Perctage of Wear (500 rev)	%	**Specific Gravity**		**Direct Shear**		

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

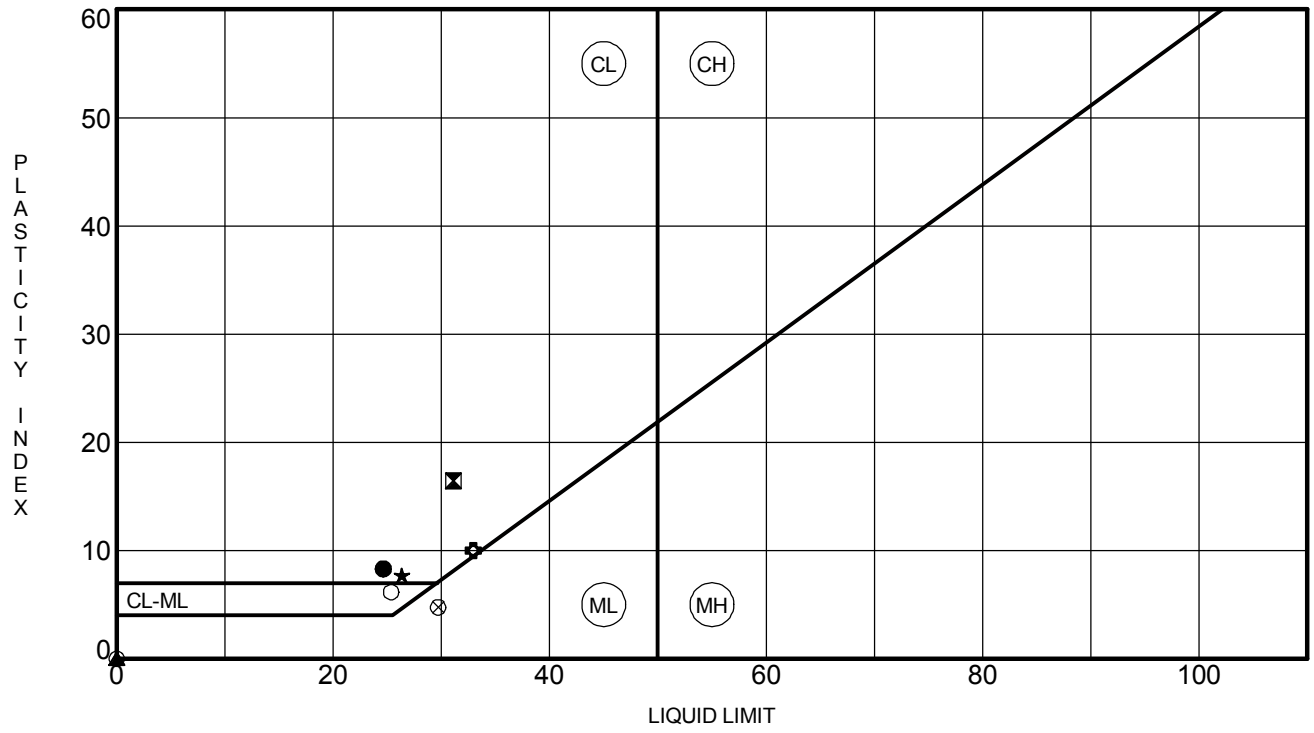
WRF - Exit 298 Lift Station and Force Main

GRAIN SIZE DISTRIBUTION

Job Number: 9718.000 Date: June 2019

PLATE

B-1.9



Specimen Identification			LL	PL	PI	Fines	Classification
●	01	0.0	25	16	9	59	Sandy LEAN CLAY (CL)
⊠	02	11.0	31	15	16	44	Clayey SAND (SC)
▲	03	16.0	NP	NP	NP	7	WELL- GRADED SAND with Silt and Gravel (SW-SM)
★	05	0.0	26	19	7	23	Silty, Clayey SAND with Gravel (SC-SM)
⊙	07	15.0	NP	NP	NP	3	POORLY-GRADED GRAVEL with Sand (GP)
✿	08	6.0	33	23	10	75	LEAN CLAY with Sand (CL)
○	10	3.5	25	19	6	57	Sandy Silty CLAY (CL-ML)
△	10	20.0	NP	NP	NP	7	POORLY-GRADED SAND with Silt (SP-SM)
⊗	10	30.0	30	25	5	50	Sandy SILT (ML)

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

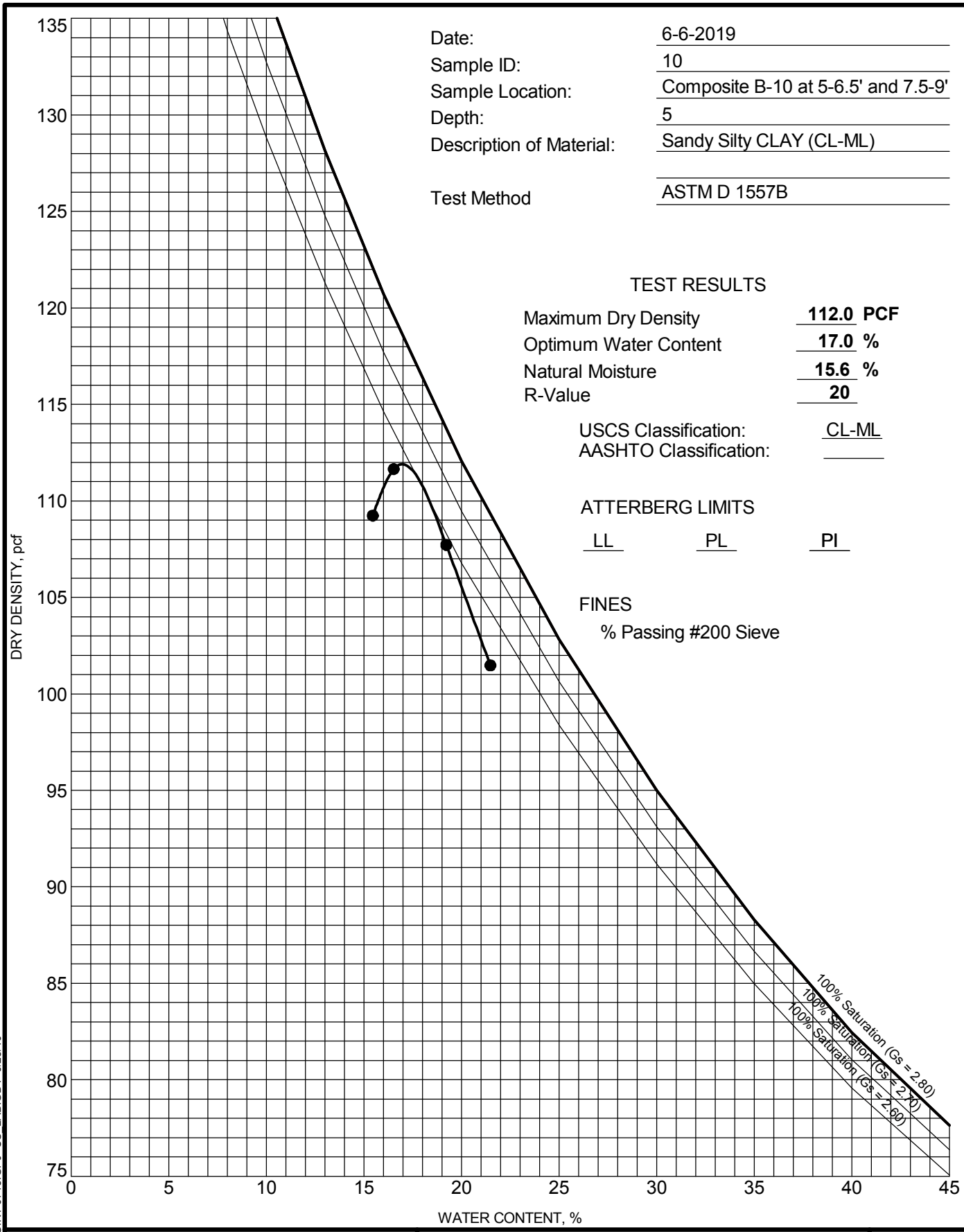
WRF - Exit 298 Lift Station and Force Main

ATTERBERG LIMITS' RESULTS

Job Number: 9718.000 Date: June 2019

PLATE

B-2



Date: 6-6-2019
Sample ID: 10
Sample Location: Composite B-10 at 5-6.5' and 7.5-9'
Depth: 5
Description of Material: Sandy Silty CLAY (CL-ML)

Test Method: ASTM D 1557B

TEST RESULTS

Maximum Dry Density	**112.0**	**PCF**
Optimum Water Content	**17.0**	**%**
Natural Moisture	**15.6**	**%**
R-Value	**20**	

USCS Classification: CL-ML
AASHTO Classification:

ATTERBERG LIMITS

LL	PL	PI

FINES
% Passing #200 Sieve

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

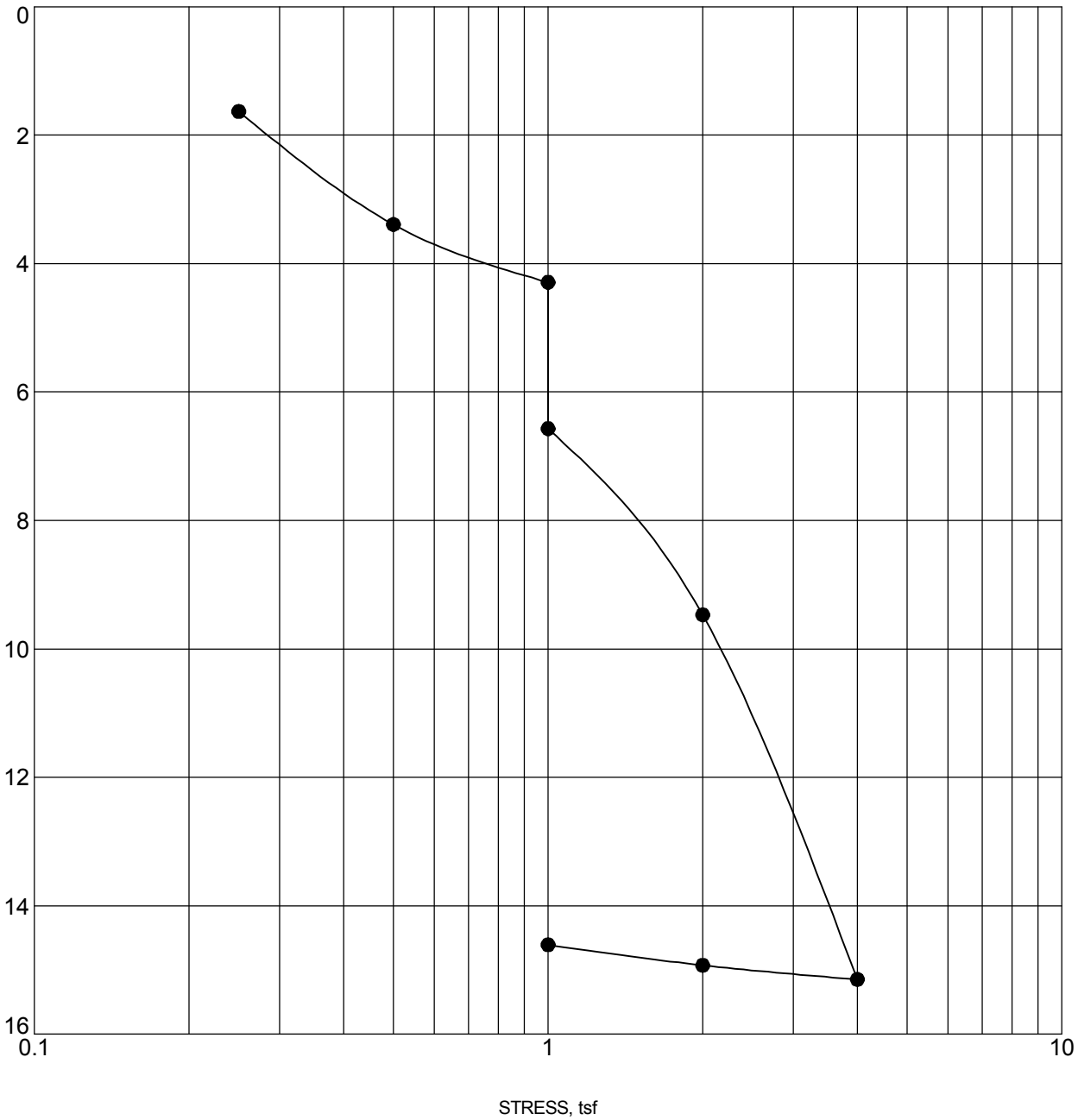
WRF - Exit 298 Lift Station and Force Main

MOISTURE-DENSITY CURVE

Job Number: 9718.000 Date: June 2019

PLATE

B-3



⊙ Field Moisture

● Soaked

Specimen Identification			Classification	γ_d	MC%
●	10	10.5	**Sandy Silty CLAY (CL-ML)**		

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

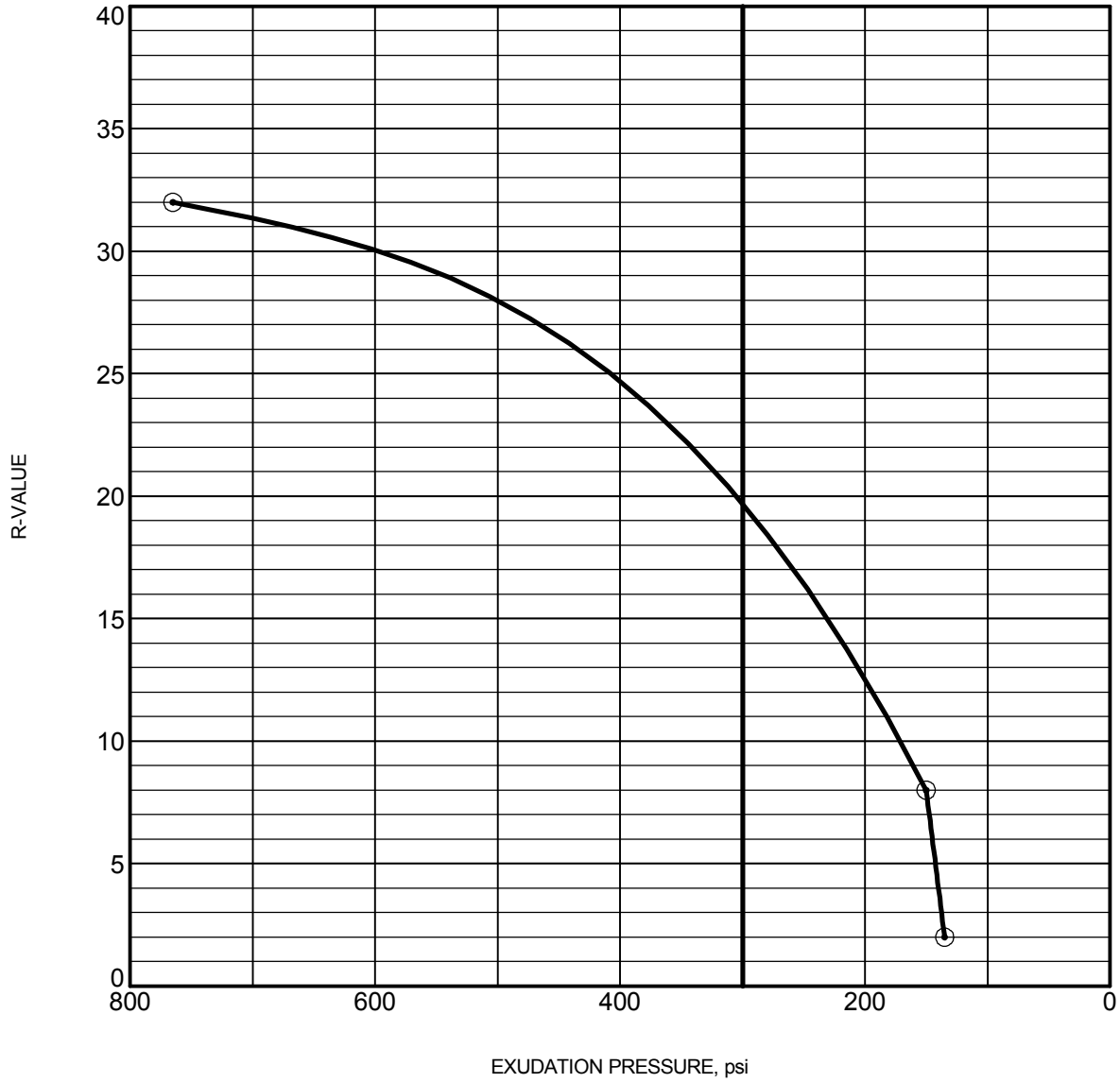
WRF - Exit 298 Lift Station and Force Main

CONSOLIDATION TEST

Job Number: 9718.000 Date: June 2019

PLATE

B-4



Test Data

Specimen No.	Water Content (%)	Dry Density (pcf)	Expansion (psf)	Exudation (psi)	Test R-Value*
1	**20.4**	**104.4**	**0.0**	**135.0**	**2.0**
2	**18.9**	**105.8**	**0.0**	**150.0**	**8.0**
3	**16.3**	**113.3**	**0.0**	**765.0**	**32.0**

* Reported values have been corrected for sample height, where required.

Test Result

Specimen Identification		Classification	R-Value
10	**5.0**	**Sandy Silty CLAY (CL-ML)**	**20**

LUMOS & ASSOCIATES

Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

RESISTANCE VALUE TEST

Job Number: 9718.000 Date: June 2019

PLATE

B-5

Silver State Labs-Reno
1135 Financial Blvd
Reno, NV 89502
(775) 857-2400 FAX: (888) 398-7002
www.ssalabs.com

Analytical Report

Workorder#: **19060291**
Date Reported: **6/19/2019**

Client: Lumos and Associates - Reno
Project Name: 9718.000 / B-3 6'-6.5'
PO #: 9718.000/MTB

Sampled By: Client

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
19060291-01	B-3 6'-6.5'	06/03/2019 11:00	6/5/2019

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	59	mg/Kg	5	MA	06/11/2019 20:58	
pH	SW-846 9045D	9.41	pH Units		AA	06/07/2019 14:23	
pH Temperature	SW-846 9045D	22.0	°C		AA	06/07/2019 14:23	
Resistivity	AASHTO T288	1800	Ohms-cm		MA	06/10/2019 14:32	
Sodium	ASTM D2791	< 0.01	%	0.01	MA	06/18/2019 12:54	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	MA	06/18/2019 14:34	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AA	06/11/2019 15:11	

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
19060291-02	B-6 10.5'-11'	06/03/2019 13:00	6/5/2019

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	27	mg/Kg	5	MA	06/11/2019 23:18	
pH	SW-846 9045D	8.33	pH Units		AA	06/07/2019 14:23	
pH Temperature	SW-846 9045D	22.0	°C		AA	06/07/2019 14:23	
Resistivity	AASHTO T288	2500	Ohms-cm		MA	06/10/2019 14:32	
Sodium	ASTM D2791	< 0.01	%	0.01	MA	06/18/2019 12:54	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	MA	06/18/2019 14:34	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AA	06/11/2019 15:11	

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
19060291-03	B-9 6'-6.5'	06/03/2019 16:00	6/5/2019

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	290	mg/Kg	5	MA	06/11/2019 23:46	
pH	SW-846 9045D	8.41	pH Units		AA	06/07/2019 14:23	
pH Temperature	SW-846 9045D	22.0	°C		AA	06/07/2019 14:23	
Resistivity	AASHTO T288	820	Ohms-cm		MA	06/10/2019 14:32	
Sodium	ASTM D2791	< 0.01	%	0.01	MA	06/18/2019 12:54	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	MA	06/18/2019 14:34	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AA	06/11/2019 15:11	

Silver State Labs-Reno
1135 Financial Blvd
Reno, NV 89502
(775) 857-2400 FAX: (888) 398-7002
www.ssalabs.com

Analytical Report

Workorder#: **19060291**
Date Reported: **6/19/2019**

Client: Lumos and Associates - Reno
Project Name: 9718.000 / B-3 6'-6.5'
PO #: 9718.000/MTB

Sampled By: Client

Laboratory Accreditation Number: NV015/CA2990

Laboratory ID	Client Sample ID	Date/Time Sampled	Date Received
19060291-04	B-10 11'-11.5'	06/04/2019 8:00	6/5/2019

Parameter	Method	Result	Units	PQL	Analyst	Date/Time Analyzed	Data Flag
Chloride	EPA 9056	150	mg/Kg	5	MA	06/12/2019 0:14	
pH	SW-846 9045D	9.01	pH Units		AA	06/07/2019 14:23	
pH Temperature	SW-846 9045D	22.0	°C		AA	06/07/2019 14:23	
Resistivity	AASHTO T288	680	Ohms-cm		MA	06/10/2019 14:32	
Sodium	ASTM D2791	0.01	%	0.01	MA	06/18/2019 12:54	
Sodium Sulfate as Na2SO4	Calculation	< 0.01	%	0.01	MA	06/18/2019 14:34	
Sulfate	SM4500 SO4E	< 0.01	%	0.01	AA	06/12/2019 13:50	

APPENDIX C

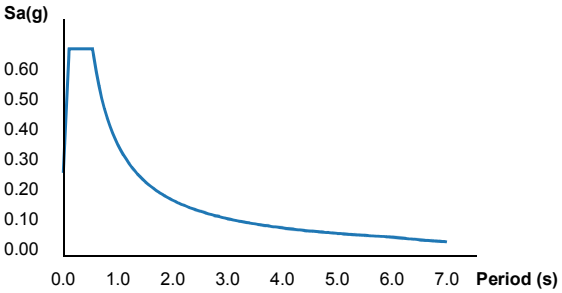
LUMOS & ASSOCIATES

ATC Hazards by Location

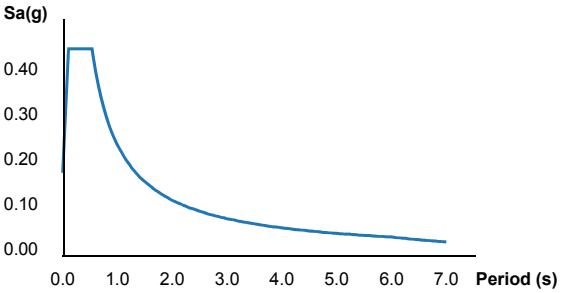
Search Information

Coordinates:	40.81000870595127, -115.82088885871343
Elevation:	5032 ft
Timestamp:	2019-06-25T23:25:51.203Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	III
Site Class:	D-default

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.486	MCE_R ground motion (period=0.2s)
S_1	0.161	MCE_R ground motion (period=1.0s)
S_{MS}	0.686	Site-modified spectral acceleration value
S_{M1}	0.366	Site-modified spectral acceleration value
S_{DS}	0.457	Numeric seismic design value at 0.2s SA
S_{D1}	0.244	Numeric seismic design value at 1.0s SA

Assuming exceptions provided in Section 11.4.8 are applicable to proposed structures, the following parameters may be utilized.

IBC 2018

F_a = 1.4 Table 1613.2.3(1) and Section 1613.2.3

F_v = 2.2 Table 1613.2.3(2)

LUMOS & ASSOCIATES
Lumos & Associates
808 E. College PKWY, Suite 101
Carson City, NV
(775) 883-7077
Fax: (775) 883 7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

SEISMIC DESIGN

Job Number: 9718.000 Date: June 2019

PLATE C-1

APPENDIX D

LUMOS & ASSOCIATES

Job # 9718.000
Client: City of Elko
Description: Asphalt Concrete Pavement Calculations for the Lift Station Parking Lot
By: P. McCreary

R-Value for Native Sandy Silty CLAY = 20
R-Value for Structural Fill = 45 (Specified)
R-Value for Gravel (Type II, Class B) = 70

T.I. = 5.0

G_f = 2.5
GE = 0.0032(TI)(100-R)
tl_{ayer} = GE/Gf

GE_{AC}= 0.0032(5.0)(100-70) = 0.48'
t_{AC}= 0.48/(2.5)*(12") = 2.3" => use 3" asphalt
$t_{AC(actual)}$= (3)(2.5)/12" = 0.63'

$GE_{AB(70)}$= 0.0032(5.0)(100-45) = 0.88'
t_{AB}= (0.88-0.63)(12")/1.1 = 2.78" => use 4" aggregate base
$t_{AB(actual)}$= (4)(1.1)/12" =0.37'

$GE_{SF(45)}$= 0.0032(5.0)(100-20) = 1.28'
t_{AB}= (1.28-0.63-0.37)(12") = 3.46" => use 12" structural fill

Therefore, 3" of Asphalt Concrete (AC) underlain by a minimum of 4" of Aggregate Base, underlain by 12" of properly prepared structural fill will be suitable for paved areas to receive light vehicle traffic.

T.I. = 6.0

G_f = 2.32
GE = 0.0032(TI)(100-R)
t_{layer} = GE/Gf

GE_{AC}= 0.0032(6.0)(100-70) = 0.58'
t_{AC}= 0.58/(2.32)*(12") = 2.76" => use 4" asphalt
$t_{AC(actual)}$= (4)(2.32)/12" = 0.77'

$GE_{AB(70)}$= 0.0032(6.0)(100-45) = 1.06'
t_{AB}= (1.06-0.77)(12")/1.1 = 3.1" => use 6" aggregate base
$t_{AB(actual)}$= (6)(1.1)/12" =0.55'

$GE_{SF(45)}$= 0.0032(6.0)(100-20) = 1.54'
t_{AB}= (1.54-0.77-0.55)(12") = 2.64" => use 12" structural fill

Therefore, 4" of Asphalt Concrete (AC) underlain by a minimum of 6" of Aggregate Base, underlain by 12" of properly prepared structural fill will be suitable for paved areas to receive truck traffic.

LUMOS & ASSOCIATES
Lumos and Associates
808 E. College Parkway
Carson City, NV 89706
(775) 883-7077
Fax: (775) 883-7114
mburns@lumosinc.com

WRF - Exit 298 Lift Station and Force Main

PAVEMENT DESIGN

Job Number: 9718.000

Date: June 2019

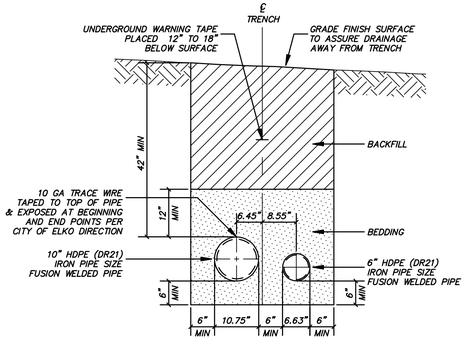
PLATE

D-1

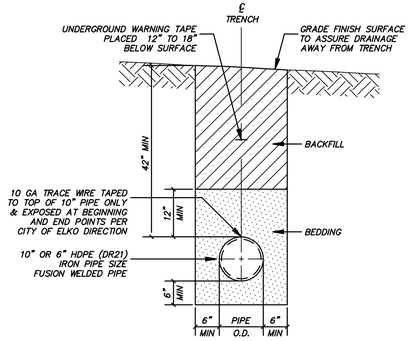
Attachment B – Cast In Place Sewer Manhole Details

HIGH DESERT ENGINEERING LLC
CONSULTING ENGINEERING & SURVEYING
640 IDAHO STREET
ELKO, NEVADA 89801
(775) 738-4053

LUMOS & ASSOCIATES
209 N. CURRY ST., STE. 200
CARSON CITY, NV 89703
TEL: 775.883.7077
WWW.LUMOSINC.COM



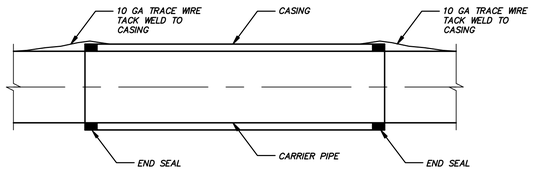
TRENCH DETAIL – DUAL FORCE MAINS (1 / D1.5)



TRENCH DETAIL – SINGLE FORCE MAIN (2 / D1.5)

1. WATER DENSIFIED BACKFILL AND TUNNELING SHALL NOT BE ALLOWED.
2. BACKFILL IN STRUCTURAL AREAS SHALL MEET THE REQUIREMENTS FOR CLASS "E" BACKFILL WITH NO ROCKS OVER 4", COMPACTED IN 6" (MAX) LIFTS TO 90% (MIN) OF MAXIMUM COMPACTION (ASTM D-1557).
3. BACKFILL IN NON-STRUCTURAL AREAS SHALL CONSIST OF NATIVE MATERIALS COMPACTED IN 6" (MAX) LIFTS TO 90% (MIN) OF MAXIMUM COMPACTION (ASTM D-1557).
4. BEDDING MATERIAL FOR HDPE PIPE UNDER NORMAL CONDITIONS SHALL BE CLASS "A" BACKFILL AS SPECIFIED IN THE STANDARD SPECIFICATIONS.
5. CLASS "A" BACKFILL MATERIAL SHALL BE COMPACTED TO 90% (MIN) OF MAXIMUM COMPACTION (ASTM D-1557).
6. BEDDING MATERIAL FOR HDPE PIPE LOCATED BELOW THE WATER TABLE SHALL BE CLASS "C" BACKFILL AS SPECIFIED IN THE STANDARD SPECIFICATIONS, AND SHALL BE EXTENDED TO AN ELEVATION AT LEAST ONE (1) FOOT ABOVE GROUNDWATER ELEVATION. CLASS "C" BACKFILL SHALL BE WRAPPED IN MORFIN 180N NONEVENT GEOMETRIES, OR APPROVED EQUAL.
7. CLASS "C" BACKFILL MATERIAL SHALL BE COMPACTED WITH A VIBRANT PLATE TO THE SATISFACTION OF THE GEOGRAPHICAL ENGINEER.
8. FOR TRENCHES IN ROADWAY SECTION, SEE TRENCH PATCH DETAILS.
9. ALL TRENCHES EXCAVATIONS SHALL CONFORM TO THE LATEST O.S.H.A. AND M.U.T.C.D. REQUIREMENTS.
10. UNDERGROUND WARNING TAPE SHALL BE METALLIC AND APPROPRIATELY LABELED AND COLORED.
11. THE CONTRACTOR SHALL NOT HAVE AN OPEN OR UNATTENDED TRENCH AT ANY TIME.

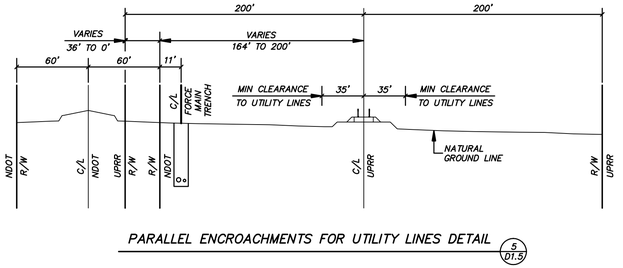
FORCE MAIN TRENCH EXCAVATION AND BACKFILL NOTES: (3 / D1.5)



NOTES:

1. STEEL CASING JOINTS TO BE WELDED IN A MANNER TO INSURE NO WELD BEADS ARE CREATED ON INSIDE OF CASING PIPE.
2. INSIDE OF CASING TO BE CLEANED OF ALL DEBRIS PRIOR TO INSERTING HDPE PIPE INTO STEEL CASING.
3. HDPE BUTT FUSION WELD BEADS TO BE REMOVED FROM OUTSIDE OF HDPE PIPE PRIOR TO INSERTING HDPE PIPE INTO STEEL CASING.
4. ENDS OF CASINGS TO BE SEALED USING AVANT AV-219 OAKUM AND AV-202 MULTIFARIOUS APPLIED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS, OR APPROVED EQUAL. CONTACT AVANT INTERNATIONAL AT WWW.AVANTIGROUT.COM: (281) 486-5600

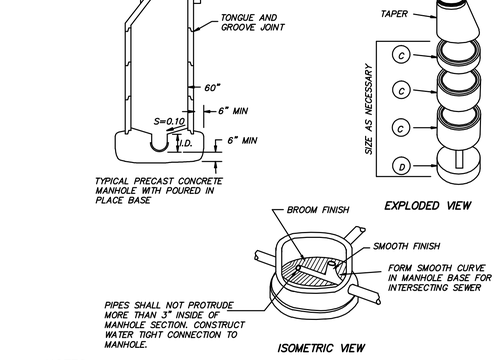
INSTALLATION THROUGH CASINGS (4 / D1.5)



PARALLEL ENCROACHMENTS FOR UTILITY LINES DETAIL (5 / D1.5)

PRECAST MANHOLE COMPONENTS SHALL CONFORM TO ASTM C-478

SYM	ITEM
A	RING & COVER
B	GRADE ADJUSTING
C	PRECAST MANHOLE SECTION
D	BASE
TAPER HEIGHT = 36"	



NOTES:

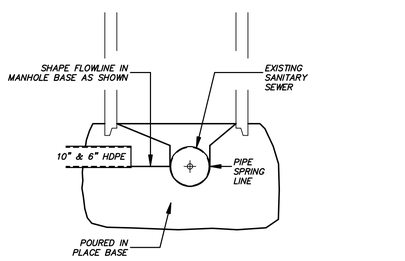
1. ALL MANHOLES SHALL MEET THE REQUIREMENTS OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
2. MANHOLE COVERS SHALL BE IDENTIFIED AS STORM DRAIN, WATER OR SEWER CLEARLY DISPLAYED ON THE COVER.
3. PRECAST MANHOLE SECTIONS, OTHER THAN GRADE RINGS, SHALL BE JOINED WITH FLEXIBLE PLASTIC GASKET MATERIAL SUCH AS "RAM-NEK" OR EQUAL AS PER MANUFACTURER'S RECOMMENDATIONS.
4. TYPE & SIZE OF MANHOLE TO BE CONSTRUCTED IN A PARTICULAR LOCATION SHALL BE DETERMINED BY THE PIPE SIZE, ALIGNMENT AND GRADE AS FOLLOWS:

   TYPE 1 & 2

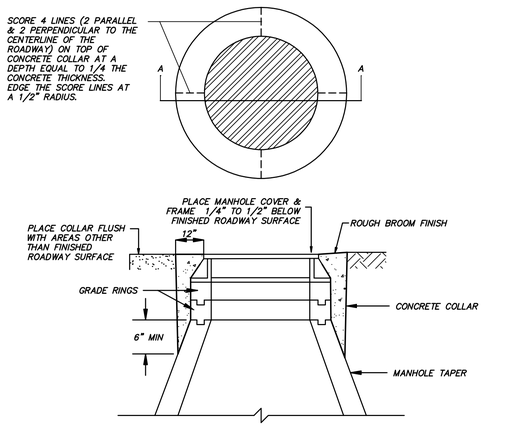
   48" SIZE
   A. ALL CASES FOR PIPE 18" AND SMALLER
   B. 24" AND SMALLER PIPE ON TANGENT LINE & GRADE

   60" SIZE
   A. 27" THROUGH 36" PIPE ON TANGENT LINE & GRADE
   B. 21" THROUGH 27" PIPE AT ANGLE POINTS & CHANGES IN GRADE OR PIPE SIZE
5. EXCAVATABLE SLURRY BACKFILL MAY BE USED AS STRUCTURAL BACKFILL FOR MANHOLES AND MUST MEET THE REQUIREMENTS OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
6. THE TOTAL HEIGHT OF MANHOLE GRADE RINGS SHALL NOT EXCEED 12 INCHES.
7. PIPE SECTION LENGTHS ARRANGED TO FIT DEPTH.
8. PRECAST BASE MAY BE USED IF APPROVED BY GOVERNING AGENCY. PRECAST BASE NOT ALLOWED FOR RECEIVING MANHOLE.
9. ECCENTRIC OR CONCENTRIC CONE MAY BE USED.

TYPE 1 MANHOLE (6 / D1.5)



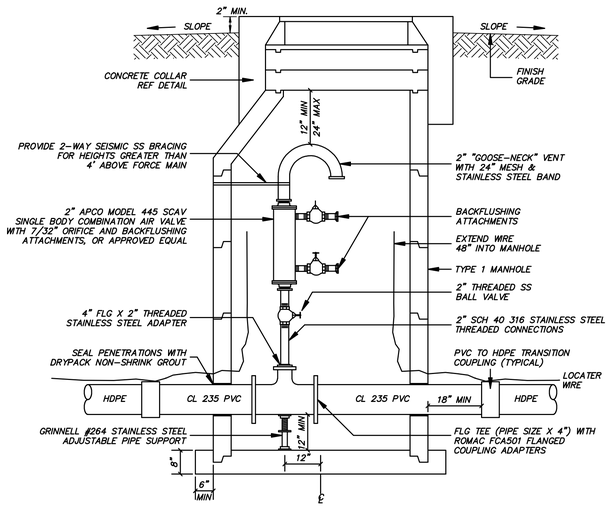
RECEIVING MANHOLE BASE DETAIL (7 / D1.5)



NOTES:

1. CONCRETE SHALL MEET THE REQUIREMENTS OF SECTION 337.10 OF THE LATEST EDITION OF THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION.
2. MANHOLE COLLAR SHALL BE SET 1/4" TO 1/2" BELOW FINISHED CONCRETE OR BITUMINOUS SURFACE. MANHOLE COLLARS IN ALL OTHER AREAS SHALL BE SET FLUSH WITH FINISHED GRADE, UNLESS OTHERWISE SPECIFIED.
3. CONCRETE COLLAR IS REQUIRED WHEN MANHOLE IS NOT LOCATED IN CONCRETE OR BITUMINOUS SURFACE.
4. REFER TO MANHOLES – GENERAL NOTES FOR ADDITIONAL INFORMATION.

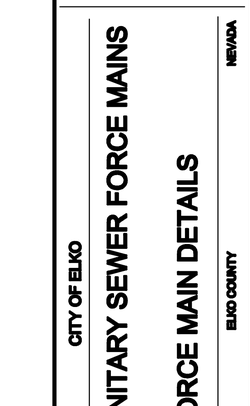
MANHOLE COLLAR DETAIL (8 / D1.5)



NOTES:

1. MANHOLE TO BE 5' DIAMETER.
2. AIR RELEASE VALVES FOR BOTH THE 6" AND THE 10" FORCE MAIN SHALL BE INSTALLED IN THE SAME MANHOLE.
3. CONTRACTOR TO PROVIDE SUBMITTALS ON ALL COMPONENTS.
4. MARK LOCATION OF MANHOLE WITH CARSONITE MARKER.

FORCE MAIN AIR RELEASE / VACUUM VALVE MANHOLE (9 / D1.5)



CITY OF ELKO

EXIT 298 SANITARY SEWER FORCE MAINS

FORCE MAIN DETAILS

ELKO COUNTY NEVADA

REV	DATE	DESCRIPTION	BY

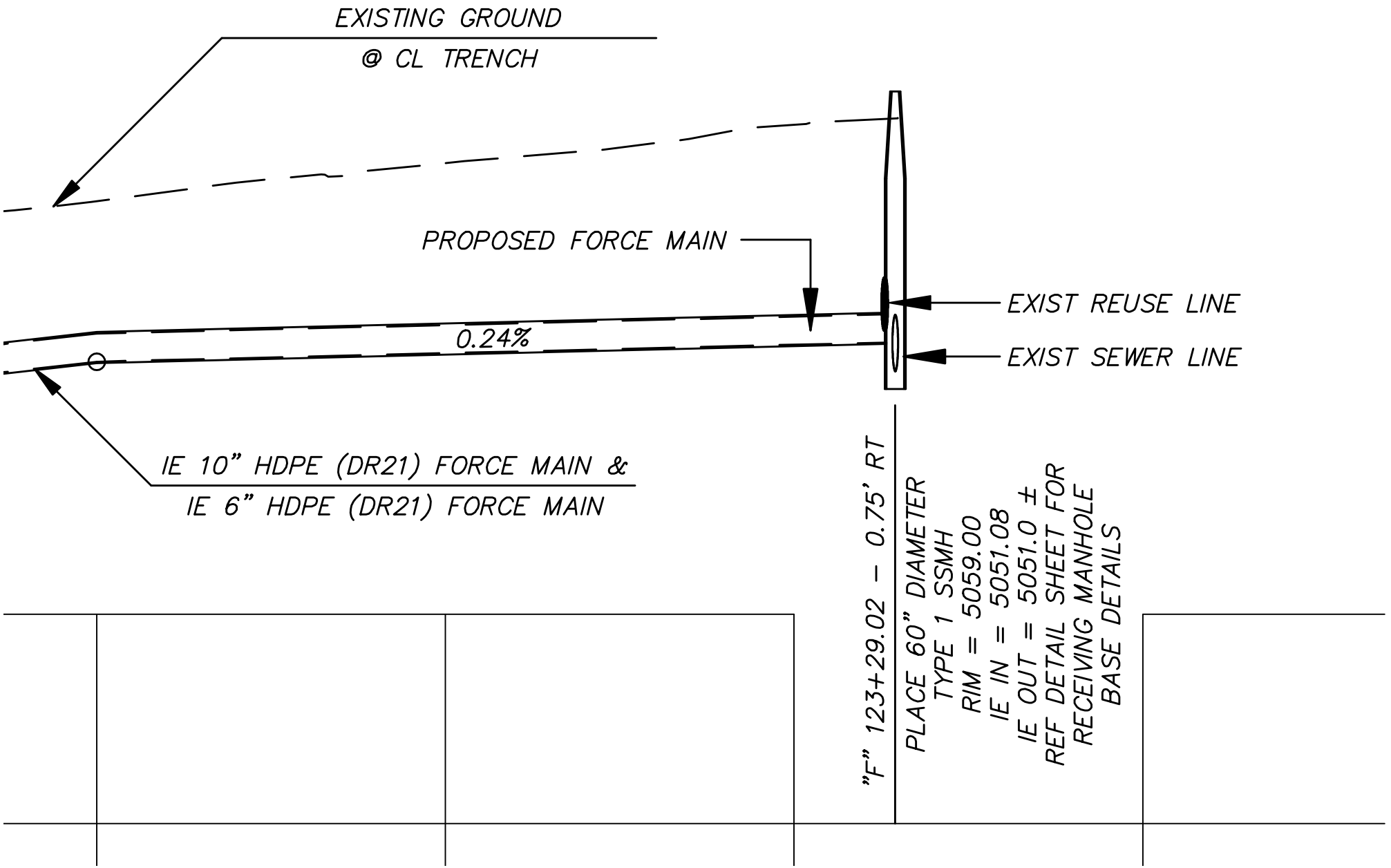
90% DESIGN
NOT FOR CONSTRUCTION
OCTOBER, 2019

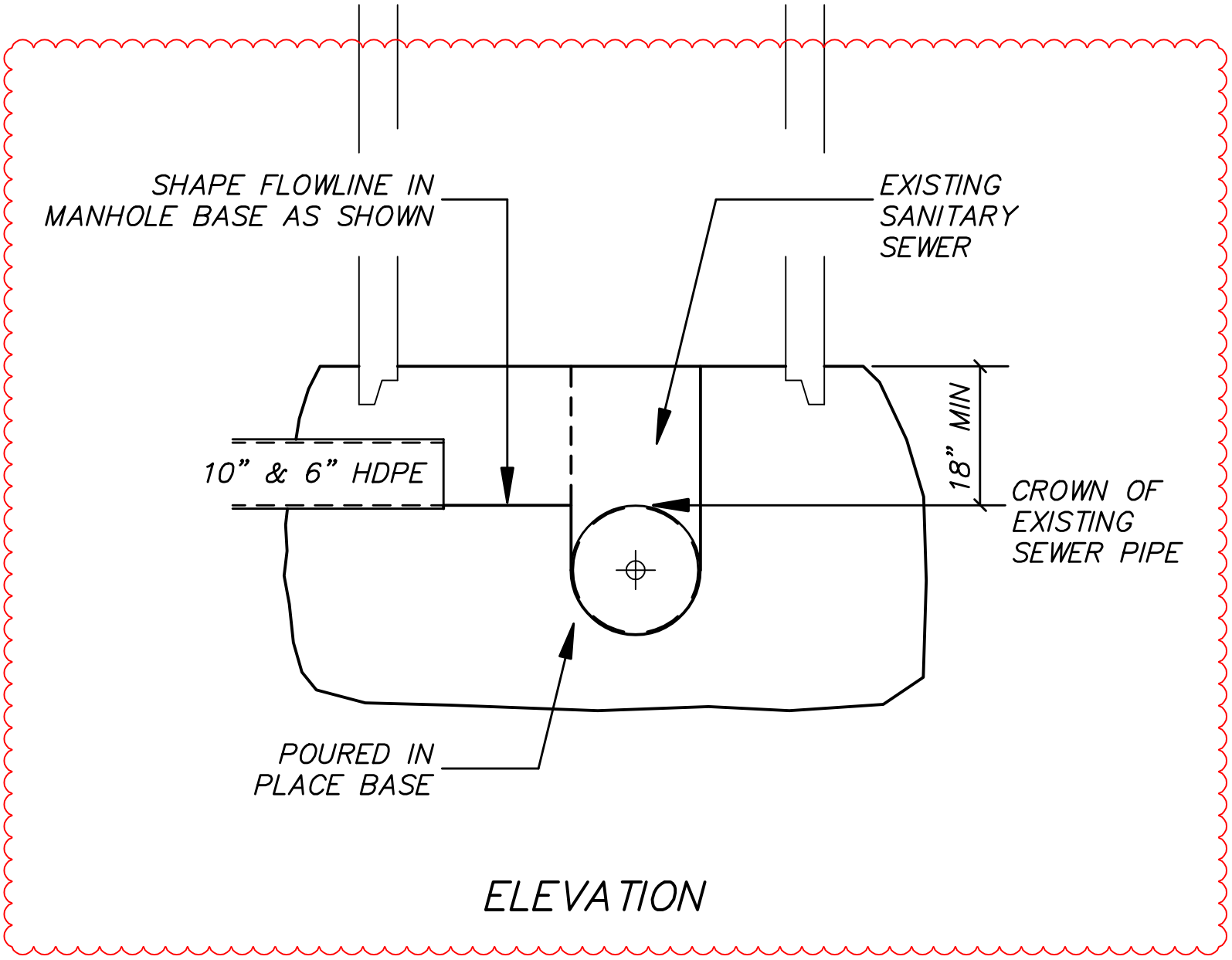
BAR IS 1 INCH ON ORIGINAL DRAWING
0 1IN

IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

D1.5

DRAWN BY:	TCB
DESIGNED BY:	TCB
CHECKED BY:	
JOB NO.:	5782
SHEETS:	


EXISTING GROUND
@ CL TRENCH
PROPOSED FORCE MAIN
EXIST REUSE LINE
0.24%
EXIST SEWER LINE
IE 10" HDPE (DR21) FORCE MAIN &
IE 6" HDPE (DR21) FORCE MAIN
"F" 123+29.02 - 0.75' RT
PLACE 60" DIAMETER
TYPE 1 SSMH
RIM = 5059.00
IE IN = 5051.08
IE OUT = 5051.0 ±
REF DETAIL SHEET FOR
RECEIVING MANHOLE
BASE DETAILS

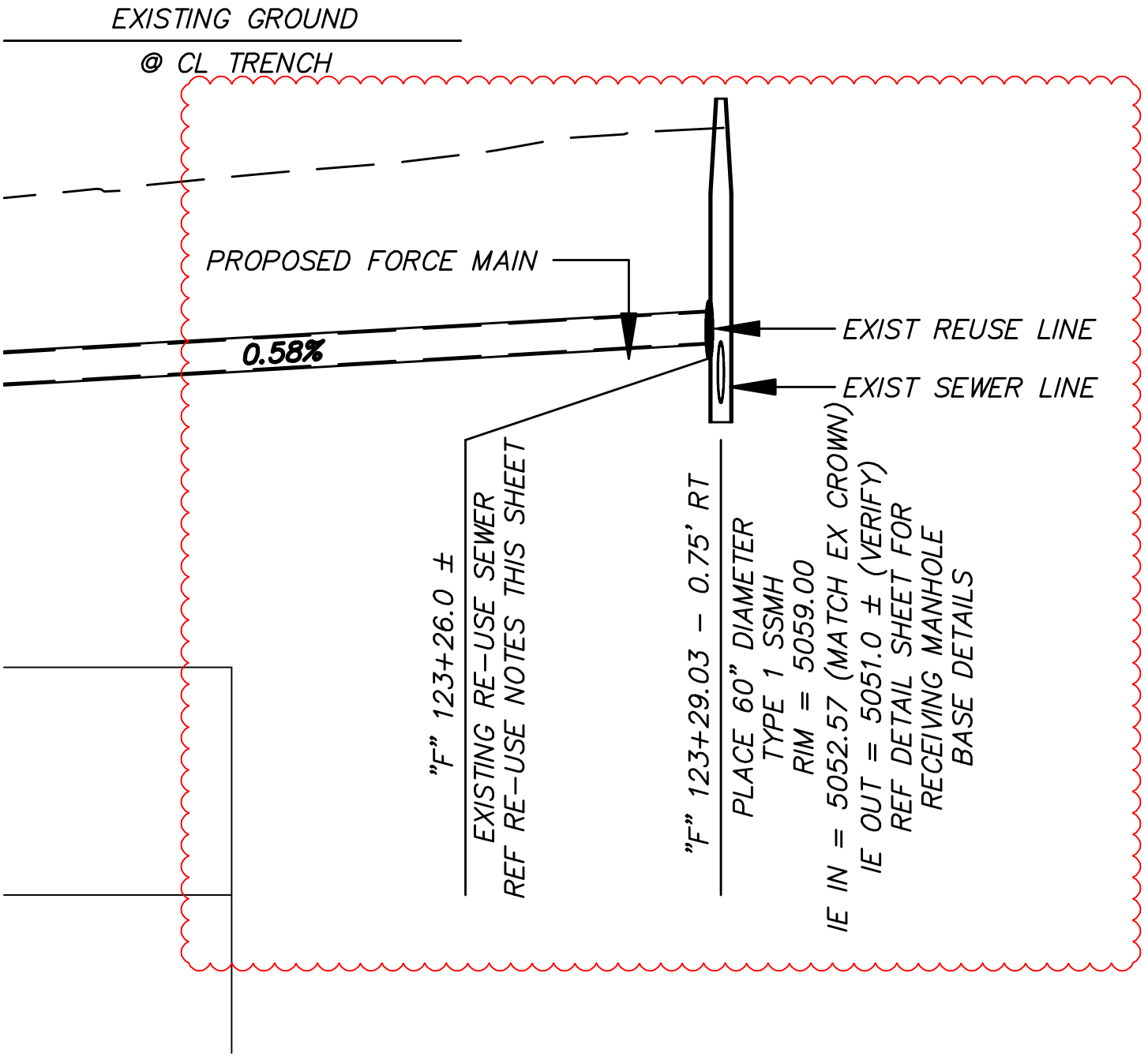

SHAPE FLOWLINE IN MANHOLE BASE AS SHOWN
EXISTING SANITARY SEWER
10" & 6" HDPE
18" MIN
CROWN OF EXISTING SEWER PIPE
POURED IN PLACE BASE

ELEVATION

RE-USE SEWER NOTES:

1. CONTRACTOR TO VERIFY SIZE & LOCATION OF EXISTING SANITARY SEWER RE-USE LINE AND PREPARE SUBMITTAL OUTLINING PROCEDURES AND TIMING FOR RELOCATING SAID LINE AROUND NEW RECEIVING MANHOLE.

2. EXISTING SANITARY SEWER REUSE LINE CAN BE TAKEN OUT OF SERVICE BY THE CITY OF ELKO WHILE CONTRACTOR IS RELOCATING SAID LINE.


EXISTING GROUND
@ CL TRENCH
PROPOSED FORCE MAIN
0.58%
EXIST REUSE LINE
EXIST SEWER LINE
"F" 123+26.0 ±
EXISTING RE-USE SEWER
REF RE-USE NOTES THIS SHEET
"F" 123+29.03 – 0.75' RT
PLACE 60" DIAMETER
TYPE 1 SSMH
RIM = 5059.00
IE IN = 5052.57 (MATCH EX CROWN)
IE OUT = 5051.0 ± (VERIFY)
REF DETAIL SHEET FOR
RECEIVING MANHOLE
BASE DETAILS

Attachment C – NDOT Emergency Repair Plan

Response Plan for Emergency Repairs

Permit Type: ROW Encroachment **Date:** 9/5/2023 **Permit Number:** 216898 SR 535

Emergency Response Plan: Please describe your approach if a failure for said permit would occur.

1. In the event of a roadway surface or pavement failure during boring operations, the Contractor will notify NDOT staff immediately.
2. The Contractor will take steps to shut down traffic and coordinate with NDOT staff to reroute traffic using MUTCD policies and procedures.
3. The Engineer of Record will prepare Civil Improvement Plans to restore the failure area to pre-project conditions.

Permittee must notify NDOT as soon as possible once they become aware of the failure.
Acknowledged

Permittee must follow MUTCD policies and procedures when implementing emergency traffic control if failure occurs.
Acknowledged

Once failure is stabilized, permittee will submit applicable plans to restore NDOT Right-of-Way to prior conditions.
Acknowledged

Contact Information:

Permittee Name: Dale Johnson Utilities Director City of Elko ***Email:*** djohnson@elkocitynv.gov ***Phone Number:*** 775-777-7212

Emergency Contact Information:

Name: Cami Jackson ***Email:*** cjackson@lumosinc.com ***Phone Number:*** 916.980.8228