

ADDENDUM #1 2025 STREET REHABILITATION UNIT 1 – KATE SMITH NEIGHBORHOOD PHASE 2 – FEDERALLY FUNDED BID # 24/25-016 / PWP # WA-2025-358 BIDS DUE NO LATER THAN: 1:45 PM ON MAY 28, 2025 PUBLIC BID OPENING: 2:00 PM ON MAY 28, 2025

This addendum is to notify all potential proposers of clarifications made to the Bid documents as stated below.

- A) Geotechnical Investigation Reports Titled (Total of 3 separate reports):
 - a. City of Sparks FY25 Unit 1 Dated February 2024 by Lumos & Associates, Inc.
 - b. City of Sparks FY24 Unit 2 Dated February 2024 by Lumos & Associates, Inc.
 - c. City of Sparks FY25 Street Rehabilitation Dated November 2024 by Lumos & Associates, Inc.

Please note and adjust your bid according to the revisions, additions, deletions, clarifications, or modifications as presented on this Addendum #1, which are made a part of this bid. NOTE: To avoid disqualification, this Addendum 1 (and any other addenda) must be signed by an authorized representative of the bidding firm in the space provided and must be submitted with your firm's sealed proposal. Failure to return this addendum, duly signed, may be cause for rejection of the bid. ALL ADDENDA SHOULD BE SIGNED AND PLACED IN SEQUENTIAL ORDER AND ATTACHED TO THE FRONT OF THE BID PACKAGE, COMPLETE WITH ALL REQUIRED DOCUMENTS.

CONTRACTOR BUSINESS NAME

Amber Sosa, P.E. City Engineer

X_____Authorized Signature

May 16, 2025

Printed Name of Person Signing

GEOTECHNICAL INVESTIGATION REPORT

CITY OF SPARKS FY25 UNIT 1 SPARKS, NV

11500.154

FEBRUARY 2024

PREPARED FOR:

CITY OF SPARKS DEPARTMENT OF PUBLIC WORKS ATTN: BOB SCHRICKER 431 PRATER WAY SPARKS, NV 89431

PREPARED BY: LUMOS & ASSOCIATES, INC. 808 E. COLLEGE PARKWAY, SUITE 101 CARSON CITY, NV 89706 775.883.7077



GEOTECHNICAL INVESTIGATION REPORT CITY OF SPARKS FY25 UNIT 1 SPARKS, NV

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CITY OF SPARKS FY25 UNIT 1 SPARKS, NV

1.0 INTRODUCTION

This report presents the results of Lumos & Associates, Inc.'s Geotechnical Analysis for the proposed roadway rehabilitation project located in Sparks, NV. 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 roadway reconstruction. Roadway reconstruction operations include asphalt pavement replacement and roadbed modification on the existing asphalt, aggregate base, and/or underlying soils. Plate 2 shows the project streets scheduled for reconstruction. 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 pavement design. In addition, information such as logs of all explorations (Appendix A) and laboratory test data (Appendix B) are provided in this report.



2.0 GEOLOGIC SETTING

The proposed project is located in the northeastern section of the Truckee Meadows, a broad valley bounded on the west by the tall granitic and volcanic peaks of the Sierra Nevada Mountains (Carson Range), and on the east by the by the lower volcanic peaks of the Virginia and Pah Rah Range. Younger volcanic hills also bound the valley on the north and south. Faults bound the valley from the mountains as is typical of the Basin and Range province. Sediments have filled the valley from a number of tributaries and ancestral lakes during the Quaternary period (2 million years ago to present day). The dominant sediment source has been and continues to be, the Truckee River and its ancestral counterparts. Stream deposits were particularly voluminous after glacial periods. Since the end of the last glacial period, some 10,000 years ago, arid erosional forces combined with faulting have been the predominant processes to shape the region. These processes have created large alluvial fans that surround the valley floor of the Truckee Meadows.

In 2011 the near surface geology of the Reno/Sparks area was mapped by Ramelli, Henry, and Walker. Their mapping shows undivided younger and older Tahoe age fluvial deposits (Qrt) and Tioga age fluvial deposits (Qr2) underlie the site. Both of these deposits are Truckee River deposits which generally are comprised of poorly bedded gravels, sands, and fine grained soils. Plate 3 shows their mapping.



3.0 SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation the project roadways had been previously paved with asphalt concrete. Where visible, the project streets generally had moderate alligator cracking, moderate surface wear, and moderate block cracking.

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

Our subsurface investigation included seven (7) test pits located within the project streets. Test pit explorations were excavated to a maximum depth of five (5) feet below existing grade (b.e.g.). Additionally, seven (7) core hole explorations were conducted within the existing project streets. Core hole explorations were dug to a maximum depth of two (2) feet. The locations of the exploratory excavations within the proposed site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnician in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected at each material change within the test pit and core hole locations. Soil samples were subsequently transported to our Reno geotechnical laboratory for testing and additional analysis.

The native soils encountered consisted generally of clayey sands (SC), silty sands (SM), poorly graded sand with silt (SP-SM), Silty Gravel (GM), and clayey gravels (GC). Aggregate base was only encountered in six of the fourteen explorations. The direct asphalt supporting material varied between aggregate base, clayey gravel, silty sand, and clayey sand materials. Table 1 on the next page presents the existing pavement sections within the project streets.



Exploration	Asphalt (inches)	Direct Supporting Layer (inches)	Subgrade	Exploration	Asphalt (inches)	Direct Supporting Layer (inches)	Subgrade
Core #1	2.25	1.75 (Base)	SM	Test Pit #1	2.5	14 (SM)	SC
Core #2	4.5	7.5 (SM)	SM & SP-SM	Test Pit #2	4	8 (SM)	SC & GM
Core #3	3.5	1.75 (Base)	SM & SC	Test Pit #4	4	6 (SM)	GC
Core #4	4	+14 (SM)	-	Test Pit #5	4	4 (Base)	SM & GM
Core #7	5	7 (SC)	SP-SM	Test Pit #6	4.25	10 (GC)	SP-SM
Core #8	4	4 (Base)	SM & GC	Test Pit #7	4.5	6 (Base)	SC
Core #10	4	9 (SM)	SC	Test Pit #8	5	6 (Base)	SM

TABLE 1THICKNESSES OF EXISTING PAVEMENT SECTIONS



4.0 FIELD AND LABORATORY TEST DATA

Laboratory tests performed on representative samples included sieve analysis (including fines), Atterberg limits, R-value, expansion index, and sulfate content. Much of this data is displayed on the "logs" of the subsurface explorations to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the subsurface explorations are included in Appendix A of this report as Plates A-1 through A-14. A key to the logs, explaining the symbols and nomenclature, is included as Plate A-15.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-4. 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.

4.1 Analytical Testing: Western Environmental Testing Laboratory (WET Lab) of Sparks, Nevada conducted the sulfate content laboratory testing. Test results are included (on WET Lab letterhead) in Appendix B on Plate B-4.

Laboratory prepared cement treated pulverized asphalt/base/subgrade compression specimens were compacted and tested. Specimens were comprised of thirty-five percent (35%) pulverized asphalt, fifteen percent (15%) aggregate base, forty percent (40%) silty sand, and ten percent (10%) clayey sand in order to simulate the existing pavement section. Specimen cement contents were 2%, 4%, and 6% by dry weight of the maximum dry density. Cement treated materials compression results are provided in Appendix D.

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.



5.0 DISCUSSION AND RECOMMENDATIONS

5.1 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 and laboratory testing phases 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.

5.2 General Site Grading

5.2.1 Clearing and Grubbing

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 not anticipated under the existing roadway. Clearing and grubbing may be required if improvements will be placed outside of the existing roadway. Where required, clearing and grubbing is anticipated to be as much as six (6) 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 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, the re-compacted surface should be proof-rolled to identify any possible yielding surfaces. Proofrolling 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.

5.2.2 Unsuitable Subgrade Mitigation

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, the 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 twelve (12) inches of four (4) to six (6) 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.



5.2.3 Structural Fill

Properly compacted structural fill soils to be used on site should consist of non-expansive materials (LL less than 35 and/or a PI less than 12 and/or Expansion Index less than 20), have an R-Value of at least 30, should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than three inches in largest dimension. All structural fill soils shall also be non-corrosive and have a water soluble sulfate content of less than 0.1%. Structural fill soils shall also meet the following gradation requirements (Table 1):

Sieve Size	% Passing
4″	100
3/4″	70 - 100
#40	15 - 65
#200	5 – 35

TABLE 2 STRUCTURAL FILL BACKFILL GRADATION

Import structural fill soils should be tested and approved prior to being placed or delivered onsite (**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 re-compacted to a minimum of **ninety percent (90%)** as determined by the ASTM D1557 Standard.



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Structural fill 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.

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 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.



6.0 PAVEMENT DESIGN

6.1 Pulverization, Cement Treatment, and Asphalt Concrete

Lumos recommends pulverizing the existing asphalt, aggregate base, and/or subgrade soils to a depth of twelve (12) inches. The pavement structural section was determined for the asphalt concrete utilizing a resistance value (R-Value) of 3 (Native Clayey Gravel with Sand) and an R-Value of 80 for the cement treated recycled aggregate base. For this project, we have assumed a Traffic Index (TI) value of 5 due to the anticipated low traffic volume. Refer to Table 3 for the recommended asphalt pavement section. The pulverized material shall meet the gradation requirements of Type 1 Recycled Aggregate Base. The pulverized material shall be regraded to accommodate four (4) inches of asphalt. The remaining eight (8) inches of pulverized material shall be cement treated. The regraded pulverized material shall be moisture conditioned to at least two percent (2%) over optimum, six and one-half percent (6.5%) cement added by dry weight of aggregate, and compacted to a minimum of **ninety-five percent (95%)** relative density of the ASTM D1557 standard. The compacted cement treated pulverized material shall be sealed with a coat of CSS applied at a rate of between 0.15 gallons to 0.25 gallon per squareyard within twenty-four (24) hours of compaction. The cement treated pulverized material shall be kept moist until the cure seal is placed. Following placement of the cure the prepared material shall be allowed to cure for a minimum of seven (7) days and reach a compressive strength of at least three-hundred pounds per square inch (300 psi) prior to paving. Immediately prior to paving, the cement treated pulverized materials shall be "microcracked", utilizing a vibratory roller. Microcracking shall be completed prior to paving and to the satisfaction of the Geotechnical Engineer. See Appendix C and D for the Pavement Calculations and Cement Treated Specimen Compression Test Data.

TRAFFIC INDEX	PULVERIZATION DEPTH	CEMENT TREATED RECYCLED BASE THICKNESS	ASPHALT THICKNESS
5	12″	8″	4″

TABLE 3 PULVERIZATION REQUIREMENTS AND PAVEMENT STRUCTURAL SECTION



We recommend a Type III, PG64-28NV, 50 blow Marshall mix targeting three percent (3%) air voids. The asphalt concrete shall be compacted to between ninety-three percent (93%) and ninety-eight percent (98%) of the theoretical maximum ("Rice") specific gravity.

7.0 CORROSION AND CHEMICAL ATTACK

Tested soils have a mild sulfate content of 150 parts per million. However, Type II cement (meeting ASTM C150) is recommended for all concrete and cement in direct contact with on-site soil.

All exterior concrete should have between four and one half and seven and one-half percent (4.5%-7.5%) 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 compressive strength of 4,000 psi is recommended for all external concrete. All concrete shall be placed pursuant to ACI recommendations.



8.0 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.

9.0 CONSTRUCTION SPECIFICATIONS

All work shall be governed by the latest adopted revision of the Standard Specifications and Standard Details for Public Works Construction, as distributed by The City of Sparks, except as modified herein.



10.0 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 The City of Sparks ("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.



GEOTECHNICAL INVESTIGATION REPORT

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.



Jeremy Macaluso, P.E. 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), 2020, Annual Book of ASTM Standards, West Conshohocken, PA
- Caltrans, Highway Design Manual, March 20, 2020, Topic 633 Engineering Procedures for New Construction and Reconstruction

Naval Facilities Engineering Command, 1986, Design Manual 7.01

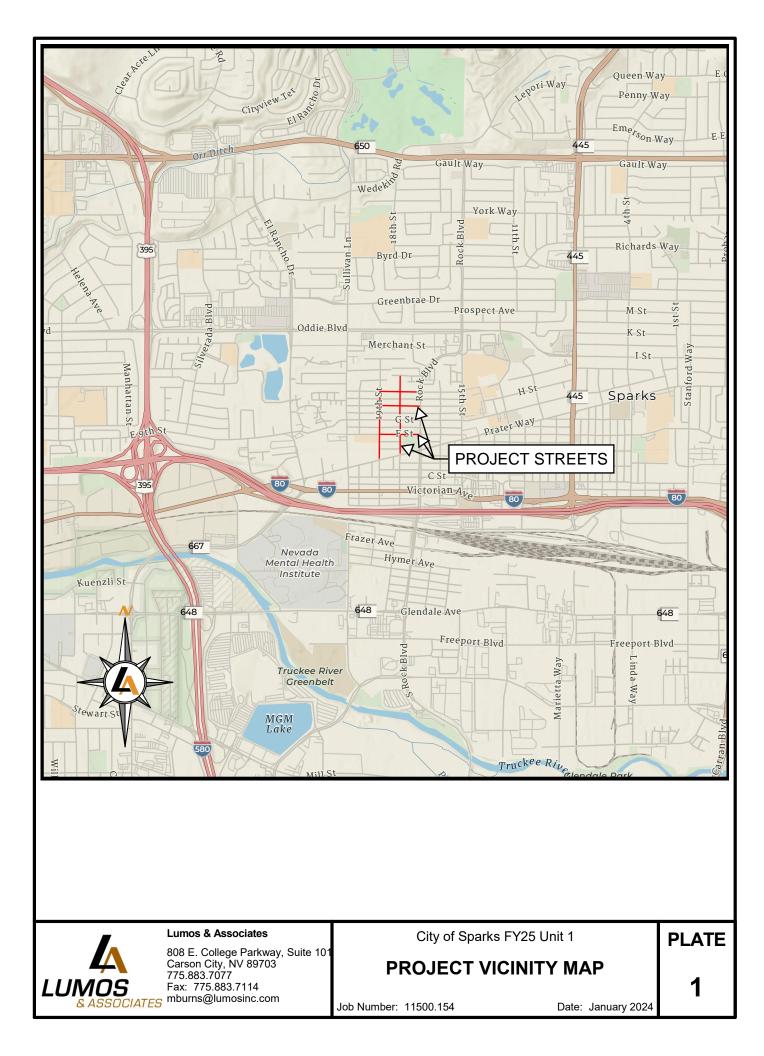
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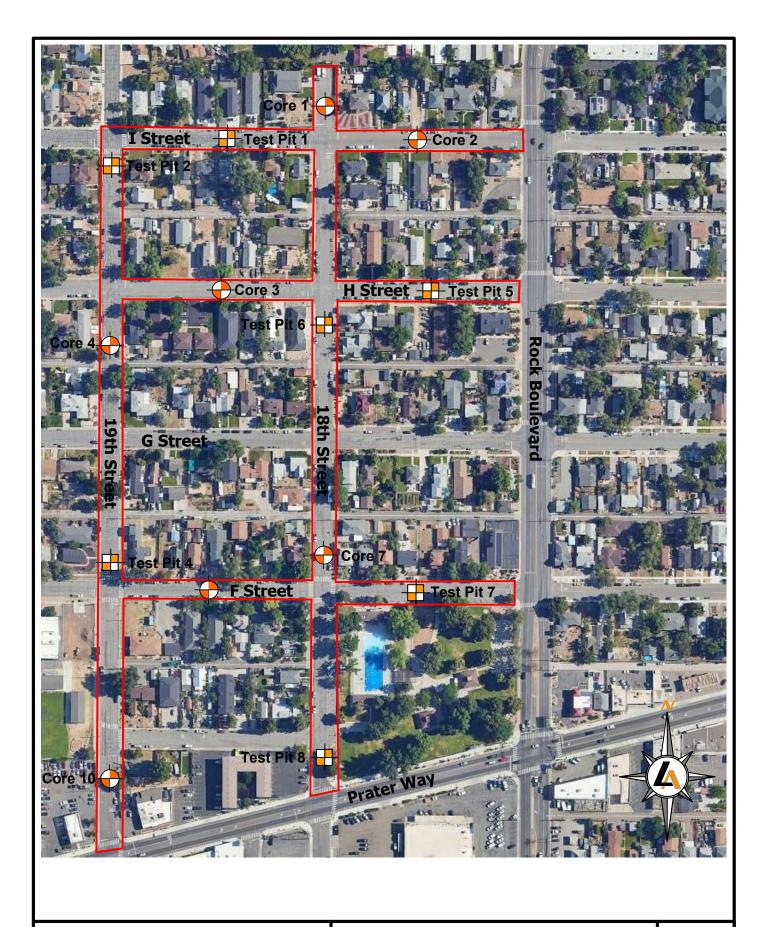
Ramelli, A.R., Henry, C.D., Walker, J.P., with contributions by Bell, J.W., Cashman, P.H., dePolo, C.M., Garside, L.J., House, P.K., Trexler, J,H., and Widmer, M.C., 2011, Preliminary revised geologic maps of the Reno urban area, Nevada, Nevada Bureau of Mines and Geology, Open File Report 2011-07, 1:24,000

USGS 2002 Website, <u>www.usgs.gov</u>

Washoe County, 2016, Standard Specifications for Public Works Construction, "Orange Book", Washoe County, NV







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City of Sparks FY25 Unit 1

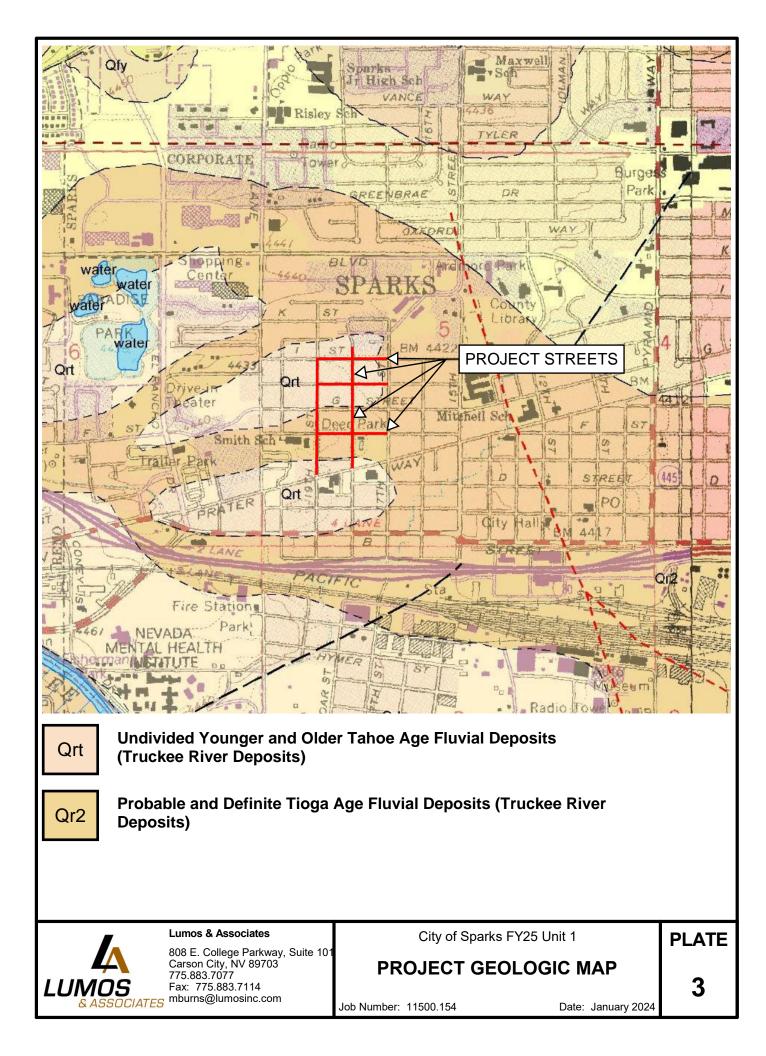
PROJECT SITE MAP

PLATE

2

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APPENDIX A

Field Exploration Logs



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CORE HOLE LOG COS FY25 UNIT 1.GPJ US_LAB.GDT 1/30/24

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1.0			70% Medium to													
			30% Moderatel	y Flaslic Clay												
	(/,/,/,/,/,/,/,/,/,/,//,//////////////															
	×.,,															
- 1.5 -																
	× , , , ,					1.6										
ŧ	<i>.</i>		Light Brown Cl	ayey SAND (SC)												
7/06/			Moist, Medium Estimated:	Dense												
- 2	×.,,,,	1_	Trace Gravel	- ; - - :												
LAD.	× × ×	1Z	80% Medium to 20% Low Plasti													
8	×.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,			o olay												
5	× , , , , ,															
2	<u> </u>					2.0										
0.021																
20																
			Core Hole terminated at 2 f Core Holes Filled with Soil	eet. and Capped with Non-Shrink Gro	ut.											
	1		Lumos & A	Associates	(Litv	of Spa	arks F	- Y25	Unit	1	I	I		PLA	TF
			808 E. Colle	ege Parkway, Suite 101									_			
		4	Carson City 775.883.707	7	LOG OF E	EXF	PLOR	RAT	ORY	CC	RE	HO	LE		-	~
LU	M	OS	Fax: 775.88 CIATES mburns@lui	33.7114											Α-	-3
	& A	SSOC	CIATES Insumswid		Job Number: 1150	0.154	1				Date:	Janu	ary 202	24		

									СО	RE	HO	LE	No.	Со	re #	04
Logo	-	•	J. Macaluso				otal De			feet						
	-	-	1/8/2024				ater De	-		-		ater	enco	unter	ed	
Drill	Туре	e:	Core Drill			G	round E	-		sting	J	1	1			
Depth in Feet	Graphic Log	Sample Type	Percolation Test	Split Spoon	Ziplock Sample		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	ss, % 0 Sieve)	R-Value	Expansion Index
Dep	Graph	Samp	California Sampler	Bulk Sample			Natural Cont	Optimum Cont	Max Dry Dei	Lin	Plas	Grav (3" - #/	San (#4 - #2	Fin€ (< #20(R-\	Expansi
			4" Asphalt	SOIL DESCRIPTION												
			Top 1.5" - Slurry Bottom 2.5" - Po	/ Overlay oor Quality		0.3										
			Light Brown Sil	ty SAND (SM)												
- 0.5 -			Moist, Medium I Estimated: 10% Medium G 60% Medium to 30% Low Plasti	ravel Fine Sand												
- 1.0 -																
CORE HOLE LOG COS FY25 UNIT 1.GPJ US_LAB.GDT 1/30/24						1.5										
5 FY25 UNIT 1.G																
OLE LOG COS			Core Hole terminated at 1.5 Core Holes Filled with Soil a	i feet. and Capped with Non-Shrink Gro	out.											
JRE H	I		Lumos & A	ssociates		ا ۲itv	of Spa	urke [[]	- V25	l Init	1	1	I	Т.	<u> </u> אור	T -
ಕ			808 E. Colle	ge Parkway, Suite 101	,	Jity	or ope	аглэ Г	120	Unit	I			'	PLA	IE
LU	M & A		Carson City, 775.883.707 Fax: 775.88 IATES	NV 89703 7 3.7114 nosinc.com	LOG OF E Job Number: 1150			RAT	ORY				LE ary 202	24	A-	4

											HO	LE	No.	Co	re #	¢07
Loge	-	-	J. Macaluso				otal Dep		2 fe							
	-	-	1/8/2024				ater De	•		-		ater	enco	unter	red	
Drill	Туре	e:	Core Drill			G	round E	1		sting]		1		,	
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon B Bulk Sample	Ziplock Sample Static Wate Table	r	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % #200 Sieve)	R-Value	Expansion Index
	0	ů –	-	SOIL DESCRIPTION			Nat	Opti				3	(#	<u>v</u>		Exp
			5" Asphalt			_										
			Medium Brown Moist, Medium I Estimated: 10% Gravel 60% Coarse to 30% Low to Mo	Fine Sand derately Plastic Cla <u>Poorly Graded SA</u> Dense	ау	0.4 1.0 2.0										
2.0 -																
			Core Hole terminated at 2 f Core Holes Filled with Soil a	eet. and Capped with Non-Shrink Gro	put.											
			Lumos & A	ssociates		City	of Spa	arks F	Y25	Unit	1				PLA	TE
	M	A os	Carson City, 775.883.707 Fax: 775.88	7 33.7114	LOG OF	-	-					но	LE		A-	
	& A	SSOC	CIATES mburns@lur	nosinc.com	Job Number: 1150	0.15	54				Date:	Janua	ary 202	24		-

									CO	RE	НО	LE	No.	Со	re #	#08
-	ged l	•	J. Macaluso			Τc	otal De	pth:		5 fee						
	-	-	1/8/2024				ater De	•		grou	Indw	ater	encol	untei	red	
Drill	Тур	e:	Core Drill			Gr	round E	1	Exi	sting	1					
Depth in Feet	Graphic Log	Sample Type	Percolation Test	Split Spoon	Ziplock Sample		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % < #200 Sieve)	R-Value	Expansion Index
Dep	Graph	Sampl	California Sampler	B Bulk Sample		r	Natural Conte	Dptimum Conte	Maxi Dry Der	Lin	Plas	Grav (3" - #4	San (#4 - #20	Fine (< #20(R-V	Expansi
			4" Aonholt	SUIL DESCRIPTION												
			<u>4" Asphalt</u> Top 1.5" - Good Bottom 2.5" - Po	l Quality oor Quality												
						0.2										
	οΨ		4" Material Sim	ilar to Aggregate E	Base	0.3										
- 0.5 -		Z														
						0.7										
- 1.0 -		Z	Medium Brown Moist, Medium Estimated: 10% Medium to 60% Coarse to 30% Low Plasti	Fine Gravel Fine Sand												
						1.3										
US LAB.GDT 1/30/24 - 5'1 -		Z	Light Brown Cl Moist, Medium Estimated: 40% Coarse to 40% Coarse to 20% Moderately	Fine Gravel Fine Sand	<u>ı Sand (GC)</u>											
.GPJ						1.8										
CORE HOLE LOG COS FY25 UNIT 1.GPJ US LAB.GDT 1/30/24 - -			Core Hole terminated at 1.													
НОГ			Core Holes Filled with Soil	and Capped with Non-Shrink Gr	out.											
CORE			Lumos & A			City	of Spa	arks F	Y25	Unit	1				PLA	TE
	ן 11/1	4 os	Carson City 775.883.707 Fax: 775.88	77 33.7114	LOG OF I	EXI	PLOF	RAT	ORY	CC Y	RE	HO	LE		A-	.6
	& A	SSOC	CIATES mburns@lui	mosinc.com	Job Number: 1150	0.15	4				Date:	Janua	ary 202	24	<i>_</i>	~

											HO	LE	No.	Со	re #	10
Logg		-	J. Hartley				otal De		2 fe							
Date	-	-					ater De	•		-		ater	enco	unter	ed	
Drill	Туре	e:	Core Drill			G	round E	1		isting)					
Depth in Feet	Graphic Log	Sample Type	Percolation Test	Split Spoon	Ziplock Sample	r	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	ies, % 00 Sieve)	R-Value	Expansion Index
Ğ	Grap	Sam	Sampler	B Bulk Sample	⁻ Table		Natura Con	Optimu Con	Dry De	<u> </u>	집프	Gra (3" - #	Sa (#4 - #;	Fir (< #2(Ŗ	Expan
			4" Asphalt	SOIL DESCRIPTION	4	_										
			Top 2" - Good G Bottom 2" - Poo	Quality r Quality												
			<u> </u>		• •	0.3										
- 0.5		Z	Brown Silty SAI Moist, Medium I Estimated: 10% Gravel 60% Coarse to I 30% Silt		<u>M)</u>											
- 1.0			Brown Clayey S Moist, Medium [AND (SC) Dense		1.1										
- 1.5 -		Z	Estimated: 70% Coarse to I		lay											
- 2.0						2.0										
- 2.0																
			Core Hole terminated at 2 fe Core Holes Filled with Soil a	eet. nd Capped with Non-Shrink G	rout.											
			Lumos & A	ssociates		Citv	of Spa	arks F	Y25	Unit	1			Т	PLA	TF
LU			Carson City, 775.883.707	7		-	-					но	LE		A-	
	& A.	SSOC	Marris@lun		Job Number: 1150	0.15	4				Date:	Janua	ary 202	24		

									I	TES	ST I	PIT	No	. TI	P #(01
Logg		-	B. Sexton			Total	•		feet							
Date	-	-				Wate	-		o gro		wate	r enc	coun	tere	d	
Equi	pme	nt T	ype: Case 590 B	ackhoe		Grou	nd Ele	ev.: E	xistir	ng			1			
:h in et	ic Log	e Type	Percolation Test	Split Spoon	Ziplock Sample	Aoisture nt. %	Moisture nt, %	num sity, pcf	imit, %	ndex, %	el, % Sieve)	1, % 0 Sieve)	s, % Sieve)	n Index	Iue	Shear
Depth in Feet	Graphic Log	Sample Type	California Sampler	Bulk Sample		Natural Moisture Content. %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines (< #200	Expansion Index	R-Value	Direct Shear
				SOIL DESCRIPTION	J											
		В	2.5" Asphalt Poor Quality			0.2										
				ty SAND with Gra Dense	vel											
		В	20% Coarse to 60% Coarse to 20% Non-Plasti	Fine Sand												
- 1 -		D	2070 11011 1 1001													
						1 /										
			Brown Clayey S	SAND (SC)		1.4										
			Moist, Medium Estimated:	Dense												
			65% Coarse to													
			35% Low to Mo	derately Plastic C	lay											
- 2 -																
	, , , , , , , , , , , , , , , , , , ,															
		R														
- 3 -																
- 4 -	////					4.0										
			Test pit terminated at 4 fee	t.												
			Test pit backfilled without c	compaction verification.												
	1					City of	Spark	ks FY2	5 Uni	t 1				P	LA1	re
		Щ	Carson City	ege Parkway, Suite 10 [,] , NV 89703	LOG OF	EXP	POR	ΑΤΟ	RY	TE	ST	PI	Г			
LU	M	09	775.883.707 Fax: 775.88	33.7114						-	- •				4-8	3
	& A	SSO	CIATES mburns@lui	mosinc.com	Job Number: 1150	0.154				Date	e: Jar	nuary 2	2024	1	- •	-

TEST PIT No. TP #													> #(02		
Logged By:B. SextonTotal Depth:5 feetDate Logged:1/8/2024Water Depth:No groundwater encountered																
	-	-			Water Depth: No groundwater encountered											
Equi	pme	nt T	ype: Case 590 Backhoe	G	Grour	nd Ele	ev.: Ex	kistir	g	1	r	1				
Depth in Feet	Graphic Log	Sample Type	Percolation Split Test Spoon Ziplock		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear	
Dep Fe	Graph	Sampl	California Sampler Bulk Sample Static W Table	/ater	Natural I Conte	Optimum Conte	Maxi Dry Der	Liquid I	Plastic I	Grav (3" - #4	San (#4 - #20	Fine (< #200	Expansic	R-V	Direct	
			SOIL DESCRIPTION			<u> </u>				1						
			4" Asphalt Top 1.75" - Slurry Overlay													
			_ Bottom 2.75" Poor Quality	0.3	3											
			Fill - Silty SAND with Gravel (SM) Moist, Medium Dense													
		В	Estimated:													
			20% Gravel 50% Coarse to Fine Sand													
- 1 -	ألجرجر		– 30% Non-Plastic Silt	1.(
			Brown Clayey SAND (SC) Moist, Medium Dense													
	ر ربر بر		Noisi, Medium Dense													
- 2 -																
	(, , , , , , , , , , , , , , , , , , ,	B			15.1			32	14	2.6	67.9	29.5				
- 3 -																
				3.	5											
			Gray Brown Silty GRAVEL with Sand (GM)	0.0												
			Moist, Medium Dense Estimated: 10% Unclassifiable Rounded Cobb	ما												
			up to 8" in Maximum Diameter with the Remain													
- 4 -			Soil Matrix Consisting of 50% Coarse to Fine Gravel													
			35% Coarse to Fine Sand													
			15% Silt													
		B														
				5.0	0											
- 5 -																
1			Test pit terminated at 5 feet. Test pit backfilled without compaction verification.													
		_	Lumos & Associates	Cit	v of 9	Snark	s FY2	5 l Ini	† 1						TE	
			808 E. College Parkway, Suite 101		-	•								LA		
Carson City, NV 89703 775.883.7077 LOG OF EXPORATORY TEST PIT																
LU	M	09	5 Fax: 775.883.7114											4-9	9	
	& A	SSO	Job Number: 1	1500.1	54				Date	e: Jar	nuary					

TEST PIT No. TP #04													04								
Logo		-		B. Sexton		Total Depth: 4 feet															
Date	-	-		1/8/2024		Water Depth: No groundwater encountered															
Equi	pme	nt T	ype:	Case 590 B	G	iroun	nd Ele	ev.: Ex	kistin	g	1	1	1								
Depth in Feet	Graphic Log	Sample Type		Percolation Test	Split Spoon	Ziplock Sample		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear			
Dep	Graph	Sampl		California Sampler	Bulk Sample	Ţ Static Wa Table	ter	Natural Conte	Optimum Conte	Maxi Dry Der	Liquid I	Plastic I	Grav (3" - #4	San (#4 - #2(Fine (< #200	Expansio	R-V	Direct			
			A'' /	\enhalt	SOIL DESCRIPTIO	IN															
			Poc	Asphalt or Condition																	
							0.3	3													
			<u>6" I</u> Moi	mport - Silty st, Medium	SAND with Grav Dense	<u>/el (SM)</u>															
			Esti	mated:																	
			20% 50%	6 Gravel 6 Coarse to	Fine Sand		0.8	3													
				6 Non-Plasti																	
- 1 -			<u>Bro</u> Moi	wn Clayey C st, Medium	GRAVEL with Sar Dense	nd (GC)															
			Esti	mated:																	
				6 Coarse to 6 Coarse to																	
	<i>X</i> ;				derately Plastic C	Clay															
- 2 -																					
		R																			
- 3 -	\times																				
	X																				
							4.0														
- 4 -							4.0														
1																					
			Test pi Test n	it terminated at 4 fee it backfilled without c	t. ompaction verification.																
			P	Lumos & A	·		City		Snark	s FY2	- 5 Ini [.]	t 1	1	1							
				808 E. Colle	ge Parkway, Suite 10	1	-		-								LA				
		4		Carson City 775.883.707	NV 89703	LOG O	FΕ	XP	OR	ΑΤΟ	RY	TE	ST	Ρľ	Γ	_	-				
LUMOS Fax: 775.883.7114										\-1	0										
& ASSOCIATES mburns@lumosinc.com						Job Number: 11	500.1	54				Date	e: Jar	nuary	2024						

										TE	ST I	PIT	No	. TI	> #(05
-	ged I	-	B. Sexton			Total	•		feet							
	e Log	-				Wate	-		o gro		wate	r enc	coun	tere	d	
Equ	lipme	nt T	ype: Case 590 B	ackhoe		Grour	nd Ele	ev.: Ex	xistin	g	1		1			
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon B Bulk Sample	Ziplock Sample Static Water Table	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
	U U U	Sar	Sampler			Nati	Optir		Liq	Pla	(3"	(#7	×)	Expé		ā
				SOIL DESCRIPTION		_							<u> </u>			
		В	4" Asphalt Poor Condition													
					_	0.3										
		В	4" Material Sim	ilar to Aggregate E	<u>Base</u>											
	00					0.7										
			Light Brown Si	Ity SAND (SM)												
			Moist, Medium Estimated:													
- 1			70% Coarse to 30% Silt	Fine Sand												
			50 /8 Siit													
0																
- 2																
		B														
/30/24																
10g-3						3.0										
LAB.0			Moist, Medium	AVEL with Sand (Dense	<u>GIVI)</u>											
SU L			Estimated: 50% Coarse to	Fine Gravel												
1.GP			30% Coarse to													
UNIT			20% Silt													
FY25																
COS						1.0										
HEAR						4.0										
S ONA																
HR-V,																
WITH																
PAGE																
ULL																
LUMOS TP_FULL PAGE WITH R-V AND SHEAR COS FY25 UNIT 1.GPJ US_LAB.GDT 1			Test pit terminated at 4 fee Test pit backfilled without c													
SOML		_	Lumos & A		(City of S	Spark	s FY2	5 Uni	t 1						
Ц			808 E. Colle	ege Parkway, Suite 101		-										
		4	Carson City 775.883.707	7	LOG OF	EXP	OR	ATO	RY	ΤE	ST	Pľ	Г		_	
ILL	JM		Fax: 775.88 CIATES mburns@lui	33.7114 mosinc.com	Jah Niemelen (1170								0004	A	\-1	1
	QA	000	UIAILU		Job Number: 1150	1.154				Date	e: Jar	nuary 2	2024			

										TE	ST I	PIT	No	. TI	P #(06		
	ged E	-	B. Sexton			Total	•		feet									
	e Log	-					Water Depth: No groundwater encountered											
Equ	ipme	nt T	ype: Case 590 B	ackhoe		Grour	nd Ele	v.: Ex	kistir	ng								
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon Bulk Sample	Ziplock Sample Static Wate Table	ل Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear		
	U U	ŝ	•	SOIL DESCRIPTIO		N	o	ā		Ē		1	Ľ	EX				
			1 25" Asnhalt	SOIL DESCIVIF HO	N													
			4.25" Asphalt Poor Condition															
	_ //					0.4												
			10" Brown Clay	vey GRAVEL with Dense	Sand (GC)													
			Moist, Mediam i	Dense														
		R				13.2			47	30	47.7	27.7	15.0	13	3			
- 1																		
			Brown Doorly (Graded SAND with	Silt and Cravel	1.2												
			(SP-SM)		i Siit and Graver													
			Moist, Medium I Estimated:	Dense														
			15% Gravel															
			75% Coarse to 10% Silt	Fine Sand														
- 2																		
		В																
/30/24																		
- 3 F.G.	1																	
S																		
25 + 2																		
ы Ч						4.0												
4 ⊐HS	· · ·																	
AND																		
7-Y T																		
I MI																		
PAG																		
FULL																		
			Test pit terminated at 4 feet Test pit backfilled without c															
2 MO		_	Lumos & A	Associates		City of	Spark	s FY2	5 Uni	t 1				D	LA	TF		
			808 E. Colle	ge Parkway, Suite 10	1	-	-				-							
		4	Carson City, 775.883.707	7	LOG OF	F EXPORATORY TEST PIT										~		
LU	IM	DS	Fax: 775.88 CIATES mburns@lur	.									A-12					
	Q A	550	UALES C.		Job Number: 1150	0.154				Date	e: Jar	nuary	2024					

									i	TE	ST	PIT	No	. TI	P #	07
Log	-	-	B. Sexton				Depth		5 fee							
	e Log	-					r Dept		-		wate	er en e	coun	tere	d	
Equ	ipme	nt i	ype: Case 590 B	аскпое		Grou		v.: Ex	kistir	ng						
Depth in Feet	Graphic Log	Sample Type	Percolation Test	Split Spoon	Ziplock Sample	Natural Moisture Content. %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear
Dep	Grapł	Samp	California Sampler	Bulk Sample		Natural Cont	Optimun Cont	Max Dry De	Liquid	Plastic	Grav (3" - #	Sar (#4 - #2	Fine (< #20	Expansi	R-\	Direct
			4.5" Asphalt													
		В	Poor Condition			0.4										
			6" Material Simi	ilar to Aggregate E	Base											
		В				0.9										
- 1			Brown Clayey S Moist, Medium I	SAND (SC) Dense												
- 2																
		В				15.1			31	12	0.7	69.1	30.2			
²⁴ - 3																
Г 1/30/																
AB.GD																
US																
1.GPJ																
LINU - 4																
OS FY2																
EAR C						4.5										
HS ON	<u>. / /</u>															
4 R-V A																
E WITH																
L PAG																
LUMOS TP_FULL_PAGE WITH R-V AND SHEAR_COS FY25 UNIT 1.GPJ_US_LAB.GDT 1/30/24			Test pit terminated at 4.5 fe													
SOML	I		Test pit backfilled without c		(Lity of	 Snark	s FY24	5 Uni	i it 1	I		1		· • •	TE
L				ge Parkway, Suite 101	City of Sparks FY25 Unit 1									PLATE		
1.1	ם ת או		775.883.707	7	LOG OF EXPORATORY TEST PIT									\-1	2	
LUMOS & ASSOCIATES					Job Number: 11500.154 Date: January 2024								2024	^	\ =	J

TEST PIT No. TP #08																			
Logged By: B. Sexton Total Depth: 4.5																			
Date	-	-			Water Depth: No groundwater encountered														
Equi	pme	nt T	ype: Case 590 Ba	ackhoe		Grou	nd Ele	ev.: Ex	cisting	9		1							
ih in et	ic Log	e Type	Percolation Test	Split Spoon	Ziplock Sample	Aoisture	m, <i>%</i> Moisture nt, %	num sity, pcf	imit, %	ndex, % ∍I, %	Sieve) 1, % 0 Sieve)	s, % Sieve)	n Index	Iue	Shear				
Depth in Feet	Graphic Log	Sample Type	California Sampler	B Bulk Sample	Y Static Wate Table	Natural Moisture	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plastic Index, % Gravel, %	(3" - #4 Sieve) Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	Expansion Index	R-Value	Direct Shear				
				SOIL DESCRIPTIC	DN														
			<u>5" Asphalt</u> Poor Condition			0.4													
			6" Material Simi	lar to Aggregate	Base	0.4													
						0.9													
- 1 -			Brown Silty SA	ND with Gravel (SM)	0.9	_												
			Estimated: 35% and Boulders up	Soil Matrix Consi Fine Gravel	Rounded Cobble	1													
- 2 -																			
- 3 -		В																	
- 4 -						4.5													
			Test pit terminated at 4.5 fe Test pit backfilled without o	et.															
 	I				1		Sport		<u> </u>	1	I	1							
		4		ge Parkway, Suite 10 NV 89703	01	City of Sparks FY25 Unit 1 LOG OF EXPORATORY TEST PIT									PLATE				
LU	М & А.	0 5	Fax: 775.88 CIATES	Job Number: 11500.154 Date: January 2024								024 A-14							

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

1/17/24
10-23-06.GDT
UNIT 1.GPJ
COS FY25
LEGEND
LUMOS

7					
-	Sulfate, and Resistivity)	AN ANAL			
	N TEST		С		
	DIRECT SHEAR TEST				
	TY CURVE		MD		
PLATE	Sparks FY25 Unit 1	s & Associates			
A-15	EGEND	808 E. College Parkway, Suite 101 Carson City, NV 89703 775.883.7077 Fax: 775.883.7114			
	Date: January 2024	s@lumosinc.com	SOCIATES mburns		

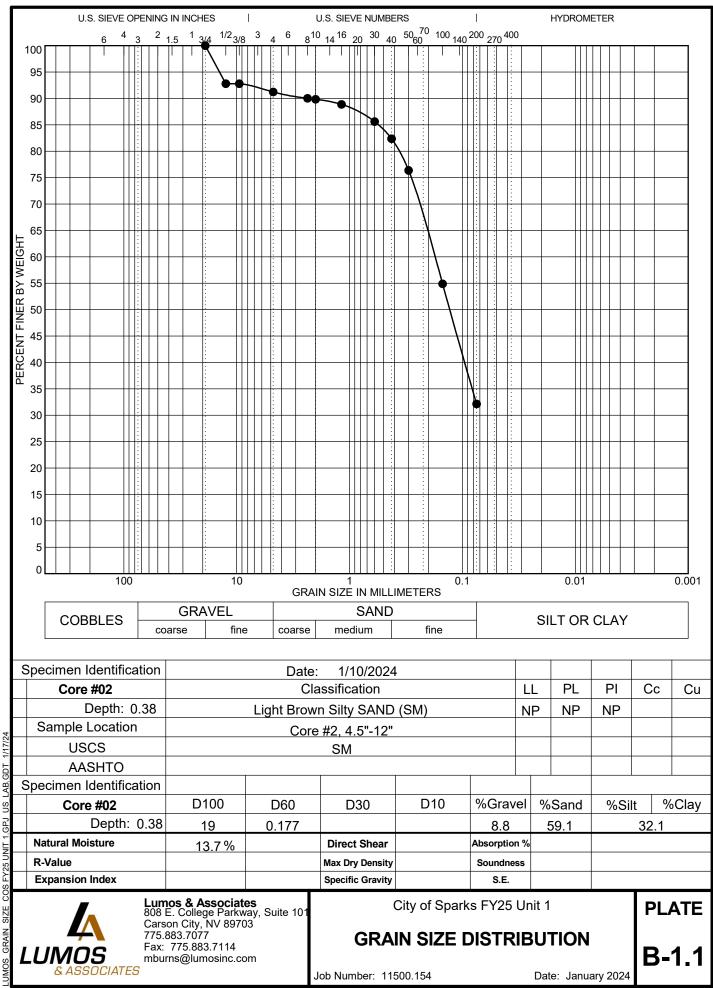
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Job Number: 11500.154

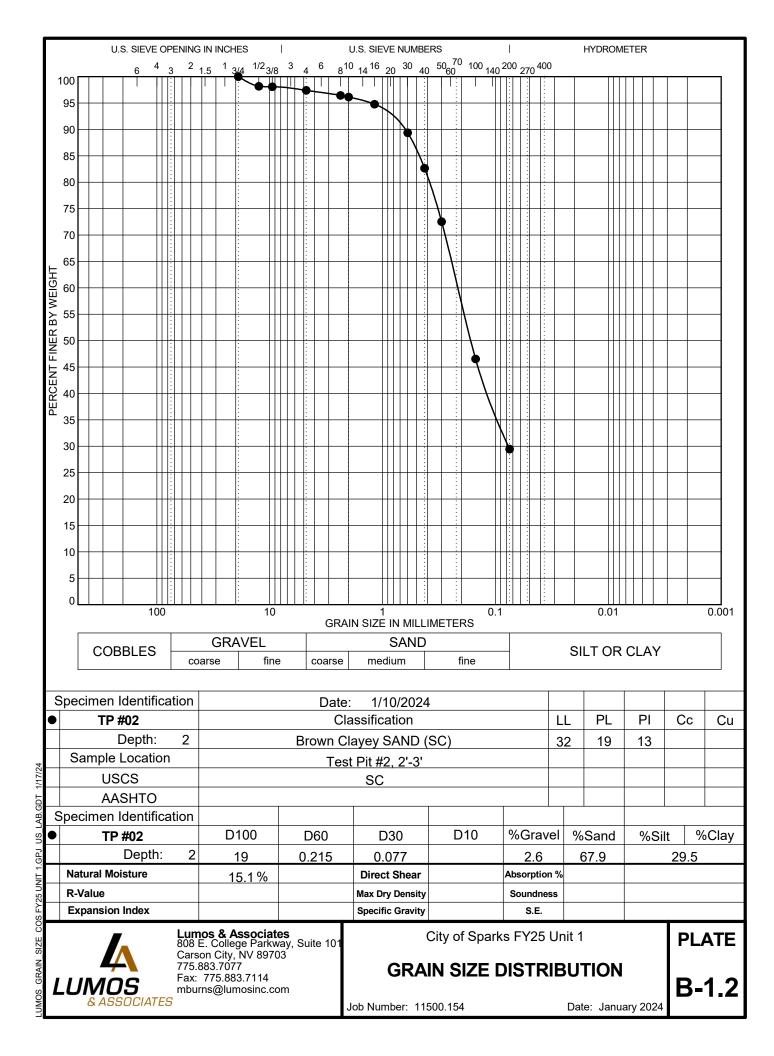
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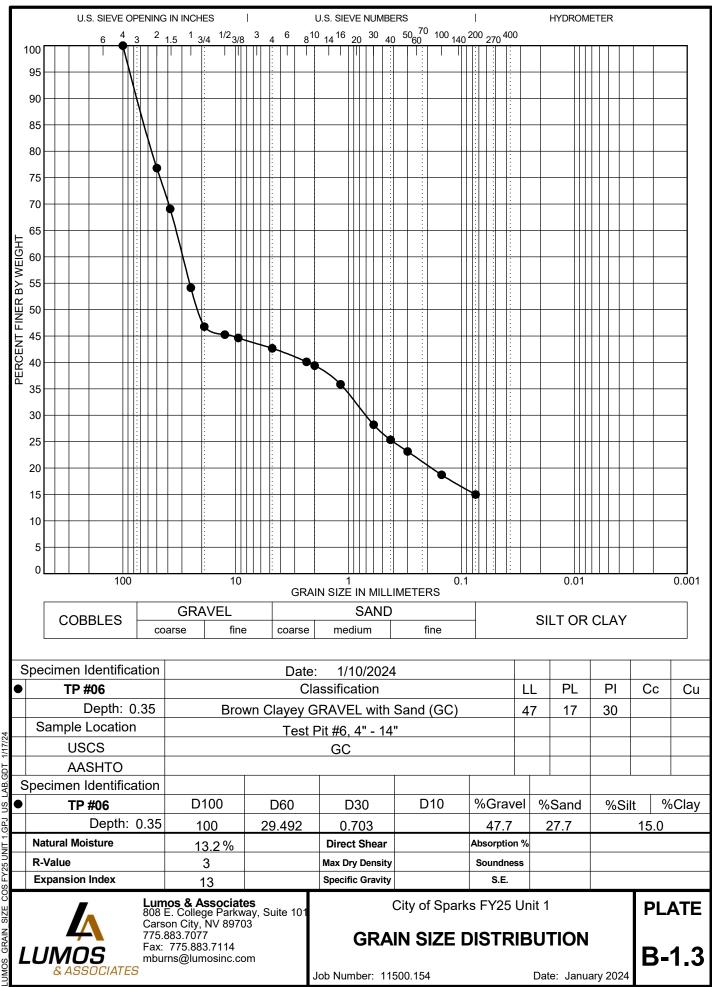
APPENDIX B Soils Laboratory Test Results



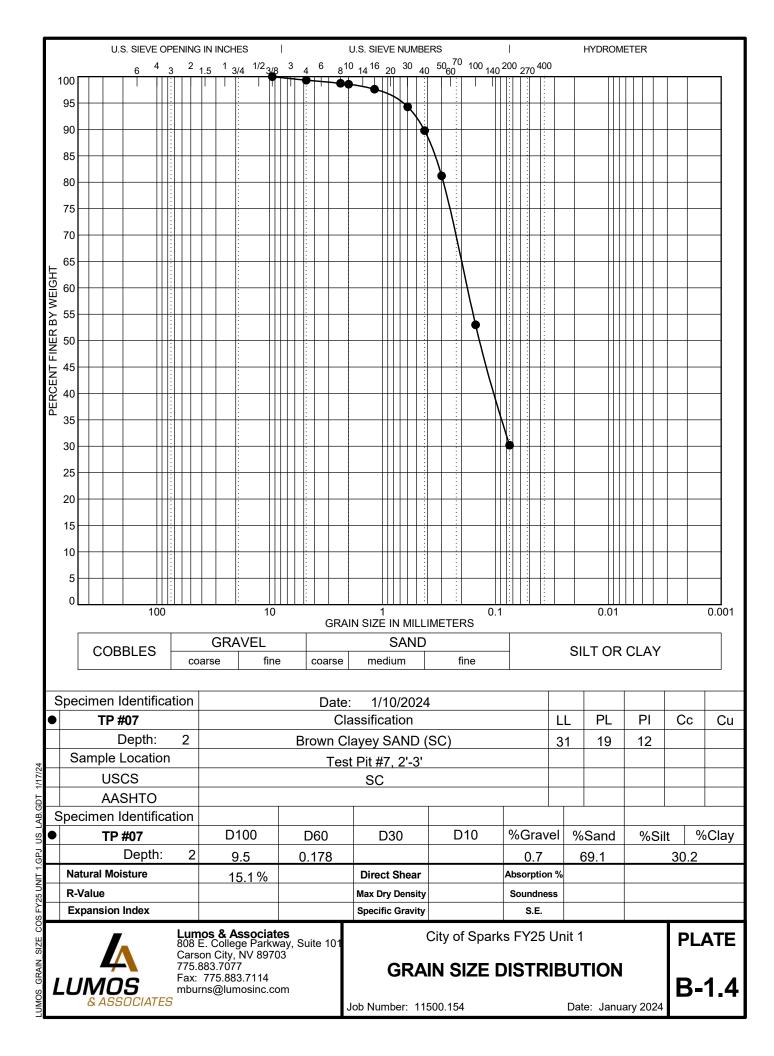


LAB. NS d C FY25 UNIT C C C SIZE GRAIN

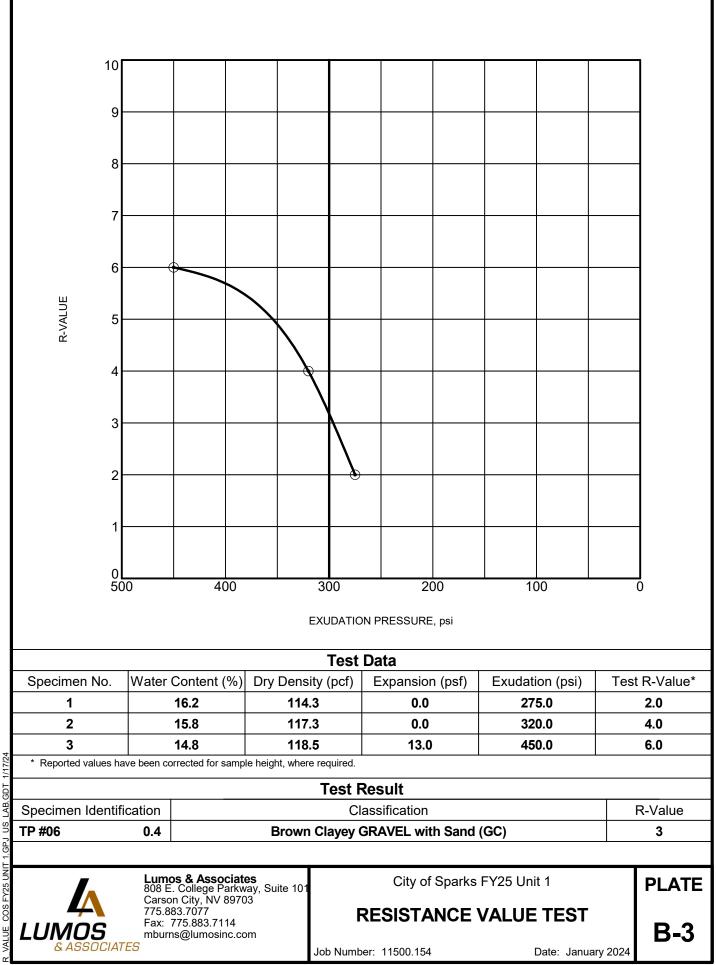




LAB. SU d U UNIT FY25 (C C C SIZE GRAIN NON



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	P L	60													
	A S T														
	C I T	40													
	T Y	-0													
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		0		2	0		40			0	8	0	100		
									LIQUID LIMI						
			n Identifi		LL	PL	PI		Classifica						
	Core			0.4	NP	NP	NP	32	Light Brown	Silty SANE	D (SM)				
X	TP #0)2		2.0	32	19	13	29	Brown Clay	ey SAND (S	SC)				
	TP #0	06		0.4	47	17	30	15	Brown Clay	ey GRAVEI	L with Sand	(GC)			
*	TP #0)7		2.0	31	19	12	30	Brown Clay	ey SAND (S	SC)				
1/24															
-AB.GI															
6 F Y 25															
				1	A				-					_	
RKG R				Lumos & 808 E. Col Carson Cit	ASSOCIA lege Parl	a tes (way, S 703	uite 101		Ci	ty of Spai	rks FY25	Unit 1		PLA	ΓE
	_	4	•	775.883.70 Fax: 775.8)77			A	TTERB	ERG L		RESU	ILTS		_
	LUN	ΛΟ	S	mburns@l	umosinc.	com								B- 2	2
LUN	& ASSOCIATES				Job Nu	mber: 1150	0.154		Date: .	January 2024					



Lumos & Associates, Inc. - 24010311

Western Environmental Testing Laboratory Analytical Report

 Lumos & Associates, Inc.
 Date Printed:
 1/16/2024

 950 Sandhill Road, Suite 100
 OrderID:
 24010311

 Reno, NV 89521
 Attn:
 Mitch Burns

 Phone:
 (775) 827-6111
 Fax:
 (775) 827-6122

 PO\Project:
 COS 24-25 Roads/11500.154/Task 1/MTB
 Collect Date/Time:
 1/8/2024

 WETLAB Sample ID:
 24010311-001
 Receive Date:
 1/11/2024
 16:10

Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
Anions by Ion Chromatography							
Sulfate	EPA 300.0	150	mg/kg	10	15	1/15/2024	NV00925
Sample Preparation							
10:1 DI Water Extraction	WL 10.0	Complete		1		1/12/2024	NV00925

DF=Dilution Factor, RL = Reporting Limit (minimum 3X the MDL), ND = Not Detected <RL or <MDL (if listed)

Page 3 of 4

SPARKS 475 E. Greg Street, Suite 119 Sparks, Nevada 89431 tel (775) 355-0202 fax (775) 355-0817 EPA LAB ID: NV00925 - ELAP No: 2523

Lumos & Associates

ELKO 1084 Lamoille Hwy Elko, Nevada 89801 tel (775) 777-9933 fax (775) 777-9933 EPA LAB ID: NV00926

Job Number: 11500.154

LAS VEGAS 3230 Polaris Ave. Suite 4 Las Vegas, Nevada 89102 tel (702) 475-8899 fax (702) 622-2868 EPA LAB ID: NV00932

Д
LUMOS & ASSOCIATE

808 E. College Parkway, Suite 10 Carson City, NV 89703 775.883.7077 Fax: 775.883.7114 mburns@lumosinc.com

City of Sparks FY25 Unit 1

SOIL SULFATE CONTENT

PLATE

B-4

Date: January 2024

APPENDIX C

Pavement Calculations



Job Number: 11500.154 Project: City of Sparks FY25 Unit 1 Rehab Client: The City of Sparks Description: Pavement Calculations By: J. Macaluso

R-Value for CTB = 80 (Assumed) R-Value for Native Soils = 3 TI (Local Road) = 5 (Light Traffic)

GE=0.0032*(TI)*(100-R)

Gf _(AC,Local)=2.5, Gf_(Cement Treated Soil)=1.2, Gf_(subgrade)=1 t_{layer} =GE/Gf

Local Road Pavement Section : Asphalt and Cement Treated Recycled Material

 $GE_{\rm AC}{=}0.0032^{*}(5)^{*}(100{-}80){=}0.32^{\prime}$ $t_{\rm AC}{=}(0.32/2.5)^{*}(12^{\prime\prime}){=}1.54^{\prime\prime}$ USE 4" Asphalt Concrete $GE_{\rm AC}{=}(4^{\prime\prime\prime}2.5)/(12^{\prime\prime}){=}0.83^{\prime}$

 $\begin{array}{l} \mathsf{GE}_{\text{CTB(Pulv.)}} = 0.0032^*(5)^*(100\text{-}3) = 1.55' \\ t_{\text{CTB(Pulv.)}} = ((1.55'\text{-}0.83')/1.2)^*(12''/1') = 7.2'' \\ \end{array} \\ \textbf{USE 8'' Cement Treated Pulverized Material} \end{array}$



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Lumos & Associates

City of Sparks FY25 Unit 1

PAVEMENT DESIGN

PLATE

C-1

Job Number: 11500.154

Date: January 2024

APPENDIX D

Cement Treated Pulverized Asphalt/Subgrade Mix Design





CEMENT TREATED BASE COMPRESSION TESTS

REPO	RT TO:	City of Sp	arks	PRC	DJECT NAME:	2025 Street Rel	nab Unit 1	
				PRC	DJECT NO.:	11500.154		
				LOC	CATION:	Sparks, Nevada		
		CONTRACTO		NTRACTOR:	-			
SAMP	SAMPLED BY: B. Sexton			DAT	TE RECEIVED:	1/9/2024		
WEAT	HER:	Lab Moldee	t	TIM	IE:	-		
AIR T	EMP:	-		MO	LDED BY:	Z. Lim		
DATE	MOLDED:	1/15/23						
MATE	RIAL DESCRIPT	TON: <u>CTB L</u>	ab Blend - 202	25 Streets - 3	85% AC, 15%	Base, 40% SM, 10	% SC	
		<u>6% C</u>	ement at 2% C	ver Optimum	Moisture Cont	ent		
SAMP	LE LOCATION:	<u>TP-1</u>	, TP-7, C-1, C	-3, C-8				
SAMP	LE TYPE:	LABORAT	ORY DESIGN	Х	FIELD SAM	IPLE		
	H			1			1	
		DIAMETER	AREA	TEST	DATE	TOTAL	UNIT	
	LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PS	I
	R-21-24	4.01	12.63	7	1/22/23	4,646	370	
	R-22-24	4.01	12.63	7	1/22/23	4,681	370	
	R-23-24	4.01	12.63	7	1/22/23	4,379	345	
				Average Co	ompressive St	trength 7-Day :	360	
Min	imum Specifi	ed Strength:	300 psi					
	REMARKS:							
	-				D-558, C-1632, O	C-1633. Standards as ap	plicable.	
	CAP	PING	U	NBONDED		X BONDED		
	TEST RES	SULTS:	C(OMPLY		DO NOT C	OMPLY	
					Respectively	Submitted by:		
	Client Not	ified of Test Resu	llts		M. Burns			
					Materials Engir	neering Manager		
		umos & Associate	s I		City of Speed			
		308 E. College Park	-			s FY25 Unit 1	-	PLATE
		Carson City, NV 897				RY CEMEN		
UN	10s 🛛	775.883.7077 Fax: 775.883.7114		TRE	AIMENT	MIX DESIG	N	D-1.1
		nburns@lumosinc.c	om					



CEMENT TREATED BASE COMPRESSION TESTS

REPOF	RT TO:	City of S	parks	PRO	DJECT NAME:	2025 Street Reh	nab Unit 1		
				PRO	DJECT NO.:	11500.154			
				LOCATION:		Sparks, Nevada			
						-			
SAMPL	ED BY:	B. Sexton	3. Sexton		. Sexton		TE RECEIVED:	1/9/2024	
WEATI	HER:	Lab Molde	d	TI№	IE:	-			
AIR TE	EMP:	-		MO	LDED BY:	Z. Lim			
DATE	MOLDED:	1/15/23							
MATE	RIAL DESCRIPT	ION: <u>CTB</u>	Lab Blend - 202	25 Streets - 3	35% AC, 15%	Base, 40% SM, 10	% SC		
		4% (Cement at 2% C	ver Optimum	Moisture Cont	ent			
SAMPL	E LOCATION:	<u>TP-1</u>	., TP-7, C-1, C	-3, C-8					
				X					
Sampl	E TYPE:	LABORA	TORY DESIGN	X	FIELD SAM	PLE			
]		DIAMETER	AREA	TEST	DATE	TOTAL	UNIT		
	LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PS	21	
ŀ	R-18-24	4.01	12.63	7	1/22/23	3,150	250	51	
F	R-10-24	4.01	12.63	7	1/22/23	3,057	230		
ŀ	R-20-24	4.01	12.63	7	1/22/23	3,563	240		
F	R-20-24	4.01	12.05	/	1/22/23	5,505	200		
-									
-									
L				Average Co	omnressive St	rength 7-Day :	260		
Mini	imum Specifie	d Strength:	300 nci	Average Co	Simplessive St	length /-Day .	200		
1-1111	inium Specific	su strengtin.	500 p3				Į]	
	REMARKS:								
-									
	Testing ar	nd Sampling were p			1 D-558, C-1632, C	-1633. Standards as ap	plicable.		
	CAPF	PING	U	NBONDED		X BONDED			
			Π.						
	TEST RESU	JLTS:		OMPLY		DO NOT C	OMPLY		
					Respectively S	Submitted by:			
Client Notified of Test Results					M. Burns	/-			
Client Notified of Test Results						ooring Managar			
					materials Engli	eering Manager			
	∎ Lu	imos & Associate	s		City of Sparks	FY25 Unit 1		PLAT	
		8 E. College Park arson City, NV 897		LAE	BORATO	RY CEMENT		• •	
<u>, т</u>	77	5.883.7077	~~			MIX DESIGN			
		ix: 775.883.7114 burns@lumosinc.c	om					D-1 .	
AN	UUUUIAI EJ	-	Jo	b Number: 11	500.154	Date: Jar	nuary 2024		



CEMENT TREATED BASE COMPRESSION TESTS

REPORT TO:	City of S	oarks		DJECT NAME: DJECT NO.:	2025 Street Ref 11500.154	nab Unit 1			
			LOCATION:		Sparks, Nevada				
			CO	NTRACTOR:	-				
SAMPLED BY:					DA	TE RECEIVED:			
WEATHER:	Lab Molde	d	TIM	1E:					
AIR TEMP:	-		MO	LDED BY:	Z. Lim				
DATE MOLDED:	1/15/23								
MATERIAL DESCRIPT	ION: <u>CTB</u>	Lab Blend - 20	25 Streets - 3	35% AC, 15%	Base, 40% SM, 10	% SC			
	2% (Cement at 2% (Over Optimum	n Moisture Cont	ent				
SAMPLE LOCATION:	<u>TP-1</u>	, TP-7, C-1, C	C-3, C-8						
SAMPLE TYPE:	LABORA	TORY DESIGN	X	FIELD SAM	IPLE				
	DIAMETER	AREA	TEST	DATE	TOTAL	UNIT]		
LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PSI			
R-15-24	4.01	12.63	7	1/22/23	1,912	150			
R-16-24	4.01	12.63	7	1/22/23	1,852	145			
R-17-24	4.01	12.63	7	1/22/23	1,825	145			
			Average Co	ompressive St	trength 7-Day :	145			
Minimum Specifie	ed Strength:	300 psi							
REMARKS:									
_	nd Sampling were p PING		dance with ASTN	1 D-558, C-1632, (C-1633. Standards as ap	oplicable.			
TEST RES	ULTS:		COMPLY		DO NOT C	OMPLY			
Client Not	ified of Test Res				Submitted by:				
				M. Burns Materials Engir	neering Manager				
808	mos & Associates B E. College Parkw			City of Sparks	FY25 Unit 1	PL	ATE		
IMOS 775	rson City, NV 8970 5.883.7077 x: 775.883.7114 urns@lumosinc.co	m	TRE	ATMENT	MIX DESIGN	יטן	-1.3		
G ADDODIATED		Jo	b Number: 115	00.154	Date: Jan	uary 2024			

GEOTECHNICAL INVESTIGATION REPORT

CITY OF SPARKS FY24 UNIT 2 SPARKS, NV

11500.154

FEBRUARY 2024

PREPARED FOR:

CITY OF SPARKS DEPARTMENT OF PUBLIC WORKS ATTN: BOB SCHRICKER 431 PRATER WAY SPARKS, NV 89431

PREPARED BY: LUMOS & ASSOCIATES, INC. 808 E. COLLEGE PARKWAY, SUITE 101 CARSON CITY, NV 89706 775.883.7077



GEOTECHNICAL INVESTIGATION REPORT CITY OF SPARKS FY24 UNIT 2 SPARKS, NV

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- 2 Project Site Map
- 3 Project Geologic Map

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- Appendix B Soils Laboratory Test Results
- Appendix C Pavement Calculations
- Appendix D Cement Treated Pulverized Asphalt/Base/Subgrade Mix Design



CITY OF SPARKS FY24 UNIT 2 SPARKS, NV

1.0 INTRODUCTION

This report presents the results of Lumos & Associates, Inc.'s Geotechnical Analysis for the proposed roadway rehabilitation project located in Sparks, NV. 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 roadway reconstruction. Roadway reconstruction operations include asphalt pavement replacement and roadbed modification on the existing asphalt, aggregate base, and/or underlying soils. Plate 2 shows the project streets scheduled for reconstruction. 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 pavement design. In addition, information such as logs of all explorations (Appendix A) and laboratory test data (Appendix B) are provided in this report.



2.0 GEOLOGIC SETTING

The proposed project is located in the northeastern section of the Truckee Meadows, a broad valley bounded on the west by the tall granitic and volcanic peaks of the Sierra Nevada Mountains (Carson Range), and on the east by the by the lower volcanic peaks of the Virginia and Pah Rah Range. Younger volcanic hills also bound the valley on the north and south. Faults bound the valley from the mountains as is typical of the Basin and Range province. Sediments have filled the valley from a number of tributaries and ancestral lakes during the Quaternary period (2 million years ago to present day). The dominant sediment source has been and continues to be, the Truckee River and its ancestral counterparts. Stream deposits were particularly voluminous after glacial periods. Since the end of the last glacial period, some 10,000 years ago, arid erosional forces combined with faulting have been the predominant processes to shape the region. These processes have created large alluvial fans that surround the valley floor of the Truckee Meadows.

In 2011 the near surface geology of the Reno/Sparks area was mapped by Ramelli, Henry, and Walker. Their mapping shows undivided younger and older Tahoe age fluvial deposits (Qrt) and Tioga age fluvial deposits (Qr2) underlie the site. Both of these deposits are Truckee River deposits which generally are comprised of poorly bedded gravels, sands, and fine grained soils. Plate 3 shows their mapping.



3.0 SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation the project roadways had been previously paved with asphalt concrete. Where visible, the project streets generally had moderate alligator cracking, moderate surface wear, and moderate block cracking.

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

Our subsurface investigation included two (2) test pits located within the project streets. Test pit explorations were excavated to a maximum depth of four and one half (4.5) feet below existing grade (b.e.g.). Additionally, three (3) core hole explorations were conducted within the existing project streets. Core hole explorations were dug to a maximum depth of two (2) feet. The locations of the exploratory excavations within the proposed site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnician in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected at each material change within the test pit and core hole locations. Soil samples were subsequently transported to our Reno geotechnical laboratory for testing and additional analysis.

The native soils encountered consisted generally of clayey sands (SC), silty sands (SM), and poorly graded gravels with clay (GP-GC). Aggregate base was only encountered in four of the five explorations. Table 1 presents the existing pavement sections within the project streets.

Exploration	Asphalt (inches)	Direct Supporting Layer (inches)	Subgrade	Exploration	Asphalt (inches)	Direct Supporting Layer (inches)	Subgrade
Core #5	3	5 (Base)	SM & SC	Test Pit #3	5	7 (Base)	GP-GC
Core #6	4	4 (SM)	SM & SC	Test Pit #9	4.5	5 (Base)	GP-GC
Core #9	5	2 (Base)	SC & SM	-	-	-	-

 TABLE 1

 THICKNESSES OF EXISTING PAVEMENT SECTIONS



4.0 FIELD AND LABORATORY TEST DATA

Laboratory tests performed on representative samples included sieve analysis (including fines), Atterberg limits, R-value, expansion index, and sulfate content. Much of this data is displayed on the "logs" of the subsurface explorations to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the subsurface explorations are included in Appendix A of this report as Plates A-1 through A-5. A key to the logs, explaining the symbols and nomenclature, is included as Plate A-6.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-4. 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.

4.1 Analytical Testing: Western Environmental Testing Laboratory (WET Lab) of Sparks, Nevada conducted the sulfate content laboratory testing. Test results are included (on WET Lab letterhead) in Appendix B on Plate B-4.

Laboratory prepared cement treated pulverized asphalt/base/subgrade compression specimens were compacted and tested. Specimens were comprised of thirty-five percent (35%) pulverized asphalt, thirty percent (30%) aggregate base, twenty-five percent (25%) silty sand, and ten percent (10%) clayey sand in order to simulate the existing pavement section. Specimen cement contents were 2%, 4%, and 6% by dry weight of the maximum dry density. Cement treated materials compression results are provided in Appendix D.

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.



5.0 DISCUSSION AND RECOMMENDATIONS

5.1 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 and laboratory testing phases 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.

5.2 General Site Grading

5.2.1 Clearing and Grubbing

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 not anticipated under the existing roadway. Clearing and grubbing may be required if improvements will be placed outside of the existing roadway. Where required, clearing and grubbing is anticipated to be as much as six (6) 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 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, the re-compacted surface should be proof-rolled to identify any possible yielding surfaces. Proofrolling 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.

5.2.2 Unsuitable Subgrade Mitigation

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, the 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 twelve (12) inches of four (4) to six (6) 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.



5.2.3 Structural Fill

Properly compacted structural fill soils to be used on site should consist of non-expansive materials (LL less than 35 and/or a PI less than 12 and/or Expansion Index less than 20), have an R-Value of at least 30, should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than three inches in largest dimension. All structural fill soils shall also be non-corrosive and have a water soluble sulfate content of less than 0.1%. Structural fill soils shall also meet the following gradation requirements (Table 1):

Sieve Size	% Passing
4″	100
3/4″	70 - 100
#40	15 - 65
#200	5 – 35

TABLE 2 STRUCTURAL FILL BACKFILL GRADATION

Import structural fill soils should be tested and approved prior to being placed or delivered onsite (**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 re-compacted to a minimum of **ninety percent (90%)** as determined by the ASTM D1557 Standard.



GEOTECHNICAL INVESTIGATION REPORT

Structural fill 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.

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 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.



6.0 PAVEMENT DESIGN

6.1 Pulverization, Cement Treatment, and Asphalt Concrete

Lumos recommends pulverizing the existing asphalt, aggregate base, and/or subgrade soils to a depth of ten (10) inches. The pavement structural section was determined for the asphalt concrete utilizing a resistance value (R-Value) of 14 (Native Poorly Graded Gravel with Clay and Sand) and an R-Value of 80 for the cement treated recycled aggregate base. For this project, we have assumed a Traffic Index (TI) value of 5 due to the anticipated low traffic volume. Refer to Table 3 for the recommended asphalt pavement section. The pulverized material shall meet the gradation requirements of Type 1 Recycled Aggregate Base. The pulverized material shall be regraded to accommodate four (4) inches of asphalt. The remaining six (6) inches of pulverized material shall be cement treated. The regraded pulverized material shall be moisture conditioned to at least two percent (2%) over optimum, four and one-half percent (4.5%) cement added by dry weight of aggregate, and compacted to a minimum of **ninety-five percent (95%)** relative density of the ASTM D1557 standard. The compacted cement treated pulverized material shall be sealed with a coat of CSS applied at a rate of between 0.15 gallons to 0.25 gallon per squareyard within twenty-four (24) hours of compaction. The cement treated pulverized material shall be kept moist until the cure seal is placed. Following placement of the cure the prepared material shall be allowed to cure for a minimum of seven (7) days and reach a compressive strength of at least three-hundred pounds per square inch (300 psi) prior to paving. Immediately prior to paving, the cement treated pulverized materials shall be "microcracked", utilizing a vibratory roller. Microcracking shall be completed prior to paving and to the satisfaction of the Geotechnical Engineer. See Appendix C and D for the Pavement Calculations and Cement Treated Specimen Compression Test Data.

TRAFFIC INDEX	PULVERIZATION DEPTH	CEMENT TREATED RECYCLED BASE THICKNESS	ASPHALT THICKNESS
5	10″	6″	4″

TABLE 3PULVERIZATION REQUIREMENTS AND PAVEMENT STRUCTURAL SECTION



We recommend a Type III, PG64-28NV, 50 blow Marshall mix targeting three percent (3%) air voids. The asphalt concrete shall be compacted to between ninety-three percent (93%) and ninety-eight percent (98%) of the theoretical maximum ("Rice") specific gravity.

7.0 CORROSION AND CHEMICAL ATTACK

Tested soils have a mild sulfate content of 23 parts per million. However, Type II cement (meeting ASTM C150) is recommended for all concrete and cement in direct contact with on-site soil.

All exterior concrete should have between four and one half and seven and one-half percent (4.5%-7.5%) 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 compressive strength of 4,000 psi is recommended for all external concrete. All concrete shall be placed pursuant to ACI recommendations.



8.0 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.

9.0 CONSTRUCTION SPECIFICATIONS

All work shall be governed by the latest adopted revision of the Standard Specifications and Standard Details for Public Works Construction, as distributed by The City of Sparks, except as modified herein.



10.0 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 The City of Sparks ("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.



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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.



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



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- American Society for Testing and Materials (ASTM), 2020, Annual Book of ASTM Standards, West Conshohocken, PA
- Caltrans, Highway Design Manual, March 20, 2020, Topic 633 Engineering Procedures for New Construction and Reconstruction

Naval Facilities Engineering Command, 1986, Design Manual 7.01

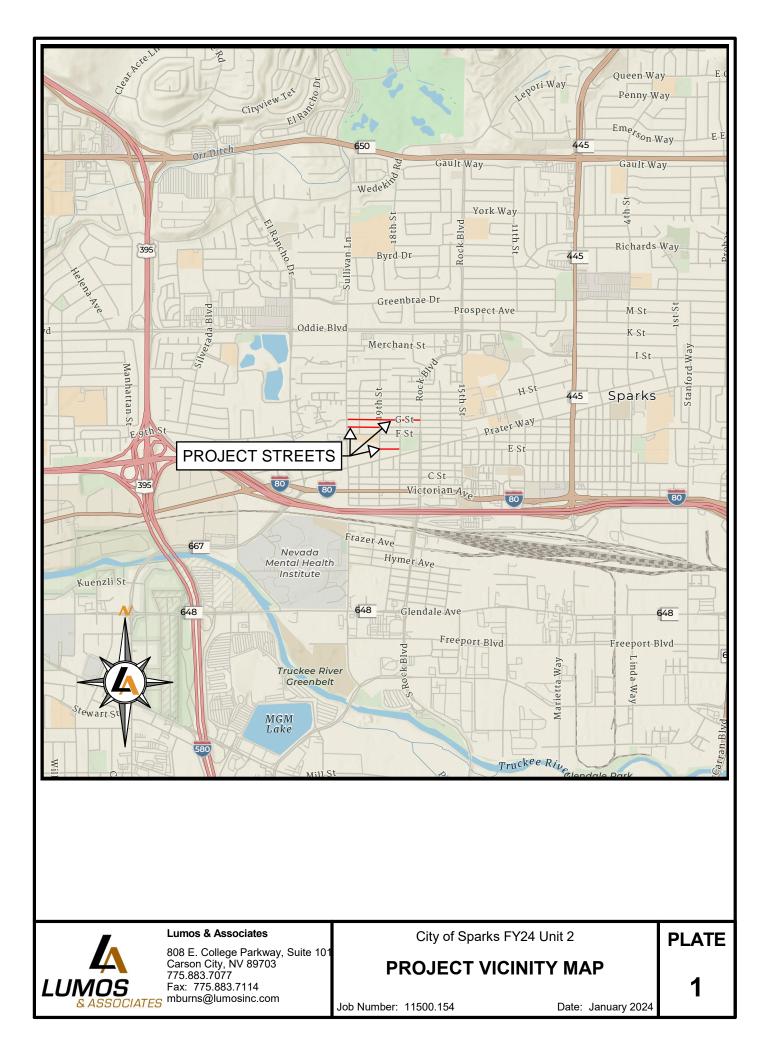
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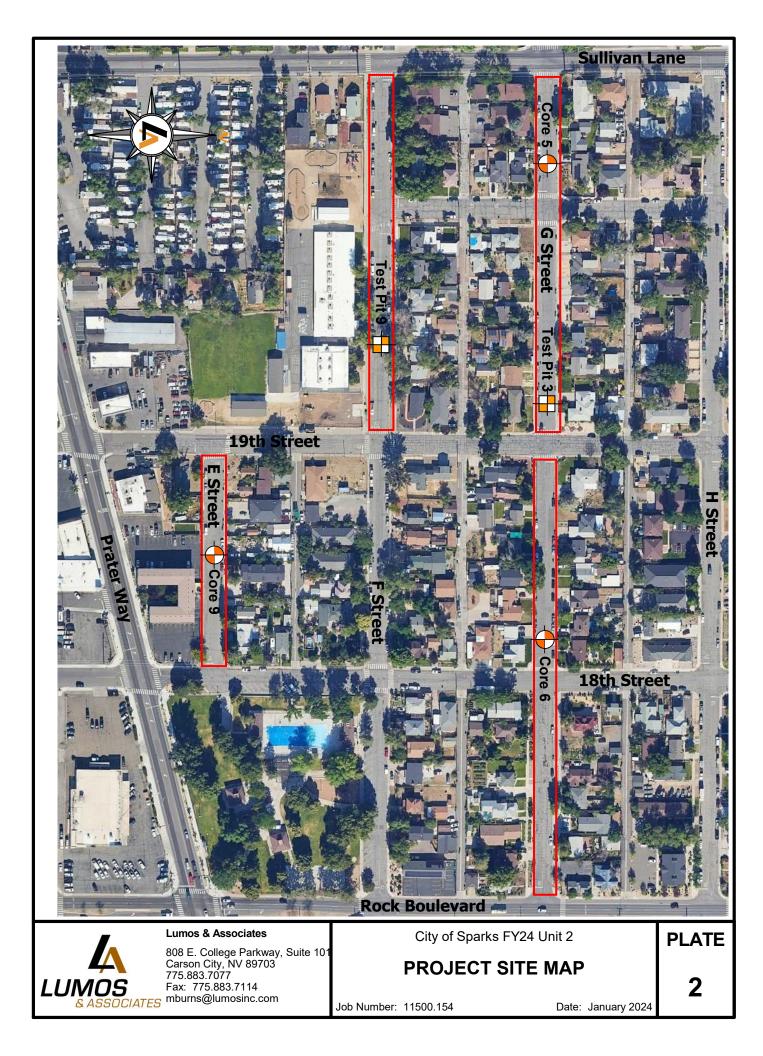
Ramelli, A.R., Henry, C.D., Walker, J.P., with contributions by Bell, J.W., Cashman, P.H., dePolo, C.M., Garside, L.J., House, P.K., Trexler, J,H., and Widmer, M.C., 2011, Preliminary revised geologic maps of the Reno urban area, Nevada, Nevada Bureau of Mines and Geology, Open File Report 2011-07, 1:24,000

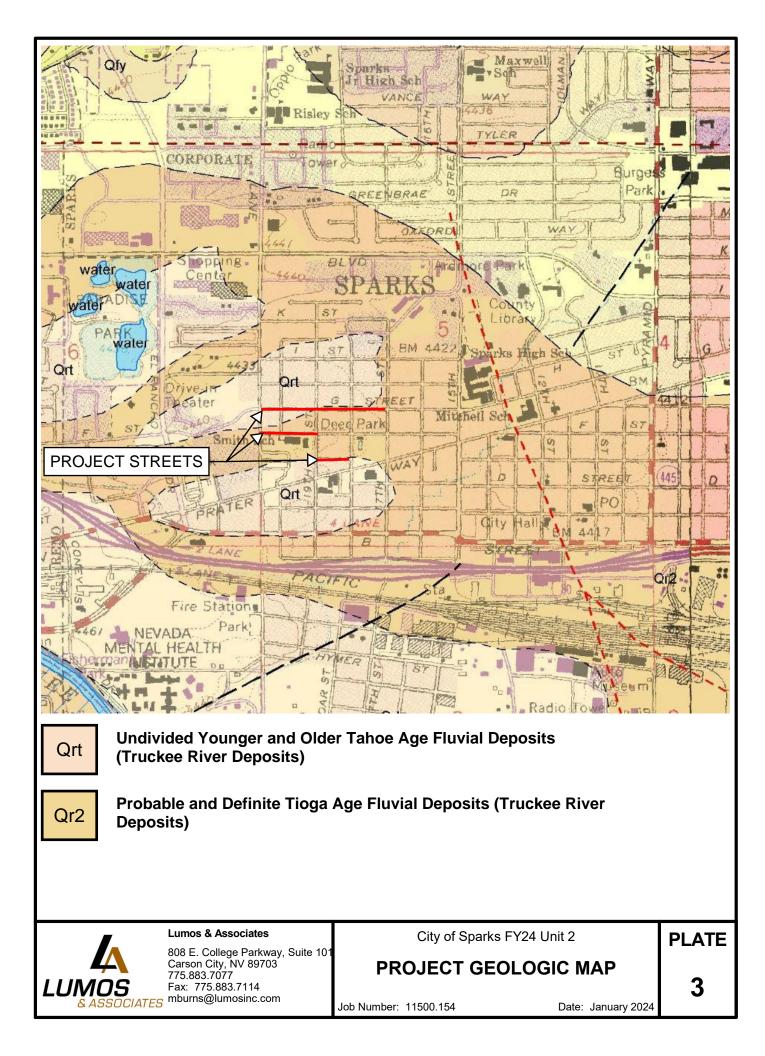
USGS 2002 Website, <u>www.usgs.gov</u>

Washoe County, 2016, Standard Specifications for Public Works Construction, "Orange Book", Washoe County, NV









APPENDIX A

Field Exploration Logs



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	Date Logged:					Water Depth: No groundwater encountered Ground Elev.: Existing				red						
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			<u>3" Asphalt</u> Highly Deteriora			0.3										
			5" Material Simi	ilar to Aggregate	<u>Base</u>											
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LUMOS TP_FULL_PAGE WITH R-V AND SHEAR FY 24 UNIT 2.GPJ_US_LAB.GDT_1/17/24																
ND SHE,						4.5										
Н К-V А																
AGE WI																
FULLF			Test pit terminated at 4.5 fe	ət.												
			Test pit backfilled without co	empaction verification.		 Citv of	f Spark	s FY24	 4 Uni	t 2				D	LA	TF
		Á	Carson City, 775 883 707	ge Parkway, Suite 101 NV 89703 7	LOG OF	•					ST	PI.	Г			
	М & А.	OS sso	Fax: 775.88 CIATES mburns@lun	3.7114	Job Number: 1150	0.154				Date	e: Jai	nuary	2024		4 -{	5

м	AJOR DIVISI	ONS	SYME	BOLS	TYPICAL
IV			GRAPH	LETTER	DESCRIPTIONS
	GRAVEL AND	CLEAN GRAVELS		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
	GRAVELLY SOILS	(LITTLE OR NO FINES)		GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
COARSE GRAINED	MORE THAN 50% OF COARSE FRACTION	GRAVELS WITH FINES		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
SOILS	RETAINED ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND	CLEAN SANDS		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	SANDY SOILS	(LITTLE OR NO FINES)		SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
	COARSE FRACTION	SANDS WITH FINES		SM	SILTY SANDS, SAND - SILT MIXTURES
	PASSING ON NO. 4 SIEVE	(APPRECIABLE AMOUNT OF FINES)		SC	CLAYEY SANDS, SAND - CLAY MIXTURES
				ML	INORGANIC SILTS AND VERY FINE SANDS, ROC FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
FINE GRAINED	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
SOILS				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER				МН	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		СН	INORGANIC CLAYS OF HIGH PLASTICITY
				ОН	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
Н	GHLY ORGANIC S	SOILS		РТ	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

 Other Tests

 AN
 ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity)

 C
 CONSOLIDATION TEST

 DS
 DIRECT SHEAR TEST

 MD
 MOISTURE DENSITY CURVE

 Lumos & Associates
 City of Sparks FY24 Unit 2



808 E. College Parkway, Suite 101 Carson City, NV 89703 775.883.7077 Fax: 775.883.7114 mburns@lumosinc.com

A-6

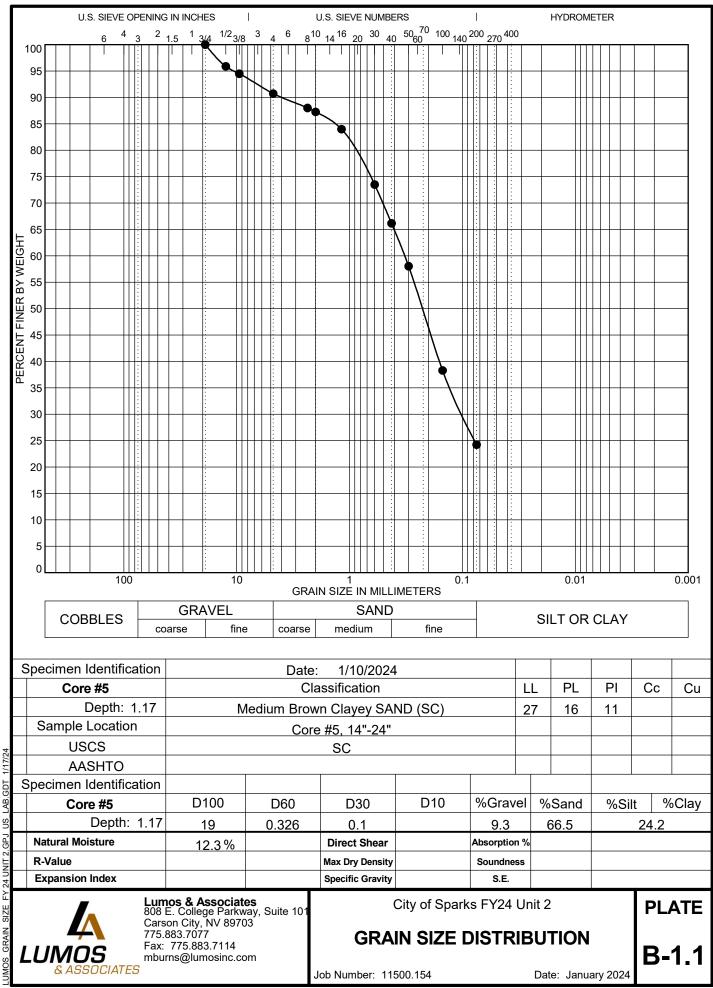
Job Number: 11500.154

LEGEND

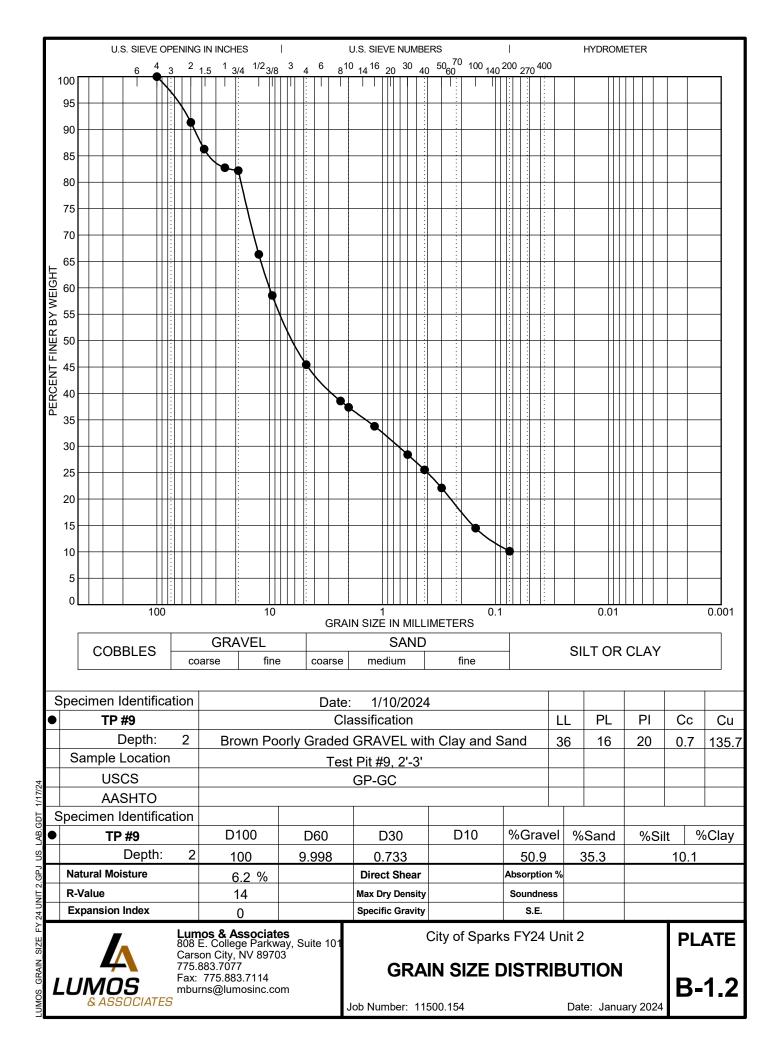
Date: January 2024

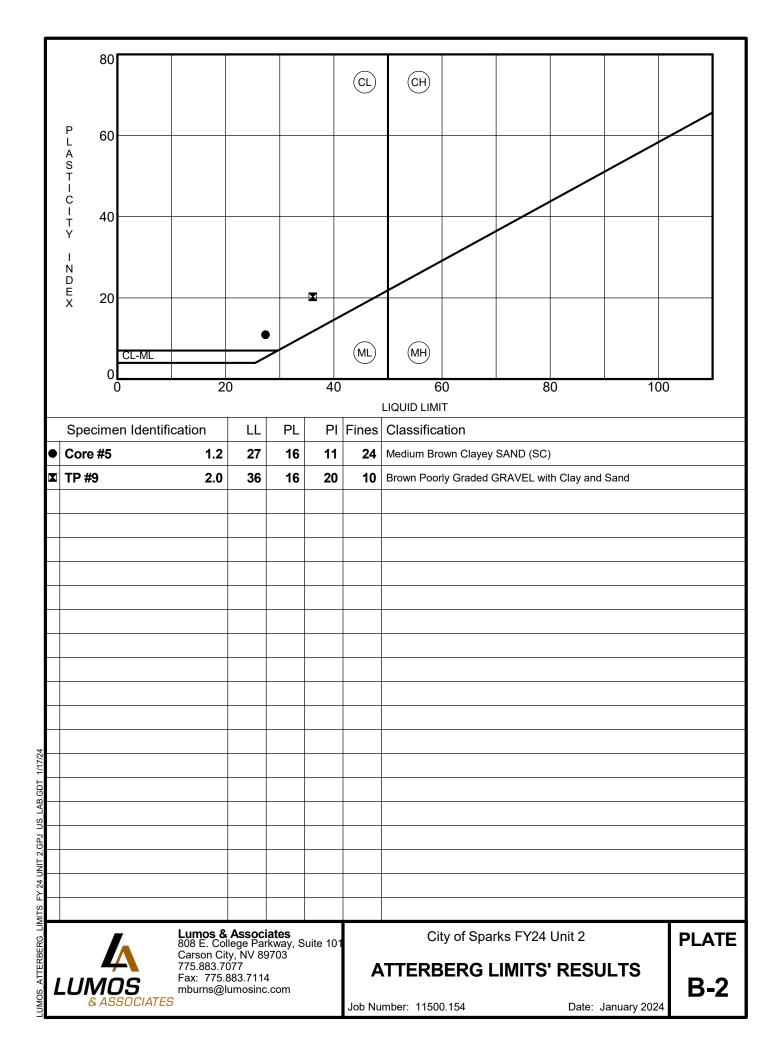
APPENDIX B Soils Laboratory Test Results

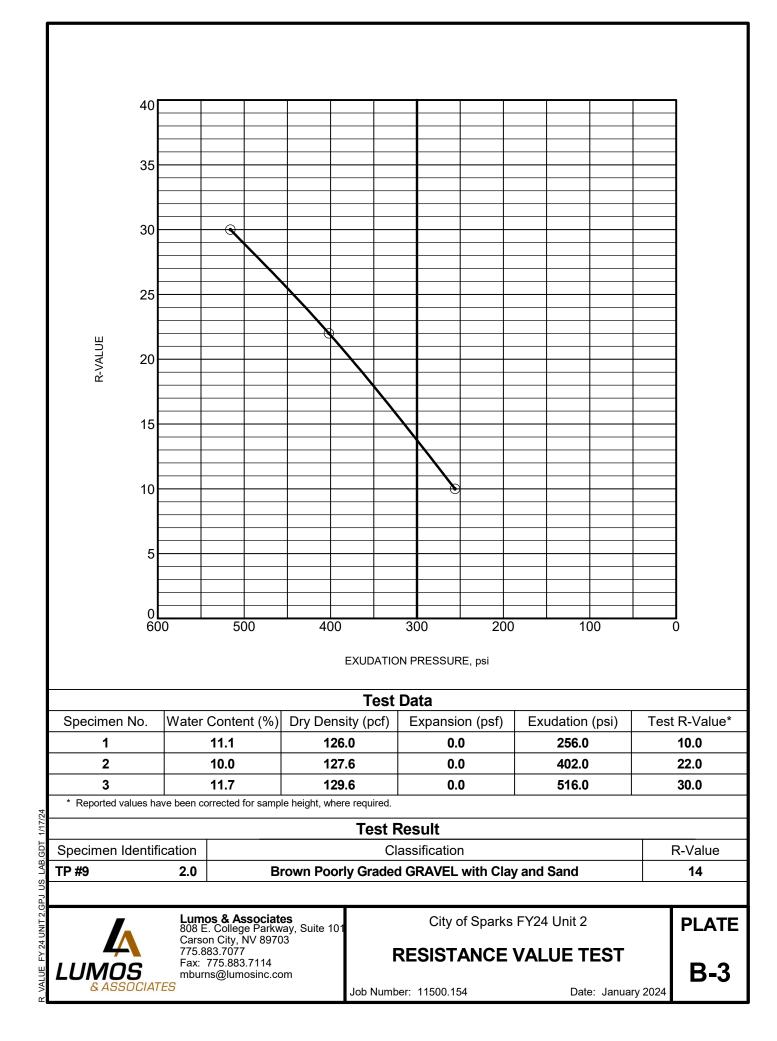




ÅB S GPJ UNIT 2.0 24 ř SIZE GRAIN







Lumos & Associates, Inc. - 24010311

Western Environmental Testing Laboratory Analytical Report

Lumos & Associates, Inc. Date Printed: 1/16/2024 OrderID: 24010311 950 Sandhill Road, Suite 100 Reno, NV 89521 Attn: Mitch Burns Phone: (775) 827-6111 Fax: (775) 827-6122 PO\Project: COS 24-25 Roads/ 11500.154/ Task 1/ MTB Customer Sample ID: TP-9 2ft-3ft Collect Date/Time: 1/9/2024 WETLAB Sample ID: 24010311-002 Receive Date: 1/11/2024 16:10 DF Method Results Units RL Analyzed LabID Analyte Anions by Ion Chromatography Sulfate EPA 300.0 23 mg/kg 10 15 1/15/2024 NV00925 Sample Preparation 10:1 DI Water Extraction WL 10.0 Complete 1 1/12/2024 NV00925

DF=Dilution Factor, RL = Reporting Limit (minimum 3X the MDL), ND = Not Detected <RL or <MDL (if listed)

Page 3 of 4

SPARKS 475 E. Greg Street, Suite 119 Sparks, Nevada 89431 tel (775) 355-0202 fax (775) 355-0817 EPA LAB ID: NV00925 - ELAP No: 2523

Lumos & Associates

ELKO 1084 Lamoille Hwy Elko, Nevada 89801 tel (775) 777-9933 fax (775) 777-9933 EPA LAB ID: NV00926 LAS VEGAS 3230 Polaris Ave. Suite 4 Las Vegas, Nevada 89102 tel (702) 475-8899 fax (702) 622-2868 EPA LAB ID: NV00932

Date: January 2024



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City of Sparks FY24 Unit 2

SOIL SULFATE CONTENT

Job Number: 11500.154

B-4

PLATE

APPENDIX C

Pavement Calculations



Job Number: 11500.154 Project: City of Sparks FY24 Unit 2 Rehab Client: The City of Sparks Description: Pavement Calculations By: J. Macaluso

R-Value for CTB = 80 (Assumed) R-Value for Native Soils = 14 TI (Local Road) = 5 (Light Traffic)

GE=0.0032*(TI)*(100-R)

Gf _(AC,Local)=2.5, Gf_(Cement Treated Soil)=1.2, Gf_(subgrade)=1 t_{layer} =GE/Gf

Local Road Pavement Section : Asphalt and Cement Treated Recycled Material

 $GE_{\rm AC}{=}0.0032^{*}(5)^{*}(100{-}80){=}0.32'$ $t_{\rm AC}{=}(0.32/2.5)^{*}(12"/1'){=}1.54"$ USE 4" Asphalt Concrete $GE_{\rm AC}{=}(4"{*}2.5)/(12"){=}0.83'$

 $\begin{array}{l} GE_{\text{CTB(Pulv.)}} = 0.0032^{*}(5)^{*}(100\text{-}14) = 1.4' \\ t_{\text{CTB(Pulv.)}} = ((1.4'\text{-}0.83')/1.2)^{*}(12''/1') = 5.7'' \\ \end{array} \\ \begin{array}{l} \textbf{USE 6'' Cement Treated Pulverized Material} \end{array}$



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Lumos & Associates

City of Sparks FY24 Unit 2

PAVEMENT DESIGN

PLATE

C-1

Job Number: 11500.154

Date: January 2024

APPENDIX D

Cement Treated Pulverized Asphalt/Subgrade Mix Design





CEMENT TREATED BASE COMPRESSION TESTS

REPORT TO:		City of S	parks		ROJECT NAME: ROJECT NO.:	2024 Street Rel 11500.154	nab Unit 2
					DCATION:	Sparks, Nevada	
					ONTRACTOR:	-	
SAMPLED BY	ŕ :	B. Sexton			ATE RECEIVED:	1/9/2024	
WEATHER:		Lab Molde	d	T	IME:	-	
AIR TEMP:		-		M	OLDED BY:	Z. Lim	
DATE MOLD	ED:	1/15/23					
MATERIAL D	DESCRIPTION	СТВ	Lab Blend - 20	24 Streets	· 35% AC, 30%	Base, 25% SM, 10	% SC
				•	m Moisture Cont	ent	
Sample Loc	CATION:	<u>TP-3</u>	8, ТР-9, С-5, С	-9			
SAMPLE TYP	νE:	LABORA	TORY DESIGN	X	FIELD SAM	PLE	
			1051		D.175		
				TEST	DATE	TOTAL	UNIT
		INCHES)	(SQ.IN)	AGE 7	TESTED	LOAD-LBS.	LOAD PSI
	·12-24 ·13-24	4.01 4.01	12.63 12.63	7	1/22/23 1/22/23	6,445	510 525
	14-24	4.01	12.63	7	1/22/23	6,194	490
	1121	1.01	12.05	/	1/22/25	0,151	150
				Average	Compressive St	rength 7-Day :	510
Minimum	Specified S	trength:	300 psi	Average (Compressive St	rength 7-Day :	510
Minimum	Specified S	trength:	300 psi	Average (Compressive St	rength 7-Day :	510
	-	trength:	300 psi	Average (Compressive St	rength 7-Day :	510
Minimum REMA	-	trength:	300 psi	Average (Compressive St	rength 7-Day :	510
	RKS:					rength 7-Day :	
	RKS:	mpling were p	erformed in accord				
	RKS:	mpling were p	erformed in accord	dance with AS ²		2-1633. Standards as ap	
REMA	RKS:	mpling were p	erformed in accord	dance with AS		2-1633. Standards as ap	pplicable.
REMA	RKS: Testing and Sa CAPPING	mpling were p	erformed in accord	dance with AS ²	ГМ D-558, C-1632, C	C-1633. Standards as ap X BONDED DO NOT C	pplicable.
REMA T	RKS: Testing and Sa CAPPING	mpling were p	erformed in accord	dance with AS ²	TM D-558, C-1632, C Respectively S	C-1633. Standards as ap X BONDED DO NOT C	pplicable.
REMA T	RKS: Testing and Sa CAPPING	mpling were p	erformed in accord	dance with AS ²	TM D-558, C-1632, C Respectively S M. Burns	E-1633. Standards as ap BONDED DO NOT C Submitted by:	pplicable.
REMA T	RKS: Testing and Sa CAPPING	mpling were p	erformed in accord	dance with AS ²	TM D-558, C-1632, C Respectively S M. Burns	C-1633. Standards as ap X BONDED DO NOT C	pplicable.
REMA T	RKS: Testing and Sa CAPPING FEST RESULTS	mpling were p	erformed in accord	dance with AS INBONDED OMPLY	TM D-558, C-1632, C Respectively S M. Burns	E-1633. Standards as ap X BONDED DO NOT C Submitted by: heering Manager	oplicable.
REMA T	RKS: Testing and Sa CAPPING TEST RESULTS Client Notified Lumos & 808 E. Co	mpling were p 5 5: of Test Res Associates	erformed in accord	dance with AS ^T INBONDED OMPLY	Respectively S M. Burns Materials Engir	E-1633. Standards as ap X BONDED DO NOT C Submitted by: heering Manager	oplicable.
REMA T	RKS: Testing and Sa CAPPING TEST RESULTS Client Notified Lumos & 808 E. Co Carson C 775.883.7	of Test Res Associates plege Parkwa ity, NV 89703	erformed in accord	dance with AS INBONDED OMPLY	Respectively S M. Burns Materials Engir City of Sparks F BORATOR	E-1633. Standards as ap BONDED DO NOT C Submitted by: heering Manager	pplicable.



CEMENT TREATED BASE COMPRESSION TESTS

REPORT TO:	City of S	oarks		DJECT NAME: DJECT NO.:	2024 Street Rel 11500.154	hab Unit 2
				CATION:	Sparks, Nevada	
				NTRACTOR:	-	
SAMPLED BY:	B. Sexton			TE RECEIVED:	1/9/2024	
WEATHER:	Lab Molde	d	TIM		-	
AIR TEMP:	-		MO	LDED BY:	Z. Lim	
DATE MOLDED:	1/15/23					
MATERIAL DESCRIPT					Base, 25% SM, 10	% SC
		Cement at 2% O		Moisture Cont	ent	
Sample location:	<u>TP-3</u>	, ТР-9, С-5, С-	-9			
SAMPLE TYPE:	LABORA	Tory Design	х	FIELD SAM	PLE	
	DIAMETER	AREA	TEST	DATE	TOTAL	UNIT
LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PSI
R-9-24	4.01	12.63	7	1/22/23	4,300	340
R-10-24	4.01	12.63	7	1/22/23	4,408	350
R-11-24	4.01	12.63	7	1/22/23	4,099	325
			Average Co	ompressive St	rength 7-Day :	340
Minimum Specifie	ed Strength:	300 psi				
REMARKS:						
Testing a	nd Sampling were p	erformed in accord	ance with ASTM	1 D-558, C-1632, C	C-1633. Standards as ap	oplicable.
CAP	PING	U	NBONDED		X BONDED	
TEST RES	ULTS:		OMPLY		DO NOT C	OMPLY
				Respectively S	Submitted by:	
	ified of Test Res	ults		Respectively S M. Burns	Submitted by:	
	ified of Test Res	ults		M. Burns	Submitted by: neering Manager	
Client Not	os & Associates		Ci	M. Burns Materials Engir ty of Sparks F	eering Manager	PLAT
Client Not	os & Associates E. College Parkwa son City, NV 89703	y, Suite 101	Ci LAB	M. Burns Materials Engir ty of Sparks F ORATOR	eering Manager Y24 Unit 2 Y CEMENT	PLAT
Client Not	os & Associates E. College Parkwa	y, Suite 101	Ci LAB	M. Burns Materials Engir ty of Sparks F ORATOR	eering Manager	PLAT



CEMENT TREATED BASE COMPRESSION TESTS

WEATH AIR TE	.ED BY: HER:	B. Sexton			CATION: NTRACTOR:	Sparks, Nevada	
WEATH AIR TE		B. Sexton		COI			
WEATH AIR TE		B. Sexton				-	
AIR TE	HER:			DA	TE RECEIVED:	1/9/2024	
		Lab Molde	d		1E:	-	
DATE N		-		MO	LDED BY:	Z. Lim	
	MOLDED:	1/15/23					
MATER	RIAL DESCRIPT					Base, 25% SM, 10	% SC
			Cement at 2% C		n Moisture Cont	ent	
SAMPL	E LOCATION:	<u>TP-3</u>	, ТР-9, С-5, С	-9			
SAMPL	E TYPE:	LABORA	Tory Design	X	FIELD SAM	PLE	
Γ		DIAMETER	AREA	TEST	DATE	TOTAL	UNIT
	LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PSI
Ī	R-6-24	4.01	12.63	7	1/22/23	2,366	185
	R-7-24	4.01	12.63	7	1/22/23	2,157	170
	R-8-24	4.01	12.63	7	1/22/23	2,346	185
				Average Co	ompressive St	rength 7-Day :	180
ļ	REMARKS:						
_							
					1 D-558, C-1632, C	-1633. Standards as ap	plicable.
	CAPF	PING	U	NBONDED		X BONDED	
	TEST RESI	ULTS:		OMPLY			OMPLY
					Respectively S	Submitted by:	
	Client Noti	fied of Test Res	ults		M. Burns		
					Materials Engin	eering Manager	
			i				
	Lumo	os & Associates		Cit	ty of Sparks F	Y24 Unit 2	PLA
	808 E	E. College Parkwa	/, Suite 101			Y24 Unit 2 (CEMENT	PLA
И	808 E Carso 775.8		/, Suite 101	LABO	ORATOR		D-1

GEOTECHNICAL INVESTIGATION REPORT

CITY OF SPARKS FY25 STREET REHABILITATION SPARKS, NEVADA

JN: 11800.120

NOVEMBER, 2024

PREPARED FOR: CITY OF SPARKS 431 PRATER WAY SPARKS, NV 89431



808 E. COLLEGE PKWY SUITE 101 CARSON CITY, NV 89706 775-883-7077

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- Appendix B Soils Laboratory Test Results
- Appendix C Pavement Design
- Appendix D Specifications for Demolition
- Appendix E Cement Treated Asphalt/Base/Subgrade Compression Test Reports



GEOTECHNICAL INVESTIGATION REPORT CITY OF SPARKS FY25 STREET REHABILITATION SPARKS, NEVADA

1.0 INTRODUCTION

This report presents the results of Lumos & Associates, Inc.'s Geotechnical Analysis for the proposed City of Sparks FY25 street rehabilitation project located in Sparks, Nevada. 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 asphalt roadway reconstruction/rehabilitation. The project scope also includes the replacement of associated concrete flatwork. We have assumed that final grades at the site will be approximately the same as the existing grades. This investigation was divided into two components; a new pavement investigation along new FY 25 project streets and collection of additional soil information on previously investigated FY 25 streets. The new FY 25 project streets include I Street and H Street between 19th Street and Sullivan Lane and 20th Street between F Street and I Street. The previously investigated project streets where additional soil information was collected include F Street between 19th Street and 18th Street and 19th Street between H Street and G Street. The project limits described above are presented on the figure below.

	4443 ft	ISt							
	108								
Greyhaven Ln	6:4		i 'm'r	-4					
				320 L					
			6 9,56 190	sock Blyd					
	162			is olimo					
			1.010-45						
	5.	F-St-	8 00-8						
	FY25 Unit 1 - Geotechnical Investigation Streets FY25 Unit 1 - Previously Investigated Streets - Additional Cores Collected								

Figure 1: Project Limits Map



Page 1 L:\LAProj\11800.120 - FY25 Street Rehabilitation Geotech\6-Construction\Geotechnical\Test Results\0.2 - GEOTECH REPORT.docx 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 and asphalt pavement improvements. In addition, information such as logs of all explorations (Appendix A), laboratory test data (Appendix B), and pulverized cement treated asphalt/base/subgrade compression test reports (Appendix E) are provided in this report.

The recommendations contained herein have been prepared based on our understanding and assumptions of the 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 site geology and sub-surface conditions is implied or intended.



2.0 GEOLOGIC SETTING

Sparks is located in the western portion of the Great Basin geomorphic province. The Great Basin is characterized by internal drainage and large normal fault-bounded valleys (grabens) separated by high mountain ranges (horst). The Sierra Nevada province to the west is characterized by large granite masses that have been uplifted and tilted a few degrees toward the west. Overlying the granites are older oceanic meta-sedimentary rocks.

More specifically the project streets are located within the eastern half of the Truckee Meadows, a broad valley bounded on the west by the tall granite peaks of the Sierra Nevada Mountains, and on the east by the lower volcanic peaks of the Virginia Range. Younger volcanic rocks also bound the valley on the north and south. Faults separate the valley from the surrounding mountains as is typical of the Basin and Range province. Sediments filled the valley from a number of tributaries and ancestral lakes during the late Tertiary period. The dominant sediment source has been, and continues to be, the Truckee River and its ancestral counterparts. Stream deposits were particularly voluminous after glacial periods. Since the end of the last glacial period, some 10,000 years ago, arid erosional forces combined with faulting have been the predominant processes to shape the region. These processes have created large alluvial fans that surround the valley floor of the Truckee Meadows. The surface geology in this area has been mapped by Alan R. Ramelli, Et al. (2011). Their mapping shows undivided younger and older Tahoe age fluvial deposits (Qrt) and Tioga age fluvial deposits (Qr2) underlie the site. Both of these deposits are Truckee River deposits which generally are comprised of poorly bedded gravels, sands, and fine grained soils. Which is consistent with what was encountered during our field investigation. Their geologic mapping is presented on Plate 3.



3.0 SITE CONDITIONS AND FIELD EXPLORATION

At the time of our investigation the site was paved. The pavement is generally in poor condition, with various types of cracking and fatigue stresses observed. Severe alligator cracking and medium severity block cracking and potholes were encountered throughout the project streets. The image below, taken on 19th Street, illustrates such pavement stresses.



Image 1: General Pavement Condition (Condition Shown Similar Throughout Project Streets)

The current investigation included test pit and asphalt core hole subsurface explorations. Five test pits and two core holes were excavated along the new FY 25 project streets and four core holes were excavated along the previously investigated FY 25 project streets (See Plate 2). The location of the subsurface explorations were determined by using existing features at the site. Therefore, the approximate location of the subsurface explorations should be considered accurate only to the degree implied by the methods used.



Carson City • El Dorado Hills • Fallon • Lake Tahoe • Reno www.lumosinc.com The five test pits were excavated to an approximate depth of four (4) to four and one-half (4.5) feet below-existing-grade (b.e.g.) utilizing a Case 590 backhoe. The six core hole explorations were dug to a maximum depth of one and one-half (1.5) feet. The locations of the exploratory test pits and core holes within the site are shown on Plate 2. The subsurface soils were continuously logged and visually classified in the field by our Geotechnician in accordance with the Unified Soil Classification System (USCS). Representative soil samples were collected at each material change within the subsurface explorations and subsequently transported to our Carson City geotechnical laboratory for testing and additional analysis.

The native soils encountered consisted generally of clayey sands (SC), silty sands (SM), clayey gravel (GC) and poorly graded gravels (GP and GP-GM). Cobbles were encountered in four of the five test pit excavations. Generally, cobbles were encountered at depths below two (2) feet, excluding test pit #2 where a cobbles were encountered at ten (10) inches (b.e.g.). Table 1 presents the existing pavement sections encountered during our investigation.

Exploration	Asphalt Thickness (in.)	Base Course Thickness (in.)	Subgrade Material	
	New FY 2	25 Project Stree	ets (I St, H St, & 20 th St)	
TP #1	4	5	Clayey Sand (SC) and Clayey Gravel with Sand and Cobble (GC)	
TP #2	5	5	Poorly Graded Gravel with Sand and Cobble (GP)	
TP #3	4	5	Clayey Sand (SC) and Poorly Graded Gravel with Silt, Sand, and Cobble (GP-GM)	
TP #4	4	8	Clayey Sand with Gravel Fill (SC) and Silty Sand with Gravel (SM)	
TP #5	5	6	Clayey Sand with Gravel Fill (SC) and Clayey Gravel with Sand and Cobble (GC)	
Core #1	4.25	5.75 Struct. Fill	Clayey Sand with Gravel (SC)	
Core #2	4	8	Silty Sand with Gravel (SM)	
Previously Investigated FY 25 Streets (F St & 19 th St)				
Core #3	4	0	Clayey Sand (SC)	
Core #4	4	0	Clayey Sand with Gravel (SC)	
Core #5	4	0	Silty Sand with Gravel Fill (SM)	
Core #6	4	0	Silty Sand with Gravel Fill (SM)	

TABLE 1: EXISTING PAVEMENT SECTIONS AND SUBGRADE DESCRIPTION



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

4.0 FIELD AND LABORATORY TEST DATA

Field data was developed from samples taken and tests conducted during the field exploration and laboratory testing phases of this project. Representative soil samples were obtained for each material encountered in the exploratory excavations. All the samples were subsequently transported to our Carson City geotechnical laboratory for testing and analysis.

Laboratory tests performed on representative samples included sieve analysis (including fines), Atterberg limits, R-value, expansion index, and soil sulfate content. Much of this data is displayed on the "logs" of the subsurface explorations to facilitate correlation. Field descriptions presented on the logs have been modified, where appropriate, to reflect laboratory test results. The logs of the subsurface explorations are included in Appendix A of this report as Plates A-1 through A-11. A key to the logs is included as Plate A-12.

Individual laboratory test results are presented in Appendix B as Plates B-1 through B-4. 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: Western Environmental Testing Laboratory (WET Lab) conducted this testing. Analytical testing included determination of the site soil's sulfate content. One sample was delivered to WET Lab's Sparks office. Analytical test results are presented on Plate B-4.

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.



5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

From a geotechnical viewpoint, the site is considered suitable for the proposed improvements when prepared as recommended herein.

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 and laboratory testing phases 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. Demolition shall be completed as specified in Appendix D.

5.2 General Site Grading

5.2.1 Clearing and Grubbing

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 not anticipated under the existing roadway. Clearing and grubbing may be required if improvements will be placed outside of the existing roadway. Where required, clearing and grubbing is anticipated to be as much as six (6) 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 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 base, the re-compacted surface should be proof-rolled to identify any possible yielding surfaces. Proofrolling 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.

5.2.2 Unsuitable Subgrade Mitigation

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, the 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 twelve (12) inches of four (4) to six (6) 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.



5.2.3 Structural Fill

Properly compacted structural fill soils to be used on site should consist of non-expansive materials (LL less than 35 and/or a PI less than 12 and/or Expansion Index less than 20), have an R-Value of at least 30, should be free of contaminants, organics (less than two percent (2%)), rubble, or natural rock larger than 4 inches in largest dimension. All structural fill soils shall also be non-corrosive and have a water soluble sulfate content of less than 0.1%. Structural fill soils shall also meet the following gradation requirements (Table 2):

Sieve Size	% Passing	
4″	100	
3/4″	70 - 100	
#40	15 - 65	
#200	5 - 35	

TABLE 2STRUCTURAL FILL GRADATION

Import structural fill soils should be tested and approved prior to being placed or delivered onsite (**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 re-compacted to a minimum of **ninety percent (90%)** as determined by the ASTM D1557 Standard.

Structural fill 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.

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.



6.0 PAVEMENT DESIGN

6.1 Pulverization, Cement Treatment, and Asphalt Concrete

Lumos recommends pulverizing the existing asphalt, aggregate base, and/or subgrade soils to a depth of twelve (12) inches. The pavement structural section was determined for the asphalt concrete utilizing a resistance value (R-Value) of 7 (Native Clayey Sand with Gravel) and an R-Value of 80 for the cement treated recycled aggregate base. For this project, we have assumed a Traffic Index (TI) value of 5 due to the anticipated low traffic volume. Refer to Table 3 for the recommended asphalt pavement section. The pulverized material shall meet the gradation requirements of Type 1 Recycled Aggregate Base. The pulverized material shall be regraded to accommodate four (4) inches of asphalt. The remaining eight (8) inches of pulverized material shall be cement treated. The regraded pulverized material shall be moisture conditioned to at least two percent (2%) over optimum, five percent (5%) cement added by dry weight of aggregate, and compacted to a minimum of **ninety-five percent (95%)** relative density of the ASTM D1557 standard. The compacted cement treated pulverized material shall be sealed with a coat of CSS applied at a rate of between 0.15 gallons to 0.25 gallon per square-yard within twenty-four (24) hours of compaction. The cement treated pulverized material shall be kept moist until the cure seal is placed. Following placement of the cure the prepared material shall be allowed to cure for a minimum of seven (7) days or until a minimum compressive strength of at least three-hundred pounds per square inch (300 psi) is achieved (we anticipate a 3 day cure will reach the specified strength). The minimum compressive strength shall be achieved prior to paving. Immediately prior to paving, the cement treated pulverized materials shall be "microcracked", utilizing a vibratory roller. Microcracking shall be completed prior to paving and to the satisfaction of the Geotechnical Engineer. See Appendix C and E for the Pavement Calculations and Cement Treated Specimen Compression Test Data.

Traffic	Pulverization	Cement Treated Recycled	Asphalt
Index	Depth	Base Thickness	Thickness
5	12″	8″	4″

TABLE 3PULVERIZATION REQUIREMENT AND PAVEMENT SECTION

*See Appendix C for the Pavement Calculations

Carson City • El Dorado Hills • Fallon • Lake Tahoe • Reno www.lumosinc.com We recommend a Type III, PG64-28NV, 50 blow Marshall mix targeting three percent (3%) air voids. The asphalt concrete shall be compacted to between ninety-three percent (93%) and ninety-eight percent (98%) of the theoretical maximum ("Rice") specific gravity.

All mix designs for asphalt concrete should be submitted to the Geotechnical Engineer for review and approval a minimum of seven (7) days prior to paving.

7.0 CORROSION AND CHEMICAL ATTACK

The on-site soil was tested and has a non-detectable amount of sulfate when evaluated utilizing EPA method 300. However, Type II cement (meeting ASTM C150) is recommended for all concrete in direct contact with on-site soil.

All exterior concrete should have between four and one half and seven and one half percent (4.5%-7.5%) 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 compressive strength of 4,000 psi is recommended for all external concrete. All concrete shall be placed pursuant to ACI recommendations.

8.0 CONSTRUCTION SPECIFICATIONS

All work shall be governed by the latest adopted revision of the Standard Specifications and Standard Details for Public Works Construction, as distributed by The City of Sparks, except as modified herein.



9.0 LIMITATIONS

This report has been prepared in accordance with the currently accepted engineering practices in Northern Nevada. 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 the City of Sparks ("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, 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.



Jeremy Macaluso, P.E. Geotechnician Lumos & Associates, Inc.

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



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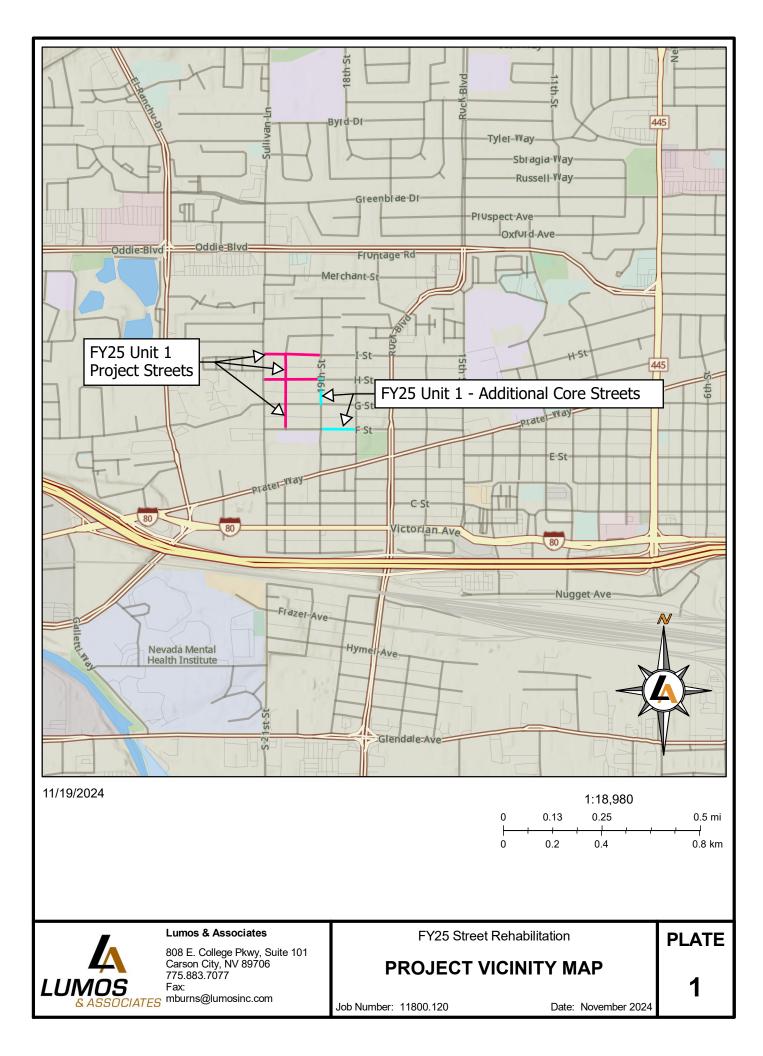
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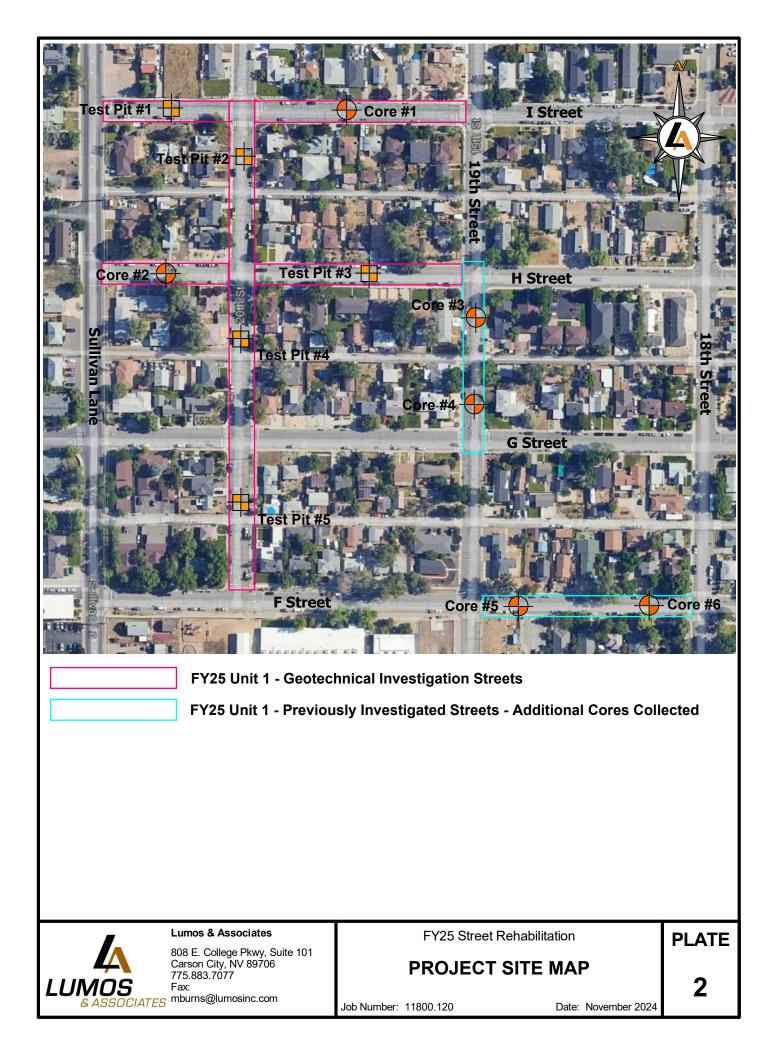
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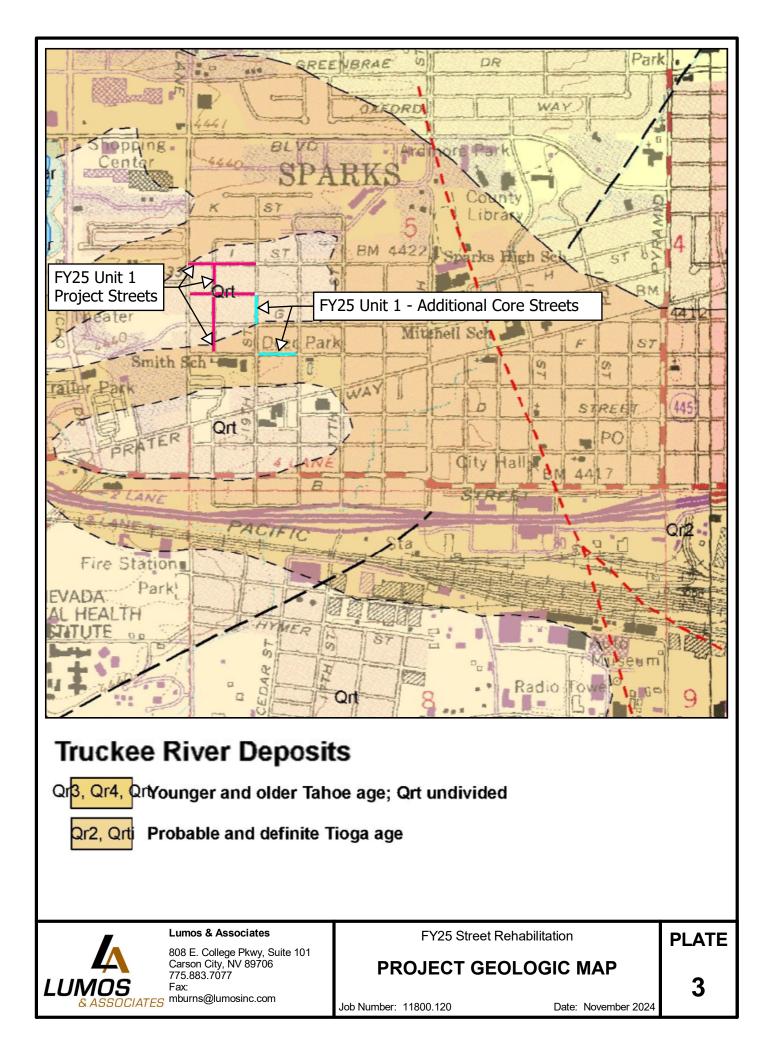
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		jed E	-	J. Macaluso				otal Dep			feet						
		-	-	11/7/2024				ater De	-		-		ater	enco	unte	red	
	Drill	Туре	э:	Core Drill/Han	d Excavation		Gr	round E			sting]					
Depth in	Feet	Graphic Log	Sample Type	Percolation Test	Split Spoon	Ziplock Sample		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
Dep	- шँ	Graph	Sampl	California Sampler	B Bulk Sample			Natural Conte	Dptimum Conte	Maxi Dry Der	Lin	Plas	Grav (3" - #/	San (#4 - #2(Fine (< #20(R-V	Expansi
-				4" Asphalt	SUIL DESCRIPTION		_										
				Top 2" Slurry - Bottom 2" Aspl	Poor Quality nalt - Poor Quality												
							0.3										
				Medium Brown Medium Dense	n Clayey SAND (SC e, Moist)											
- ().5 —																
			B					11.0			33	15	13.6	58.5	27 9		
- 1	.0 –							11.0			00		10.0	00.0	21.0		
/24																	
3DT 11/25																	
CORE HOLE LOG SPARKS FY25.GPJ US LAB.GDT 11/25/24	.5 –						1.5										
S FY25.GP,																	
G SPARK																	
HOLE LO				Core Hole terminated at 1 Core Holes Filled with Soi	.5 feet. I and Capped with Non-Shrink Gr	out.											
CORE					Associates ege Pkwy, Suite 101	F	FY2	25 Stree	et Re	habil	itatio	n				PLA	TE
,]]			Carson Cit	y, NV 89706 77	LOG OF E	EXI	PLOR	AT	ORY	' CC	DRE	HO	LE		A-	8
Ľ		& A	SSOC	Fax: Matter Matter Fax: Fax: Matter Matter Fax:	umosinc.com	Job Number: 1180).12	0			Da	ate: N	oveml	oer 202	24		-

											EH	OLE	E No). C	ore	#4
	ged I	•	J. Macaluso				tal De		1 fe							
	-	-	11/7/2024				ater De	•				ater e	enco	unter	ed	
Drill	Туре	e:	Core Drill/Hand	Excavation		Gro	ound E			sting	J					
Depth in Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon B Bulk Sample	Ziplock Sample Static Water Table	r	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
			4" Asphalt													
			Top 2" Slurry - (Bottom 2" Asph	Good Quality alt - Poor Quality		0.3										
	×.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Brown Clayey S	AND with Gravel (m Dense, Moist	(SC)											
- 0.5 -		В	Loose to Mediu Estimated: 30% Coarse to 50% Coarse to 20% Medium Pl Fines Decrease Gravel Increase	Fine Gravel Fine Sand astic Clay with Depth		10										
- 1.0 -	<u>, , , , , , , , , , , , , , , , , , , </u>					1.0										
CORE HOLE LOG SPARKS FY25.GPJ US LAB.GDT 11/25/24			Core Hole terminated at 1 f Core Holes Filled with Soil a	set. and Capped with Non-Shrink Gr	out.											
OKE		_	Lumos & A	ssociates		FY2	5 Stree	et Re	habil	itatio	n				PLA	TE
Ŭ			808 E. Colle	ge Pkwy, Suite 101										1'	⁻ LA	
LU	IМ & А	US SSOC	Carson City, 775.883.707 Fax: MATES mburns@lur	NV 89706 7	LOG OF E			RATO	ORY				LE Der 202	24	A-	9

										C	ORI	E H	OLE	E No). C	ore	#5
		jed E	-	J. Macaluso				al Dep		1 fe							
		-	-	11/7/2024				ter De	•		-		ater	enco	unte	red	
D	rill ⁻	Туре	e:	Core Drill/Hand	I Excavation		Gro	ound E			sting	1				1	
Depth in	Feet	Graphic Log	Sample Type	Percolation Test California Sampler	Split Spoon B Bulk Sample	Ziplock Sample Table		Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % (< #200 Sieve)	R-Value	Expansion Index
					Moderate Quality alt - Very Poor Qu	uality	0.3										
	.5 —		В	FILL	<u>ND with Gravel (S</u> Moist, Contains (1.0	7.8			NP	NP	21.7	59.2	19.1		
CORE HOLE LOG SPARKS FY25.GPJ US LAB.GDT 11/25/24	.0 —			Core Hole terminated at 1 fr Core Holes Filled with Soil a	eet. and Capped with Non-Shrink G	Grout.											
CORE				Lumos & A	ssociates	l i	FY25	5 Stree	et Re	habil	itatio	n				PLA	TE
1				808 E. Colle Carson City,	ge Pkwy, Suite 101		·v~		• • •	יחר				. –			
	U	M & A		T75.883.707 Fax: Material Material Carson City, 775.883.707 Fax: Mburns@lur	7	LOG OF E			κΑΓ(JRY				DE Der 20		A- ′	10

Drill	Log	ged: e:	J. Macaluso 11/7/2024 Core Drill/Hanc				otal Dej		1.5	feet						
Drill	Туре	∋: 				1										
			Core Drill/Hand				ater De	•		grou	Indw	ater	enco	unter	ed	
in t	Braphic Log	/be		I Excavation		G	round E	Elev.:	Exi	sting	J					
Depth in Feet		Sample Type	Percolation Test California Sampler	Split Spoon B Bulk Sample	Ziplock Sample Static Wate Table	r	Natural Moisture Content, %	Optimum Moisture Content, %	Maximum Dry Density, pcf	Liquid Limit, %	Plasticity Index, %	Gravel, % (3" - #4 Sieve)	Sand, % (#4 - #200 Sieve)	Fines, % #200 Sieve)	R-Value	Expansion Index
		ů –		SOIL DESCRIPTION	J		Nat	Opti	Dry			() ()	(#4	v		Exp
			4" Asphalt	SOIL DESCRIPTION	۹ 											
			Top 2" Moderate Bottom 2" Very Brown Silty SAI FILL Medium Dense, Estimated:	Poor Quality <u>ND with Gravel (S</u> Moist, Contains (Clay Chunks	0.3										
- 0.5 -		В	20% Coarse to 60% Coarse to 20% Fines	Fine Gravel - 2" M Fine Sand	laximum											
						1.5										
CORE HOLE LOG SPARKS FY25.GPJ US_LAB.GDT 11/25/24 			Core Hole terminated at 1.5 Core Holes Filled with Soil a	feet. and Capped with Non-Shrink G	irout.											
CKE E			Lumos & A	ssociates		FY2	25 Stree	et Re	habil	itatio	n			Г	PLA	TF
U			808 E. Colle	ge Pkwy, Suite 101									.	'	L/4	
LU	M & A		Carson City, 775.883.707 Fax: CIATES	7	LOG OF I Job Number: 1180			RATO	ORY				LE		۹-۲	11

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

UMOS_LEGEND_SPARKS_FY25.GPJ_10-23-06.GDT_11/19/24

LUN

95

Other Tests AN ANALYTICAL TEST (pH, Soluble Sulfate, and Resistivity) С CONSOLIDATION TEST DS DIRECT SHEAR TEST MD MOISTURE DENSITY CURVE Lumos & Associates FY25 Street Rehabilitation

808 E. College Pkwy, Suite 101 Carson City, NV 89706 775.883.7077 Fax: & ASSOCIATES mburns@lumosinc.com

PLATE A-12

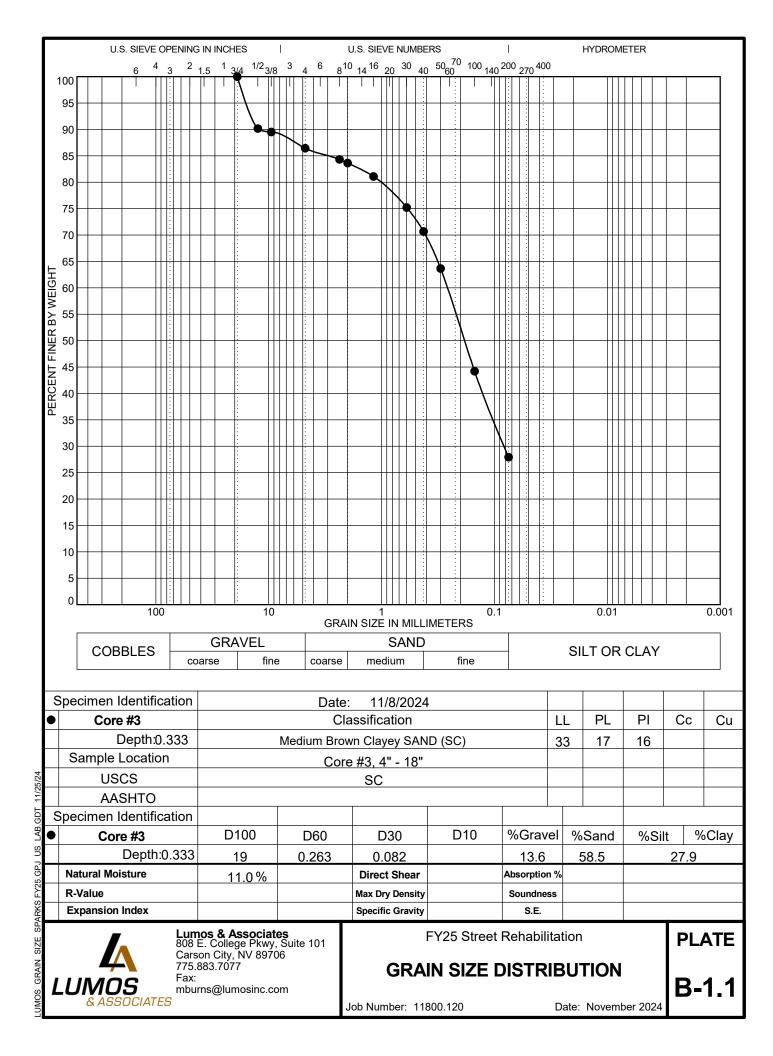
Job Number: 11800.120

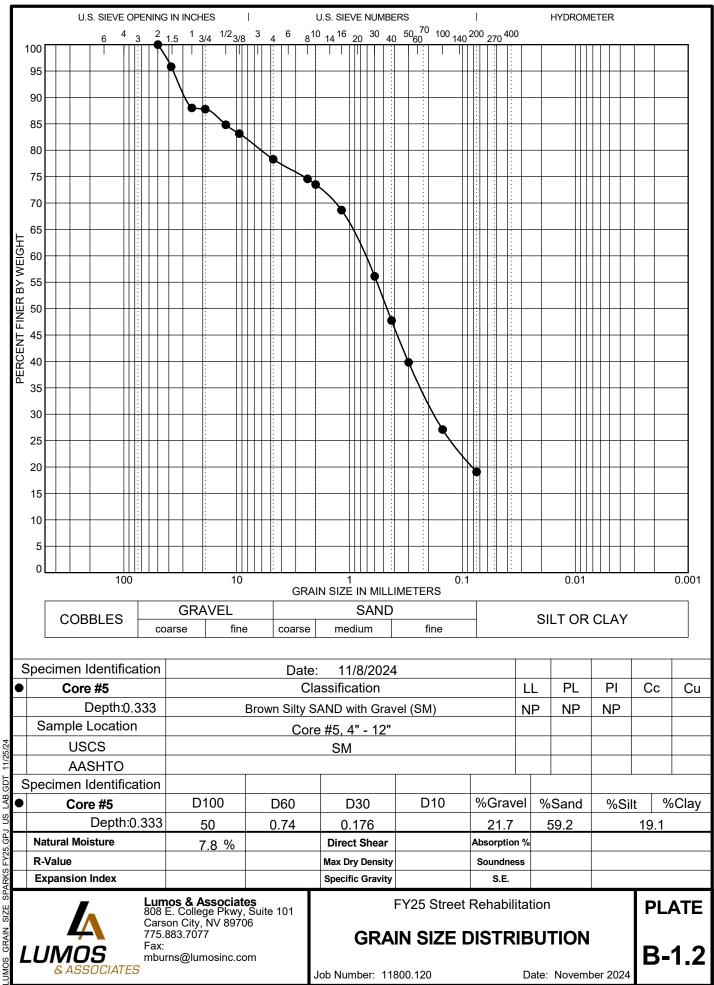
LEGEND

Date: November 2024

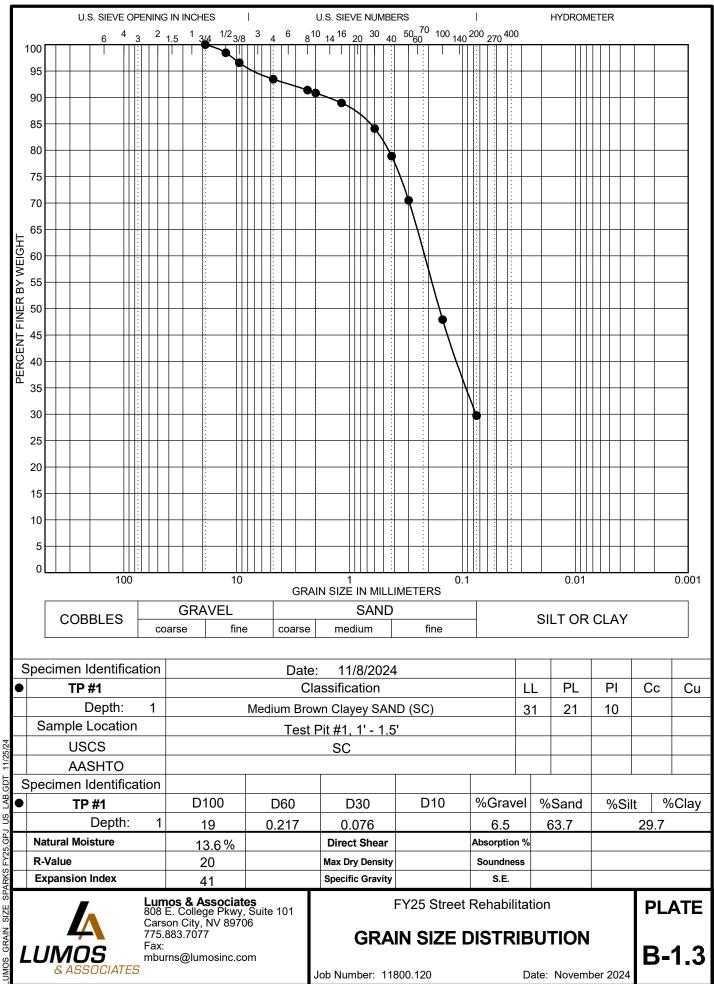
APPENDIX B SOILS LABORATORY TEST RESULTS



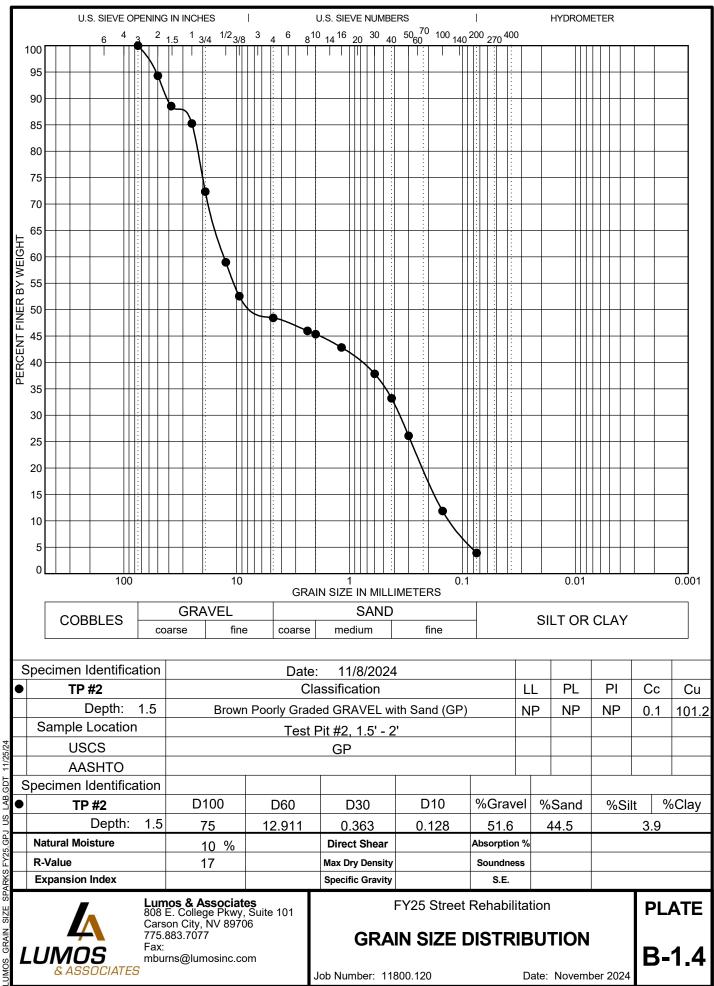




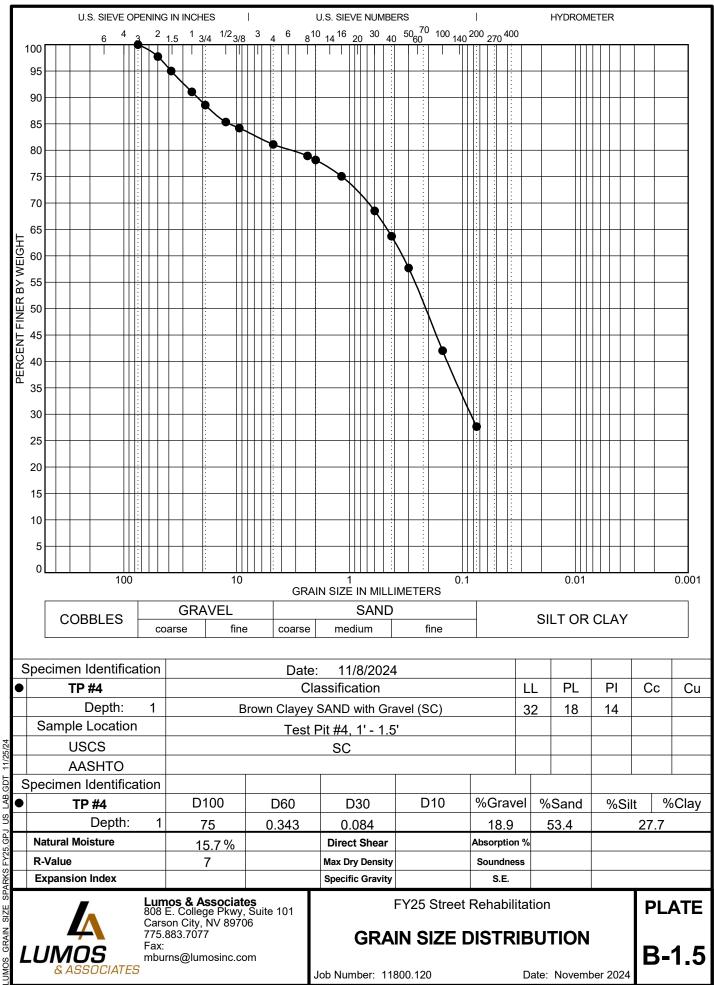
AB ŝ d C FY25 SPARKS SIZE GRAIN



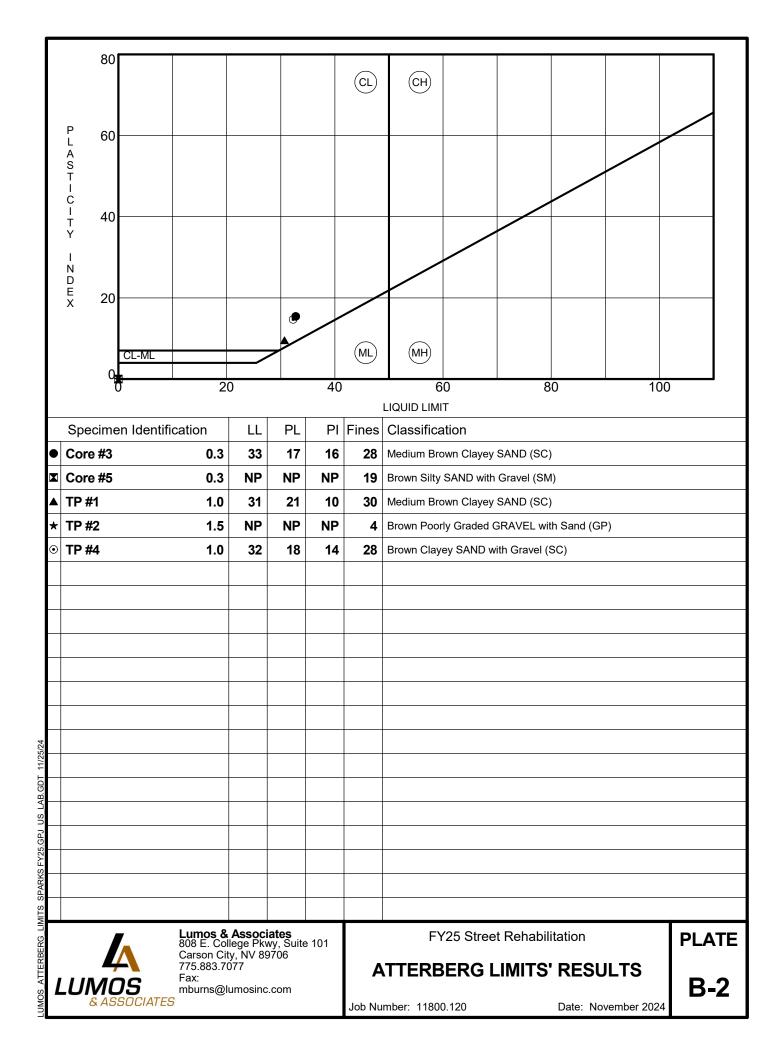
GDT AB ŝ a C FY25 SPARKS SIZE GRAIN

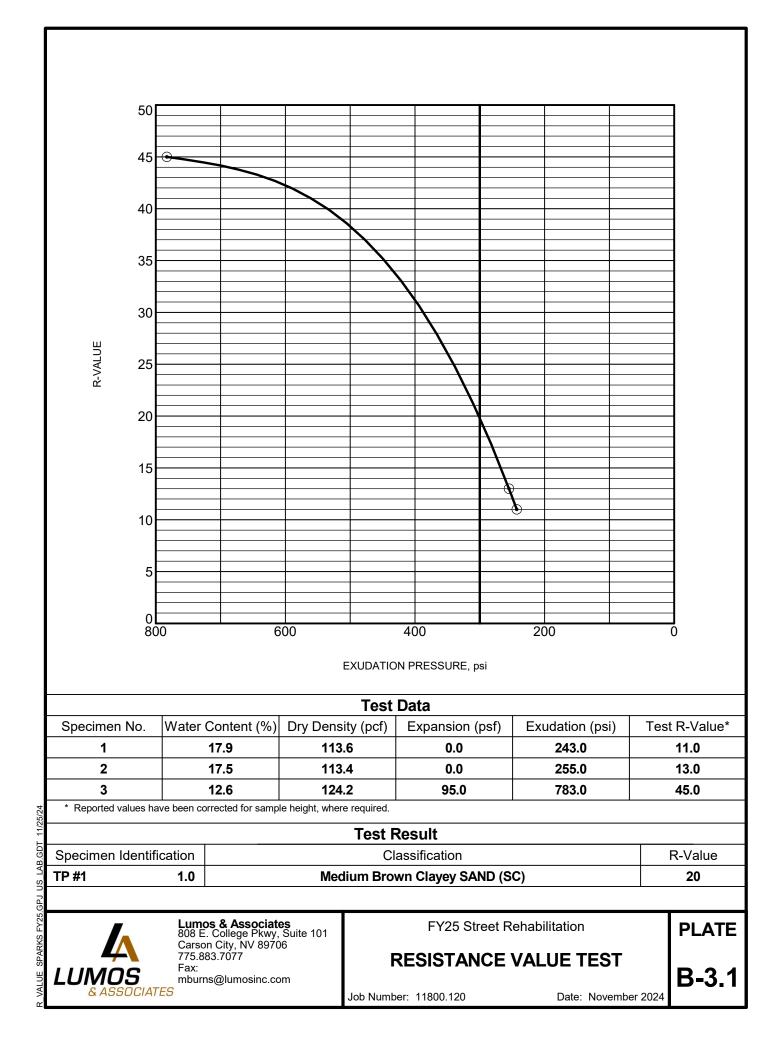


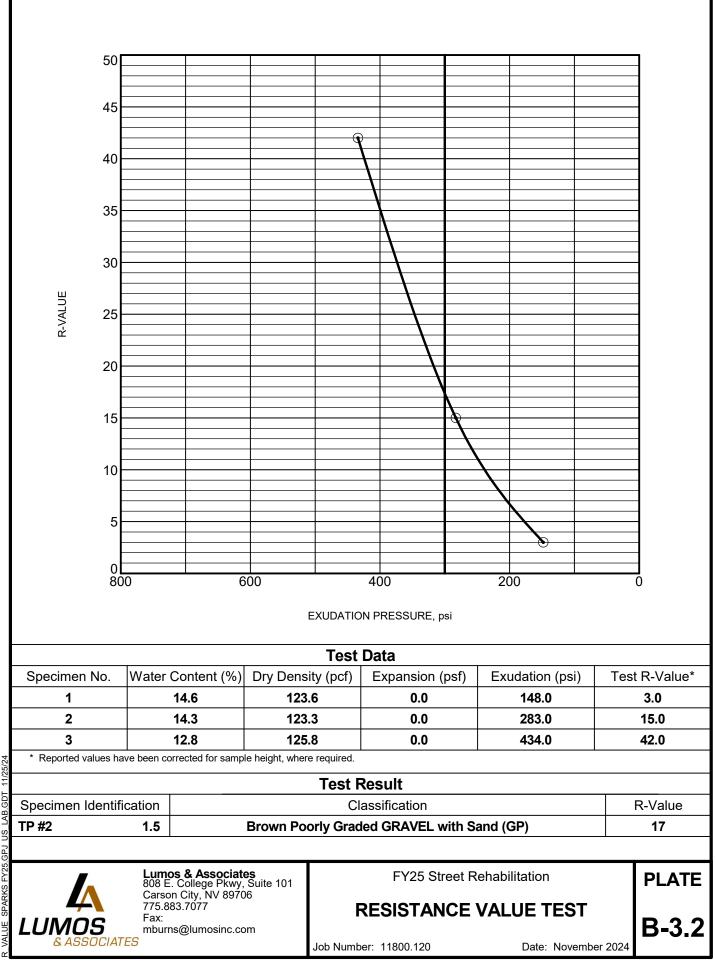
AB ŝ d C FY25 SPARKS SIZE GRAIN



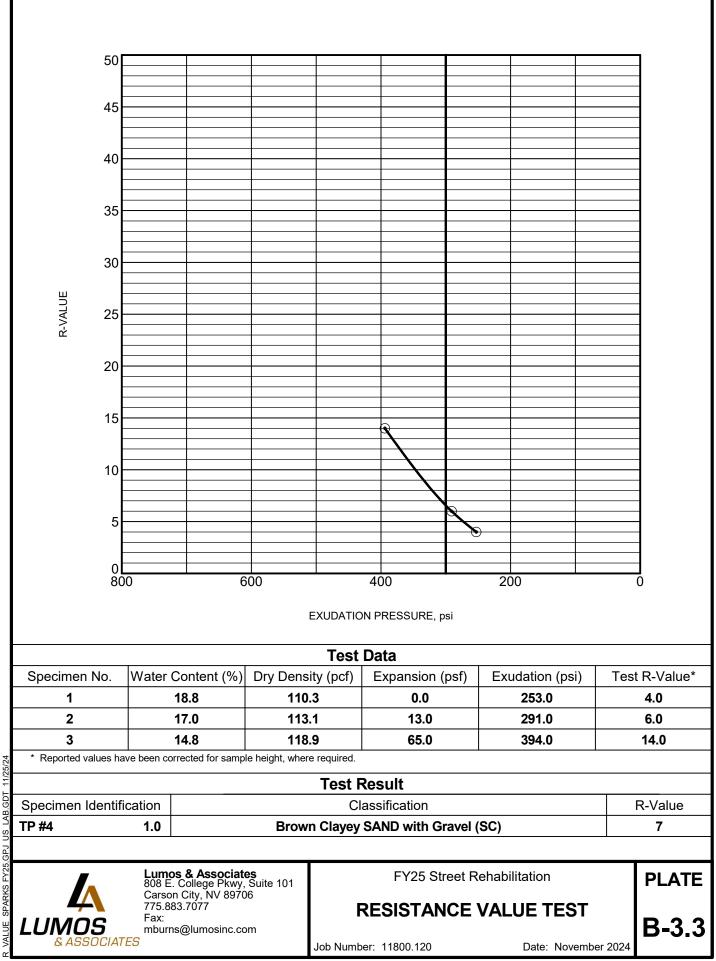
GDT AB ŝ a C FY25 SPARKS SIZE GRAIN UMOS



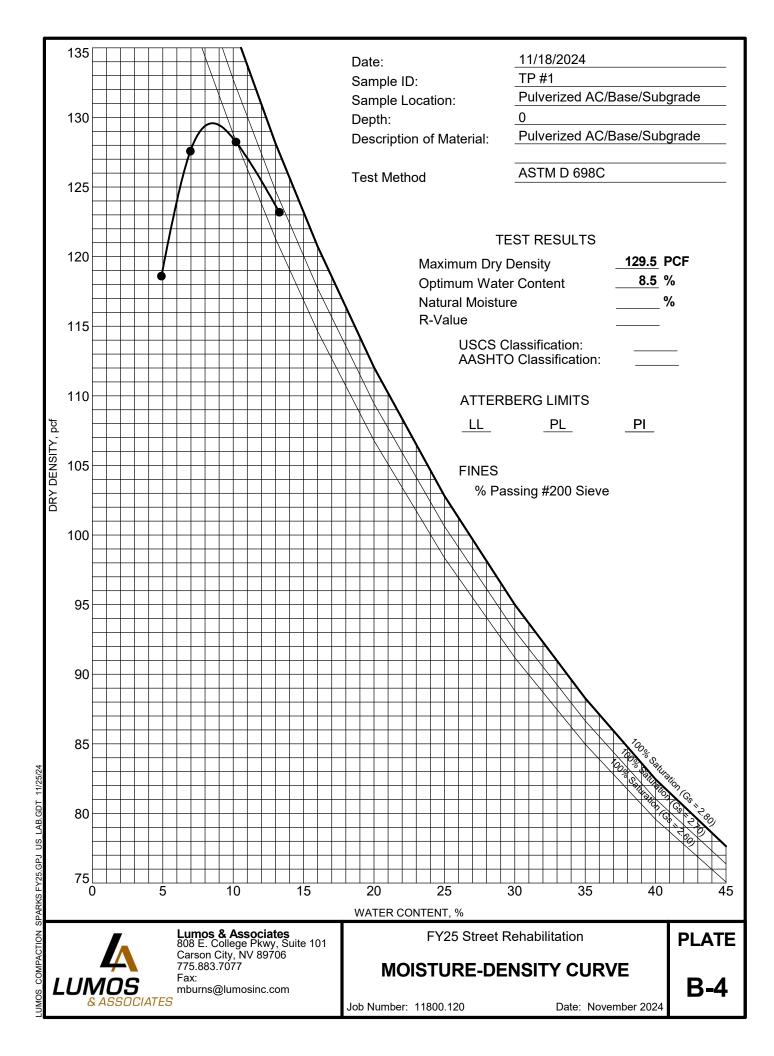




LAB.GDT SU E C SPARKS **ALUE**



LAB.GDT SU E C SPARKS



Lumos & Associates, Inc. - 24110260

Western Environmental Testing Laboratory **Analytical Report**

Lumos & Associates, Inc. 950 Sandhill Road, Suite 100 Reno, NV 89521 Attn: Mitch Burns Phone: (775) 827-6111 Fax: PO\Project: FY25 Rehab/11800.1	(775) 827-6122 20/MTB/Task 1				ate Printed: vrderID:	11/13/2024 24110260	
Customer Sample ID: TP-3 1ft-1.5 WETLAB Sample ID: 24110260-0					te/Time: 11/8 ive Date: 11/1		
Analyte	Method	Results	Units	DF	RL	Analyzed	LabID
Anions by Ion Chromatography Sulfate Sample Preparation	EPA 300.0	ND	mg/kg	10	15	11/12/2024	NV00925
10:1 DI Water Extraction	WL 10.0	Complete		1		11/11/2024	NV00925

DF=Dilution Factor, RL = Reporting Limit (minimum 3X the MDL), ND = Not Detected <RL or <MDL (if listed)

SPARKS 475 E. Greg Street, Suite 119 Sparks, Nevada 89431 tel (775) 355-2022 fax (775) 355-0817 EPA LAB ID: NV00925 - ELAP No: 2523

Lumos & Associates

& ASSOCIATES mburns@lumosinc.com

808 E. College Pkwy, Suite 101 Carson City, NV 89706 775.883.7077 Fax:

ELKO 1084 Lamoille Hwy Elko, Nevada 89801 tel (775) 777-9933 fax (775) 777-9933 EPA LAB ID: NV00926 LAS VEGAS 3230 Polaris Ave. Suite 4 Las Vegas, Nevada 89102 tel (702) 475-8899 fax (702) 622-2868 EPA LAB ID: NV00932

FY25 Street Rehabilitation	PLATE
SOIL SULFATE CONTENT	B-5

Page 3 of 4

Job Number: 11800.120

Date: November 2024





Job Number: 11800.120 Project: City of Sparks FY25 Rehabilitation **Description: Pavement Calculations** By: J. Macaluso

R-Value for CTB = 80 (Assumed) R-Value for Native Clayey Sand with Gravel = 7 TI (Local Road) = 5 (Light Traffic)

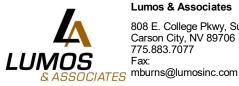
GE=0.0032*(TI)*(100-R)

Gf (AC,Local)=2.5, Gf(Cement Treated Soil)=1.2, Gf(subgrade)=1 t_{laver}=GE/Gf

Local Road Pavement Section : Asphalt and Cement Treated Recycled Material

GE_{AC}=0.0032*(5)*(100-80)=0.32' $t_{AC}=(0.32/2.5)^{*}(12^{*}/1^{*})=1.54^{*}$ USE 4" Asphalt Concrete GE_{AC}=(4"*2.5)/(12")=0.83'

GE_{CTB(Pulv.)}=0.0032*(5)*(100-7)=1.49' t_{CTB(Pulv.)}=((1.49'-0.83')/1.2)*(12"/1')=6.6" USE 8" Cement Treated Pulverized Material



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FY25 Street Rehabilitation

PAVEMENT DESIGN

PLATE

C-1

Date: November 2024

Job Number: 11800.120

APPENDIX D SPECIFICATIONS FOR DEMOLITION



SPECIFICATIONS FOR DEMOLITION

Demolition shall include the removal of all designated structures/improvements to be removed, i.e. concrete structures, asphalt pavements, utilities, pipes and unsuitable Excavations caused by removal of existing material within the project area. improvements and utilities shall be cleared of all wastes, debris, and any loose/soft soils, and backfilled with properly compacted fill, as specified under the General Site Grading section of this report. All fill compaction should be performed under observation and testing by the Geotechnical Engineer.

Broken concrete, asphalt, and other materials shall be considered waste and shall be removed from the site.

Any existing drain lines, wires, utilities, etc., which are to remain on the site shall be protected from damage. Buried drain lines, pipe conduits, utilities, etc. which are necessarily cut shall be either carefully and permanently capped at the property line as specified by the City Engineer or re-routed as necessary. Utility lines not specifically noted for disposition, but which are encountered in the work area shall be capped, extended, protected or re-routed as necessary for completion of the work, as directed.

All work shall be performed in accordance with the Federal Occupational Safety and Health Administration, the local Division of Occupational Safety and Health requirements, and applicable ordinances of the governing municipality.

Care shall be taken not to damage adjoining utilities or structures to remain after completion of the work. Finished work damaged by operations during demolition and site preparation shall be repaired or replaced to the satisfaction of the Owner at no cost to the Owner.

All materials resulting from demolition and site preparation not designated by the Owner to be recovered or to be relocated by the Contractor shall be removed promptly and disposed of off the site.

Upon completion of demolition and site preparation, the site shall be "raked clean" - if applicable – and all waste, rubble, debris, etc. shall be removed and disposed of off the site.



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FY25 Street Rehabilitation SPECIFICATIONS FOR

DEMOLITION

PLATE

D-1

Job Number: 11800.120

Date: November 2024



CEMENT TREATED ASPHALT/BASE/SUBGRADE COMPRESSION TEST REPORTS





CEMENT TREATED BASE COMPRESSION TESTS

REPO	RT TO:	City of Sp	arks		PR	OJECT NAME:	FY 25 Street	Rehab	
	PROJECT NO.:		OJECT NO.:	11800.120					
					LO	CATION:	Sparks, NV		
				CONTRACTOR: DATE RECEIVED:		N/A			
SAMP	LED BY:	J. Macalus	0			TE RECEIVED:	11/7/24		
WEAT	HER:	N/A				ME:	PM		
AIR T	EMP:	N/A			MC	DLDED BY:	M.A./K.F.		
DATE	MOLDED:	11/19/24			_				
MATE	RIAL DESCRIPTIO	ON: <u>40%</u>	AC, 30% B	ase, and	30% Su	bgrade - Lab Mi	x		
		2.5%	Cement	at 2% (Over Op	timum Moistu	re		
SAMPI	LE LOCATION:	Vario	us Location	IS					
Sampi	LE TYPE:	LABORA	Tory desi	GN	Х	FIELD SAM	PLE		
		DIAMETER	AREA		TEST	DATE	TOTAL	UNIT	
	LAB NO.	(INCHES)	(SQ.IN)		AGE	TESTED	LOAD-LBS		
	CC-2779-24	4.01	12.63		3	11/22/24	2,610	205	
	CC-2780-24	4.07	13.01		3	11/22/24	3,440	265	
	CC-2781-24	4.08	13.07		3	11/22/24	3,265	250	
	CC-2782-24	4.07	13.01		7	11/26/24	3,315	255	
	CC-2783-24	4.07	13.01		7	11/26/24	3,810	295	
	CC-2784-24	4.03	12.76		7	11/26/24	3,240	255	
				1	Average	Compressive	Strength 3-Da	y: 240	
					verage	Compressive	Strength 7-Da	y: 270	
	REMARKS:	nd Sampling were p	erformed in a			M D-558, C-1632, C			
	CAPP	PING		UNBC	NDED		X BONDE	D	
	TEST RESU	ILTS:		COMP	LY		DO NO	OT COMPLY	
	Cli	ent Notified of T	est Results			Respectively	Submitted by:		
						Mitch Burns			
		Carson C	City • El Do	orado F	lills • Fa	allon • Lake Ta	hoe • Reno		
				www.l	umosIr	nc.com			
		Associates ollege Pkwy, Suite	e 101			FY25 Street R			
	Carson C 775.883. Fax:	ity, NV 89706			OMP	IT TREAT RESSION	TESTS		



CEMENT TREATED BASE COMPRESSION TESTS

REPO	RT TO:	City of Sp	arks		PROJEC	T NAME:	FY 25 Street Rel	hab	_
					PROJECT NO .:		11800.120	_	
					LOCATI	ON:	Sparks, NV		
					CONTRA	ACTOR:	N/A		_
SAMP	LED BY:	BY: J. Macaluso			DATE R	ECEIVED:	11/7/24	_	
WEAT	THER:	N/A			TIME:		PM	_	
AIR T	EMP:	N/A			MOLDED BY:		M.A./K.F.		_
DATE	MOLDED:	11/19/24			_				
MATE	RIAL DESCRIPTION	ON: <u>40%</u>	AC, 30% Ba	se, and 30%	6 Subgrad	de - Lab Mi	x		_
		5% (Cement at	2% Over 0	ptimum	Moisture			_
SAMP	LE LOCATION:	Vario	us Locations	5					_
SAMP	LE TYPE:	LABORA	Tory desig	SN >	x	FIELD SAM	PLE		_
-						_			
		DIAMETER	AREA	TEST	т	DATE	TOTAL	UNIT	7
	LAB NO.	(INCHES)	(SQ.IN)	AGE	Ξ	TESTED	LOAD-LBS.	LOAD PSI	
	CC-2786-24	4.04	12.82	3	1	1/22/24	5,400	420	
	CC-2787-24	4.05	12.88	3	1	1/22/24	4,790	370	
	CC-2788-24	4.06	12.95	3	1	1/22/24	4,805	370	
	CC-2789-24	4.08	13.07	7	1	1/26/24	5,565	425	
	CC-2790-24	4.04	12.82	7	1	1/26/24	5,485	430	
	CC-2791-24	4.05	12.88	7		1/26/24	6,620	515	
				-	-	-	Strength 3-Day:	385	
				Avera	age Con	npressive	Strength 7-Day:	455	
	REMARKS:						C-1633. Standards as ap		
	TEST RESU	ILTS:		COMPLY			DO NOT C	OMPLY	
	Cli	ent Notified of T	est Results			spectively h Burns	Submitted by:		
		Carson C					ahoe • Reno		-
				www.Lumo	osinc.co	m			
	808 E. C	& Associates ollege Pkwy, Suite City, NV 89706	e 101	CEMI			Rehabilitation	MEN	PL
105	775.883. Fax:	7077 Dlumosinc.com	J		OMP	RESS	ION TESTS		E



CEMENT TREATED BASE COMPRESSION TESTS

	TO:	<u>City of Sp</u>	arks	PRC	JECT NAME:	FY 25 Street Ref	nab	
				PRC	JECT NO.:	11800.120		
				LOC	ATION:	Sparks, NV		
	AMPLED BY: J. Macaluso			COI	ITRACTOR:	<u>N/A</u> 11/7/24 PM		
SAMPLE)	DAT	E RECEIVED:			
WEATHE	R:	N/A		TIM	E:			
AIR TEM				MOLDED BY:		M.A./K.F.		
DATE MO		11/19/24		<u> </u>				
MATERIA	AL DESCRIPTIO	-	AC, 30% Base,		-			
	OCATION		Cement at 2	% Over Opt	imum Moistur	e		
SAMPLE	LOCATION:	Vario	us Locations					
SAMPLE	TYPE:	LABORAT	ORY DESIGN	X	FIELD SAM	PLE		
		DIAMETER	AREA	TEST	DATE	TOTAL	UNIT	
	LAB NO.	(INCHES)	(SQ.IN)	AGE	TESTED	LOAD-LBS.	LOAD PSI	
	CC-2793-24	4.05	12.88	AGE 3	11/22/24	4,280	330	
	CC-2793-24 CC-2794-24	4.04	12.82	3	11/22/24	5,220	405	
	CC-2795-24	4.04	12.82	3	11/22/24	6,845	535	
	CC-2796-24	4.05	12.88	7	11/26/24	7,070	550	
	CC-2797-24	4.04	12.82	7	11/26/24	7,525	585	
	CC-2798-24	4.03	12.76	7	11/26/24	5,725	450	
L				Average		Strength 3-Day:	425	
				Average	Compressive	Strength 7-Day:	530	
RE	-	d Sampling were p				C-1633. Standards as ap	plicable.	
			—			X BONDED		
	CAPP	PING		NBONDED		BOINDED		
	CAPP TEST RESU	-		OMPLY		DO NOT CO	OMPLY	
	TEST RESU	-		OMPLY	Respectively		OMPLY	
	TEST RESU	ILTS:		OMPLY	Respectively s Mitch Burns		OMPLY	
	TEST RESU	ILTS: ent Notified of T	est Results	OMPLY	Mitch Burns	DO NOT CO	OMPLY	
	TEST RESU	ILTS: ent Notified of T	est Results	omply Io Hills • Fal	Mitch Burns	DO NOT CO	OMPLY	
	TEST RESU	ILTS: ent Notified of T	est Results	OMPLY	Mitch Burns	DO NOT CO	OMPLY	
	TEST RESU Cli	ILTS: ent Notified of T Carson C Associates	est Results	OMPLY Io Hills • Fal w.LumosIn	Mitch Burns Ion • Lake Ta c.com Y25 Street R	DO NOT CO Submitted by: whoe • Reno ehabilitation		
	TEST RESU Cli Lumos & 808 E. Co	ILTS: ent Notified of T Carson C Associates ollege Pkwy, Suite ity, NV 89706	est Results	DMPLY Io Hills • Fal /w.LumosIn F CEMEN	Mitch Burns Ion • Lake Ta c.com Y25 Street R T TREAT	DO NOT CO Submitted by:	/EN F	

REPORT TO:	<u>City of Sparks</u>	PRC	DJECT NAME: DJECT NO.: CATION:	FY 25 Street Rehab 11800.120 Sparks, NV
SAMPLED BY: DATE MOLDED:	J. Macaluso 11/19/2024	DAT	TE RECEIVED:	
MATERIAL DESCRIPTI	2% Over	0% Base, and 30% Su Optimum Moisture		Mix
SAMPLE LOCATION: SAMPLE TYPE:	Various Loc LABORATORY I	ations DESIGN X	FIELD SAM	IPLE
TEST AGE	2.5%	Percent Cement 5.0%	7.5%	
3-DAY Strength (psi)	240	385	425	
7-DAY Strength (psi)	270	455	530	
700 (ist) 600 500 400 200 100 1.0% 2.	CE	5.0% 6.0% 7.0% MENT CONTENT bry Weight of Aggregate)	8.0% 9.0%	 3-Day Strength 300 (psi) 7-Day Strength Linear (3-Day Strength) Linear (7-Day Strength) Target Value
	Carson City • E	Dorado Hills • Fal		