July 23, 2025

Lars Ewing, PE
Lake County
Interim Public Works Director
255 N. Forbes Street
Lakeport, CA 95453

RE: Lake County 2024 Pavement Rehabilitation Project - Pavement Design

Dear Mr. Ewing:

NCE is pleased to present this final letter-report for the pavement design for the Lake County 2024 Pavement Rehabilitation Project for 2025 construction. We previously provided our recommendations for pavement rehabilitation treatments in tabular format by street on February 14, 2024. This letter formalizes the pavement recommendations in a final letter format.

Background

The County had requested that NCE provide pavement and civil design for the pavement rehabilitation of the select roads within the County's 2025 construction work plan, as shown in the February 14, 2024 table below. Since this initial plan, the County has removed and added select streets as shown in the design and construction drawings. Many of the neighborhoods in which these pavements reside have been heavily damaged by fire with some residents rebuilding their homes. The pavements in this project exhibit significant load related cracking and potholes, patches, surface raveling and weathering and overall are in poor condition. Based on the County's StreetSaver database, the Cobb Mountain and Pine Summit neighborhoods consists of 24 and 6 pavement sections with a weighted average pavement condition index (PCI) of 23 and 30 respectively.

NCE assessed a range of pavement treatment and rehabilitation strategies. Generally, the subject sections appear to be strong candidates for very cost effective recycle in-place technology such as Full Depth Reclamation (FDR) recycling with asphalt concrete (AC) overlays or surface treatments (surface seals) for the final wearing course.

In these designs, NCE understood that the geometry of the roads was to remain the same and that no curb and gutter would be installed. Raising of the roads by a few inches was acceptable if drainage was not negatively impacted and conforms to existing driveways and cross streets was addressed.

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Table: List of County Roads (February 14, 2024)

Name	Begin Location	End Location	Name	Begin Location	End Location
ADAMS SPRINGS CT	ADAMS SPRINGS DR.	END	KAREN WAY	HOBERG DRIVE SOUTH	END
ADAMS SPRINGS DR.	ADAMS SRINGS CT	SH 175	LASSEN DR.	ELLIOT DR.	VENTURI DR.
ADAMS SPRINGS DR.	SH 175	ADAMS SPRINGS CT	LEMA COURT	LEMA LANE	END
ANGELLY WAY	HOBERG DRIVE SOUTH	HOBERG DRIVE SOUTH	LEMA LN.	EMERFORD	HARRINGTON FLAT
ARROYO VISTA	SR 175	PARNASSUS	MAPES PASS - MAPESP	PINE SUMMIT DRIVE	GIFFORD SPRINGS ROAD
BLEUSS COURT	HOBERG DRIVE SOUTH	END	MAPLE SHADOWS DR	SR 175	SR 175
BLEUSS WY (137 L)	KAREN WY	END	NELSON COURT	LEMA LANE	END
BROOKSIDE DR	MAPLE SHADOWS	FOREST LAKE	NELSON LANE	LEMA LANE	END
CAROLYN DRIVE	ELLIOTT	LASSEN	PALMER COURT	PALMER DRIVE	END
CASENTINI DR	SNEAD DR	HARRINGTON FLAT	PALMER DR	HARRINGTON FLAT	END
CASTLEWOOD	MAPLE SHADOWS	END	PAMELA DRIVE	ELLIOTT DR.	VENTURI DR.
COSTELLO WAY	ADAMS SPRINGS RD.	ADAMS SPRINGS RD.	PARNASUS DR	MAPLE SHADOWS	FORD FLAT ROAD
CREEK VIEW DRIVE	HARRINGTON FLAT RD.	END	PINE SUMMIT DRIVE	GIFFORD SPRINGS RD.	PAVEMENT CHANGE
DOVE DR	QUAIL ROAD	END	PINE SUMMIT DRIVE	PAVEMENT CHANGE	PAVEMENT CHANGE
ELLIOT DR	VENTURI DR.	ST. HELENA DR.	PINE SUMMIT DRIVE	PAVEMENT CHANGE	END
ENTRANCE ROAD	SR 175	GROUSE ROAD	PINEWOOD WAY	BROOKSIDE DR	END
FOREST LAKE DR	SR 175	SR 175	PRATHER COURT	PRATHER WAY	END
FOX DR.	300' W. OF REGINA	END	PRATHER WAY	COSTELLO WAY	END
FOX DR.	EMERFORD	300' W. OF REGINA	QUAIL DR	ENTRANCE RD	GROUSE RD
GLENN ROAD	SUMMIT BLVD.	SHASTA	RED HILLS RD.	SR 29	SR 175
GREENAWAY COURT(128E)	PINE SUMMIT DR	END	REGINA WAY	FOX DRIVE	FOX DRIVE
GROUSE RD	ENTRANCE RD	END	SHASTA ROAD (136D)	SUMMIT BLVD.	GLENN ROAD
HARRINGTON FLAT	SULPHUR CREEK ROAD	SR 175	SNEAD DR.	SH 175	SH 175
HOBERG DR (136FA)	EMERFORD DR	HOBERG RD SOUTH	ST. HELENA DRIVE	FOX DRIVE	VENTURI DRIVE
HOBERG DR. SO.	HOBERG DR.	BLEUSS CT.	SUGAR PINE DRIVE	SUMMIT DRIVE	SUMMIT DRIVE
HOBERG DRIVE (136F)	SUMMIT BOULEVARD	HOBERG DR EAST	SULPHER CREEK ROAD	BOTTLE ROCK ROAD	HARRINGTON FLAT
HOBERG DRIVE (136F)	HOBERG DR EAST	HOBERG DR SOUTH	SUMMIT BOULEVARD	HOBERG DRIVE	SR 175
HOBERG DRIVE EAST	HOBERG DR	END	SUMMIT BOULEVARD	HOBERG DRIVE	END
HOGAN HILL LANE	SNEAD DR	END	SUMMIT DRIVE	SR 175	END
HUMBOLDT DRIVE	SUMMIT	SR 175	TANYA TERRACE	PINE SUMMIT DRIVE	PINE SUMMIT DRIVE
HUMBOLDT DRIVE EXTENSION	SUMMIT BLVD.	END	TRINITY ROAD	SUMMIT BLVD.	SHASTA ROAD
JONES COURT	HOGAN HILL LANE	END	VENTURI DR.	FOX DR.	EMERFORD

Field Investigation

Pavement Condition Survey

NCE performed a driving and walking pavement condition survey on November 7 and 8, 2023 of the road sections in this project covering the travel lanes to assess the pavement distresses present as the basis in combination with pavement coring and ground penetrating radar for developing pavement rehabilitation treatments. It was apparent from the condition survey that the roads in this project are in poor condition and exhibit high severity distresses such as potholes, alligator cracking, patching, utility cuts, and surface wear. Ride quality varied, and in the poorer condition residential areas and was frequently very rough. Examples of representative pavement conditions are shown in the following photos.

Pavement Coring and Ground Penetrating Radar

NCE performed pavement coring November 28 to December 1, 2023 and December 18 and 19, 2023 to help interpret the nature of the distresses, material conditions, and the thickness of the pavement layers. A total of 66 cores were obtained, including 19 bulk samples for subgrade assessment. The bulk sampling was done in areas throughout the project to assess the overall subgrade character as sampling on every street section was cost prohibitive. Coring details are presented in the Appendix.

For each core sample, the surface material type was identified, and AC layer thicknesses were measured and recorded. Additional structural materials such as aggregate base were also measured and recorded during bulk subgrade sampling and noted whether present in remaining cores. No fabric was present in any of the cores. Pavement surface layer thicknesses were predominantly very thin with 58 of the 66 cores at 2 inches or less and 20 cores at 1 inch or less. Where measured, aggregate base (AB) varied in thickness from 1 inch to 14 inches with typical values in the 4 in to 9 inch range.

Ground penetrating radar (GPR) testing was performed on Red Hills Road, Sulphur Creek Road, Harrington Flat, Hoberg Drive, and Summit Boulevard as these were the highest trafficked roads with the need for most significant rehabilitation. GPR allowed for continuous measurements of thickness on these roads to supplement the limited coring performed. Thicknesses of AC for these major roads measured by GPR ranged generally from approximately 1.5 inches (Harrington Flat, Hoberg) to 3.5 inches (Summit Blvd) and matched that of the cores. AB thickness varied markedly over the length of these street sections – ranging from 2 inches to over 10 inches. Details are presented in the Appendix with graphs indicating thickness by location.

Laboratory Testing

Bulk subgrade samples were taken at 20 locations spread geographically over the project to acquire subgrade conditions throughout the project. The samples were generally taken in areas of poorer pavement condition or in areas where pavement material information was deemed more valuable. This testing was done to support

potential reconstruction design decisions of select sections and to evaluate the soil characteristics in advance of construction, specifically soil preparation and compaction during and after pulverization. RGH in Santa Rosa performed laboratory testing on the bulk samples obtained during coring. The laboratory tests determined in-situ moisture content, Atterberg Limits (liquid limit, plastic limit, and plasticity index), and R-Value. These test results provide good indications of subgrade soil material type, plasticity, strength pavement section, suitability for construction purposes, and drainage characteristics. In general a subgrade with high R-value, lower plasticity, and lower moisture content is typically desired for pavement section properties and constructability. The plasticity index gives a good indication of subgrade expansion/contraction potential. The greater the PI, the greater the soil expansion/contraction potential and problematic the soils can be during construction and compaction.

Laboratory testing results showed that the in-situ moisture content of the subgrade for most areas tested was between 10% and 20%. Testing indicated generally lean clays to sandy lean clays with plasticity indexes mostly in the 11 to 20 range (lower to moderate) with one fat clay and some containing gravel with a PI of 27 (higher), with R-Values ranging from 14 to 76, with most in the 20s and 30s, indicating on average mostly reasonable to strong subgrade support.

Pavement Design and Rehabilitation Recommendations

Pavement design was conducted with the goals of producing well performing, smooth riding pavements in a cost effective manner that were within the desired budget of the County. Given the high level of distress present on the street sections and that many to most of the streets exhibited very rough rides, traditional mill and AC overlay treatments would not be reasonable except possibly for those with the thickest AC and better ride quality. Therefore alternative solutions were sought. NCE considered multiple options such as:

- Pulverization with Overlay
- Pulverization with Double Chip Seal
- Full Depth Reclamation with Cement
- Mill and Overlay
    - Conventional AC Overlay
    - Fiberized AC Overlay
    - RHMA-G Overlay
    - Any of the above options with Warm Mix Asphalt Technology
    - Any of the above options with a rubberized Stress Absorbing Membrane Interlayer (SAMI-R)
- Cold In-Place Recycling
- Deep Lift AC in areas of high severity cracking, pumping, and rutting
- Microsurfacing or double Microsurfacing seal treatments with base repairs,
- Rubberized Cape Seal

With reference to the alternatives above, NCE developed pavement designs and final wearing course treatment selections based on a number of factors including perimeter streets functioning more like collectors vs interior rural/residential streets, fire damage, smaller limited width streets, and other considerations. Traditional 20 year Caltrans designs (reconstruction) would yield pavement thickness recommendations that far exceeded the available budget. After studying pavement conditions and layer thicknesses, mill and overlay options were not practical given the very poor condition of the exiting AC, the typically very thin AC layer, the likelihood of existing AC failure during milling, and the high cost of AC overlays if used throughout. Overlaying directly on top of the failing pavements would subject the new overlay to a very short service life and cracking distresses will

readily reflect through the newer overlay. Other treatments such as CIR, deep lift repairs, and seals such as Microsurfacing or Rubberized Cape Seal were either not appropriate or far insufficient to provide a reasonable service life or were not constructable (e.g. inadequate AC thickness to support CIR).

Using engineering judgement based on pavement condition surveys, coring, and GPR data in combination with typical County practices and factors stated in the above paragraph, and discussions with the County led to the development of recommendations for this project. Regrading to a smooth profile that can also meet driveway entrances can be done through a pulverization process, where a reclaiming machine blends the existing AC and AB, the material is graded, and then compacted to form a firm and smooth paving platform. The reclaiming process, often called full depth reclamation (FDR) can be done to varying depths and with and without the use of a binding agent such as cement. In this case, given the generally competent subgrades and amount of rock available between the AC and AB, a shallow uncemented pulverized layer should provide sufficient support for the wearing surfaces. A cement binding agent adds significantly to the cost of this treatment making it potentially cost prohibitive. This shallow depth of pulverization allowed for compaction of an aggregate rich, stable layer that could be graded to a smooth surface.

To help meet the County's overall project budget, and based upon the above criteria, we recommend a group of streets be surfaced with a double chip seal, composed of a larger lower chip and a finer upper chip for smoothness and placed on the pulverized layer. This treatment is very commonly used in County roads around the western US. For the remainder of the streets assessed through this same criteria, an AC overlay of various thicknesses is recommended to be placed on the pulverized layer.

Further details of these pavement designs are presented in Table 1 of the Appendix. Note that the street list in this report differs from the final design and construction plans as the County has added and removed various streets from this project since these pavement designs were developed.

Closure

We trust this letter report provides the necessary information at this time. If you have any further questions, please contact us at (510) 215-3620.

Yours very truly,

Nichols Consulting Engineers, Chtd.

Prepared by:

James Signore, PhD, PE

Principal

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APPENDIX

Pavement Design Tables

- **Table 1 – Pavement Rehabilitation Recommendations**
- **Table 2 – Pavement Layer Thicknesses and Lab Results Summary**

GPR Report

Laboratory Test Results

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Appendix A - Pavement Design Tables

Table 1: Lake County 2024 Resurfacing Project
Recommended Pavement Treatments

Street Name	Begin Location	End Location	No. of Lanes [1]	Neighborhood	Functional Class [1]	Length (ft)	Width (ft)	Approx. Area (sf)	PCI [1]	Surface Type [1]	Existing AC Thickness from Core (in.) [2]	Existing AC Thickness, from GPR (in.) Average	Existing AB Thickness (in.) [3]	Subgrade RV PI MC Soil Type [4]	Recommended Design
ADAMS SPRINGS CT	ADAMS SPRINGS DR.	END	2	ADAMS SPRING	Rural Local	211	21	4,431	18	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
ADAMS SPRINGS DR.	ADAMS SRINGS CT	SH 175	2	ADAMS SPRING	Rural Local	1,954	25	48,850	21	AC	1.9 - 6.0	-	2.4 AT 6.0'' CORE	31 16.2 16.4	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
ADAMS SPRINGS DR.	SH 175	ADAMS SPRINGS CT	2	ADAMS SPRING	Rural Local	1,162	20	23,240	21	AC	1.2 - 3.0	-	PRESENT AT 1.2'' CORE	22 21.4 4.3	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
ANGELLY WAY	HOBERG DRIVE SOUTH	HOBERG DRIVE SOUTH	2	HOB	Rural Local	1,003	23	23,069	19	AC	1.8	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
ARROYO VISTA	SR 175	PARNASSUS	2	PUTAH CREEK	Rural Local	1,162	15	17430	23	AC	0.9	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
BLEUSS COURT	HOBERG DRIVE SOUTH	END	2	HOB	Rural Local	1,109	23	26,932	11	AC	1.9	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
BLEUSS WY (137 L)	KAREN WY	END	2	HOB	Residential/Local	686	23	15,778	5	AC	1.9	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
BROOKSIDE DR	MAPLE SHADOWS	FOREST LAKE	2	PUTAH CREEK	Rural Local	3,485	19	66215	22	AC	0.5 - 0.7	-	PRESENT AT 7'' CORE	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
CAROLYN DRIVE	ELLIOTT	LASSEN	2	W ADAMS	Rural Local	1,162	21	24,402	16	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
CASENTINI DR	SNEAD DR	HARRINGTON FLAT	2	AD	Rural Local	1,690	22	37,180	3	AC	0.5 - 1.8	-	8.6 AT 1.8'' CORE	52 11 10.8	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
CASTLEWOOD	MAPLE SHADOWS	END	1	PUTAH CREEK	Rural Local	634	15	9510	-	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
COSTELLO WAY	ADAMS SPRINGS RD.	ADAMS SPRINGS RD.	2	ADAMS SPRING	Rural Local	634	20	12,680	11	ST	1.3	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
CREEK VIEW DRIVE	HARRINGTON FLAT RD.	END	2	HF	Rural Local	1,003	20	20,060	5	ST	0.8	-	3.5	19 18.7 12.7	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
DOVE DR	QUAIL ROAD	END	1	GROUSE	Rural Local	792	12	9504	5	AC	1.6	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
ELLIOT DR	VENTURI DR.	ST. HELENA DR.	2	W ADAMS	Rural Local	1,954	20	39,080	27	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
ENTRANCE ROAD	SR 175	GROUSE ROAD	2	GROUSE	Rural Local	370	18	6660	25	AC	0.9	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
FOREST LAKE DR	SR 175	SR 175	2	PUTAH CREEK	Rural Local	1,426	19	27094	18	AC	0.5	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
FOX DR.	300' W. OF REGINA	END	2	W ADAMS	Rural Local	3,168	24	76,032	67	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
FOX DR.	EMERFORD	300' W. OF REGINA	2	W ADAMS	Rural Local	3,168	20	63,360	43	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
GLENN ROAD	SUMMIT BLVD.	SHASTA	2	CMC	Rural Local	898	18	16,164	9	ST	1.3	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay

Table 1: Lake County 2024 Resurfacing Project
Recommended Pavement Treatments

Street Name	Begin Location	End Location	No. of Lanes [1]	Neighborhood	Functional Class [1]	Length (ft)	Width (ft)	Approx. Area (sf)	PCI [1]	Surface Type [1]	Existing AC Thickness from Core (in.) [2]	Existing AC Thickness, from GPR (in.) Average	Existing AB Thickness (in.) [3]	Subgrade RV PI MC Soil Type [4]	Recommended Design
GREENAWAY COURT(128E)	PINE SUMMIT DR	END	2	S GLIFFORD	Residential/Local	475	18	8,550	21	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
GROUSE RD	ENTRANCE RD	END	2	GROUSE	Rural Local	792	15	11880	12	AC	1.0	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
HARRINGTON FLAT	SULPHUR CREEK ROAD	SR 175	2	HF	Rural Minor Collector	5,800	22	127,600	33	ST	0.8 - 1.0	1.7	11.6 AT 0.8'' CORE	18 13.5 12.7	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
HOBERG DR (136FA)	EMERFORD DR	HOBERG RD SOUTH	2	HOB	Rural Minor Collector	2,112	23	48,576	21	AC	0.7	1.3	5.0	76 14.2 17.2	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
HOBERG DR. SO.	HOBERG DR.	BLEUSS CT.	2	HOB	Rural Local	2,270	20	45,400	4	AC	1.8	1.3	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
HOBERG DRIVE (136F)	SUMMIT BOULEVARD	HOBERG DR EAST	2	HOB	Rural Minor Collector	697	20	13,940	10	ST	1.2	1.6	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
HOBERG DRIVE (136F)	HOBERG DR EAST	HOBERG DR SOUTH	2	HOB	Rural Minor Collector	2,056	18	37,008	8	AC	1.1	1.2	4.0	54 13.9 19.1	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
HOBERG DRIVE EAST	HOBERG DR	END	2	HOB	Residential/Local	528	22	11,616	50	ST	1.2	1.6	PRESENT		Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
HOGAN HILL LANE	SNEAD DR	END	2	AD	Rural Local	792	18	14,256	9	ST	1.0	-	10.0	27 27.6 17.3	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
HUMBOLDT DRIVE	SUMMIT	SR 175	2	CMC	Rural Local	1,056	18	19,008	55	ST	2.4	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
HUMBOLDT DRIVE EXTENSION	SUMMIT BLVD.	END	2	CMC	Rural Local	264	20	5,280	35	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
JONES COURT	HOGAN HILL LANE	END	2	AD	Rural Local	475	20	9,596	33	ST	0.7	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
KAREN WAY	HOBERG DRIVE SOUTH	END	2	HOB	Rural Local	634	23	14,582	6	ST	1.5	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
LASSEN DR.	ELLIOT DR.	VENTURI DR.	2	W ADAMS	Rural Local	1,267	21	26,607	40	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
LEMA COURT	LEMA LANE	END	2	AD	Rural Local	211	25	6,953	18	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
LEMA LN.	EMERFORD	HARRINGTON FLAT	2	AD	Rural Local	2,851	20	57,020	30	ST	0.7 - 1.7	-	14.7	23 18.8 15.9	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
MAPES PASS - MAPESP	PINE SUMMIT DRIVE	GIFFORD SPRINGS ROAD	2	S GLIFFORD	Rural Local	528	20	10,560	26	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
MAPLE SHADOWS DR	SR 175	SR 175	2	PUTAH CREEK	Rural Local	2,429	17	41293	70	AC	0.6 - 8.3	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
NELSON COURT	LEMA LANE	END	2	AD	Rural Local	422	23	10,651	7	ST	0.8	-	7.1	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
NELSON LANE	LEMA LANE	END	2	AD	Rural Local	686	23	16,842	12	ST	0.4	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay

Table 1: Lake County 2024 Resurfacing Project
Recommended Pavement Treatments

Street Name	Begin Location	End Location	No. of Lanes [1]	Neighborhood	Functional Class [1]	Length (ft)	Width (ft)	Approx. Area (sf)	PCI [1]	Surface Type [1]	Existing AC Thickness from Core (in.) [2]	Existing AC Thickness, from GPR (in.) Average	Existing AB Thickness (in.) [3]	Subgrade RV PI MC Soil Type [4]	Recommended Design
PALMER COURT	PALMER DRIVE	END	2	HF	Rural Local	581	20	11,620	2	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PALMER DR	HARRINGTON FLAT	END	2	HF	Rural Local	1,742	20	34,840	6	ST	1.7	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PAMELA DRIVE	ELLIOTT DR.	VENTURI DR.	2	W ADAMS	Rural Local	528	22	11,616	40	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PARNASUS DR	MAPLE SHADOWS	FORD FLAT ROAD	2	PUTAH CREEK	Rural Local	1,320	15	19800	50	AC	1.4	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PINE SUMMIT DRIVE	GIFFORD SPRINGS RD.	PAVEMENT CHANGE	2	S GLIFFORD	Rural Local	1,848	25	46,200	29	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
PINE SUMMIT DRIVE	PAVEMENT CHANGE	PAVEMENT CHANGE	2	S GLIFFORD	Rural Local	528	23	12,144	22	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
PINE SUMMIT DRIVE	PAVEMENT CHANGE	END	2	S GLIFFORD	Rural Local	264	24	7,166	21	ST	1.9	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
PINEWOOD WAY	BROOKSIDE DR	END	2	PUTAH CREEK	Rural Local	898	12	10776	14	AC	3.6	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PRATHER COURT	PRATHER WAY	END	2	ADAMS SPRING	Rural Local	211	25	5,275	14	ST	1.4	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
PRATHER WAY	COSTELLO WAY	END	2	ADAMS SPRING	Rural Local	1,373	25	35,345	8	ST	0.8	-	9.8	22 19.4 16.2	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
QUAIL DR	ENTRANCE RD	GROUSE RD	2	GROUSE	Rural Local	739	13	9607	16	AC	0.8	-	PRESENT	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
RED HILLS RD.	SR 29	SR 175	2	RED HILLS	Rural Minor Collector	11,620	24	278,880	29	AC	0.9 - 2.7	2.2	6.8 AT 0.9" CORE	56.5 11.55 11.75	8 in. FDR with Cement, 3 in. AC Overlay
REGINA WAY	FOX DRIVE	FOX DRIVE	2	W ADAMS	Rural Local	739	24	17,736	57	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
SHASTA ROAD (136D)	SUMMIT BLVD.	GLENN ROAD	2	CMC	Rural Local	950	18	17,100	24	ST	1.9	-	1.1	71 16.5 23.3	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
SNEAD DR.	SH 175	SH 175	2	AD	Rural Local	2,164	20	43,280	24	ST	0.8 - 1.0	-	9 AT 1.0" CORE	27 17.8 13.4	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
ST. HELENA DRIVE	FOX DRIVE	VENTURI DRIVE	2	W ADAMS	Rural Local	2,323	22	51,106	46	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
SUGAR PINE DRIVE	SUMMIT DRIVE	SUMMIT DRIVE	2	CMC	Rural Local	1,426	23	32,798	18	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
SULPHER CREEK ROAD	BOTTLE ROCK ROAD	HARRINGTON FLAT	2	SC ROAD	Rural Minor Collector	6,300	22	138,600	40	ST	0.8 - 2.6	2.4	10.0 - 14.4	24.5 23.4 30.3	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
SUMMIT BOULEVARD	HOBERG DRIVE	SR 175	2	CMC	Rural Minor Collector	2,100	20	42,000	14	ST	1.9	3.4	1.1	32 23.3 34.7	Pulverize 4 in., Grade, Compact in Place. 3 in. AC Overlay
SUMMIT BOULEVARD	HOBERG DRIVE	END	2	CMC	Rural Minor Collector	1,003	18	18,054	31	AC	2.4	2.7	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay

Table 1: Lake County 2024 Resurfacing Project
Recommended Pavement Treatments

Street Name	Begin Location	End Location	No. of Lanes [1]	Neighborhood	Functional Class [1]	Length (ft)	Width (ft)	Approx. Area (sf)	PCI [1]	Surface Type [1]	Existing AC Thickness from Core (in.) [2]	Existing AC Thickness, from GPR (in.) Average	Existing AB Thickness (in.) [3]	Subgrade RV PI MC Soil Type [4]	Recommended Design
SUMMIT DRIVE	SR 175	END	2	CMC	Rural Local	1,162	26	31,812	11	ST	0.8	-	4.5	14 19.4 24	Pulverize 4 in., Grade, Compact in Place. Double Chip Seal
TANYA TERRACE	PINE SUMMIT DRIVE	PINE SUMMIT DRIVE	2	S GLIFFORD	Rural Local	363	20	7,260	7	ST	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
TRINITY ROAD	SUMMIT BLVD.	SHASTA ROAD	2	CMC	Rural Local	1,214	20	24,280	44	ST	1.0	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay
VENTURI DR.	FOX DR.	EMERFORD	2	W ADAMS	Rural Local	3,907	20	78,140	40	AC	-	-	-	-	Pulverize 4 in., Grade, Compact in Place. 2.5 in. AC Overlay

Table 2 - Pavement Layer Thicknesses and Lab Results Summary

No.	Road Name	Neighborhood	No. of Cores	Core No. [1]	Direction	Fabric Depth (in.)	Asphalt Concrete (AC)						Aggregate Base (AB) Layer	Subgrade Layer					
							Depth from Surface to the bottom of layers (in.)					Total Thickness (in.)	Presence / Thickness From Core (in.) [2]	Type of Soil	R-Value	Moisture Content (%)	Plasticity Index (PI) [3]	Liquid limit	Depth Moisture Sample Taken (in.)
							Layer1	Layer2	Layer3	Layer4	Layer5								
2	ADAMS SPRINGS DR.	ADAMS SPRING	2	AD-1 BULK	W	N/A	3.5	4.5	6.0	-	-	6.0	2.4	Light Brown Sandy Clay W/ Gravel (CL)	31	16.4	16.2	37.1	20.9
				AD-3	E	N/A	0.1	1.2	1.9	-	-	1.9	NO						
				AR-1	E	N/A	0.1	0.6	1.2	-	-	1.2	YES						
3	ADAMS SPRINGS DR.	ADAMS SPRING	2	AR-3 BULK OPT	E	N/A	0.1	1.2	1.8	3.0	-	3.0	NO	Light Brown Sandy Clay W/ Gravel (CL)	22	14.3	21.4	44.1	20.9
4	ANGELLY WAY	HOB	1	ANG-1	E	N/A	1.8	-	-	-	-	1.8	YES						
5	BLEUSS COURT	HOB	1	BLC-1	W	N/A	1.8	-	-	-	-	1.8	YES						
6	BLEUSS WY (137 L)	HOB	1	BLE-1	E	N/A	1.9	-	-	-	-	1.9	YES						
8	CASENTINI DR	AD	2	CA-1	S	N/A	0.5	-	-	-	-	0.5	YES						
				CA-3 BULK	S	N/A	0.5	1.8	-	-	-	1.8	8.6	Light Brown Sandy Clay W/ Gravel (CL)	52	10.8	11	30.1	22.8
9	CREEK VIEW DRIVE	HF	1	CD-1 BULK	E	N/A	0.1	0.8	-	-	-	0.8	3.5	Light Brown Sandy Clay W/ Gravel (CL)	19	12.7	18.7	41.2	16.3
10	COSTELLO WAY	ADAMS SPRING	1	CW-1	N	N/A	0.6	1.3	-	-	-	1.3	YES						
14	GLENN ROAD	S GLIFFORD	1	GLE-1	N	N/A	1.3	-	-	-	-	1.3	NO						
15	HARRINGTON FLAT	HF	3	HF-1	E	N/A	0.1	0.9	-	-	-	0.9	YES						
				HF-2 BULK	E	N/A	0.1	0.8	-	-	-	0.8	11.6	Brown Sandy Clay (CL)	18	12.7	13.5	32.2	26.2
				HF-3	E	N/A	0.1	1.0	-	-	-	1.0	YES						
16	HOBERG DRIVE EAST	HOB	1	HOB-1	E	N/A	0.3	1.2	-	-	-	1.2	YES						
17	HOBERG DR (136FA)	HOB	1	HOB-9 BULK	E	N/A	0.7	-	-	-	-	0.7	5.0	Light Brown Silty Gravel W/ Sand (GM)	76	17.2	14.2	41.6	22.0
18	HOBERG DRIVE (136F)	HOB	1	HOB-3	W	N/A	0.3	1.2	-	-	-	1.2	YES						
19	HOBERG DRIVE (136F)	HOB	1	HOB-5 BULK	S	N/A	0.1	1.1	-	-	-	1.1	4.0	Brown Clayey Sand W/ Gravel (SC)	54	19.1	13.9	35.5	21.7
20	HOBERG DR. SO.	HOB	1	HOB-7	E	N/A	1.8	-	-	-	-	1.8	YES						

Table 2 - Pavement Layer Thicknesses and Lab Results Summary

No.	Road Name	Neighborhood	No. of Cores	Core No. [1]	Direction	Fabric Depth (in.)	Asphalt Concrete (AC)						Aggregate Base (AB) Layer	Subgrade Layer					
							Depth from Surface to the bottom of layers (in.)					Total Thickness (in.)	Presence / Thickness From Core (in.) [2]	Type of Soil	R-Value	Moisture Content (%)	Plasticity Index (PI) [3]	Liquid limit	Depth Moisture Sample Taken (in.)
							Layer1	Layer2	Layer3	Layer4	Layer5								
21	HOGAN HILL LANE	AD	1	HL-1 BULK	N	N/A	0.5	1.0	-	-	-	1.0	10.0	Light Brown Sandy Clay W/ Gravel (CH)	27	17.3	27.6	55.7	22.4
22	HUMBOLDT DRIVE	CMC	1	HUM-1	S	N/A	0.2	2.4	-	-	-	2.4	NO						
24	JONES COURT	AD	1	JC-2 OPT	W	N/A	0.7	-	-	-	-	0.7	YES						
25	KAREN WAY	HOB	1	KAR-1	S	N/A	1.5	-	-	-	-	1.5	YES						
28	LEMA LN.	AD	4	LL-2 BULK OPT	N	N/A	1.0	-	-	-	-	1.0	14.7	Brown Sandy Clay W/ Gravel (CL)	23	15.9	18.8	41.5	26.0
				LL-4 OPT	S	N/A	0.1	0.8	-	-	-	0.8	YES						
				LL-5	N	N/A	0.7	1.7	-	-	-	1.7	YES						
				LL-6	N	N/A	0.7	-	-	-	-	0.7	YES						
29	NELSON COURT	AD	1	NC-1 BULK	W	N/A	0.8	-	-	-	-	0.8	7.1	Light Brown Sandy Clay W/ Gravel (CL)	25	15.9	16.3	38.7	19.3
30	NELSON LANE	AD	1	NL-2 OPT	W	N/A	0.4	-	-	-	-	0.4	YES						
31	PALMER DR	HF	1	PD-2 OPT	E	N/A	1.7	-	-	-	-	1.7	YES						
34	PRATHER COURT	ADAMS SPRING	1	PC-1	W	N/A	0.7	1.4	-	-	-	1.4	YES						
35	PRATHER WAY	ADAMS SPRING	2	PW-1	W	N/A	0.1	0.8	-	-	-	0.8	YES						
				PW-2 BULK OPT	E	N/A	0.8	-	-	-	-	0.8	9.8	Light Brown Sandy Clay W/ Gravel (CL)	22	16.2	19.4	42.3	20.5
36	RED HILLS RD.	RED HILLS	6	RE-1 BULK	E	N/A	0.1	0.3	0.9	-	-	0.9	6.8	Red/Brown Clayey Sand (SC)	64	11.1	12	32.3	23.2
				RE-2	E	N/A	0.1	0.7	1.7	-	-	1.7	YES						
				RE-4	E	N/A	0.1	0.9	1.8	-	-	1.8	NO						
				RE-5	W	N/A	0.1	0.8	1.7	-	-	1.7	NO						
				RE-6 BULK	E	N/A	0.1	0.7	1.5	-	-	1.5	NO	Red/Brown Clayey Sand (SC)	49	12.4	11.1	29.6	18.5
				RE-8	W	N/A	0.1	0.6	1.6	2.7	-	2.7	YES						
39	SHASTA ROAD (136D)	CMC	1	SHA-1 BULK	S	N/A	0.1	1.9	-	-	-	1.9	1.1	Brown Sandy Silt W/ Gravel (ML)	71	23.3	16.5	48	24.8
				SD-1	S	N/A	0.4	0.8	-	-	-	0.8	YES						

Table 2 - Pavement Layer Thicknesses and Lab Results Summary

No.	Road Name	Neighborhood	No. of Cores	Core No. [1]	Direction	Fabric Depth (in.)	Asphalt Concrete (AC)						Aggregate Base (AB) Layer	Subgrade Layer					
							Depth from Surface to the bottom of layers (in.)					Total Thickness (in.)	Presence / Thickness From Core (in.) [2]	Type of Soil	R-Value	Moisture Content (%)	Plasticity Index (PI) [3]	Liquid limit	Depth Moisture Sample Taken (in.)
							Layer1	Layer2	Layer3	Layer4	Layer5								
40	SNEAD DR.	AD	2	SD-2 BULK	N	N/A	0.4	1.0	-	-	-	1.0	9.0	Brown Clayey Sand W/ Gravel (SC)	27	13.4	17.8	38.1	18.1
41	SULPHER CREEK ROAD	SC ROAD	5	SC-1	E	N/A	0.1	0.5	0.8	-	-	0.8	YES						
				SC-2 BULK	E	N/A	0.1	1.6	-	-	-	1.6	10.0	Gray/Brown Clayey Sand W/ Gravel (SC)	23	20.4	26.3	52.9	19.9
				SC-3	W	N/A	0.1	0.6	1.1	-	-	1.1	YES						
				SC-4	E	N/A	0.1	0.8	2.0	-	-	2.0	YES						
				SC-5 BULK	E	N/A	2.6	-	-	-	-	2.6	14.4	Brown Clayey Sand W/ Gravel (SC)	26	9.9	20.5	42.2	32.7
42	SUMMIT BOULEVARD	CMC	1	SUM-1 BULK	W	N/A	0.1	1.9	-	-	-	1.9	1.1	Brown Sandy Clay W/ Gravel (CL)	32	34.7	23.3	50.3	25.6
43	SUMMIT BOULEVARD	S GLIFFORD	1	SUM-3	N	N/A	0.9	2.4	-	-	-	2.4	NO						
44	TRINITY ROAD	CMC	1	TRI-1	N	N/A	0.4	1.0	-	-	-	1.0	NO						
50	PINE SUMMIT DRIVE	S GLIFFORD	1	PI-1	W	N/A	1.2	1.9	-	-	-	1.9	YES						
53	SUMMIT DRIVE	S GLIFFORD	1	SU-1 BULK	N	N/A	0.1	0.8	-	-	-	0.8	4.5	Light Brown Sandy Clay W/ Gravel (CL)	14	24	19.4	46.7	17.9
55	ARROYO VISTA	PUTAH CREEK	1	ARR-1	E	N/A	0.2	0.9	-	-	-	0.9	YES						
56	BROOKSIDE DR	PUTAH CREEK	3	BRO-1	E	N/A	0.5	-	-	-	-	0.5	NO						
				BRO-3	S	N/A	0.1	0.7	-	-	-	0.7	YES						
				BRO-5	S	N/A	0.1	0.7				0.7	YES						
58	DOVE DR	GROUSE	1	DOV-1	S	N/A	0.3	1.6	-	-	-	1.6	YES						
59	ENTRANCE ROAD	GROUSE	1	ENT-1	E	N/A	0.1	0.9	-	-	-	0.9	YES						
60	FOREST LAKE DR	PUTAH CREEK	1	FOR-1	E	N/A	0.5	-	-	-	-	0.5	YES						
61	GROUSE RD	GROUSE	1	GRO-1	S	N/A	1.0	-	-	-	-	1.0	YES						
62	MAPLE SHADOWS DR	PUTAH CREEK	2	MAP-1	W	N/A	0.4	3.5	5.4	7.2	8.3	8.3	YES						
				MAP-3	W	N/A	0.6	-	-	-	-	0.6	YES						
63	PARNASUS DR	PUTAH CREEK	1	PAR-2 OPT	W	N/A	0.7	1.4	-	-	-	1.4	YES						
64	PINEWOOD WAY	PUTAH CREEK	1	PIN-2 OPT	N	N/A	0.4	2.9	3.6	-	-	3.6	YES						
65	QUAIL DR	GROUSE	1	QUA-1	N	N/A	0.1	0.8	-	-	-	0.8	YES						

* Gravel Road

[1] Core numbers are not numerically sequential since optional core locations were included in the numbering system should any identified core locations be deemed unsuitable for coring due to utility interference or other obstructions.

[2] For all the 4" cores, existance of AB was visualy observed but not measured

Appendix B - GPR Report

INFRASENSE

Ground Penetrating Radar (GPR) Pavement Structure Evaluation of Local Roads in Lake County, California

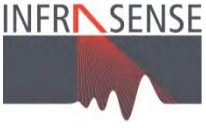
FINAL REPORT

SUBMITTED TO:

NCE
1003 W. Cutting Blvd., Suite 110
Pt. Richmond, CA 94804

SUBMITTED BY:

Infrasense, Inc.
21G Olympia Ave, Suite 45
Woburn, MA 01801



1. Introduction

The objective of this project was to evaluate the pavement structure of a group of local roads in Lake County, CA (see Figure 1). The pavement structure evaluation was carried out utilizing ground penetrating radar (GPR) to determine the thickness of the bound and unbound material layers. The following sections describe the data collection procedures, analysis methods, and resulting deliverables.

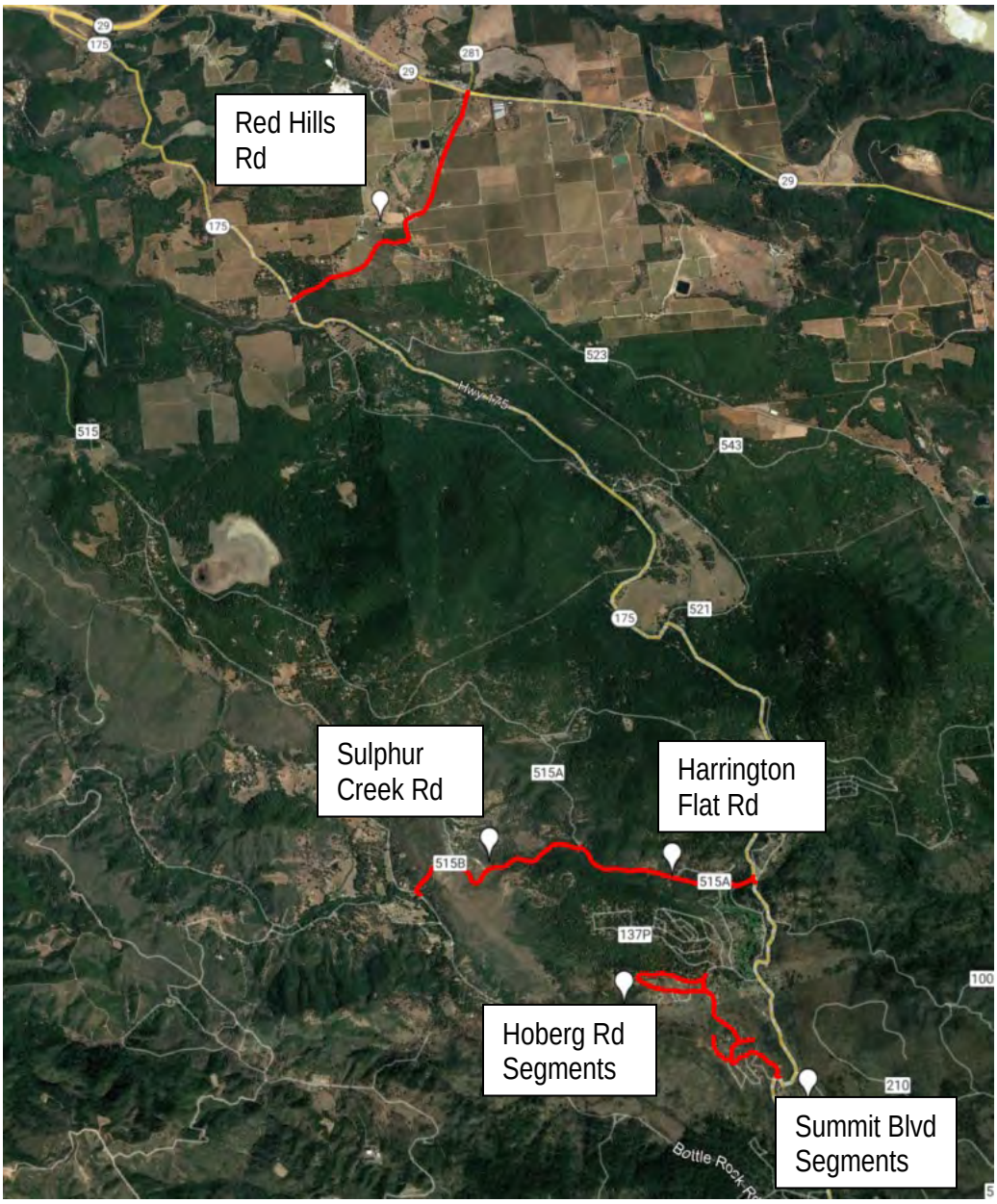


Figure 1 – Project Section

2. Data Collection

The GPR data collection was carried out on November 8th, 2023, at normal driving speed using a 1-GHz horn antenna system manufactured by GSSI, Inc. of Nashua, NH (see Figure 2). The vehicle is equipped with an electronic distance-measuring instrument (DMI) mounted to the rear wheel, providing synchronous distance data as the GPR data was collected; and a Trimble GPS unit, providing high resolution, differentially corrected geo-spatial information. The data collection and recording are controlled by the SIR-4000 GPR system operated from within the survey vehicle. The data was collected at a rate of two scans per foot of travel along each surveyed lane.

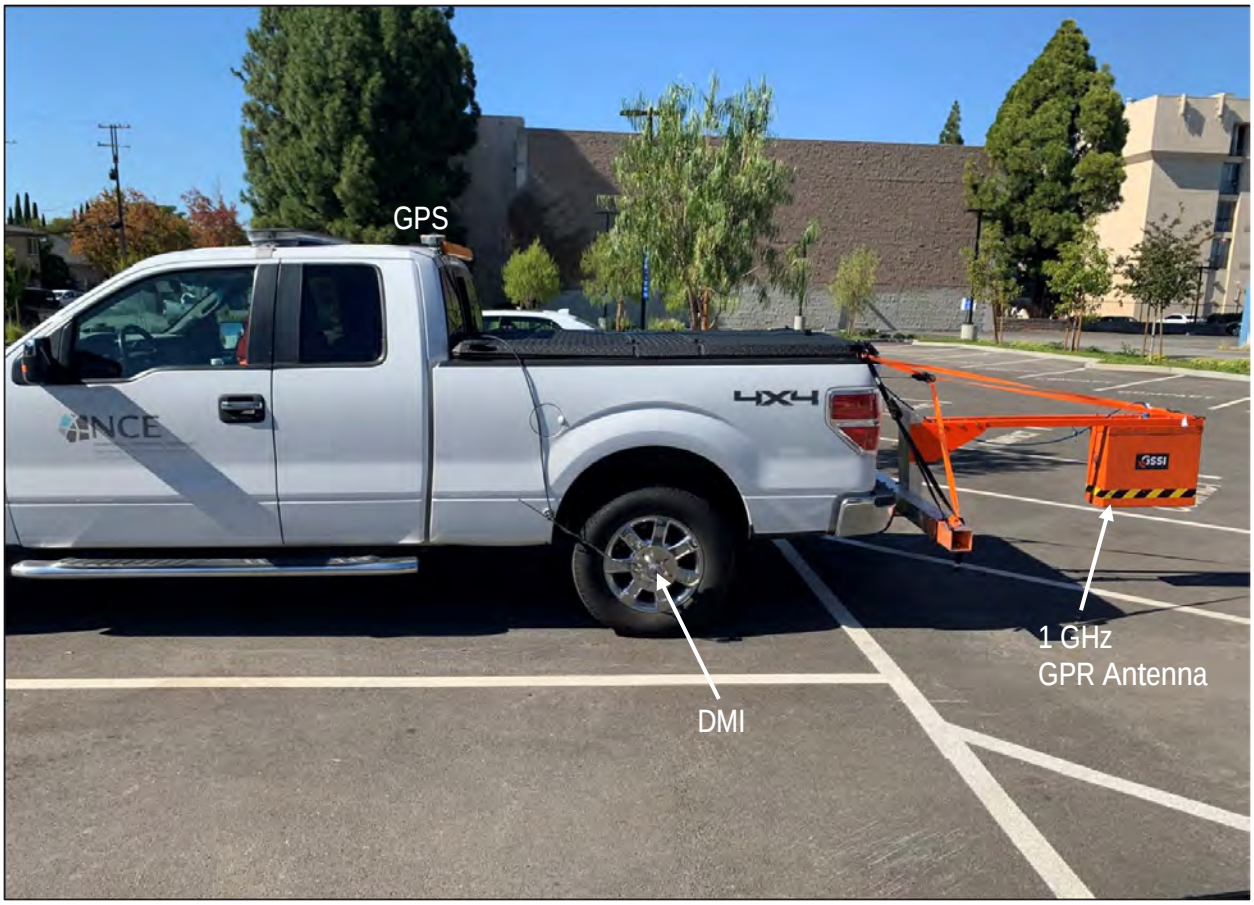


Figure 2 – GPR Equipment Setup

3. Data Analysis and Results

3.1 Pavement Thickness

The GPR data was analyzed to identify the thickness of the surface asphalt concrete (AC) and underlying base layer. The GPR data, when displayed in a gray scale "B-scan", reveals the pavement cross-section including the individual pavement layers. Figure 3 shows a representative sample of the data and identifies the layers detected and reported for the project section. Figure 4 shows the same sample data, but with individual asphalt and base layers "picked" by the GPR analyst. The software carries out the dielectric and thickness calculations on this picked data.

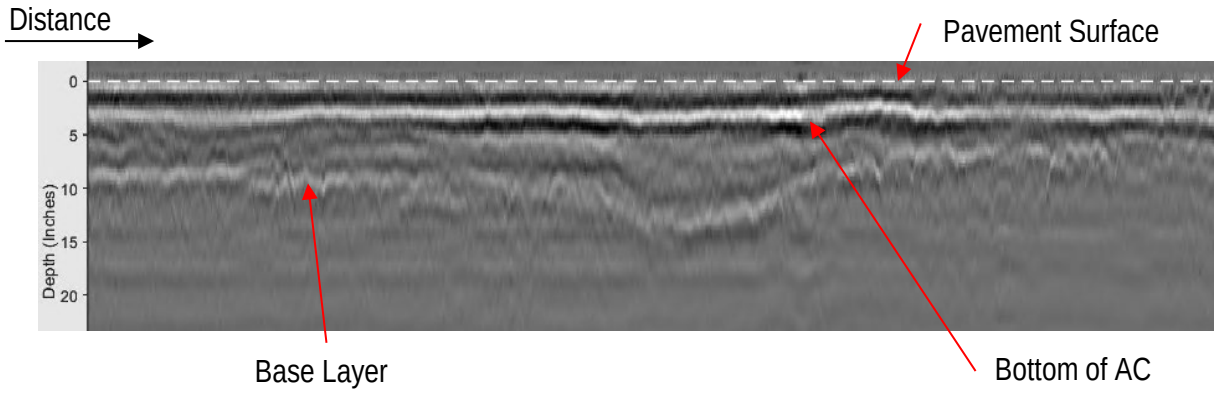


Figure 3 – Sample GPR Data Showing Pavement Layers
(Sample Along Red Hill Rd, Westbound)

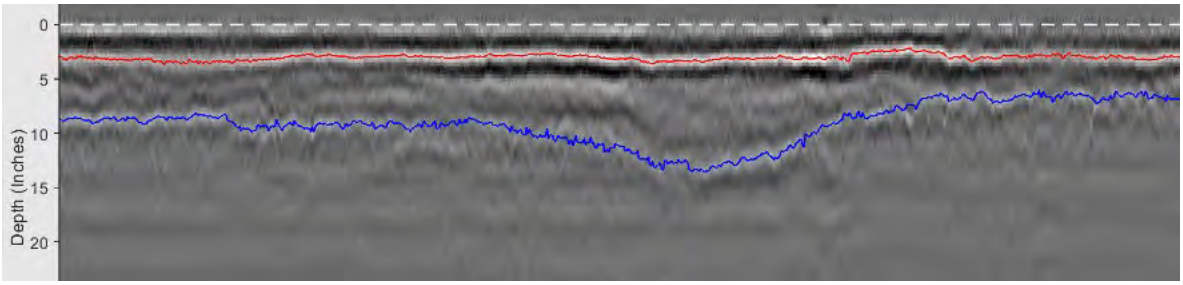


Figure 4 – Sample GPR Data Showing Pavement Layers "Picked" By Analyst
(Sample Along Red Hill Rd, Westbound)

The pavement layer thicknesses were calculated and reported at 5-foot increments. The GPR results show an average of 2.0" AC over all prescribed lanes. A more detailed statistical summary of the pavement layer thickness results is provided in Table 1. Note that a 0.5" cutoff was used for shallow AC values, in accordance with the detection abilities of the GPR equipment.

Table 1 –AC Pavement Statistics (in.)

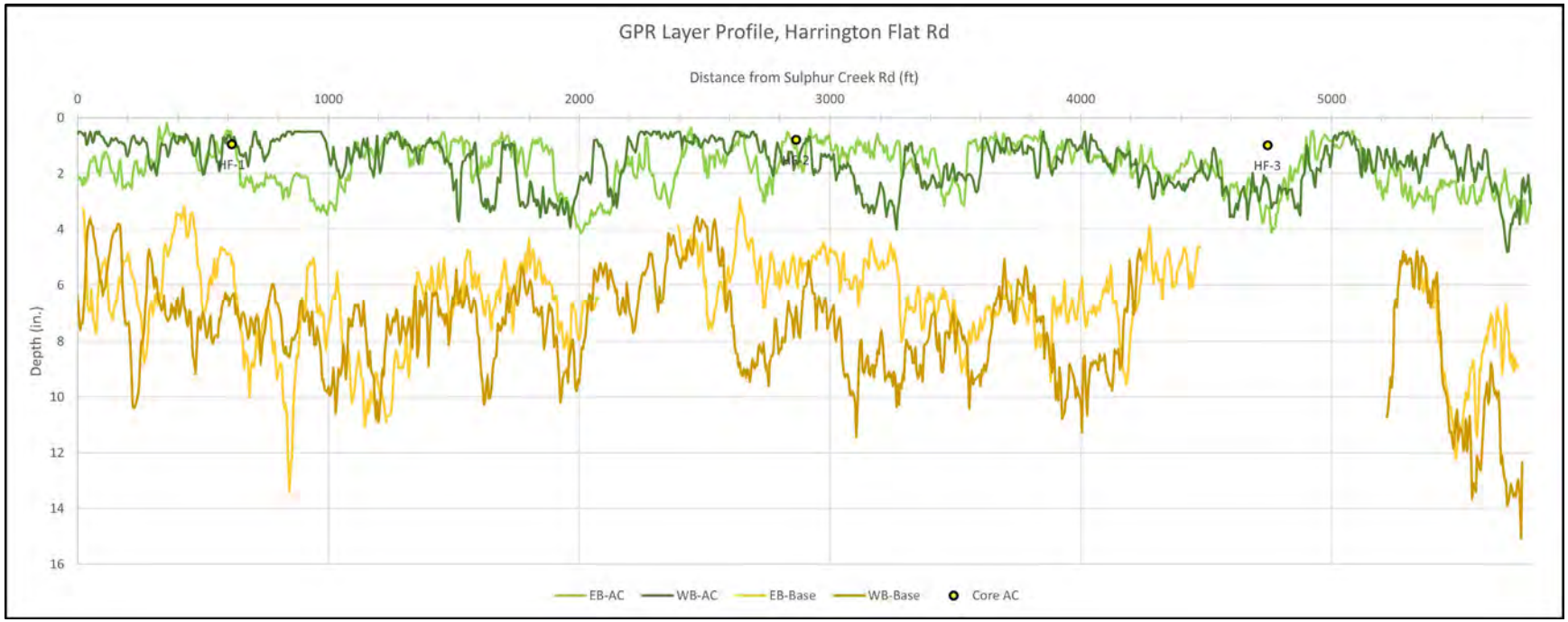
Segment	Lane	Average (in.)	Median (in.)	25th Percentile (in.)	75th Percentile (in.)
Harrington Flat Rd	EB	1.7	1.6	1.0	2.4
	WB	1.6	1.4	0.9	2.2
Hoberg Dr E	NB	1.1	0.8	0.6	1.6
	SB	1.2	1.0	0.7	1.5
Hoberg Dr Loop	CW	1.3	1.3	0.6	1.8
	CCW	1.3	1.3	0.5	1.8
Hoberg Rd	NB	1.6	1.8	0.7	2.2
	SB	1.6	1.6	1.2	2.0
Red Hills Rd	EB	2.1	1.9	1.1	2.7
	WB	2.2	2.0	1.2	3.0
Sulphur Creek Rd	EB	2.6	2.5	1.7	3.5
	WB	2.1	2.0	1.3	2.7
Summit Blvd (1)	EB	3.6	3.6	2.7	4.4
	WB	3.1	2.6	1.9	3.8
Summit Blvd (2)	EB	2.6	2.3	1.9	3.1
	WB	2.8	2.7	2.0	3.2

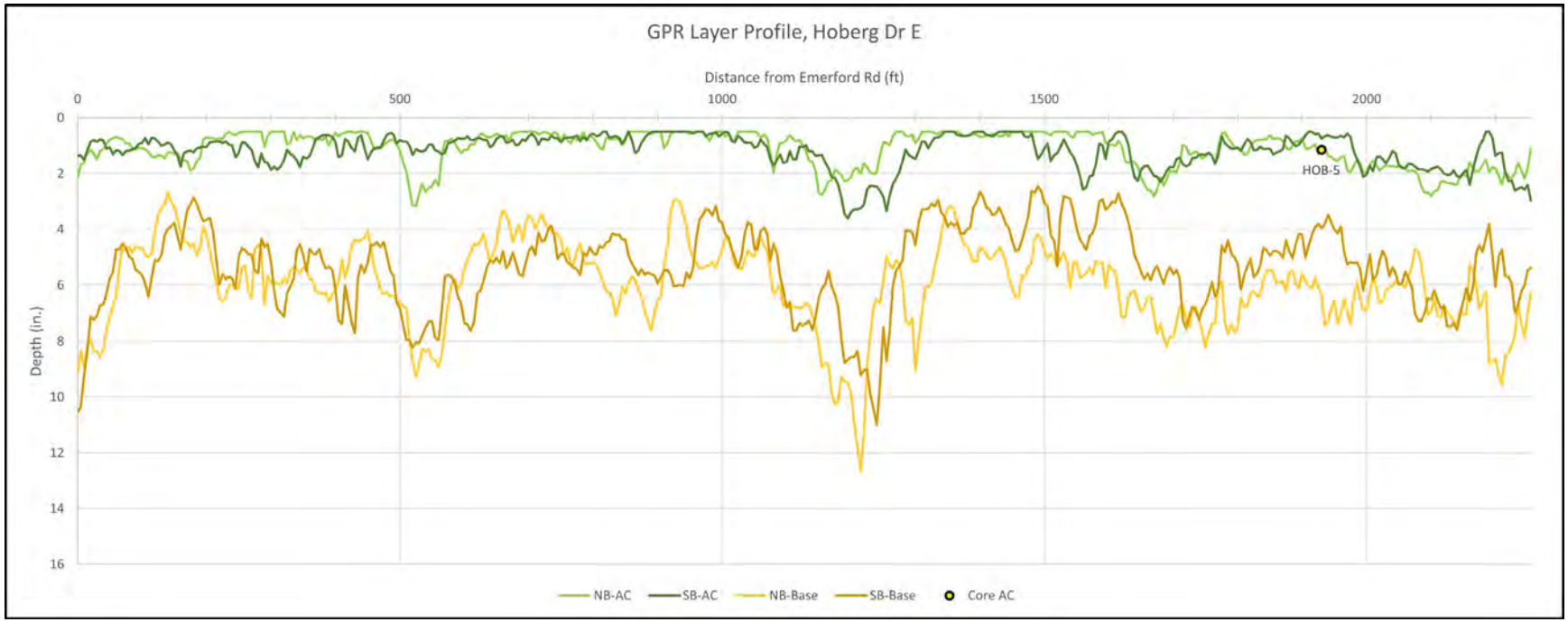
Coring measurements at 20 locations within the were provided to aid the GPR analysis by confirming the material type for each of the subsurface layers. These cores have been provided with an ID and are overlaid on the GPR layer thickness plots for comparison.

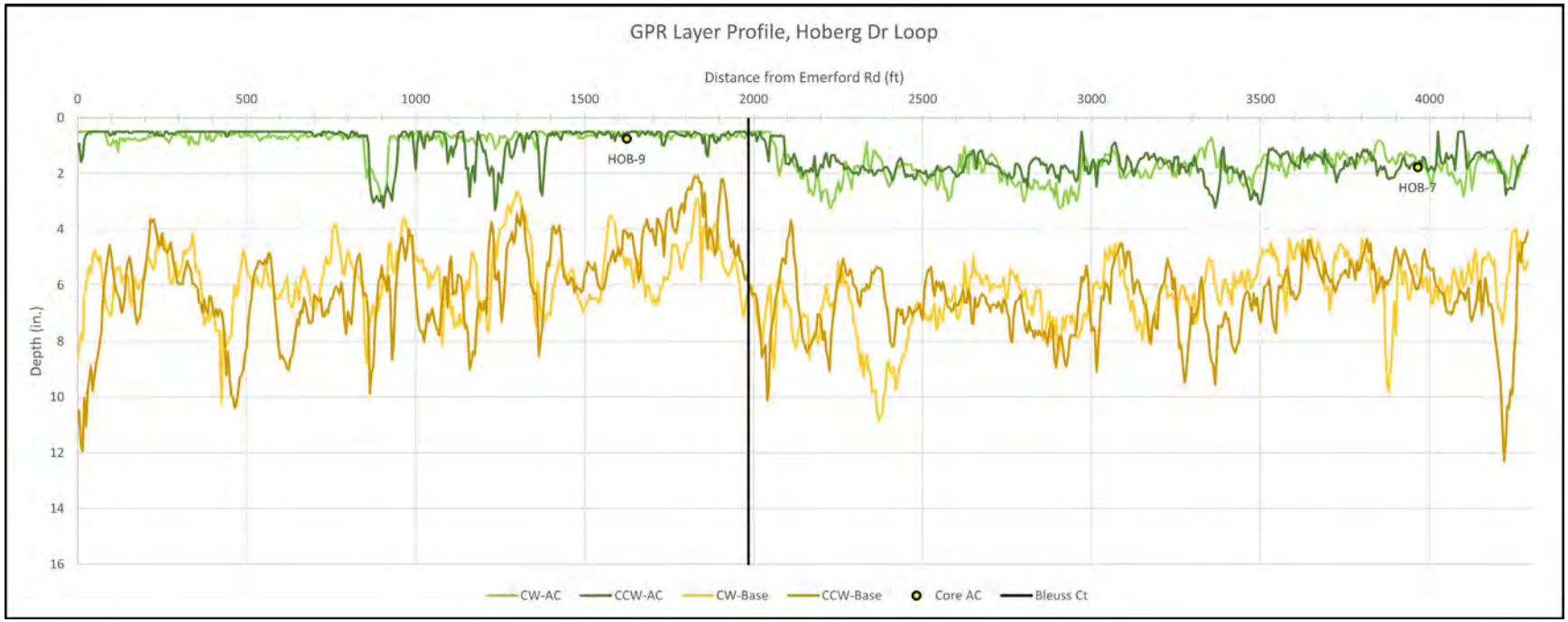
The pavement layer thickness results with corresponding distance referencing and GPS coordinates for each lane have been submitted as a tabular Excel file (see Attachment B). In addition, depth profile plots of the pavement structure have been provided as Attachment A. These are also included within the “Plots” tab of the Excel files. Additional information on the principles of GPR for pavement thickness measurements is provided as Attachment C.

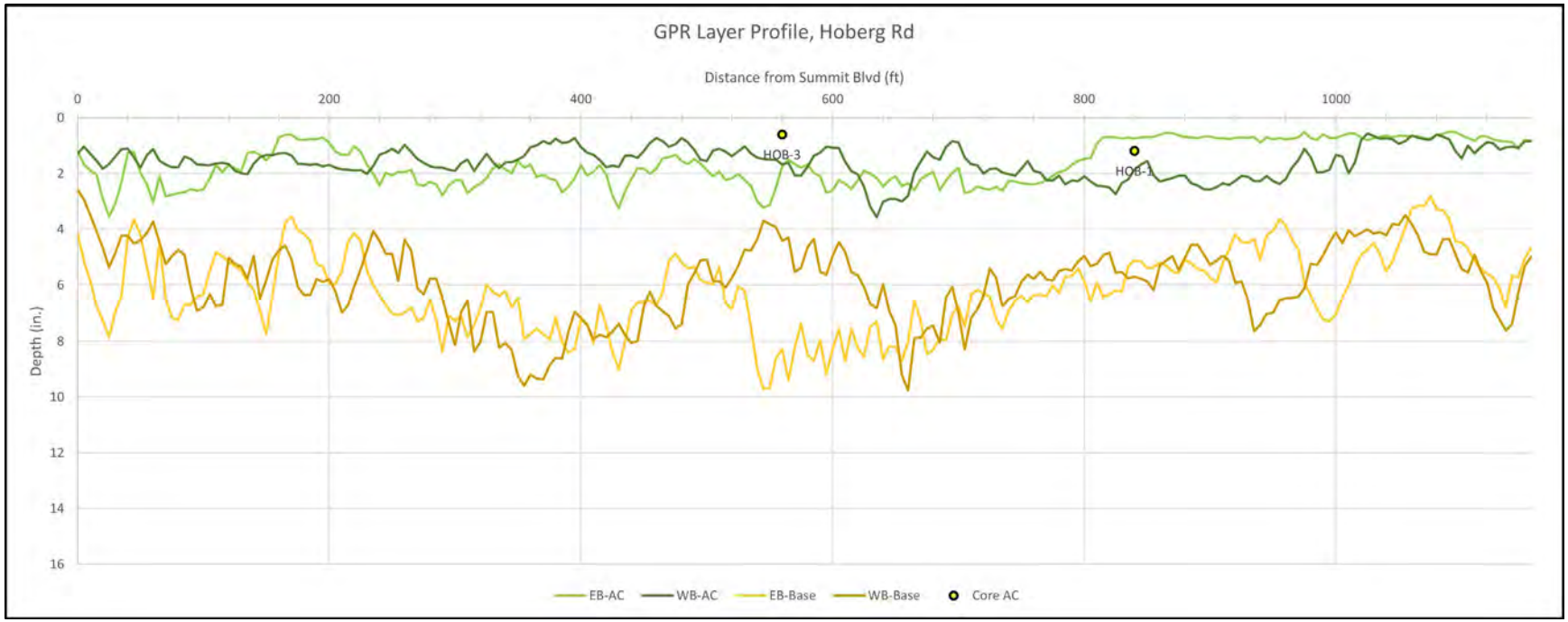
ATTACHMENT A

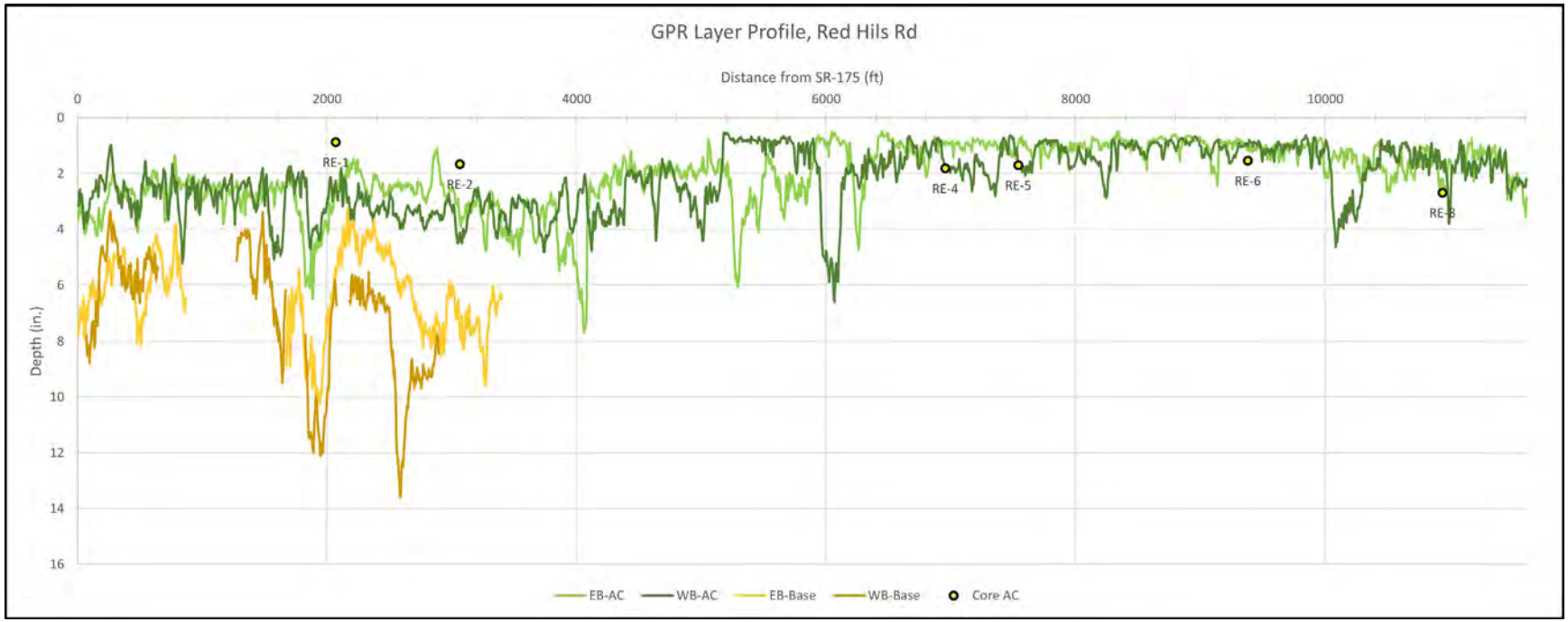
PAVEMENT LAYER THICKNESS PLOTS

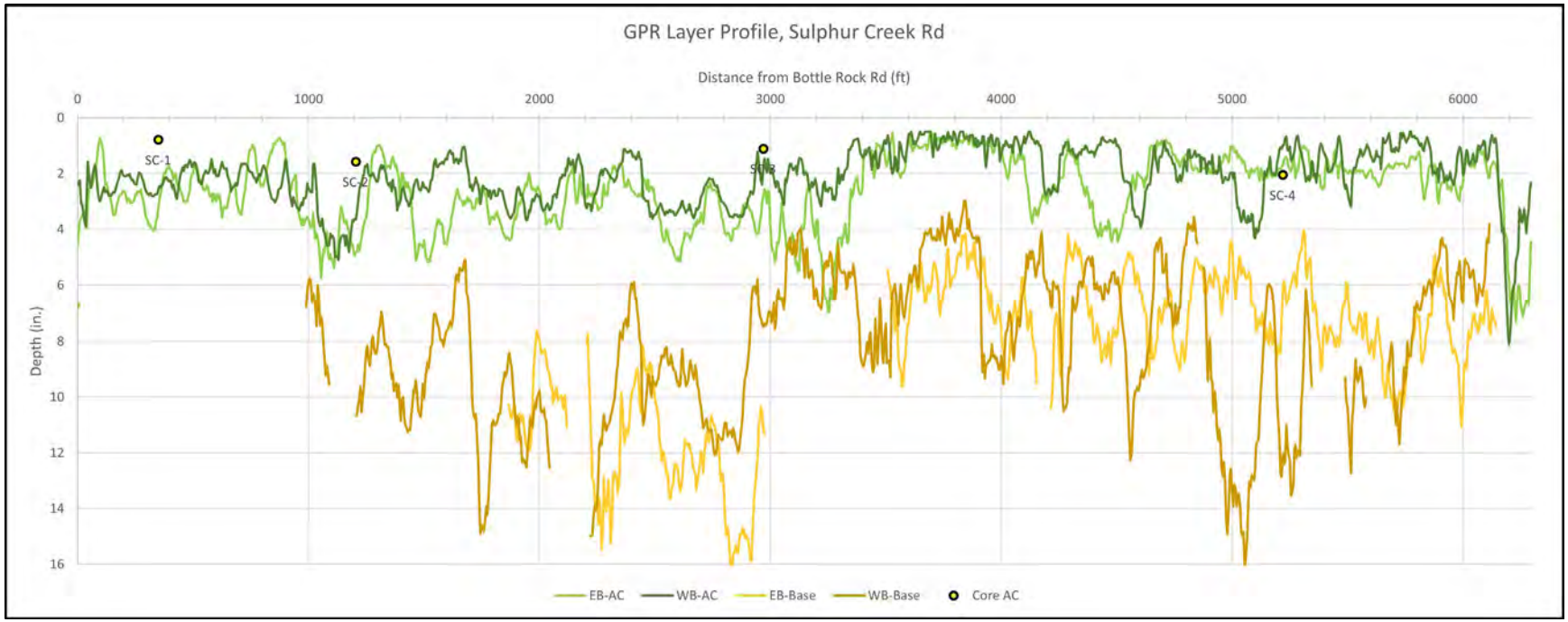

GPR Layer Profile, Harrington Flat Rd
Distance from Sulphur Creek Rd (ft)
0
1000
2000
3000
4000
5000
Depth (in.)
0
2
4
6
8
10
12
14
16
HF-1
HF-2
HF-3
EB-AC
WB-AC
EB-Base
WB-Base
Core AC

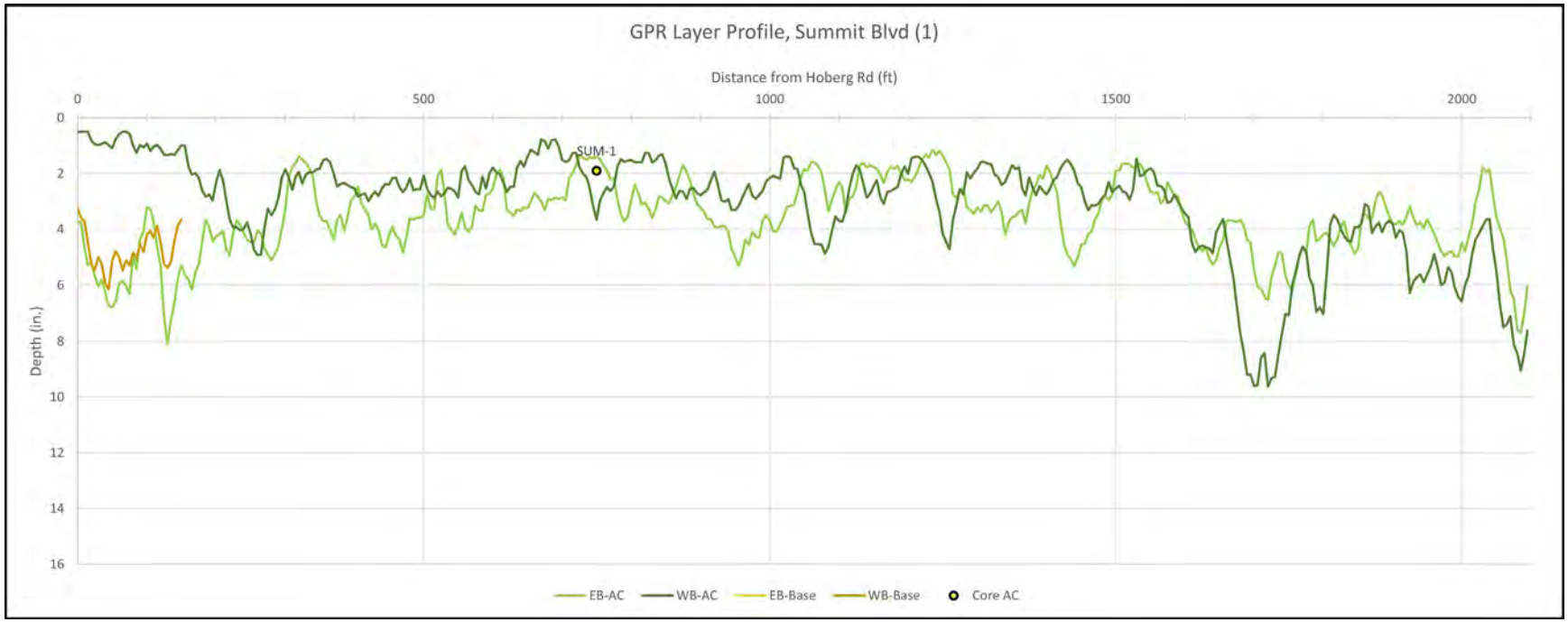

GPR Layer Profile, Hoberg Dr E
Distance from Emerford Rd (ft)
0
500
1000
1500
2000
Depth (in.)
0
2
4
6
8
10
12
14
16
HOB-5
NB-AC
SB-AC
NB-Base
SB-Base
Core AC

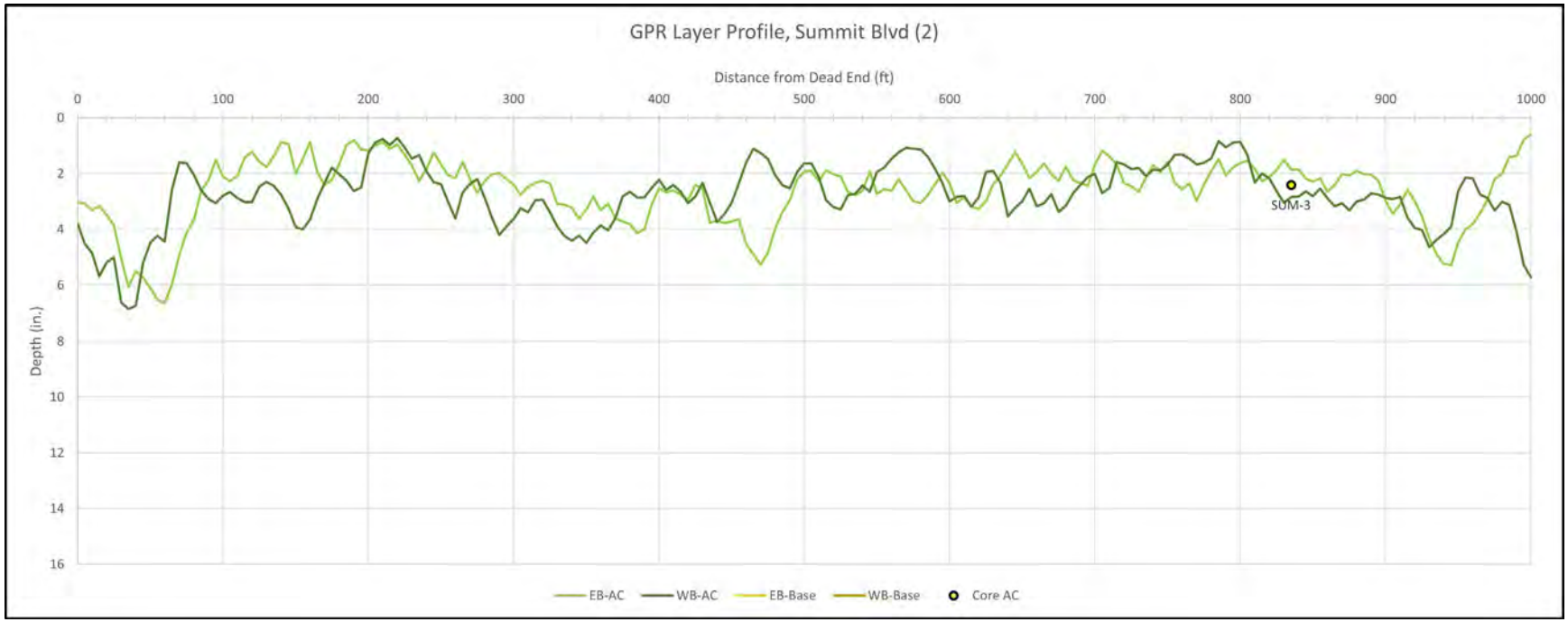

GPR Layer Profile, Hoberg Dr Loop
Distance from Emerford Rd (ft)
0
500
1000
1500
2000
2500
3000
3500
4000
Depth (in.)
0
2
4
6
8
10
12
14
16
HOB-9
HOB-7
CW-AC
CCW-AC
CW-Base
CCW-Base
Core AC
Bleuss Ct


GPR Layer Profile, Hoberg Rd
Distance from Summit Blvd (ft)
0
200
400
600
800
1000
Depth (in.)
0
2
4
6
8
10
12
14
16
HOB-3
HOB-1
EB-AC
WB-AC
EB-Base
WB-Base
Core AC


GPR Layer Profile, Red Hils Rd
Distance from SR-175 (ft)
0
2000
4000
6000
8000
10000
Depth (in.)
0
2
4
6
8
10
12
14
16
RE-1
RE-2
RE-4
RE-5
RE-6
RE-8
EB-AC
WB-AC
EB-Base
WB-Base
Core AC


GPR Layer Profile, Sulphur Creek Rd
Distance from Bottle Rock Rd (ft)
0
1000
2000
3000
4000
5000
6000
Depth (in.)
0
2
4
6
8
10
12
14
16
SC-1
SC-2
SC-3
SC-4
EB-AC
WB-AC
EB-Base
WB-Base
Core AC


GPR Layer Profile, Summit Blvd (1)
Distance from Hoberg Rd (ft)
0
500
1000
1500
2000
Depth (in.)
0
2
4
6
8
10
12
14
16
SUM-1
EB-AC
WB-AC
EB-Base
WB-Base
Core AC


GPR Layer Profile, Summit Blvd (2)
Distance from Dead End (ft)
0
100
200
300
400
500
600
700
800
900
1000
Depth (in.)
0
2
4
6
8
10
12
14
16
SUM-3
EB-AC
WB-AC
EB-Base
WB-Base
Core AC

ATTACHMENT B

TABULAR RESULTS

transmitted electronically as

"Harrington Flat Rd_GPR Pavement Structure.xlsx"

"Hoberg Dr E_GPR Pavement Structure.xlsx"

"Hoberg Dr Loop_GPR Pavement Structure.xlsx"

"Hoberg Rd_GPR Pavement Structure.xlsx"

"Red Hills Rd_GPR Pavement Structure.xlsx"

"Sulphur Creek Rd_GPR Pavement Structure.xlsx"

"Summit Blvd (1)_GPR Pavement Structure.xlsx"

"Summit Blvd (2)_GPR Pavement Structure.xlsx"

"Asphalt Thickness Statistics.xlsx"

ATTACHMENT C

PRINCIPLES OF GPR FOR PAVEMENT EVALUATION

Ground penetrating radar operates by transmitting short pulses of electromagnetic energy into the pavement using an antenna attached to a survey vehicle These pulses are reflected back to the antenna with an arrival time and amplitude that is related to the location and nature of dielectric discontinuities in the material (air/asphalt or asphalt/concrete, reinforcing steel, etc.). The reflected energy is captured and may be displayed on an oscilloscope to form a series of pulses that are referred to as the radar waveform. The waveform contains a record of the properties and thicknesses of the layers within the pavement (Figure C1).

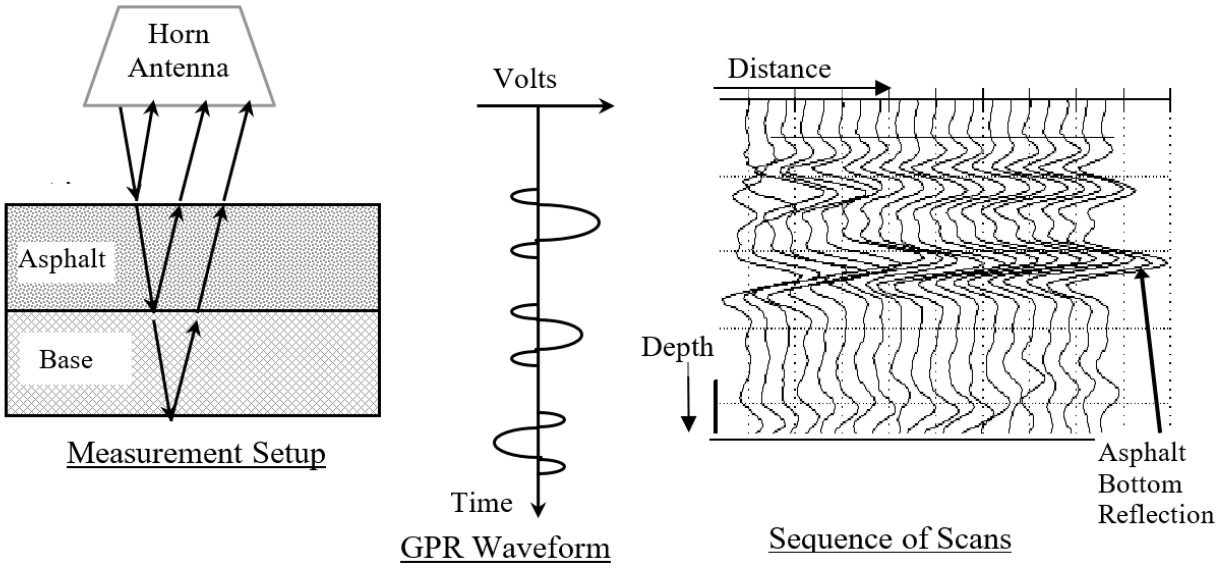


Figure C1 – Structure of the GPR Signal for Pavements

The sequence of scans shown on the right of Figure C1 is frequently coded in color or gray scale to produce the "b" scan representation, examples of which have been shown in the body of the report. The b-scan provides the equivalent of a cross sectional view of the pavement, with the individual pavement layers showing up as colored horizontal bands. The white and black bands indicate stronger reflections and occur when the dielectric contrast is greater. The grey regions indicate weaker reflections and occur when there is little dielectric contrast.

Layer thickness is calculated from the arrival time of the reflection from the top and bottom of each layer as follows:

$$\text{Thickness (in.)} = (5.9\ t)/\sqrt{\varepsilon_a} \qquad (1)$$

where time (t) is measured in nanoseconds and ε_a is the relative dielectric permittivity or "dielectric constant" of the pavement layer (Roddis, et. al., 1992).
Computation of the dielectric constant of the surface layer can be made by measuring the ratio of the radar reflection from the pavement surface to the radar amplitude incident on the pavement. The incident amplitude on the pavement is determined by measuring the reflection from a metal plate on the pavement surface, since the metal plate reflects 100% of the incident energy. Using this data, one obtains the asphalt dielectric constant, ε_a as follows:

$$\varepsilon_a = [(A_{pl} + A)/(A_{pl} - A)]^2 \qquad (2)$$

where A = amplitude of reflection from asphalt, and A_{pl} = amplitude of reflection from metal plate (negative of incident amplitude) (Roddis, et. al., 1992). Table C1 shows typical dielectric constants and associated GPR velocities for pavement materials. Note that the range of dielectric constant for asphalt is large, due to the variations in density and aggregate composition.

Table C1 – GPR Velocities and Dielectric Constants for Pavement Materials

VELOCITY			DIELECTRIC CONSTANT	NOTES
METRIC		ENGLISH		
M/NS	CM/NS	IN/NS		
0.90	9.0	3.54	11.00	typical for PCC
0.100	10.0	3.94	9.00	
0.105	10.5	4.13	8.16	
0.110	11.0	4.33	7.44	
0.115	11.5	4.53	6.81	
0.120	12.0	4.72	6.25	
0.125	12.5	4.92	5.76	
0.130	13.0	5.12	5.33	
0.135	13.5	5.31	4.94	typical for AC
0.140	14.0	5.51	4.59	
0.145	14.5	5.71	4.28	
0.150	15.0	5.90	4.00	
0.155	15.5	6.10	3.75	

A similar calculation can be made for the dielectric constant of the base material. Changes in base moisture content have a strong effect on the base dielectric constant, and thus the base dielectric constant can be used as an indicator of high moisture content.

The calculations described above are automated in Infrasense's *win*Decar© data analysis software program for computing pavement layer thickness and changes in pavement layer properties. The analytical

techniques described above serve as the basis for data analysis carried out during this project, as described in Section 3 of the report.

References

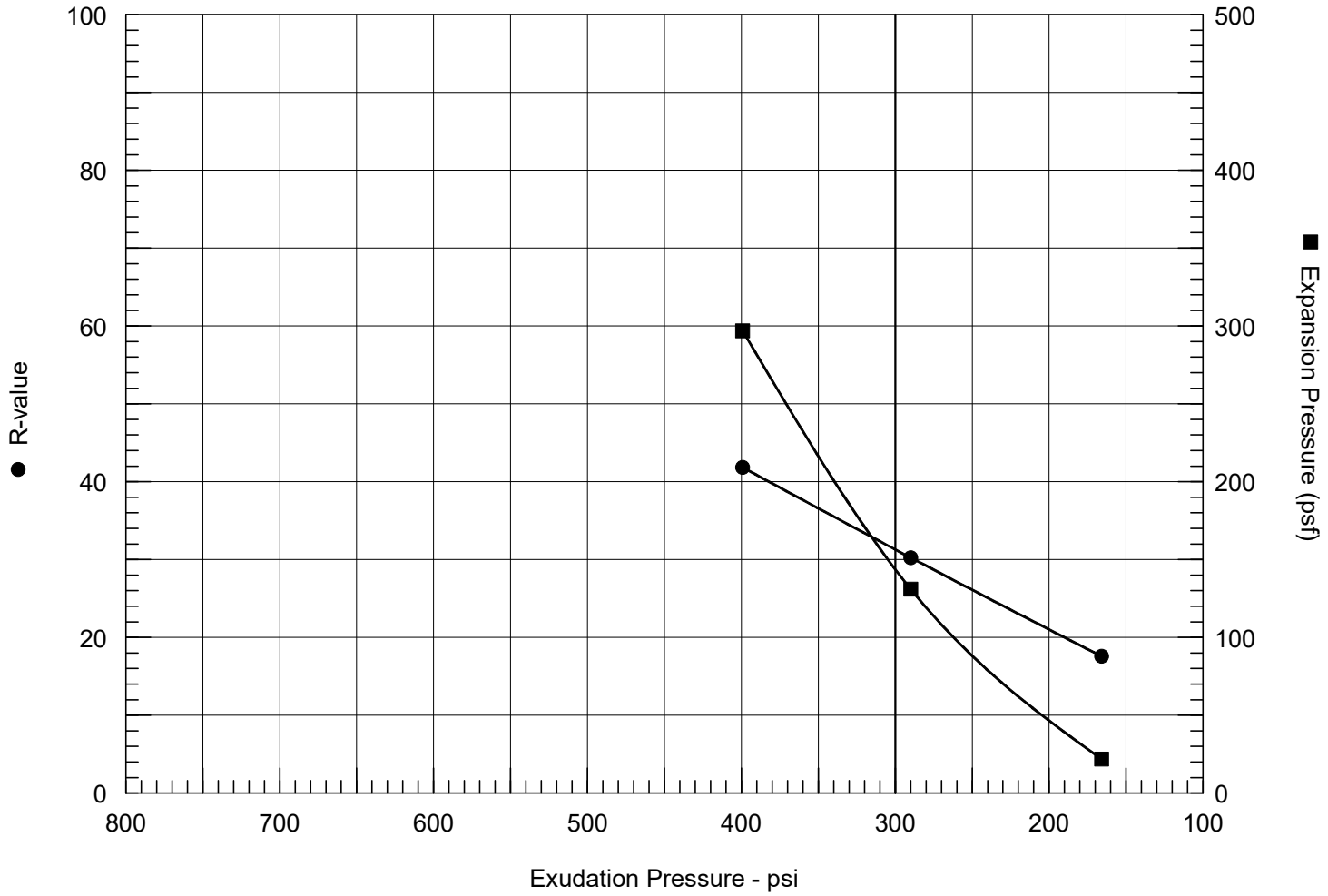
ASTM D 4748–98, “Standard Test Method for Determining the Thickness of Bound Pavement Layers Using Short-Pulse Radar.” Annual Book of ASTM Standards, American Society for Testing and Materials (March 1998).

Maser, K.R., Scullion, T., “Influence of Asphalt Layering and Surface Treatments on Asphalt and Base Layer Thickness Computations Using Radar.” Texas DOTPD Report TX-92-1923-1, Austin, TX (1992b).

Roddis, W.M., Kim, Maser, K.R., and Gisi, A.J., “Radar Pavement Thickness Evaluations for Varying Base Conditions,” Transportation Research Record No. 1355, TRB National Research Council, pp. 90-98, 1992.

Attachment C – Laboratory Test Results

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	65	108.9	19.0	22	120	2.56	166	17	18
2	100	113.5	17.1	131	94	2.49	290	30	30
3	165	114.9	15.9	297	75	2.52	399	42	42

Test Results	Material Description
R-value at 300 psi exudation pressure = 31 **Exp. pressure at 300 psi exudation pressure =** 144 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: AD-1 **Depth:** 151-495mm

Date: 12/13/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

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Figure ____

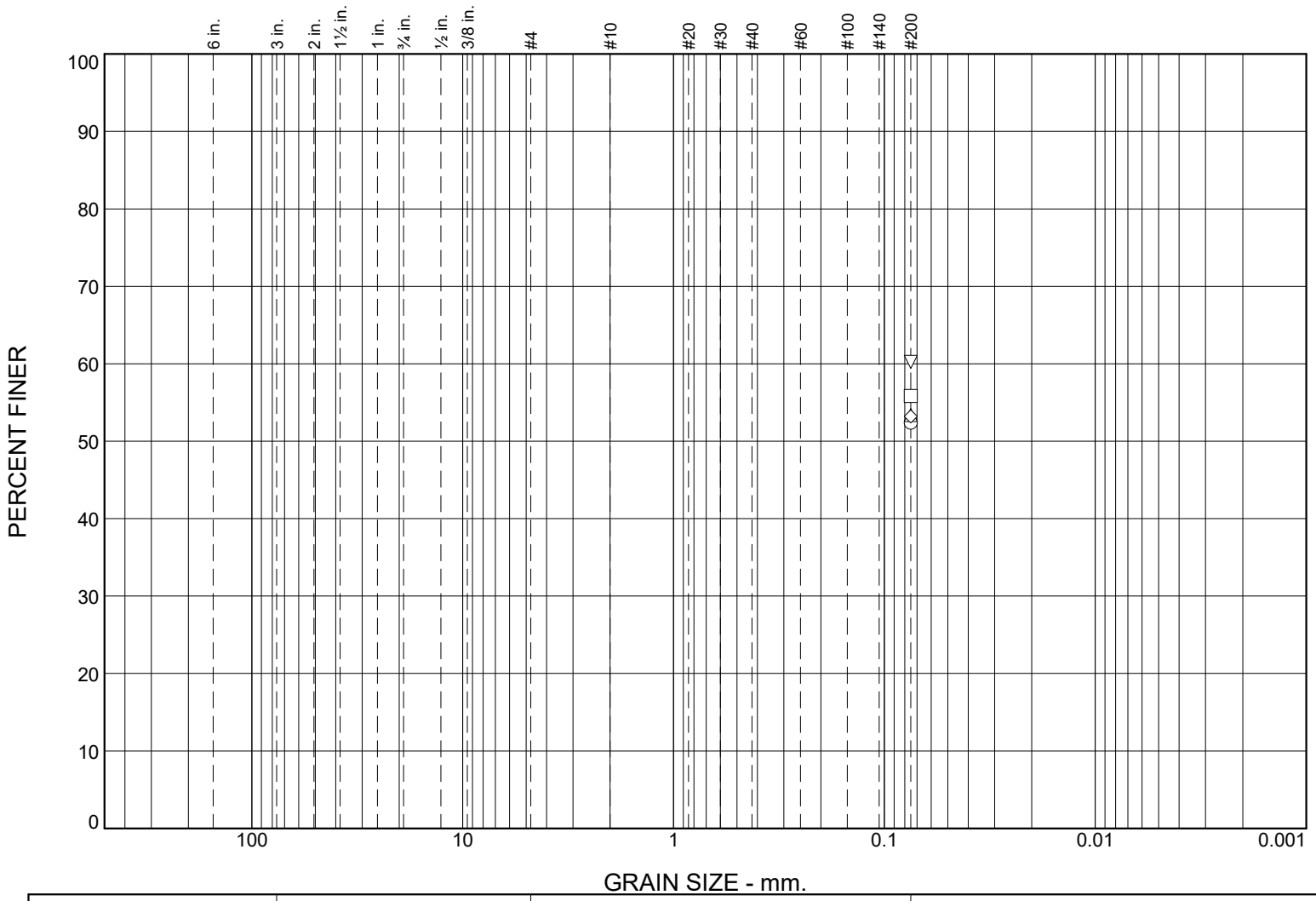
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: AD-1
Depth: 151-495mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	65	100	165
Wet weight (gms):	1050.9	1022.4	994.4
Dry weight (gms):	899.1	887.9	872.0
Tare weight (gms):	100.4	102.4	101.4
% Moisture:	19.0	17.1	15.9
Exudation load (lbs.):	2085	3643	5016
Exudation pressure (psi):	166	290	399
Total weight (gms.):	3052.3	3061.5	3062.8
Mold weight (gms.):	1958.0	1969.9	1955.9
Sample weight (gms.):	1094.3	1091.6	1106.9
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	30	68
Expansion pressure (psf):	22	131	297
Ph at 2000 lbs.:	120	94	75
D turns:	4.10	4.05	3.94
R:	17	30	42
Height (in.):	2.56	2.49	2.52
Dry density (pcf):	108.9	113.5	114.9
Corrected R:	18	30	42

R-Value at 300 psi exudation pressure = 31
Expansion pressure at 300 psi = 144 psf

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							52.4	
□							55.8	
△							53.4	
◇							53.2	
▽							60.2	

SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	AD-1		151-495mm	Light Brown Sandy Clay W/ Gravel (CL)	CL
□	AR-3		74-470mm	Light Brown Sandy Clay W/ Gravel (CL)	CL
△	CA-3		265-560mm	Light Brown Sandy Clay W/ Gravel (CL)	CL
◇	CD-1		110-405mm	Light Brown Sandy Clay W/ Gravel (CL)	CL
▽	HF-2		315-645mm	Brown Sandy Clay (CL)	CL

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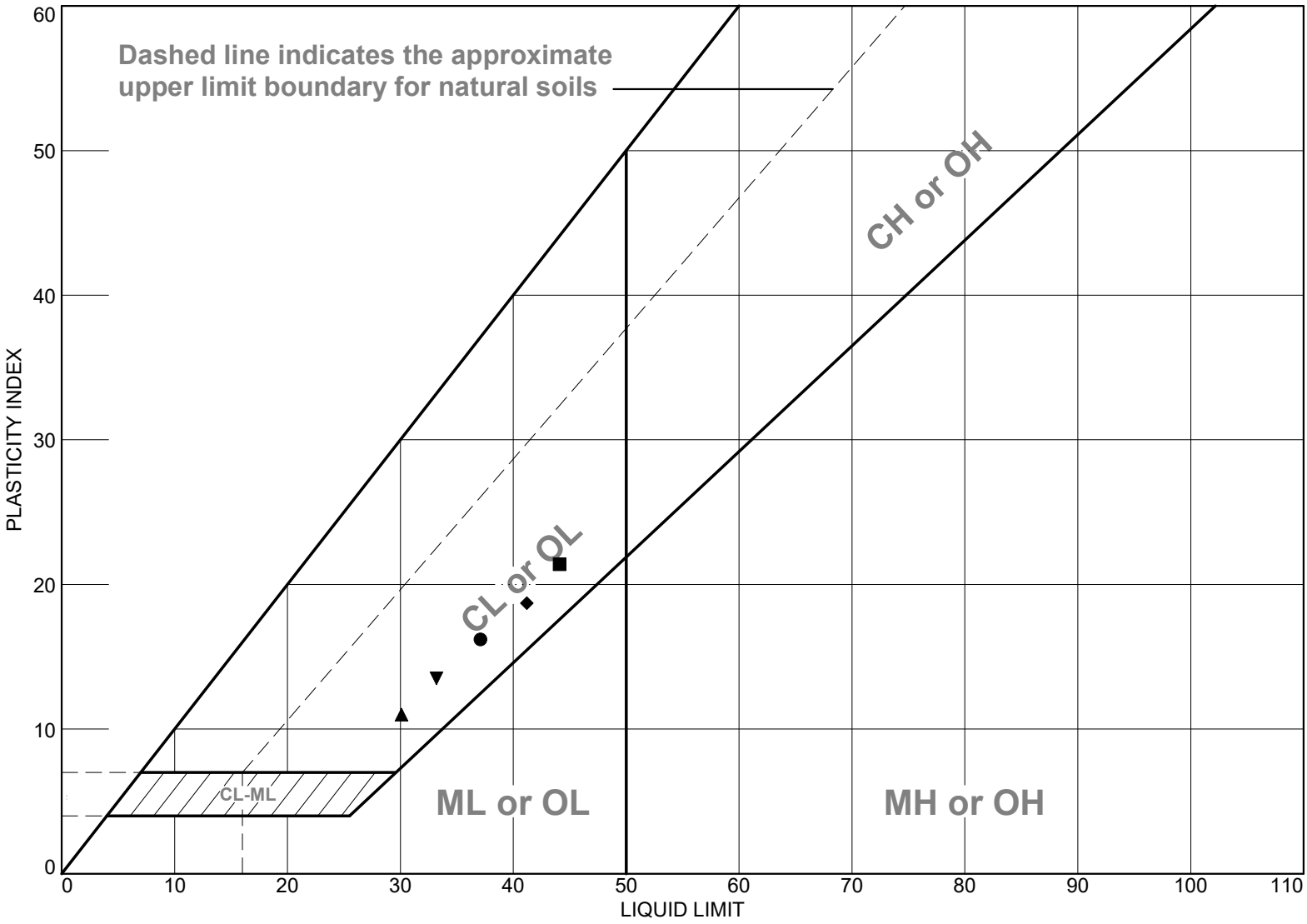
Client: NCE

Project: Lake County 2024

Project No.: 6670.002.11.3 (NCE: 1210.01.55 2B) **Figure**

Tested By: SAA **Checked By:** SEF

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Brown Sandy Clay W/ Gravel (CL)	37.1	20.9	16.2		52.4	CL
■	Light Brown Sandy Clay W/ Gravel (CL)	44.1	22.7	21.4		55.8	CL
▲	Light Brown Sandy Clay W/ Gravel (CL)	30.1	19.1	11.0		53.4	CL
◆	Light Brown Sandy Clay W/ Gravel (CL)	41.2	22.5	18.7		53.2	CL
▼	Brown Sandy Clay (CL)	33.2	19.7	13.5		60.2	CL

Project No. 6670.002.11.3 **Client:** NCE

Project: Lake County 2024

● **Source of Sample:** AD-1 **Depth:** 151-495mm

■ **Source of Sample:** AR-3 **Depth:** 74-470mm

▲ **Source of Sample:** CA-3 **Depth:** 265-560mm

◆ **Source of Sample:** CD-1 **Depth:** 110-405mm

▼ **Source of Sample:** HF-2 **Depth:** 315-645mm

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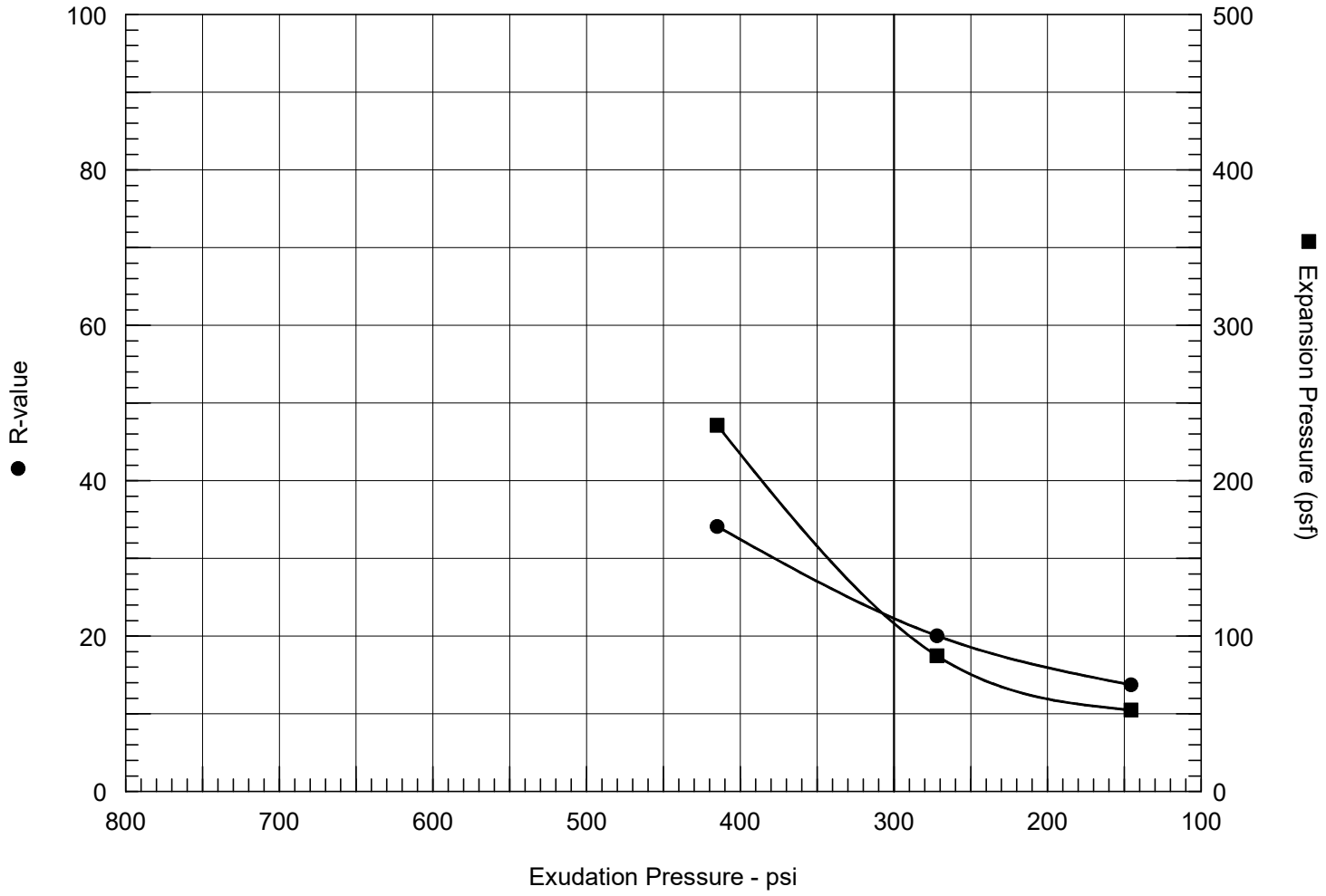
Remarks:

● NCE Project #: 1210.01.55 2B
Reported 12/13/23

Figure

Tested By: SCW **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	65	109.4	18.7	52	126	2.56	146	13	14
2	100	113.1	17.4	87	113	2.55	272	20	20
3	175	116.5	15.6	236	88	2.52	415	34	34

Test Results	Material Description
R-value at 300 psi exudation pressure = 22 **Exp. pressure at 300 psi exudation pressure =** 108 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: AR-3 **Depth:** 74-470mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

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Figure ____

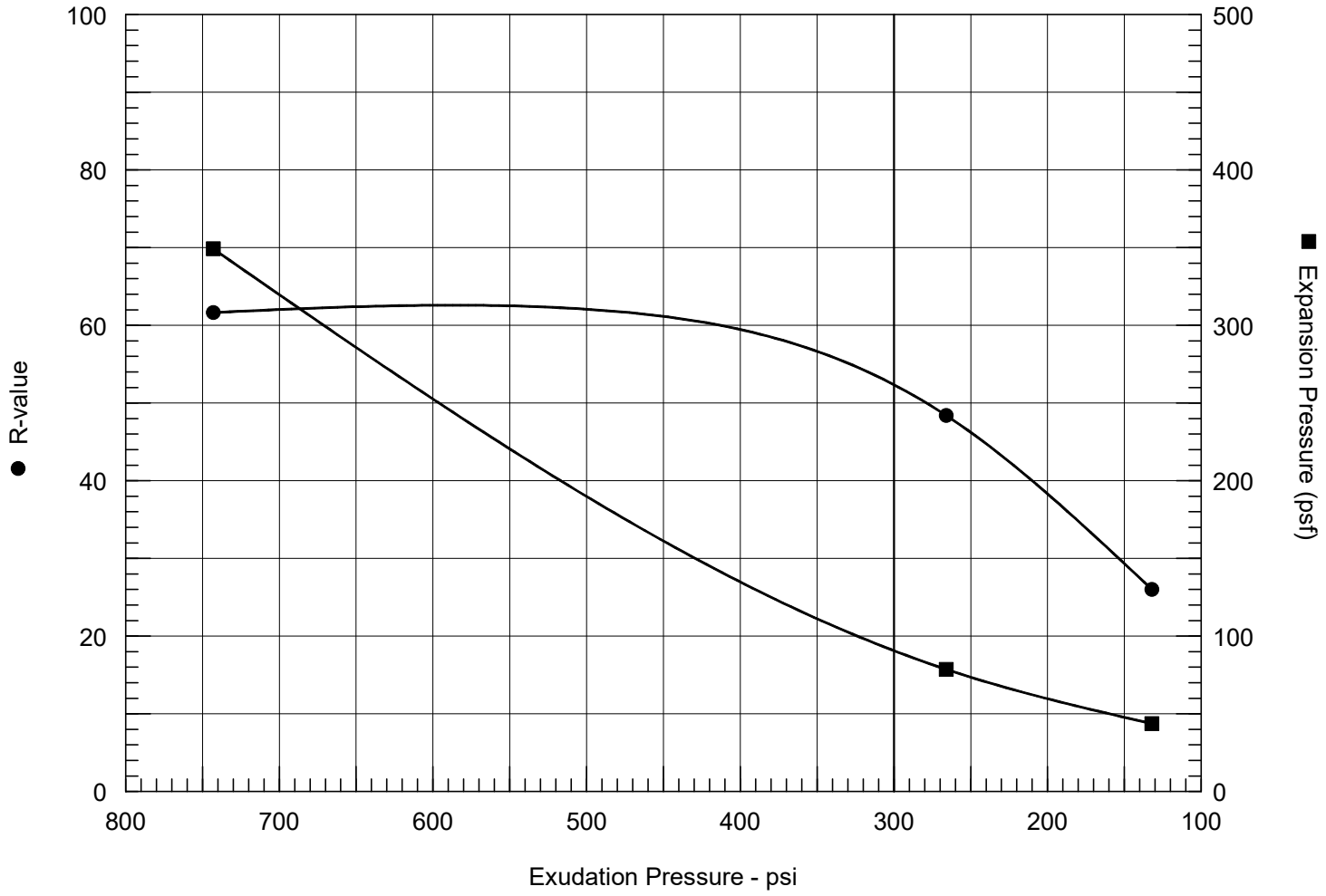
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: AR-3
Depth: 74-470mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	65	100	175
Wet weight (gms):	1041.6	1023.0	998.7
Dry weight (gms):	893.1	886.1	877.8
Tare weight (gms):	99.7	101.4	103.2
% Moisture:	18.7	17.4	15.6
Exudation load (lbs.):	1831	3417	5215
Exudation pressure (psi):	146	272	415
Total weight (gms.):	3054.4	3087.7	3075.6
Mold weight (gms.):	1957.9	1969.9	1955.9
Sample weight (gms.):	1096.5	1117.8	1119.7
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	12	20	54
Expansion pressure (psf):	52	87	236
Ph at 2000 lbs.:	126	113	88
D turns:	4.43	4.15	3.95
R:	13	20	34
Height (in.):	2.56	2.55	2.52
Dry density (pcf):	109.4	113.1	116.5
Corrected R:	14	20	34

R-Value at 300 psi exudation pressure = 22
Expansion pressure at 300 psi = 108 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	113.6	16.4	44	103	2.60	132	24	26
2	125	114.8	14.1	79	64	2.55	266	48	48
3	350	120.8	12.9	349	43	2.40	743	64	62

Test Results	Material Description
R-value at 300 psi exudation pressure = 52 **Exp. pressure at 300 psi exudation pressure =** 91 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: CA-3 **Depth:** 265-560mm

Date: 12/13/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

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Figure ____

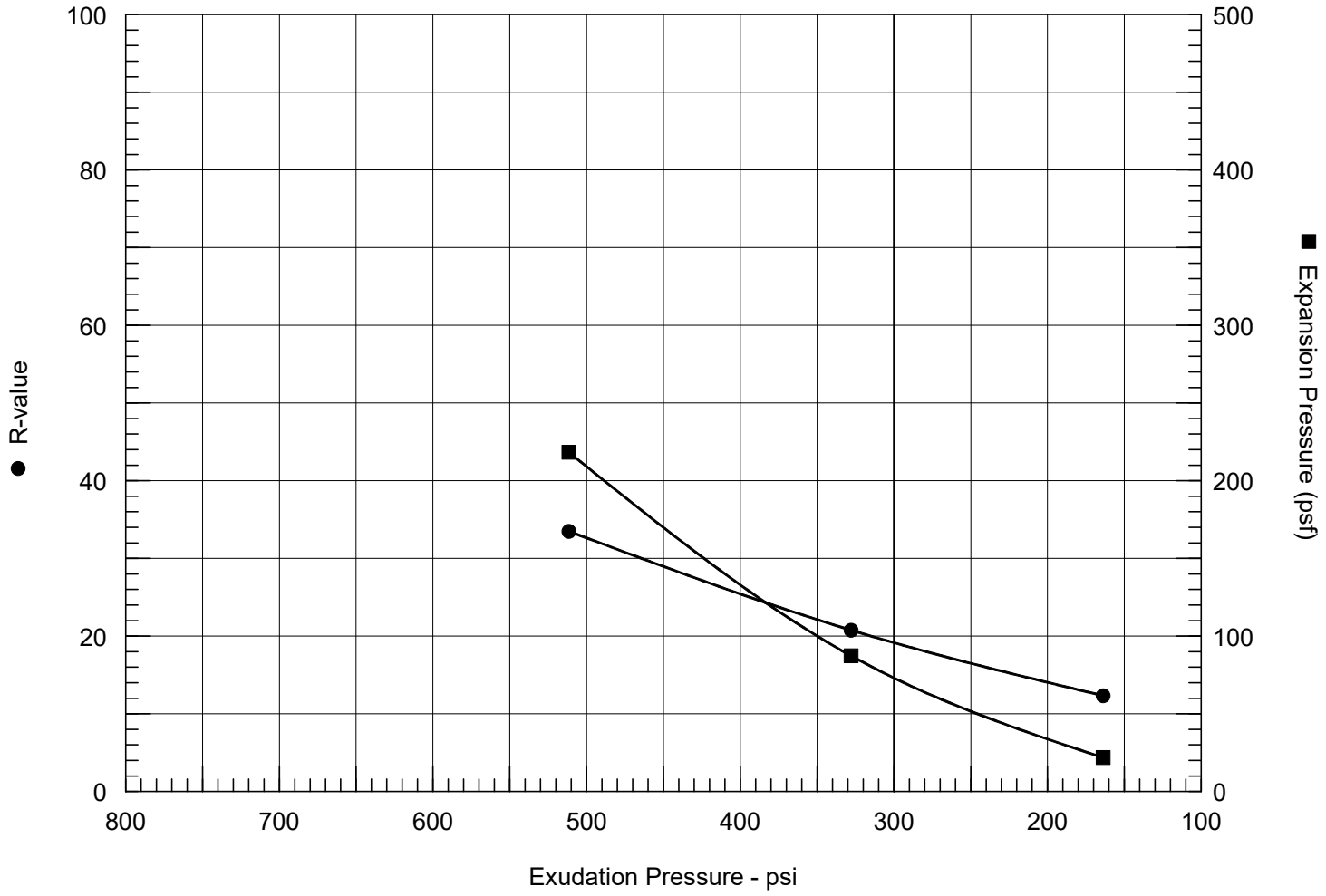
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: CA-3
Depth: 265-560mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	55	125	350
Wet weight (gms):	1022.7	1038.1	1006.2
Dry weight (gms):	893.0	922.1	902.8
Tare weight (gms):	102.7	101.6	103.0
% Moisture:	16.4	14.1	12.9
Exudation load (lbs.):	1660	3341	9337
Exudation pressure (psi):	132	266	743
Total weight (gms.):	3224.5	3185.8	3172.2
Mold weight (gms.):	2089.9	2083.9	2092.3
Sample weight (gms.):	1134.6	1101.9	1079.9
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	10	18	80
Expansion pressure (psf):	44	79	349
Ph at 2000 lbs.:	103	64	43
D turns:	4.30	4.00	3.83
R:	24	48	64
Height (in.):	2.60	2.55	2.40
Dry density (pcf):	113.6	114.8	120.8
Corrected R:	26	48	62

R-Value at 300 psi exudation pressure = 52
Expansion pressure at 300 psi = 91 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	60	110.7	18.7	22	129	2.52	164	12	12
2	100	114.7	16.8	87	114	2.51	328	21	21
3	175	117.4	15.8	218	92	2.47	512	33	33

Test Results	Material Description
R-value at 300 psi exudation pressure = 19 **Exp. pressure at 300 psi exudation pressure =** 73 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: CD-1 **Depth:** 110-405mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

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Figure ____

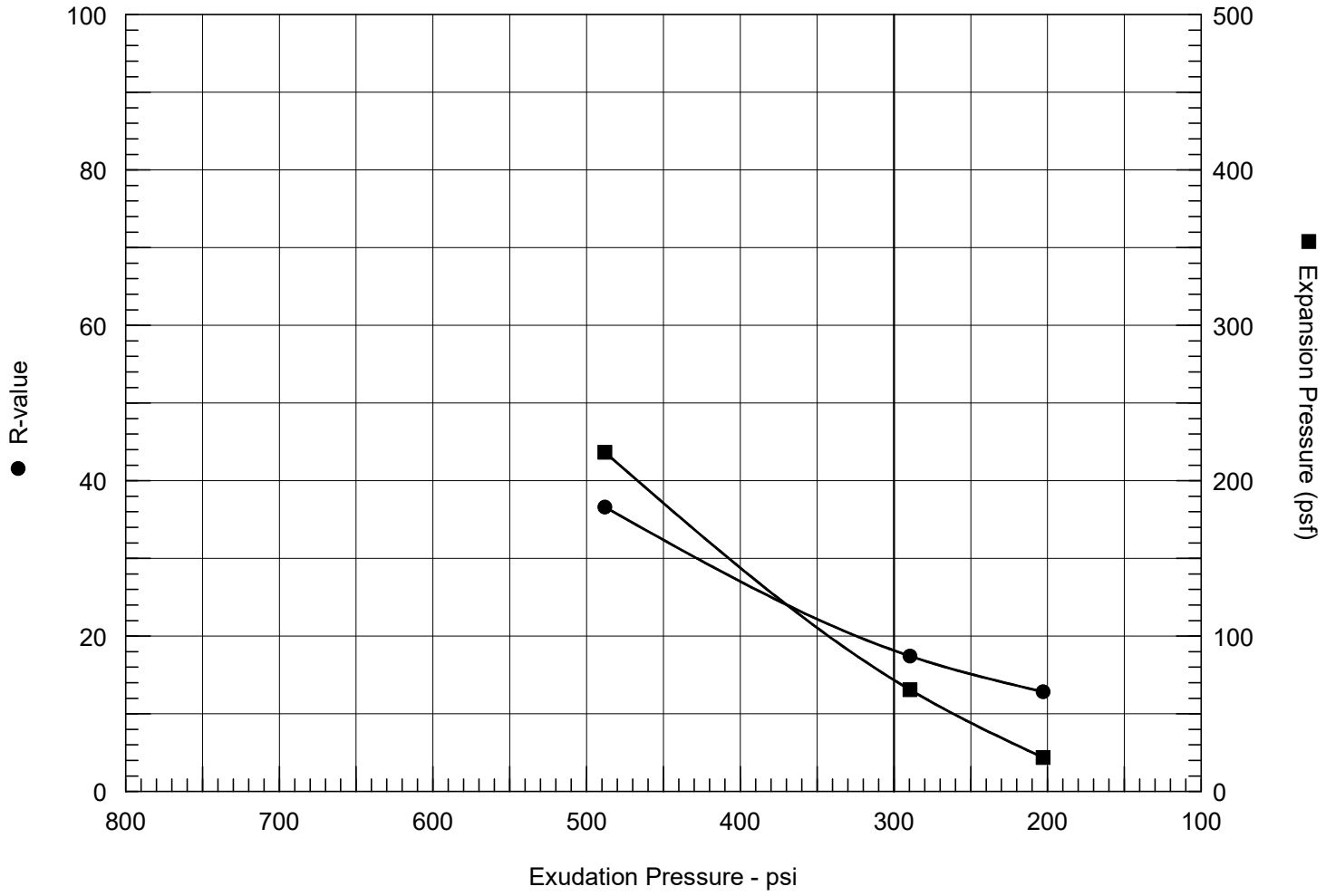
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: CD-1
Depth: 110-405mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	60	100	175
Wet weight (gms):	1107.3	1094.4	1064.2
Dry weight (gms):	949.1	951.4	932.5
Tare weight (gms):	102.3	101.5	100.3
% Moisture:	18.7	16.8	15.8
Exudation load (lbs.):	2059	4119	6428
Exudation pressure (psi):	164	328	512
Total weight (gms.):	3178.0	3215.3	3187.5
Mold weight (gms.):	2085.5	2105.8	2079.7
Sample weight (gms.):	1092.5	1109.5	1107.8
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	20	50
Expansion pressure (psf):	22	87	218
Ph at 2000 lbs.:	129	114	92
D turns:	4.27	3.85	3.67
R:	12	21	33
Height (in.):	2.52	2.51	2.47
Dry density (pcf):	110.7	114.7	117.4
Corrected R:	12	21	33

R-Value at 300 psi exudation pressure = 19
Expansion pressure at 300 psi = 73 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	65	109.2	18.5	22	126	2.53	203	13	13
2	85	111.5	17.2	65	116	2.54	290	17	17
3	200	116.4	15.7	218	80	2.40	488	39	37

Test Results

R-value at 300 psi exudation pressure = 18

Exp. pressure at 300 psi exudation pressure = 72 psf

Material Description

Brown Sandy Clay (CL)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: HF-2 **Depth:** 315-645mm

Date: 12/13/2023

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 12/13/23

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Figure _____

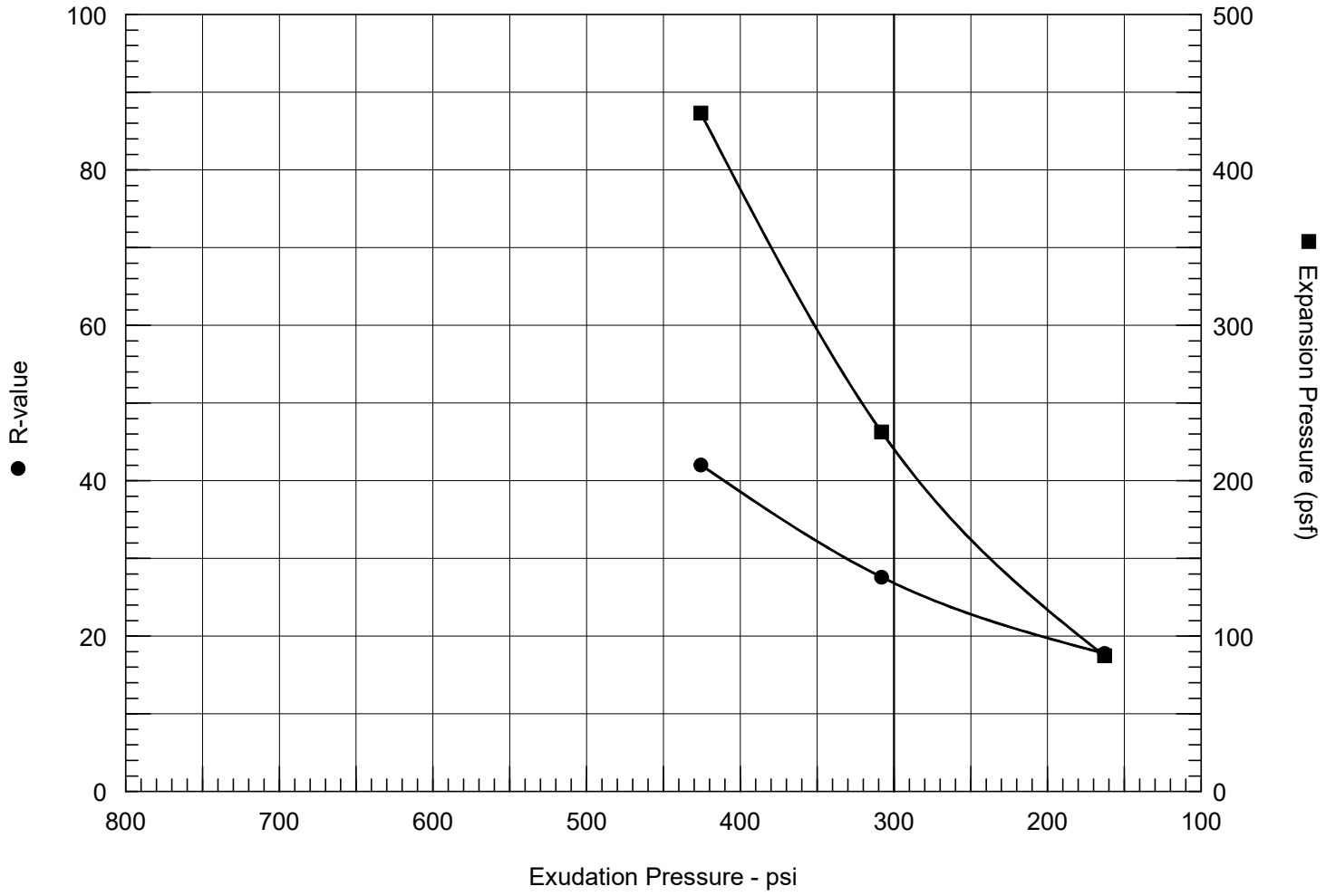
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: HF-2
Depth: 315-645mm
Material Description: Brown Sandy Clay (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	65	85	200
Wet weight (gms):	1094.8	1045.7	1045.1
Dry weight (gms):	939.5	907.3	917.5
Tare weight (gms):	100.4	101.5	102.4
% Moisture:	18.5	17.2	15.7
Exudation load (lbs.):	2550	3639	6133
Exudation pressure (psi):	203	290	488
Total weight (gms.):	3049.9	3050.9	3024.2
Mold weight (gms.):	1970.0	1956.0	1958.0
Sample weight (gms.):	1079.9	1094.9	1066.2
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	15	50
Expansion pressure (psf):	22	65	218
Ph at 2000 lbs.:	126	116	80
D turns:	4.58	4.49	3.90
R:	13	17	39
Height (in.):	2.53	2.54	2.40
Dry density (pcf):	109.2	111.5	116.4
Corrected R:	13	17	37

R-Value at 300 psi exudation pressure = 18
Expansion pressure at 300 psi = 72 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	75	98.7	24.0	87	121	2.59	163	17	18
2	125	104.8	22.6	231	102	2.52	308	28	28
3	175	105.8	21.2	437	82	2.55	426	42	42

Test Results	Material Description
R-value at 300 psi exudation pressure = 27 **Exp. pressure at 300 psi exudation pressure =** 220 psf	Light Brown Sandy Clay W/ Gravel (CH)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: HL-1 **Depth:** 280-510mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

RGH CONSULTANTS

Figure ____

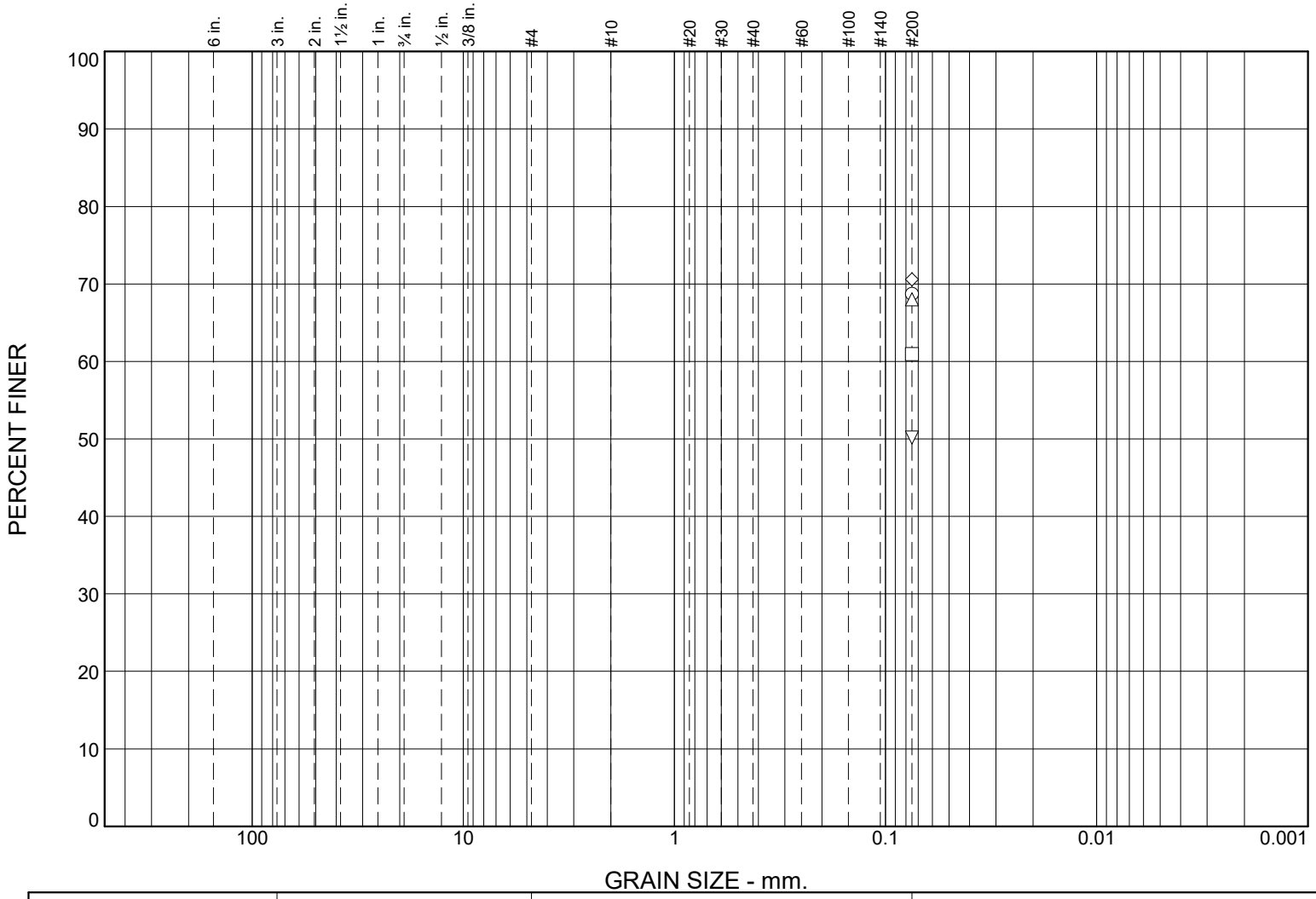
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: HL-1
Depth: 280-510mm
Material Description: Light Brown Sandy Clay W/ Gravel (CH)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	75	125	175
Wet weight (gms):	1090.7	1066.7	1043.4
Dry weight (gms):	899.0	888.2	878.9
Tare weight (gms):	99.8	100.0	101.4
% Moisture:	24.0	22.6	21.2
Exudation load (lbs.):	2048	3871	5349
Exudation pressure (psi):	163	308	426
Total weight (gms.):	3003.9	3038.3	3034.1
Mold weight (gms.):	1957.9	1969.9	1955.8
Sample weight (gms.):	1046.0	1068.4	1078.3
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	20	53	100
Expansion pressure (psf):	87	231	437
Ph at 2000 lbs.:	121	102	82
D turns:	4.00	3.73	3.28
R:	17	28	42
Height (in.):	2.59	2.52	2.55
Dry density (pcf):	98.7	104.8	105.8
Corrected R:	18	28	42

R-Value at 300 psi exudation pressure = 27
Expansion pressure at 300 psi = 220 psf

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							68.7	
□							60.9	
△							68.0	
◇							70.6	
▽							50.2	

SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	HL-1		280-510mm	Light Brown Sandy Clay W/ Gravel (CH)	CH
□	LL-2		400-630mm	Brown Sandy Clay W/ Gravel (CL)	CL
△	NE-1		200-470mm	Light Brown Sandy Clay W/ Gravel (CL)	CL
◇	OAK-1		345-660mm	Light Brown Silt W/ Sand (MH)	MH
▽	PW-2		270-500mm	Light Brown Sandy Clay W/ Gravel (CL)	CL

RGH CONSULTANTS

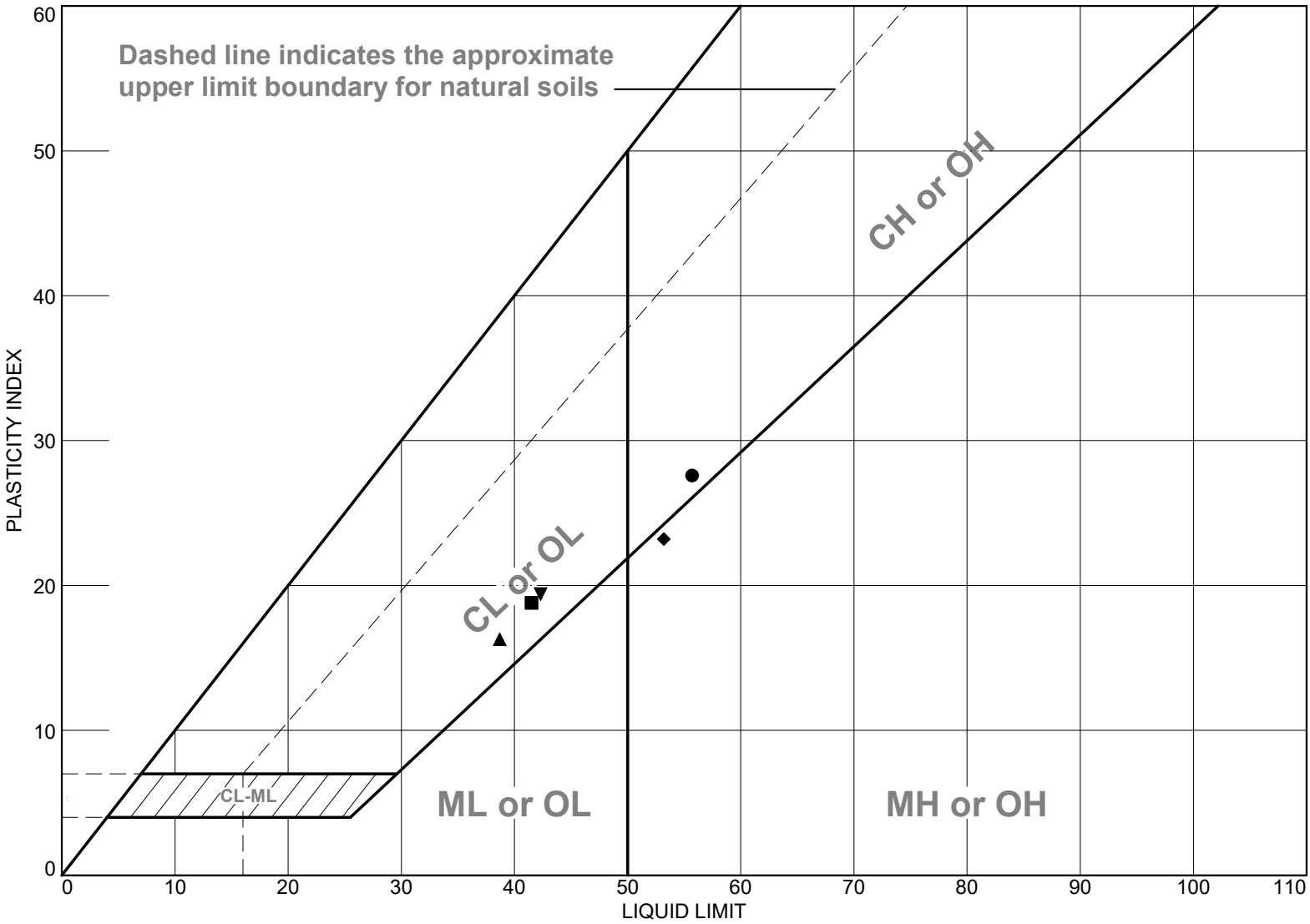
Client: NCE

Project: Lake County 2024

Project No.: 6670.002.11.3 (NCE: 1210.01.55 2B) **Figure**

Tested By: SAA **Checked By:** SEF

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Brown Sandy Clay W/ Gravel (CH)	55.7	28.1	27.6		68.7	CH
■	Brown Sandy Clay W/ Gravel (CL)	41.5	22.7	18.8		60.9	CL
▲	Light Brown Sandy Clay W/ Gravel (CL)	38.7	22.4	16.3		68.0	CL
◆	Light Brown Silt W/ Sand (MH)	53.2	30.0	23.2		70.6	MH
▼	Light Brown Sandy Clay W/ Gravel (CL)	42.3	22.9	19.4		50.2	CL

Project No. 6670.002.11.3 **Client:** NCE

Project: Lake County 2024

● **Source of Sample:** HL-1 **Depth:** 280-510mm
■ **Source of Sample:** LL-2 **Depth:** 400-630mm
▲ **Source of Sample:** NE-1 **Depth:** 200-470mm
◆ **Source of Sample:** OAK-1 **Depth:** 345-660mm
▼ **Source of Sample:** PW-2 **Depth:** 270-500mm

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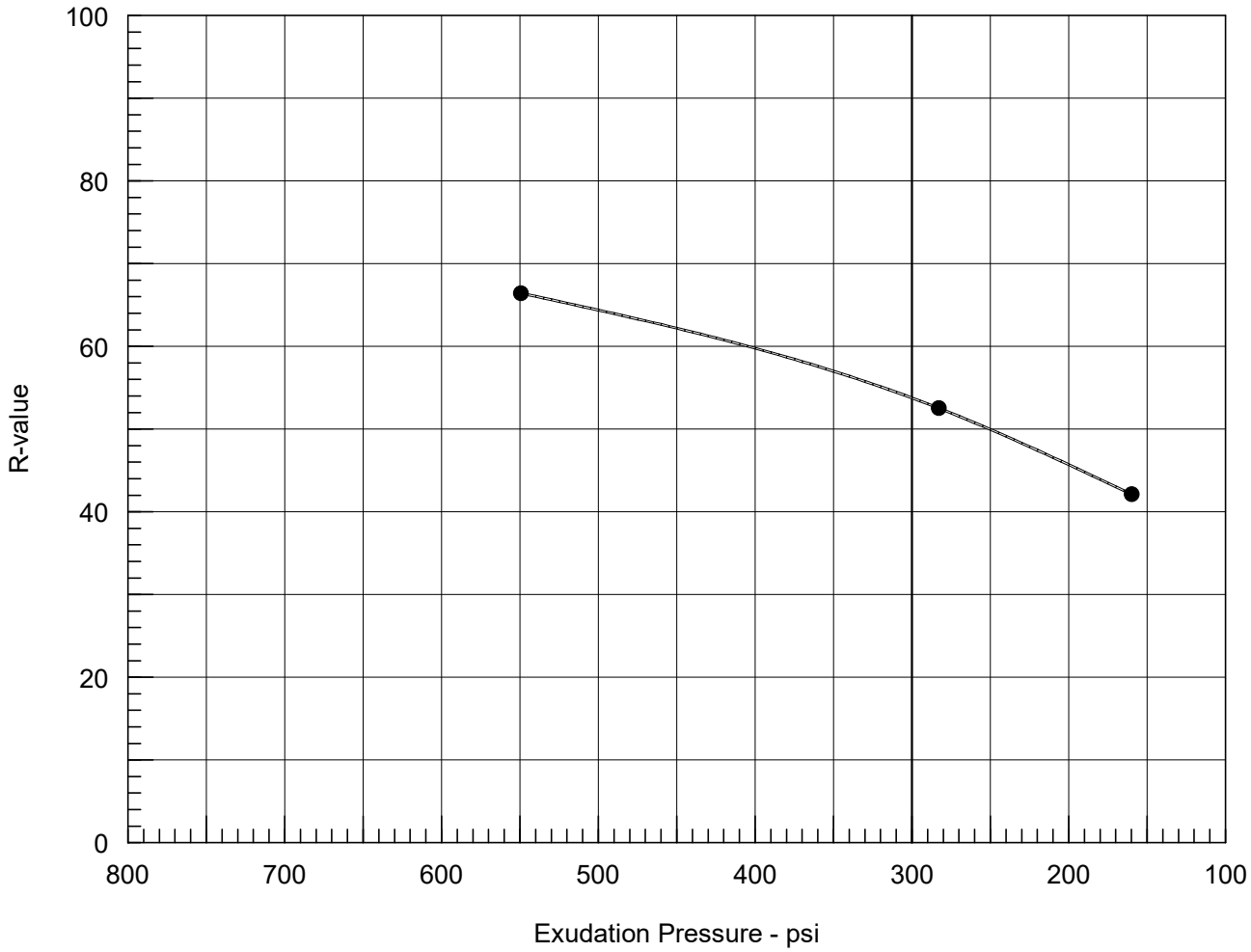
Remarks:

● NCE Project #: 1210.01.55 2B
Reported 12/13/23

Figure

Tested By: SCW **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	65	104.6	19.1	0	73	2.57	160	40	42
2	100	108.3	18.6	0	53	2.41	283	55	53
3	175	109.9	17.9	0	37	2.41	549	68	66

Test Results	Material Description
R-value at 300 psi exudation pressure = 54	Brown Clayey Sand W/ Gravel (SC)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: HOB-5 **Depth:** 240-530mm

Date: 1/2/2024

Tested by: SEF

Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

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Figure _____

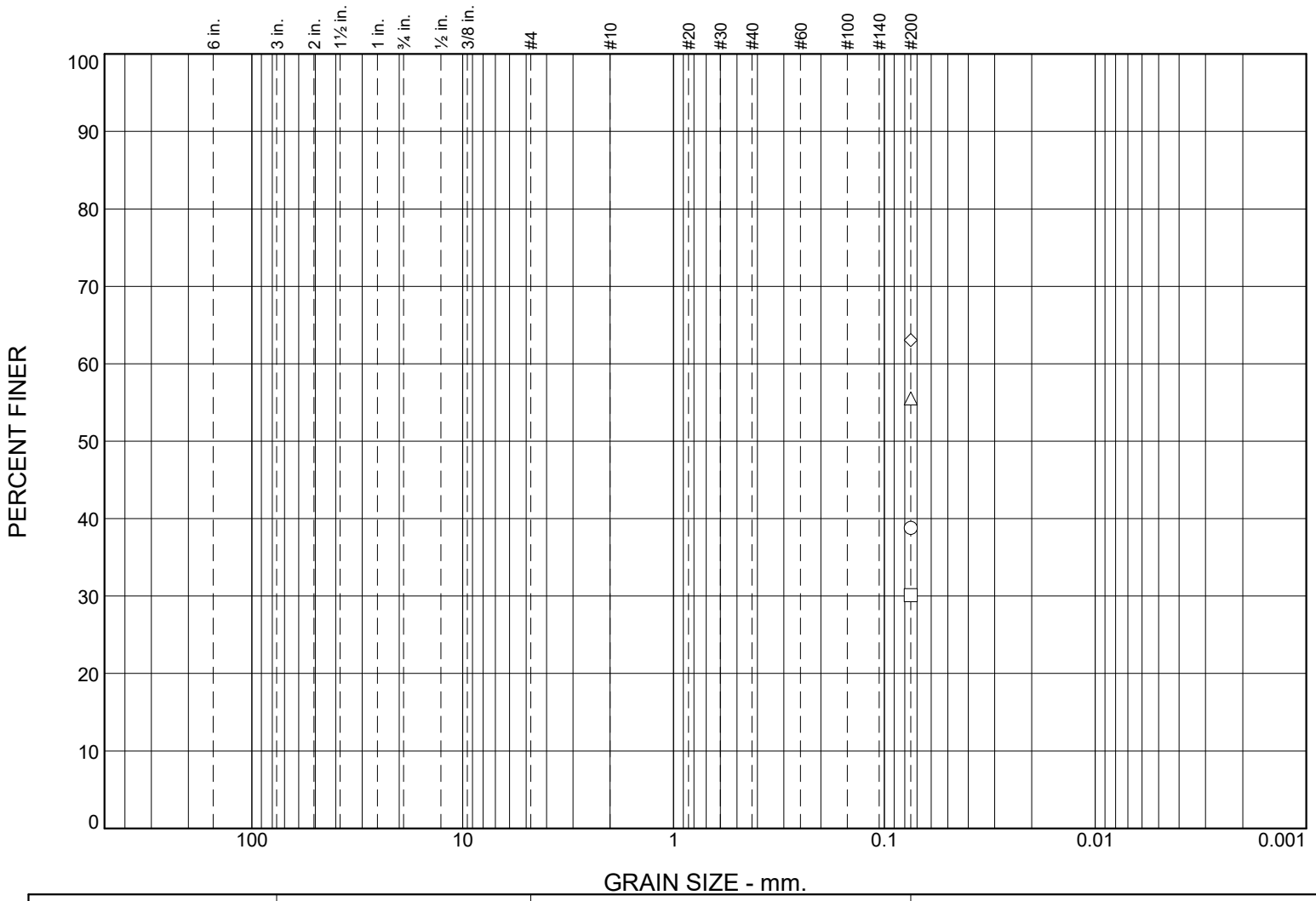
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: HOB-5
Depth: 240-530mm
Material Description: Brown Clayey Sand W/ Gravel (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

Test specimen number	1	2	3
Compaction pressure (psi):	65	100	175
Wet weight (gms):	1143.1	1129.8	1118.6
Dry weight (gms):	975.9	968.4	963.7
Tare weight (gms):	102.4	101.5	100.4
% Moisture:	19.1	18.6	17.9
Exudation load (lbs.):	2009	3555	6905
Exudation pressure (psi):	160	283	549
Total weight (gms.):	3018.3	2991.7	2993.3
Mold weight (gms.):	1961.5	1970.4	1963.0
Sample weight (gms.):	1056.8	1021.3	1030.3
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	0	0	0
Expansion pressure (psf):	0	0	0
Ph at 2000 lbs.:	73	53	37
D turns:	4.40	4.15	3.85
R:	40	55	68
Height (in.):	2.57	2.41	2.41
Dry density (pcf):	104.6	108.3	109.9
Corrected R:	42	53	66

R-Value at 300 psi exudation pressure = 54
Expansion pressure at 300 psi = n/a psf

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							38.8	
□							30.1	
△							55.5	
◇							63.1	

SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	HOB-5		240-530mm	Brown Clayey Sand W/ Gravel (SC)	SC
□	HOB-9		145-545mm	Light Brown Silty Gravel W/ Sand (GM)	GM
△	SHA-1		270-615mm	Brown Sandy Silt W/ Gravel (ML)	ML
◇	SUM-1		330-620mm	Brown Sandy Clay W/ Gravel (CH)	CH

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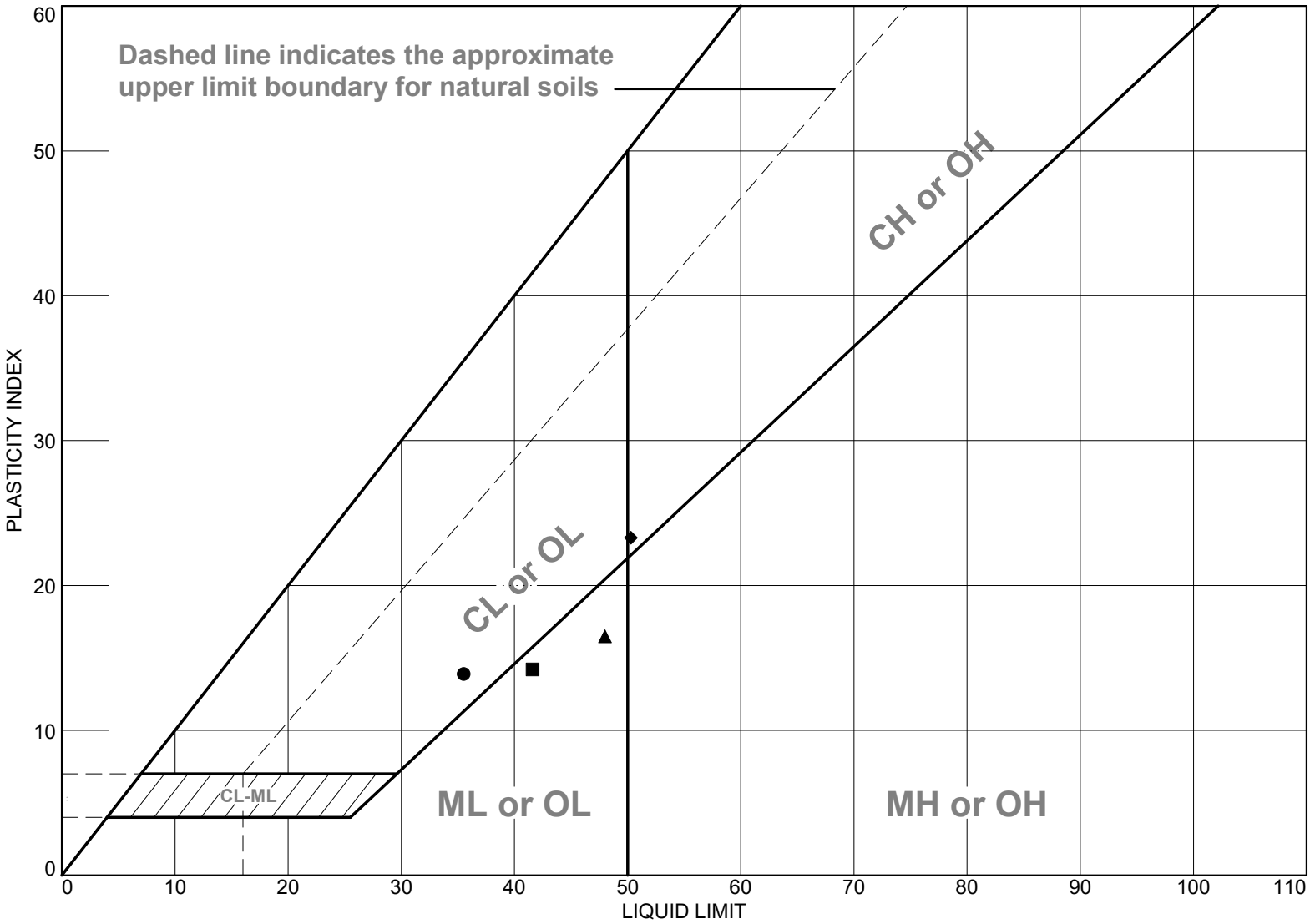
Client: NCE

Project: Lake County 2024

Project No.: 6670.002.11.3 (NCE: 1210.01.55 2B) **Figure**

Tested By: SAM **Checked By:** SEF

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown Clayey Sand W/ Gravel (SC)	35.5	21.6	13.9		38.8	SC
■	Light Brown Silty Gravel W/ Sand (GM)	41.6	27.4	14.2		30.1	GM
▲	Brown Sandy Silt W/ Gravel (ML)	48.0	31.5	16.5		55.5	ML
◆	Brown Sandy Clay W/ Gravel (CH)	50.3	27.0	23.3		63.1	CH

Project No. 6670.002.11.3 **Client:** NCE

Project: Lake County 2024

● **Source of Sample:** HOB-5 **Depth:** 240-530mm
■ **Source of Sample:** HOB-9 **Depth:** 145-545mm
▲ **Source of Sample:** SHA-1 **Depth:** 270-615mm
◆ **Source of Sample:** SUM-1 **Depth:** 330-620mm

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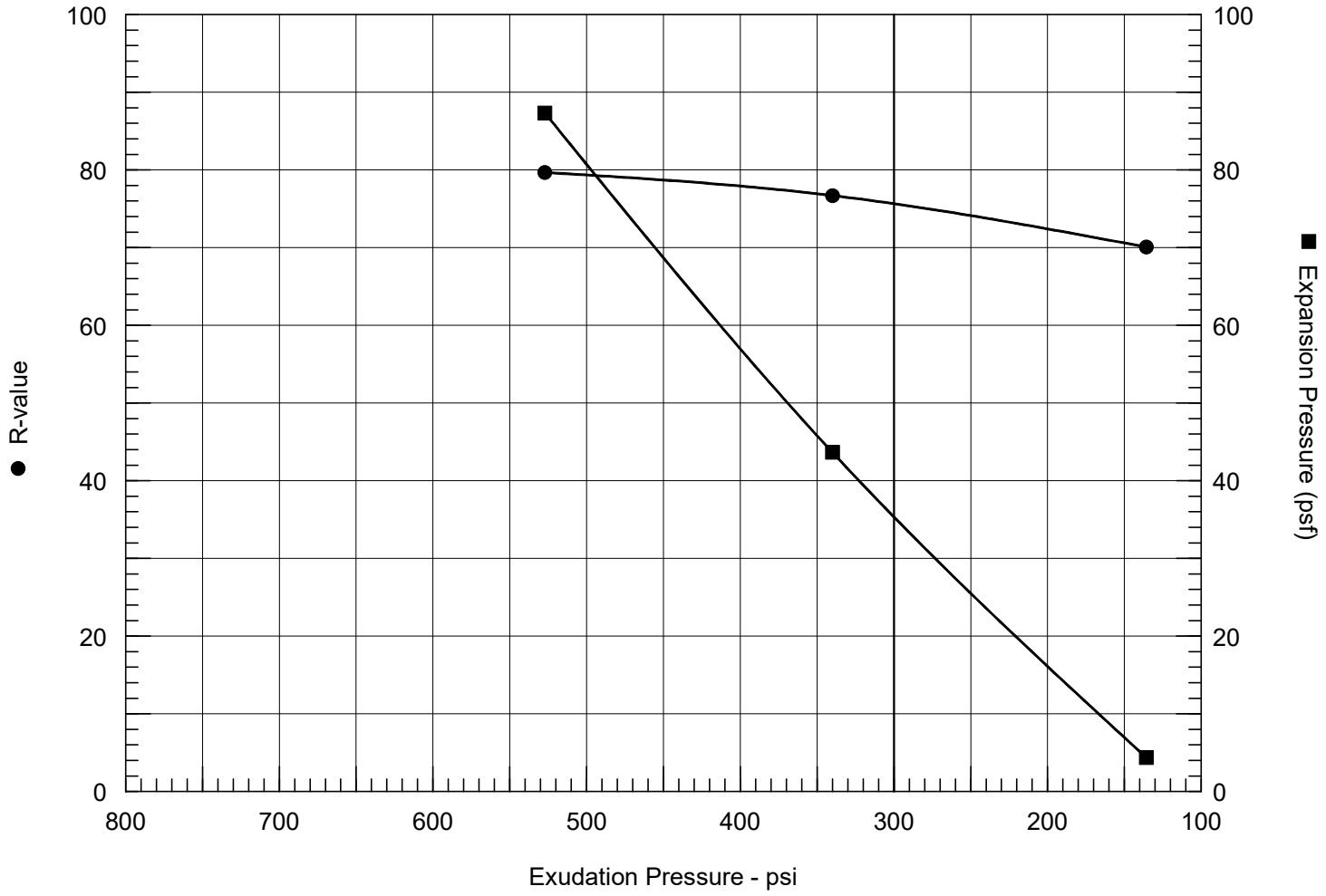
Remarks:

● NCE Project #: 1210.01.55 2B
Reported 1/2/24

Figure

Tested By: SAM **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	350	98.6	22.0	4	32	2.51	136	70	70
2	350	101.1	21.2	44	25	2.48	340	77	77
3	350	100.6	20.3	87	22	2.51	527	80	80

Test Results

R-value at 300 psi exudation pressure = 76

Exp. pressure at 300 psi exudation pressure = 35 psf

Material Description

Light Brown Silty Gravel W/ Sand (GM)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: HOB-9 **Depth:** 145-545mm

Date: 1/2/2024

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 1/2/24

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Figure _____

RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: HOB-9
Depth: 145-545mm
Material Description: Light Brown Silty Gravel W/ Sand (GM)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

Test specimen number	1	2	3
Compaction pressure (psi):	350	350	350
Wet weight (gms):	1145.7	1135.8	1129.0
Dry weight (gms):	957.4	955.2	955.7
Tare weight (gms):	101.7	102.7	102.9
% Moisture:	22.0	21.2	20.3
Exudation load (lbs.):	1706	4273	6624
Exudation pressure (psi):	136	340	527
Total weight (gms.):	2951.8	2972.6	2960.4
Mold weight (gms.):	1955.8	1969.9	1958.0
Sample weight (gms.):	996.0	1002.7	1002.4
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	10	20
Expansion pressure (psf):	4	44	87
Ph at 2000 lbs.:	32	25	22
D turns:	4.27	4.10	4.00
R:	70	77	80
Height (in.):	2.51	2.48	2.51
Dry density (pcf):	98.6	101.1	100.6
Corrected R:	70	77	80

R-Value at 300 psi exudation pressure = 76
Expansion pressure at 300 psi = 35 psf

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ASTM D-2216
Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client:	NCE	**Sampled:**	11/30/2023
Project:	Lake County 2024	**Received:**	12/2/2023
Project #:	6670.002.11.3 (NCE Project #:1210.01.55 2B)	**Reported:**	12/13/2023
Source:	Various Locations		

Sample ID	AD-1	AR-3	CA-3	CD-1	HF-2	HL-1
Depth	495-530mm	470-560mm	560-580mm	405-415mm	645-665mm	510-570mm
Tare + Wet Soil (g)	2480.7	2768.5	2762.7	2512.4	2669.9	2205.9
Tare + Dry Soil (g)	2210.0	2504.7	2557.5	2275.5	2441.8	1939.4
Tare Weight (g)	555.2	657.0	659.0	402.9	645.6	402.2
Moisture Loss (g)	270.7	263.8	205.2	236.9	228.1	266.5
Dry Soil (g)	1654.8	1847.7	1898.5	1872.6	1796.2	1537.2
Moisture Content (%)	16.4	14.3	10.8	12.7	12.7	17.3

Sample ID	LL-2	NE-1	OAK-1	PW-2	RE-1	RE-6
Depth	630-660mm	470-490mm	660-690mm	500-520mm	560-590mm	420-440mm
Tare + Wet Soil (g)	3197.5	2015.9	2210.6	2382.9	2715.3	2327.5
Tare + Dry Soil (g)	2844.6	1794.6	1787.7	2129.2	2499.9	2143.8
Tare Weight (g)	620.1	402.4	581.4	566.8	551.7	661.7
Moisture Loss (g)	352.9	221.3	422.9	253.7	215.4	183.7
Dry Soil (g)	2224.5	1392.2	1206.3	1562.4	1948.2	1482.1
Moisture Content (%)	15.9	15.9	35.1	16.2	11.1	12.4

Sample ID	SC-2	SC-5	SD-1	SU-1		
Depth	525mm	800mm	410-460mm	430-455mm		
Tare + Wet Soil (g)	1670.2	3098.8	2420.6	1967.0		
Tare + Dry Soil (g)	1455.3	2869.6	2182.9	1696.0		
Tare Weight (g)	403.3	551.4	404.2	567.0		
Moisture Loss (g)	214.9	229.2	237.7	271.0		
Dry Soil (g)	1052.0	2318.2	1778.7	1129.0		
Moisture Content (%)	20.4	9.9	13.4	24.0		

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Napa, CA 94559
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ASTM D-2216
Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

Client:	**NCE**	**Sampled:**	**12/19/2023**
Project:	**Lake County 2024**	**Received:**	**12/19/2023**
Project #:	**6670.002.11.3 (NCE Project #:1210.01.55 2B)**	**Reported:**	**12/21/2023**
Source:	**Various Locations**		

Sample ID	**HOB-5**	**HOB-9**	**SHA-1**	**SUM-1**		
Depth	**530-550mm**	**545-560mm**	**615-630mm**	**620-640mm**		
Tare + Wet Soil (g)	**1499.4**	**1635.8**	**1480.9**	**1596.7**		
Tare + Dry Soil (g)	**1323.4**	**1454.5**	**1277.4**	**1288.9**		
Tare Weight (g)	**402.3**	**403.2**	**404.2**	**402.2**		
Moisture Loss (g)	**176.0**	**181.3**	**203.5**	**307.8**		
Dry Soil (g)	**921.1**	**1051.3**	**873.2**	**886.7**		
Moisture Content (%)	**19.1**	**17.2**	**23.3**	**34.7**		

Sample ID						
Depth						
Tare + Wet Soil (g)						
Tare + Dry Soil (g)						
Tare Weight (g)						
Moisture Loss (g)						
Dry Soil (g)						
Moisture Content (%)						

Sample ID						
Depth						
Tare + Wet Soil (g)						
Tare + Dry Soil (g)						
Tare Weight (g)						
Moisture Loss (g)						
Dry Soil (g)						
Moisture Content (%)						

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Experience is the difference

LABORATORY FEES

Effective January 15, 2022

Description	Test Designation	Rate
Moisture-Density Relationship Tests		
Standard Proctor Compaction - 4-inch mold	ASTM D-698	$270/each
Standard Proctor Compaction - 6-inch mold	ASTM D-698	$295/each
Modified Proctor Compaction - 4-inch mold	ASTM D-1557	$280/each
Modified Proctor Compaction - 6-inch mold	ASTM D-1557	$330/each
Check Point (4-inch mold)	ASTM D-698 or D-1557	$100/each
Check Point (6-inch mold).	ASTM D-698 or D-1557	$115/each
Check Point (CAL-216)	CAL-216	$120/each
California Impact (CAL-216)	CAL-216	$365/each
Rock Correction	ASTM-4718	$100/each
Classification and Index Tests		
Particle Size:		
Sieve Analysis to #200	ASTM D-422 or Cal 202	$145/each
Sieve Analysis to #200 with split sieve	ASTM D-422 or Cal 202	$230/each
Sieve Analysis to #200 with split sieve (If > 15 kg Sample Required)	ASTM D-422 or Cal 202	$270/each
Sieve Analysis % Minus #200	ASTM D-1140	$85/each
Sieve Analysis % Minus #200 with split sieve	ASTM D-1140	$175/each
Sieve Analysis with Standard Hydrometer (Assumed Gs)	ASTM D-422	$220/each
Sieve Analysis with Standard Hydrometer with split sieve (Assumed Gs)	ASTM D-422	$300/each
Hydrometer Only	ASTM D-422	$145/each
Bouyoucos Hydrometer		$125/each
Septic System Bulk Density		$60/each
Atterberg Limits (PI) wet method	ASTM D-4318	$265/each
Atterberg Limits (PI) dry method	ASTM D-4318	$285/each
Atterberg Limits, if found to be non-plastic	ASTM D-4318	$180/each
Specific Gravity of Soil (Gs)	ASTM D-854	$120/each
Porosity of Soil		$160/each
Organic Content	ASTM D-2974	$130/each
pH Test	ASTM D-4972	$75/each
Lime Stabilization Ability	ASTM D-6276	$430/each
Moisture Content	ASTM D-2216	$20/each
Moisture Density-2.43-inch diameter tube sample	ASTM D-7263	$30/each
Moisture Density-2.87-inch diameter tube sample	ASTM D-7263	$30/each
Chunk Density	ASTM D-7263	$85/each
Chunk Dispersion	ASTM D-6572	$95/each
Moisture Content At 100% Saturation		$160/each

RGH *- Laboratory Fees*

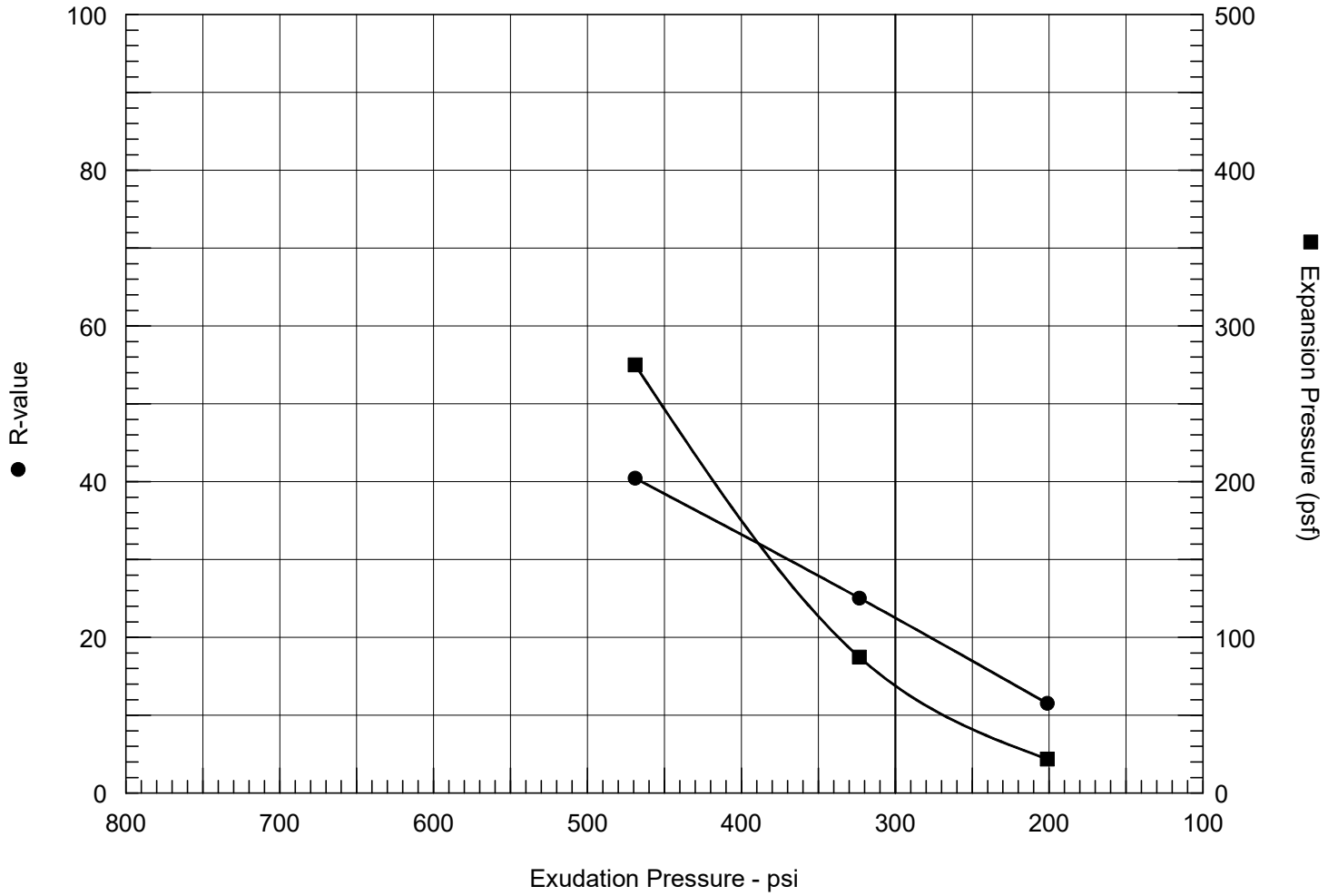
Description	Test Designation	Rate
Unconfined and Triaxial Shears		
Unconfined Compression (UC)	ASTM D-2166	$100/each
Unconsolidated-Undrained (TX/UU)	ASTM D-2850	$160/each
Unconsolidated-Undrained Saturated (TX/UU/S)		$275/each
Consolidated-Undrained-Saturated W/Pore Pressure (TX/CU) ……	ASTM D-4767	$545/each
2 Stage TX/CU W/Pore Pressure		$825/each
3 Stage - TX/CU W/Pore Pressure		$1070/each
Consolidated-Drained-Saturated (TX/CD)	EM-1110	$735/each
Direct Shear Tests		
Unsaturated (DS/UU)		$125/each
Unconsolidated-Undrained (DS/UU)		$195/each
Consolidated Drained (DS/CD)	ASTM D-3080	$300/each
Consolidated-Drained, Residual (DS/CD/R)		$485/each
For multiple points multiply single point price by number of points.		
Shear Times exceeding one day		$120/day
Consolidation/Expansion Tests		
Consolidation without Time Rates	ASTM D-2435	$370/each
Consolidation with Two Time Rates	ASTM D-2435	$420/each
Additional Time Rates		$75/each
Percent Free Swell		$70/each
Expansion Index	ASTM D-4829	$330/each
Permeability Tests		
Fixed Wall, Constant Head 2-3" sample	ASTM D-2434	$395/each
Triaxial Method, Falling Head	ASTM D-5084	$395/each
Each Additional Effective Stress		$110/each
Admixtures (Addition of lime, cement, etc.)		$55/each
Remolded Specimen		$85/each

RGH *- Laboratory Fees*

Description	Test Designation	Rate
Aggregate Tests		
Sodium Sulfate Soundness	ASTM C-88 or CAL-214	$175/Size Fraction
Organic Impurities in Sand	ASTM C-40	$75/each
Dry Unit Weight or Bulk Density	ASTM C-29	$100/each
Specific Gravity and Absorption, Fine	ASTM C-128 or CAL-207	$150/each
Specific Gravity and Absorption, Coarse	ASTM C-127 or CAL-206	$125/each
Sand Equivalent, average of three	CAL-217	$200/each
Durability, Fine	CAL-229	$140/each
Durability, Coarse	CAL-229	$200/each
Flat and Elongated Particles	ASTM D-4791	$160/each
Cleanness Test	CAL-227	$160/each
Crushed Particles	CAL-205	$140/each
Clay Clumps and Friable Particles	ASTM C-142	$110/each
Los Angeles Abrasion Test, 500 Rev.	ASTM C-131 or CAL-211	$255/each
Los Angeles Abrasion Test, 100 and 500 Rev	ASTM C-131 or CAL-211	$280/each
Los Angeles Abrasion Test, 1000 Rev	ASTM C-535	$330/each
R-Value, (untreated)	ASTM D-2844 or CAL-301	$330/each
Fine Aggregate Angularity	CAL-234	$150/each
Slake Durability	ASTM D-4644	$185/each
Point Load Index	ASTM D-5731	$75/each
Asphaltic Concrete Tests		
% Bitumen Content, (Ignition Oven)	ASTM D-6307 or CAL-382	$205/each
% Bitumen Content, with Gradation	ASTM D-6307 or CAL-382	$350/each
Calibration for Ignition Oven, Mix Specific	ASTM D-6307 or CAL-382	$395/each
Hveem Stability, set of three briquettes	ASTM D-1560 or CAL-366	$220/each
Unit Weight of core or compacted sample	ASTM D-2726 or CAL-308	$75/each
Moisture Content of AC, by microwave method	CAL-370	$75/each
Max. Hveem, compact, perform density on 3 briquettes	ASTM D-1561 or CAL-304	$365/each
Max. Theoretical Specific Gravity, (RICE)	ASTM D-2041 or CAL-309	$160/each
Max. Marshall, compaction, perform density on 3 briquettes	ASTM D-6926 & D-2726	$400/each
Marshall Stability, Set of 3 briquettes	ASTM D-6927	$280/each
Equipment and other services		
Trimming 2.87-inch to 2.43-inch		$40/each
Sample Prep ½ hr. increments		$47.50/each

Rush Testing: Standard fee x2 (Accepted only after consultation with the lab manager. Rush testing includes a dedicated technician who will perform the test as fast as the test allows within normal business hours)

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	70	106.6	21.3	22	130	2.46	201	12	12
2	125	110.0	19.6	87	106	2.45	323	25	25
3	175	110.9	18.6	275	82	2.49	469	40	40

Test Results

R-value at 300 psi exudation pressure = 23

Exp. pressure at 300 psi exudation pressure = 69 psf

Material Description

Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: LL-2 **Depth:** 400-630mm

Date: 12/20/2023

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 12/20/23

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Figure _____

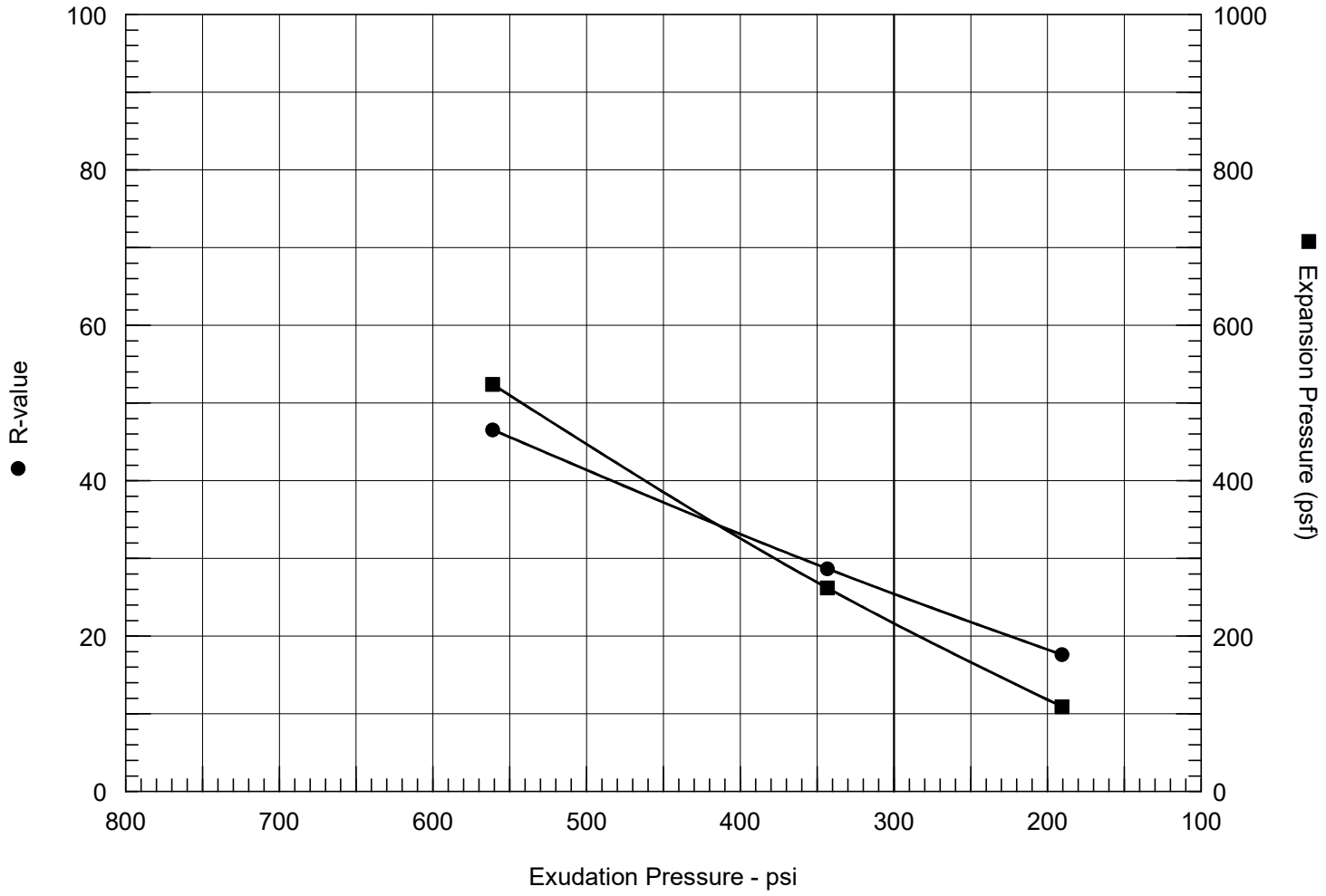
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: LL-2
Depth: 400-630mm
Material Description: Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	70	125	175
Wet weight (gms):	1083.9	1055.8	1034.9
Dry weight (gms):	911.2	899.0	888.6
Tare weight (gms):	102.2	100.2	101.4
% Moisture:	21.3	19.6	18.6
Exudation load (lbs.):	2528	4063	5895
Exudation pressure (psi):	201	323	469
Total weight (gms.):	3020.0	3026.0	3041.7
Mold weight (gms.):	1970.3	1963.0	1961.5
Sample weight (gms.):	1049.7	1063.0	1080.2
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	20	63
Expansion pressure (psf):	22	87	275
Ph at 2000 lbs.:	130	106	82
D turns:	4.43	3.81	3.50
R:	12	25	40
Height (in.):	2.46	2.45	2.49
Dry density (pcf):	106.6	110.0	110.9
Corrected R:	12	25	40

R-Value at 300 psi exudation pressure = 23
Expansion pressure at 300 psi = 69 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	95	112.4	18.3	109	120	2.52	191	18	18
2	150	116.2	16.5	262	100	2.50	343	29	29
3	275	117.1	15.3	524	68	2.41	561	49	47

Test Results	Material Description
R-value at 300 psi exudation pressure = 25 **Exp. pressure at 300 psi exudation pressure =** 216 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: NE-1 **Depth:** 200-470mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

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Figure ____

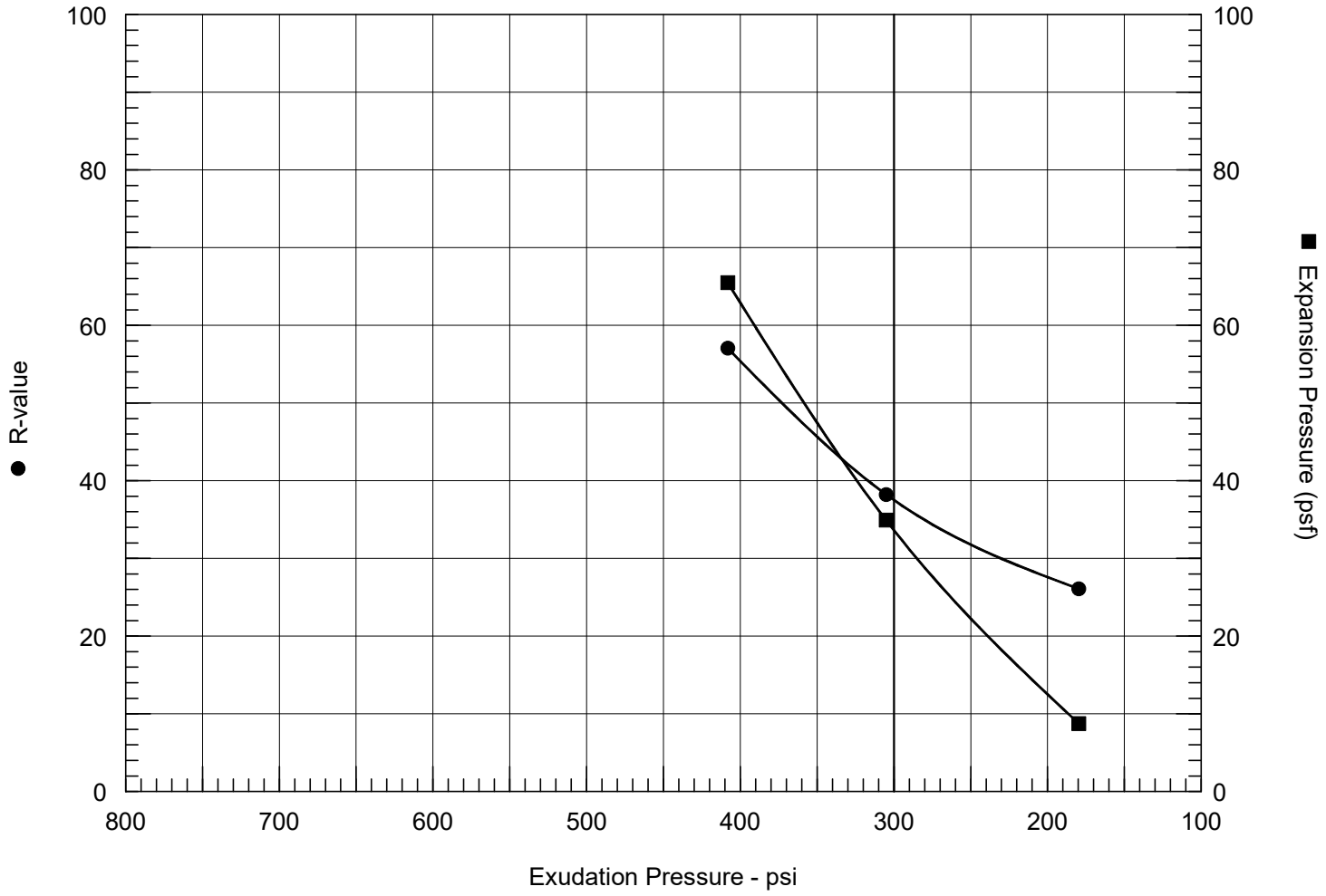
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: NE-1
Depth: 200-470mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	95	150	275
Wet weight (gms):	1078.8	1054.7	1032.0
Dry weight (gms):	927.6	919.9	909.1
Tare weight (gms):	99.7	100.9	103.2
% Moisture:	18.3	16.5	15.3
Exudation load (lbs.):	2396	4314	7051
Exudation pressure (psi):	191	343	561
Total weight (gms.):	3211.0	3195.5	3158.3
Mold weight (gms.):	2105.6	2079.5	2085.2
Sample weight (gms.):	1105.4	1116.0	1073.1
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	25	60	120
Expansion pressure (psf):	109	262	524
Ph at 2000 lbs.:	120	100	68
D turns:	3.90	3.73	3.53
R:	18	29	49
Height (in.):	2.52	2.50	2.41
Dry density (pcf):	112.4	116.2	117.1
Corrected R:	18	29	47

R-Value at 300 psi exudation pressure = 25
Expansion pressure at 300 psi = 216 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	65	93.4	28.5	9	100	2.52	180	26	26
2	125	94.6	26.9	35	83	2.59	305	36	38
3	200	95.0	26.1	65	53	2.52	408	57	57

Test Results

R-value at 300 psi exudation pressure = 38

Exp. pressure at 300 psi exudation pressure = 34 psf

Material Description

Light Brown Silt W/ Sand (MH)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: OAK-1 **Depth:** 345-660mm

Date: 12/20/2023

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 12/20/23

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Figure ____

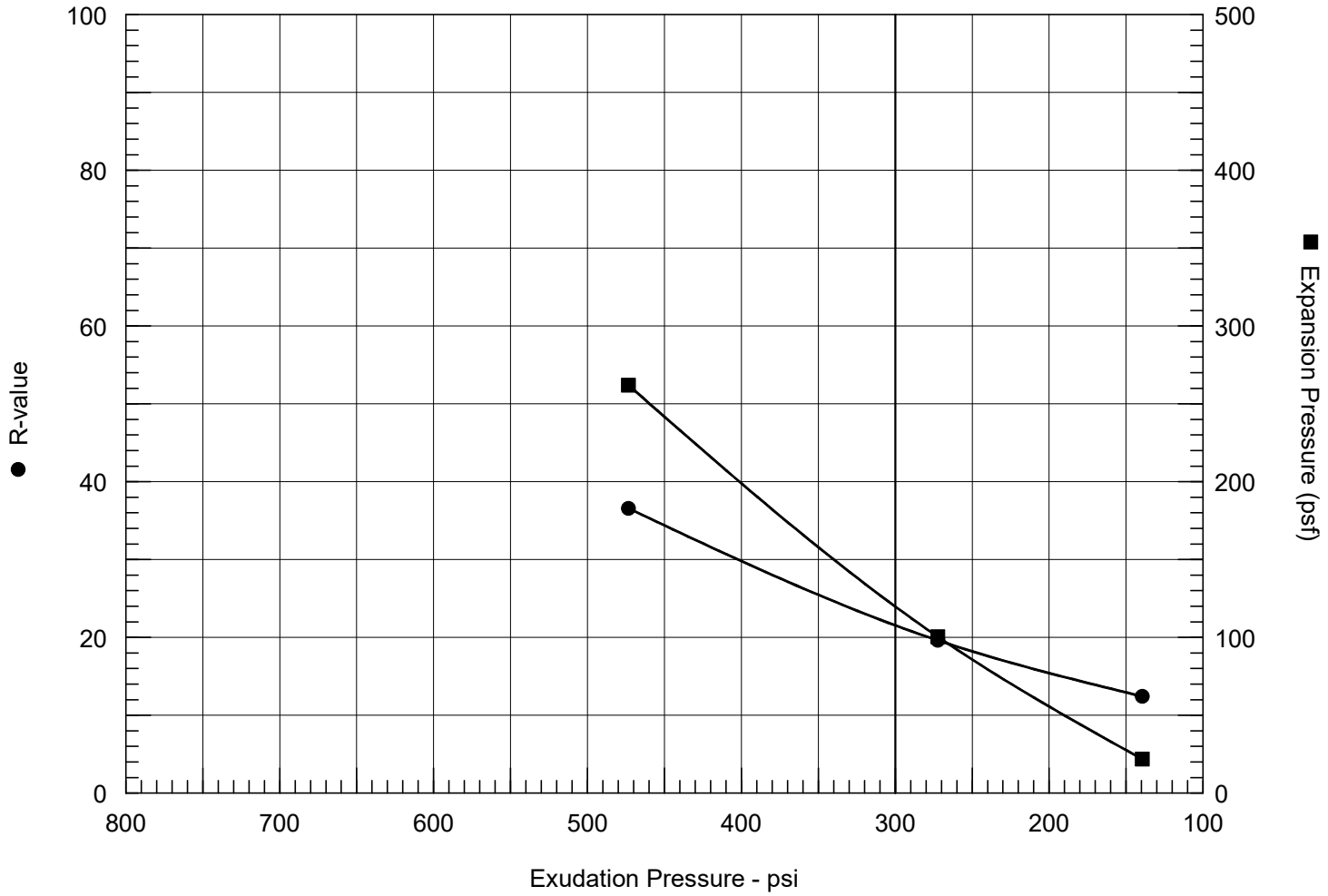
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: OAK-1
Depth: 345-660mm
Material Description: Light Brown Silt W/ Sand (MH)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	65	125	200
Wet weight (gms):	1093.4	1070.9	1042.5
Dry weight (gms):	872.8	865.2	847.3
Tare weight (gms):	100.0	100.9	99.7
% Moisture:	28.5	26.9	26.1
Exudation load (lbs.):	2257	3834	5129
Exudation pressure (psi):	180	305	408
Total weight (gms.):	2967.8	2988.3	2957.1
Mold weight (gms.):	1970.3	1963.0	1961.5
Sample weight (gms.):	997.5	1025.3	995.6
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	2	8	15
Expansion pressure (psf):	9	35	65
Ph at 2000 lbs.:	100	83	53
D turns:	4.25	4.10	3.80
R:	26	36	57
Height (in.):	2.52	2.59	2.52
Dry density (pcf):	93.4	94.6	95.0
Corrected R:	26	38	57

R-Value at 300 psi exudation pressure = 38
Expansion pressure at 300 psi = 34 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	60	108.2	19.7	22	126	2.56	139	12	12
2	90	111.6	18.2	100	112	2.53	272	20	20
3	175	117.2	16.7	262	84	2.43	473	38	37

Test Results	Material Description
R-value at 300 psi exudation pressure = 22 **Exp. pressure at 300 psi exudation pressure =** 120 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: PW-2 **Depth:** 270-500mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

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Figure ____

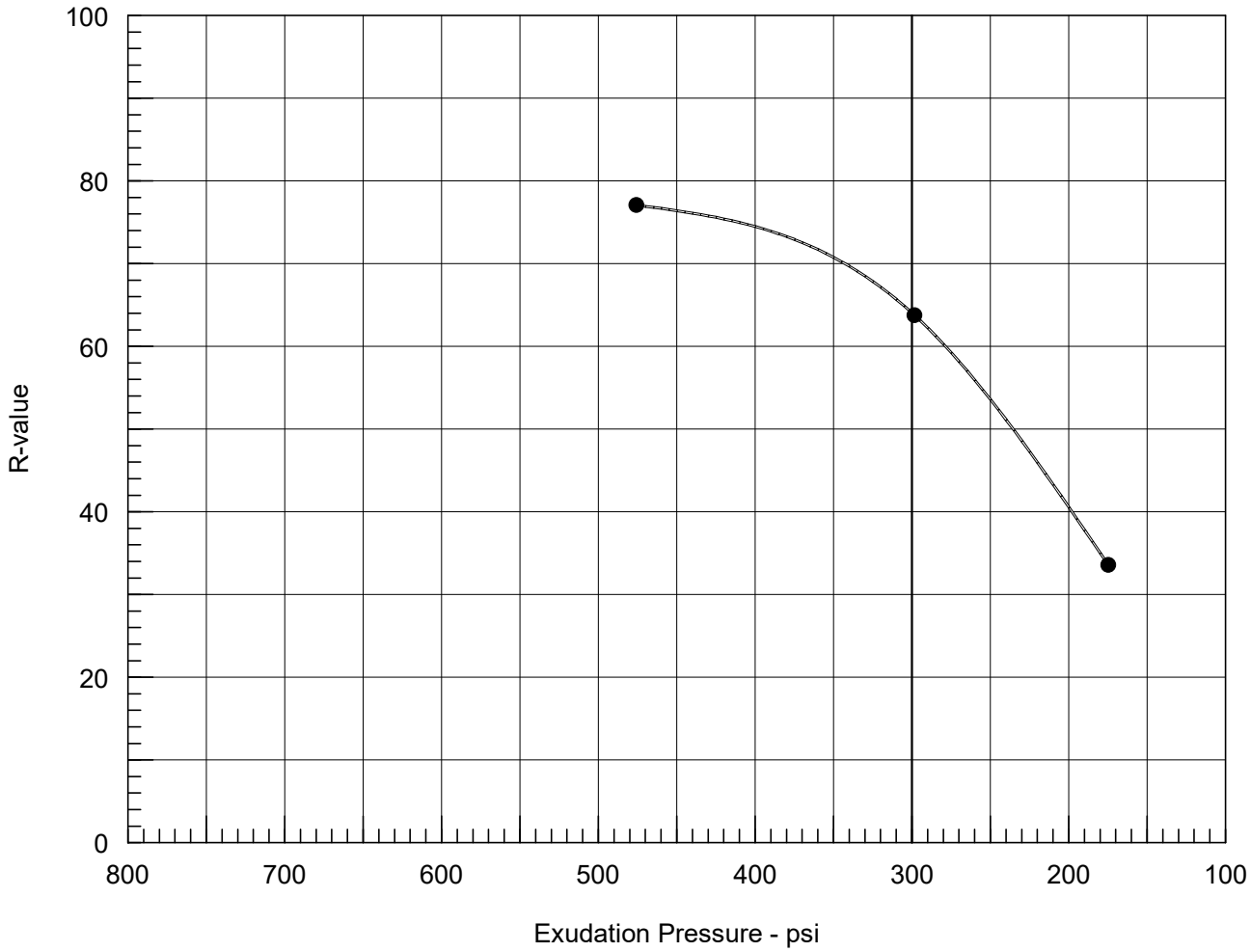
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: PW-2
Depth: 270-500mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	60	90	175
Wet weight (gms):	1078.4	1038.8	1023.4
Dry weight (gms):	917.5	894.5	891.7
Tare weight (gms):	101.0	101.3	100.9
% Moisture:	19.7	18.2	16.7
Exudation load (lbs.):	1753	3422	5948
Exudation pressure (psi):	139	272	473
Total weight (gms.):	3064.5	3063.9	3057.2
Mold weight (gms.):	1970.3	1962.9	1961.5
Sample weight (gms.):	1094.2	1101.0	1095.7
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	23	60
Expansion pressure (psf):	22	100	262
Ph at 2000 lbs.:	126	112	84
D turns:	4.96	4.39	3.65
R:	12	20	38
Height (in.):	2.56	2.53	2.43
Dry density (pcf):	108.2	111.6	117.2
Corrected R:	12	20	37

R-Value at 300 psi exudation pressure = 22
Expansion pressure at 300 psi = 120 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	60	119.3	14.0	0	88	2.56	175	32	34
2	175	118.5	13.3	0	41	2.46	298	64	64
3	350	119.6	12.5	0	25	2.43	476	78	77

Test Results	Material Description
R-value at 300 psi exudation pressure = 64	Red/Brown Clayey Sand (SC)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: RE-1 **Depth:** 195-560mm

Date: 12/13/2023

Tested by: SEF

Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

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Figure _____

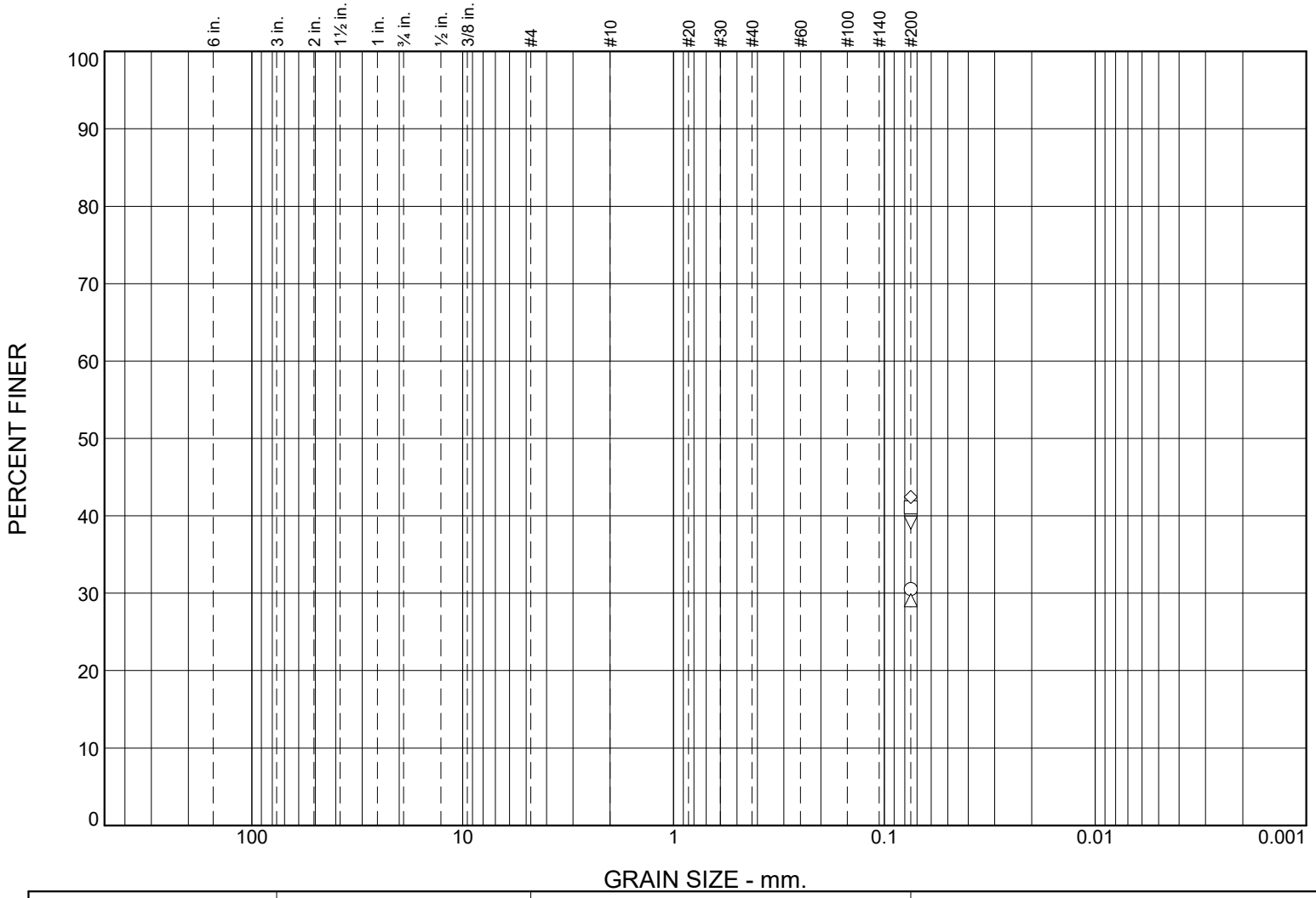
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: RE-1
Depth: 195-560mm
Material Description: Red/Brown Clayey Sand (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	60	175	350
Wet weight (gms):	1010.4	964.6	973.5
Dry weight (gms):	898.9	863.5	876.1
Tare weight (gms):	101.0	103.3	99.8
% Moisture:	14.0	13.3	12.5
Exudation load (lbs.):	2196	3750	5980
Exudation pressure (psi):	175	298	476
Total weight (gms.):	3118.6	3050.9	3042.1
Mold weight (gms.):	1970.3	1961.5	1963.0
Sample weight (gms.):	1148.3	1089.4	1079.1
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	0	0	0
Expansion pressure (psf):	0	0	0
Ph at 2000 lbs.:	88	41	25
D turns:	4.29	4.12	3.78
R:	32	64	78
Height (in.):	2.56	2.46	2.43
Dry density (pcf):	119.3	118.5	119.6
Corrected R:	34	64	77

R-Value at 300 psi exudation pressure = 64
Expansion pressure at 300 psi = n/a psf

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							30.5	
□							41.1	
△							29.1	
◇							42.4	
▽							39.1	

SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	RE-1		195-560mm	Red/Brown Clayey Sand (SC)	SC
□	RE-6		39-420mm	Red/Brown Clayey Sand (SC)	SC
△	SC-2		295-525mm	Gray/Brown Clayey Sand W/ Gravel (SC)	SC
◇	SC-5		430-800mm	Brown Clayey Sand W/ Gravel (SC)	SC
▽	SD-1		255-410mm	Brown Clayey Sand W/ Gravel (SC)	SC

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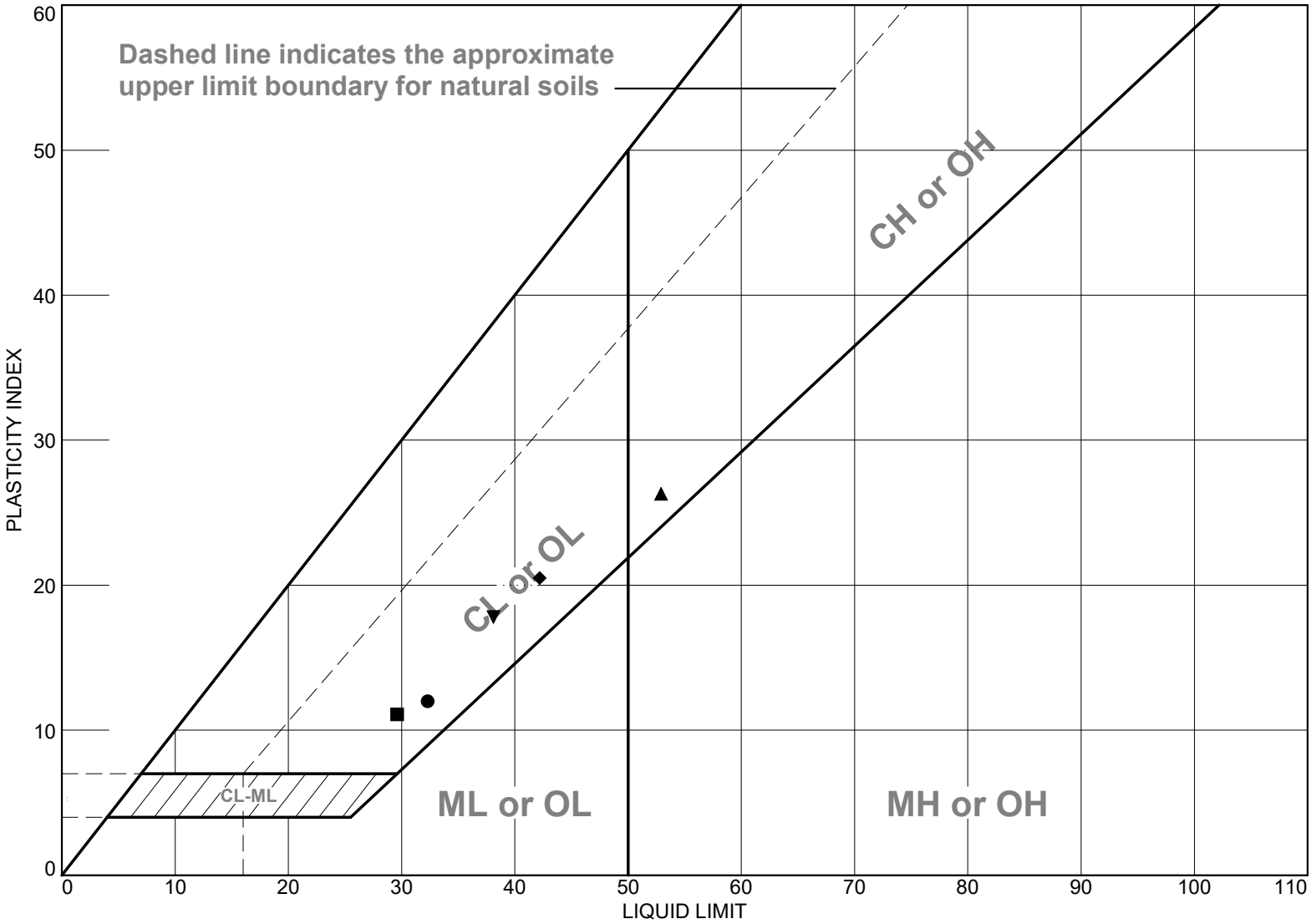
Client: NCE

Project: Lake County 2024

Project No.: 6670.002.11.3 (NCE: 1210.01.55 2B) **Figure**

Tested By: SAA **Checked By:** SEF

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Red/Brown Clayey Sand (SC)	32.3	20.3	12.0		30.5	SC
■	Red/Brown Clayey Sand (SC)	29.6	18.5	11.1		41.1	SC
▲	Gray/Brown Clayey Sand W/ Gravel (SC)	52.9	26.6	26.3		29.1	SC
◆	Brown Clayey Sand W/ Gravel (SC)	42.2	21.7	20.5		42.4	SC
▼	Brown Clayey Sand W/ Gravel (SC)	38.1	20.3	17.8		39.1	SC

Project No. 6670.002.11.3 **Client:** NCE

Project: Lake County 2024

● **Source of Sample:** RE-1 **Depth:** 195-560mm

■ **Source of Sample:** RE-6 **Depth:** 39-420mm

▲ **Source of Sample:** SC-2 **Depth:** 295-525mm

◆ **Source of Sample:** SC-5 **Depth:** 430-800mm

▼ **Source of Sample:** SD-1 **Depth:** 255-410mm

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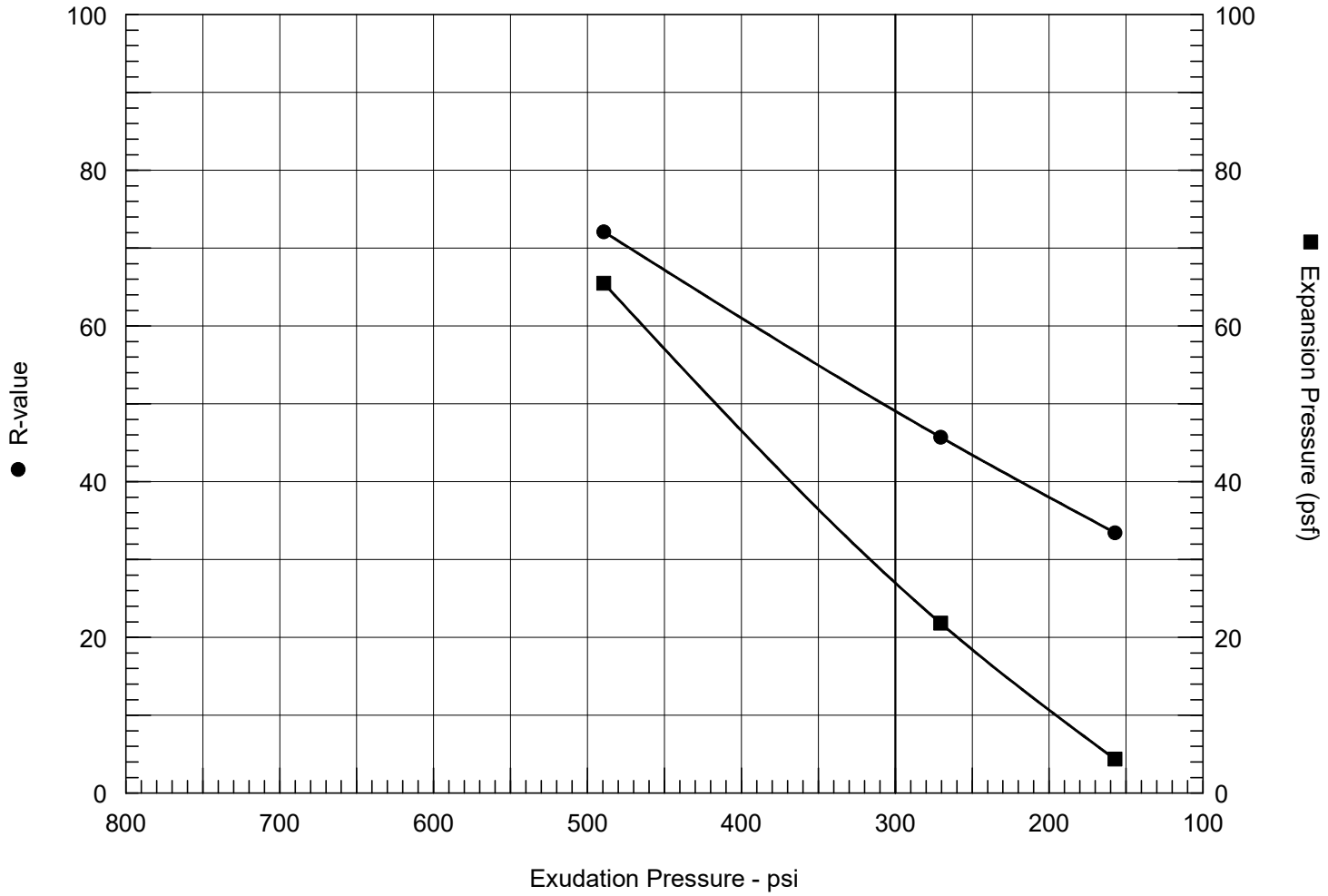
Remarks:

● NCE Project #: 1210.01.55 2B
Reported 12/13/23

Figure

Tested By: SCW **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	116.7	13.5	4	82	2.54	157	33	33
2	65	117.4	12.3	22	65	2.53	270	46	46
3	300	119.0	11.4	65	30	2.40	489	74	72

Test Results	Material Description
R-value at 300 psi exudation pressure = 49 **Exp. pressure at 300 psi exudation pressure =** 27 psf	Red/Brown Clayey Sand (SC)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: RE-6 **Depth:** 39-420mm

Date: 12/20/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

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Figure ____

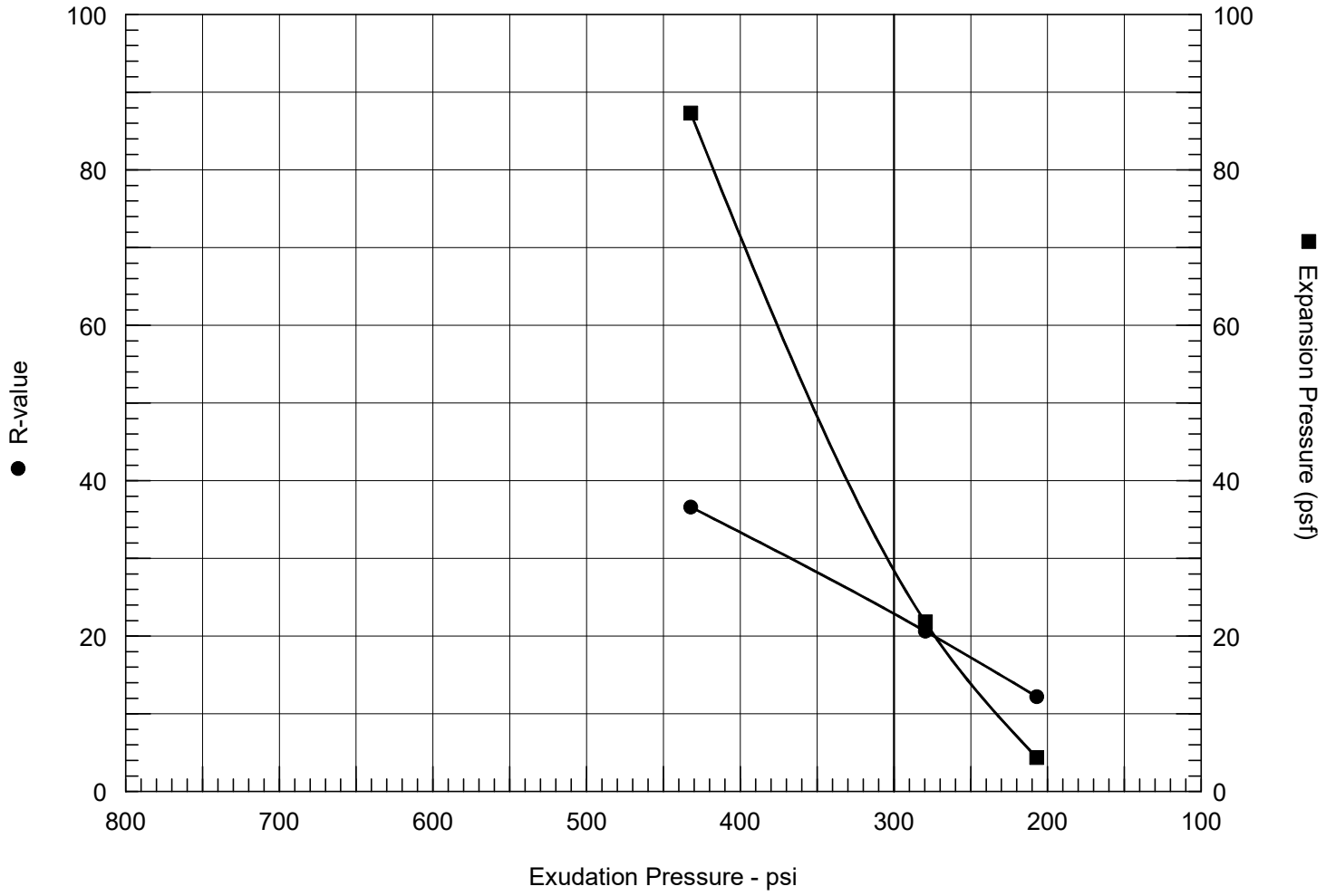
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: RE-6
Depth: 39-420mm
Material Description: Red/Brown Clayey Sand (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	55	65	300
Wet weight (gms):	1061.0	1043.7	1021.4
Dry weight (gms):	946.9	940.5	926.9
Tare weight (gms):	103.2	100.9	99.8
% Moisture:	13.5	12.3	11.4
Exudation load (lbs.):	1977	3399	6150
Exudation pressure (psi):	157	270	489
Total weight (gms.):	3079.8	3055.7	3008.1
Mold weight (gms.):	1969.9	1955.9	1958.0
Sample weight (gms.):	1109.9	1099.8	1050.1
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	5	15
Expansion pressure (psf):	4	22	65
Ph at 2000 lbs.:	82	65	30
D turns:	4.73	4.34	3.83
R:	33	46	74
Height (in.):	2.54	2.53	2.40
Dry density (pcf):	116.7	117.4	119.0
Corrected R:	33	46	72

R-Value at 300 psi exudation pressure = 49
Expansion pressure at 300 psi = 27 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	106.7	20.3	4	129	2.55	207	12	12
2	75	108.9	19.7	22	113	2.52	280	21	21
3	125	111.6	18.5	87	87	2.51	432	37	37

Test Results

R-value at 300 psi exudation pressure = 23

Exp. pressure at 300 psi exudation pressure = 28 psf

Material Description

Gray/Brown Clayey Sand W/ Gravel (SC)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: SC-2 **Depth:** 295-525mm

Date: 12/20/2023

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 12/20/23

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Figure _____

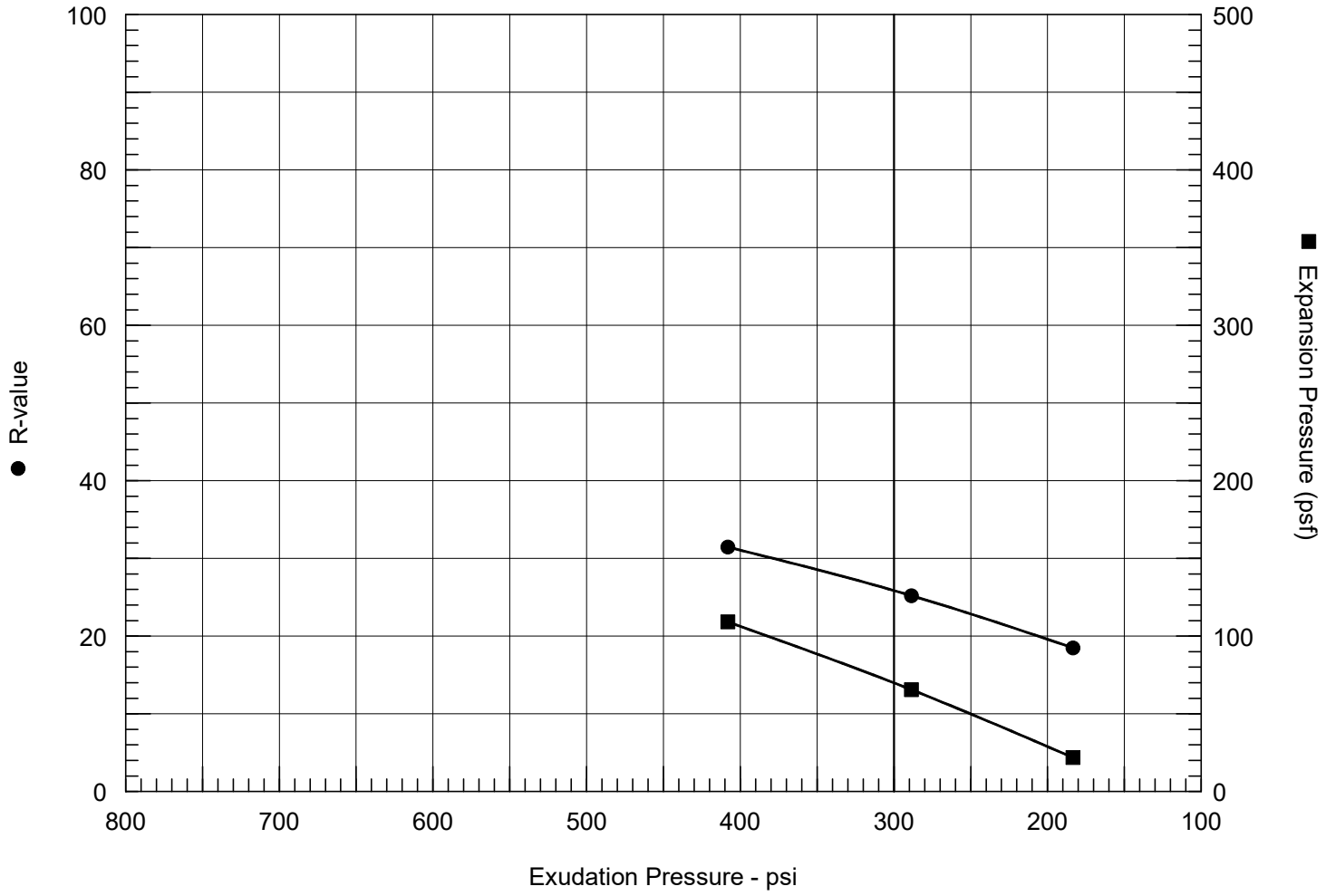
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SC-2
Depth: 295-525mm
Material Description: Gray/Brown Clayey Sand W/ Gravel (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	55	75	125
Wet weight (gms):	1084.8	1078.8	1059.6
Dry weight (gms):	918.9	918.4	910.4
Tare weight (gms):	101.7	103.0	102.7
% Moisture:	20.3	19.7	18.5
Exudation load (lbs.):	2601	3514	5432
Exudation pressure (psi):	207	280	432
Total weight (gms.):	3049.8	3046.4	3055.7
Mold weight (gms.):	1970.4	1963.0	1961.5
Sample weight (gms.):	1079.4	1083.4	1094.2
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	5	20
Expansion pressure (psf):	4	22	87
Ph at 2000 lbs.:	129	113	87
D turns:	4.32	4.00	3.63
R:	12	21	37
Height (in.):	2.55	2.52	2.51
Dry density (pcf):	106.7	108.9	111.6
Corrected R:	12	21	37

R-Value at 300 psi exudation pressure = 23
Expansion pressure at 300 psi = 28 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	90	113.2	17.3	22	117	2.49	183	18	18
2	125	116.1	16.7	65	103	2.44	289	26	25
3	150	116.2	16.1	109	96	2.47	408	31	31

Test Results

R-value at 300 psi exudation pressure = 26

Exp. pressure at 300 psi exudation pressure = 70 psf

Material Description

Brown Clayey Sand W/ Gravel (SC)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: SC-5 **Depth:** 430-800mm

Date: 12/20/2023

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 12/20/23

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Figure ____

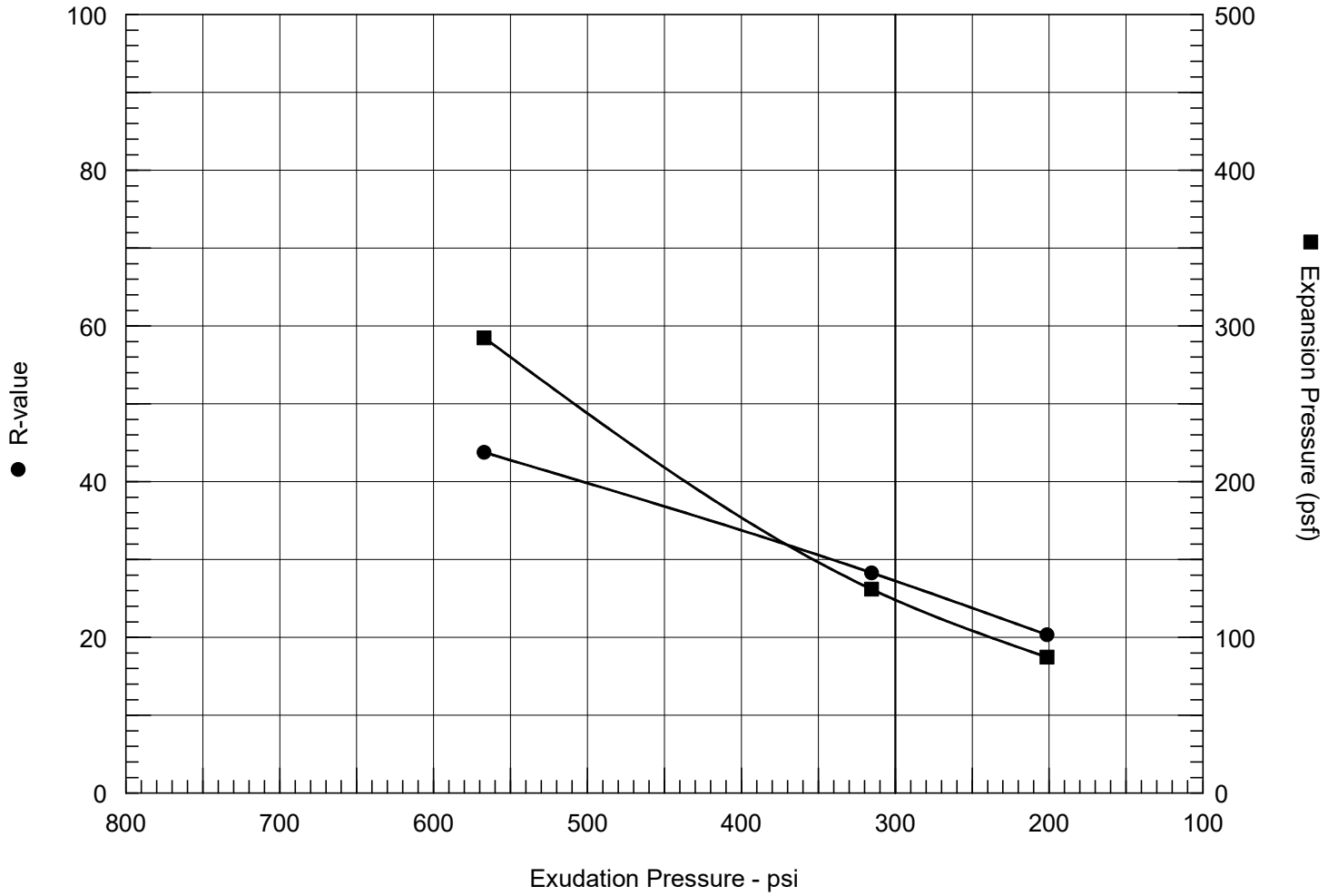
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SC-5
Depth: 430-800mm
Material Description: Brown Clayey Sand W/ Gravel (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/20/23

Test specimen number	1	2	3
Compaction pressure (psi):	90	125	150
Wet weight (gms):	1066.6	1052.2	1046.4
Dry weight (gms):	924.6	916.0	915.4
Tare weight (gms):	103.2	99.7	100.9
% Moisture:	17.3	16.7	16.1
Exudation load (lbs.):	2305	3626	5129
Exudation pressure (psi):	183	289	408
Total weight (gms.):	3048.9	3060.1	3054.9
Mold weight (gms.):	1958.0	1969.9	1955.9
Sample weight (gms.):	1090.9	1090.2	1099.0
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	5	15	25
Expansion pressure (psf):	22	65	109
Ph at 2000 lbs.:	117	103	96
D turns:	4.05	3.88	3.63
R:	18	26	31
Height (in.):	2.49	2.44	2.47
Dry density (pcf):	113.2	116.1	116.2
Corrected R:	18	25	31

R-Value at 300 psi exudation pressure = 26
Expansion pressure at 300 psi = 70 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	75	116.7	15.8	87	115	2.50	201	20	20
2	100	123.4	14.2	131	100	2.43	315	30	28
3	200	123.4	13.6	292	74	2.42	567	46	44

Test Results	Material Description
R-value at 300 psi exudation pressure = 27 **Exp. pressure at 300 psi exudation pressure =** 124 psf	Brown Clayey Sand W/ Gravel (SC)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: SD-1 **Depth:** 255-410mm

Date: 12/13/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

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Figure ____

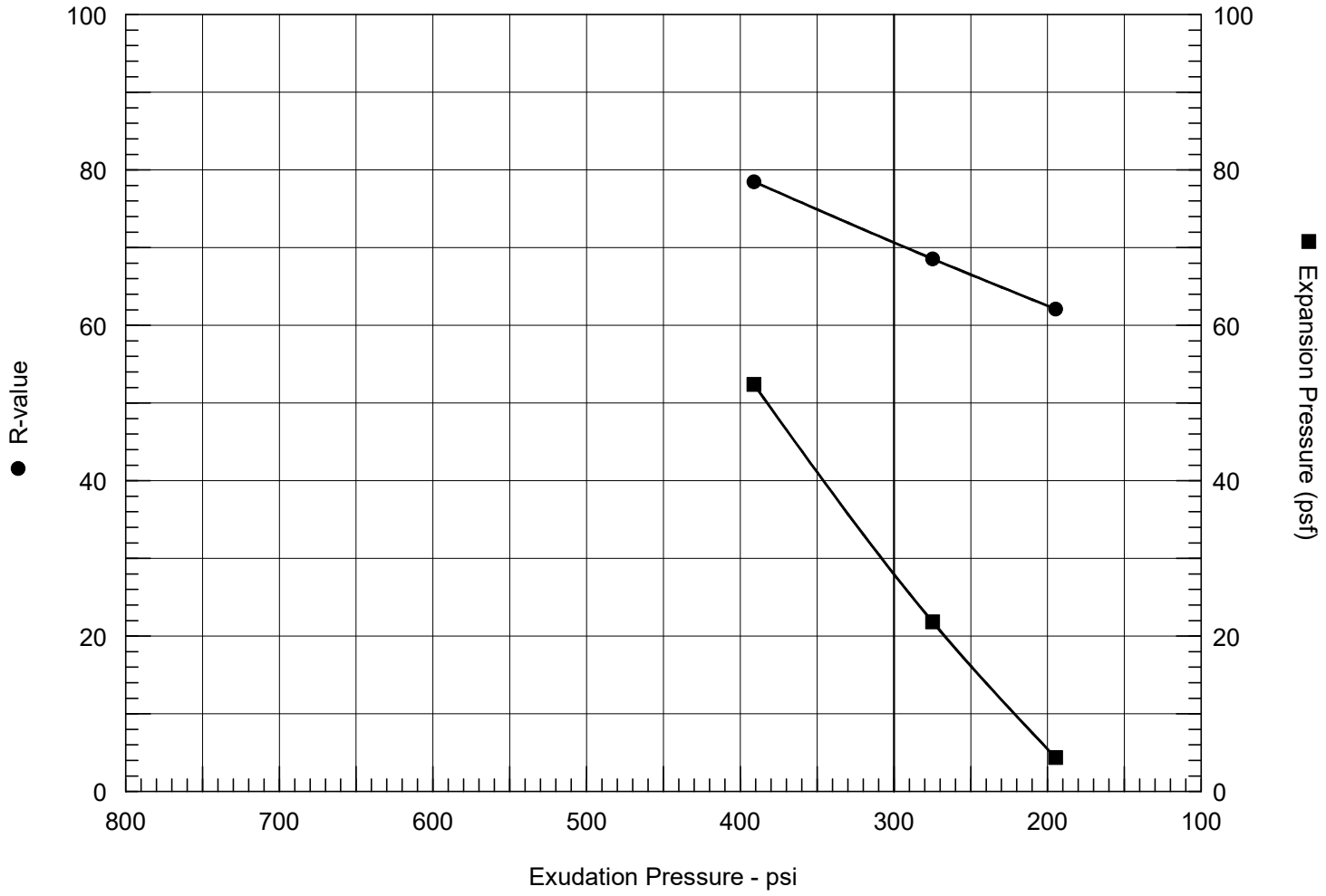
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SD-1
Depth: 255-410mm
Material Description: Brown Clayey Sand W/ Gravel (SC)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	75	100	200
Wet weight (gms):	1043.3	1029.0	1006.1
Dry weight (gms):	914.4	914.1	897.4
Tare weight (gms):	101.0	103.2	99.8
% Moisture:	15.8	14.2	13.6
Exudation load (lbs.):	2532	3964	7127
Exudation pressure (psi):	201	315	567
Total weight (gms.):	3076.0	3099.5	3081.9
Mold weight (gms.):	1961.5	1970.4	1963.0
Sample weight (gms.):	1114.5	1129.1	1118.9
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	20	30	67
Expansion pressure (psf):	87	131	292
Ph at 2000 lbs.:	115	100	74
D turns:	3.83	3.55	3.43
R:	20	30	46
Height (in.):	2.50	2.43	2.42
Dry density (pcf):	116.7	123.4	123.4
Corrected R:	20	28	44

R-Value at 300 psi exudation pressure = 27
Expansion pressure at 300 psi = 124 psf

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	200	92.9	26.4	4	46	2.58	195	60	62
2	250	94.3	25.5	22	38	2.57	275	67	69
3	350	93.7	25.0	52	25	2.52	391	78	78

Test Results

R-value at 300 psi exudation pressure = 71

Exp. pressure at 300 psi exudation pressure = 28 psf

Material Description

Brown Sandy Silt W/ Gravel (ML)

Project No.: 6670.002.11.3

Project: Lake County 2024

Source of Sample: SHA-1 **Depth:** 270-615mm

Date: 1/2/2024

Tested by: SEF

Checked by: TAW

Remarks:

NCE Proj. #: 1210.01.55 2B

Reported 1/2/24

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Figure ____

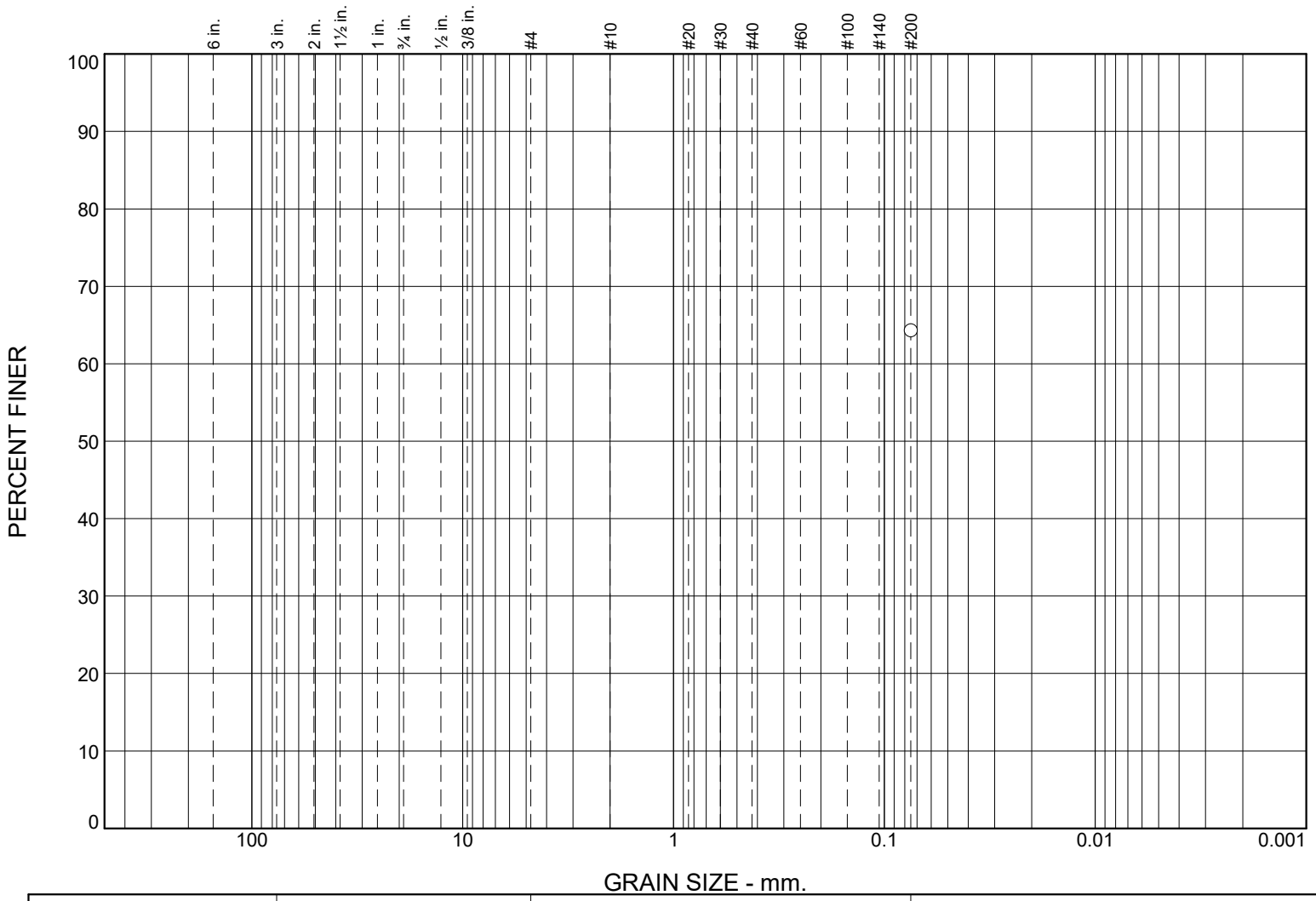
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SHA-1
Depth: 270-615mm
Material Description: Brown Sandy Silt W/ Gravel (ML)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

Test specimen number	1	2	3
Compaction pressure (psi):	200	250	350
Wet weight (gms):	1166.2	1160.4	1146.2
Dry weight (gms):	943.5	944.9	937.3
Tare weight (gms):	101.0	101.2	100.9
% Moisture:	26.4	25.5	25.0
Exudation load (lbs.):	2447	3453	4915
Exudation pressure (psi):	195	275	391
Total weight (gms.):	2957.7	2973.0	2929.8
Mold weight (gms.):	1957.9	1969.9	1955.9
Sample weight (gms.):	999.8	1003.1	973.9
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	5	12
Expansion pressure (psf):	4	22	52
Ph at 2000 lbs.:	46	38	25
D turns:	4.11	3.95	3.70
R:	60	67	78
Height (in.):	2.58	2.57	2.52
Dry density (pcf):	92.9	94.3	93.7
Corrected R:	62	69	78

R-Value at 300 psi exudation pressure = 71
Expansion pressure at 300 psi = 28 psf

Particle Size Distribution Report



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○							64.3	

SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	SU-1		135-430mm	Light Brown Sandy Clay W/ Gravel (CL)	CL

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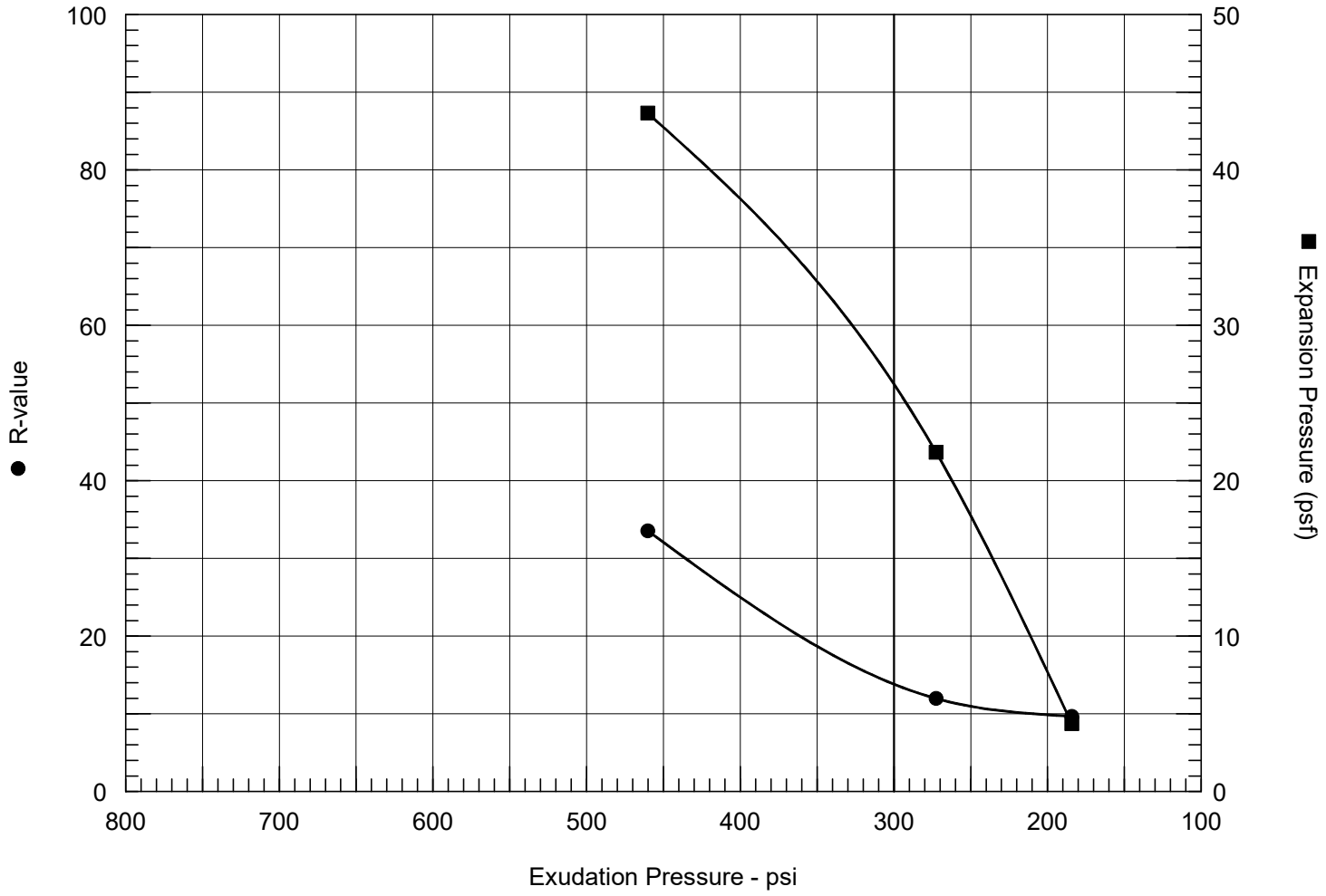
Client: NCE

Project: Lake County 2024

Project No.: 6670.002.11.3 (NCE: 1210.01.55 2B) **Figure**

Tested By: SAA **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	94.1	28.4	4	134	2.55	184	10	10
2	65	97.4	27.2	22	131	2.52	273	12	12
3	100	99.4	25.4	44	90	2.49	460	34	34

Test Results	Material Description
R-value at 300 psi exudation pressure = 14 **Exp. pressure at 300 psi exudation pressure =** 26 psf	Light Brown Sandy Clay W/ Gravel (CL)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: SU-1 **Depth:** 135-430mm

Date: 12/13/2023

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

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Figure ____

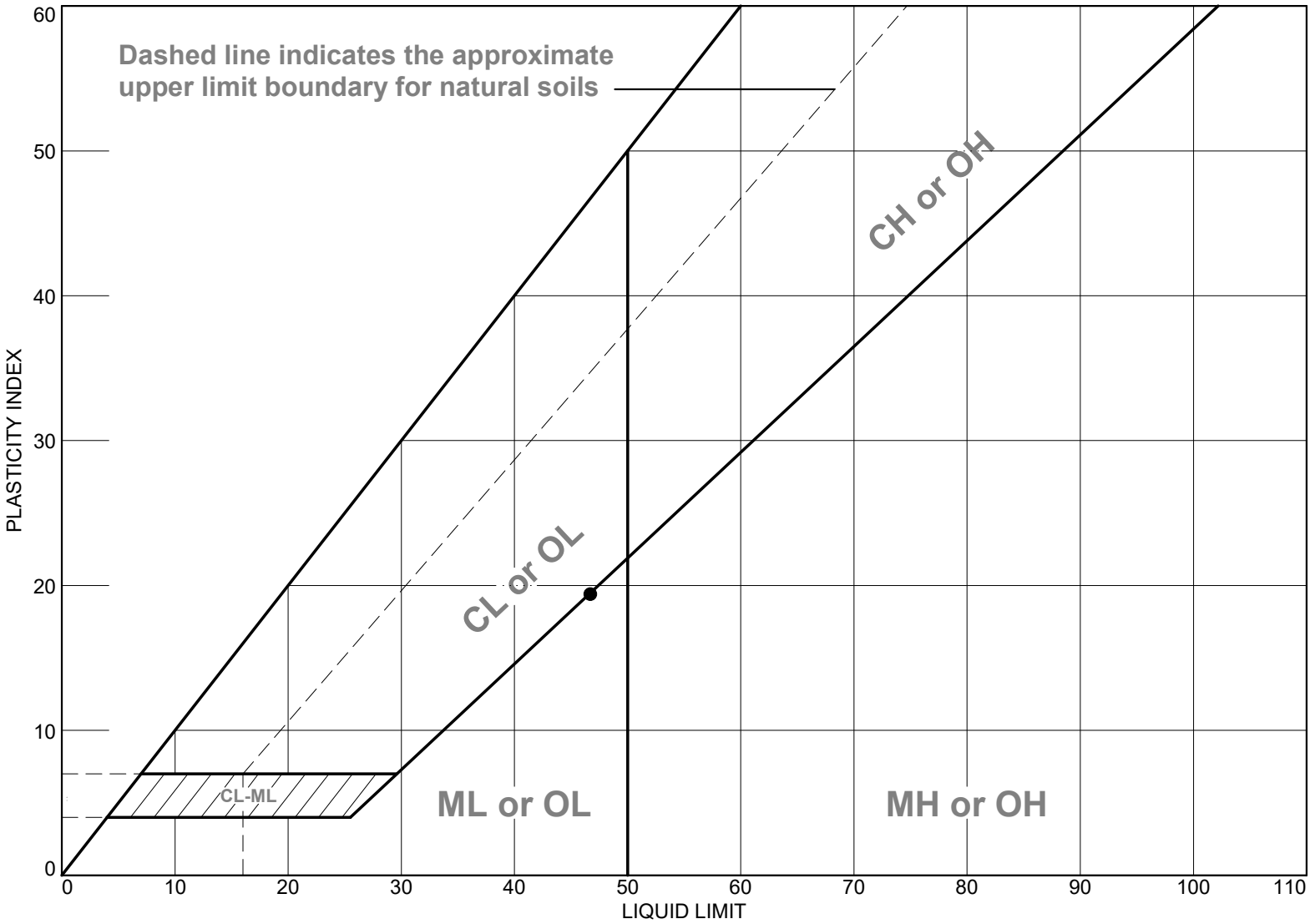
RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SU-1
Depth: 135-430mm
Material Description: Light Brown Sandy Clay W/ Gravel (CL)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 12/13/23

Test specimen number	1	2	3
Compaction pressure (psi):	55	65	100
Wet weight (gms):	1165.9	1129.4	1113.6
Dry weight (gms):	931.1	909.5	908.5
Tare weight (gms):	103.3	100.9	99.8
% Moisture:	28.4	27.2	25.4
Exudation load (lbs.):	2315	3425	5783
Exudation pressure (psi):	184	273	460
Total weight (gms.):	3121.6	3109.1	3108.8
Mold weight (gms.):	2105.8	2079.6	2085.5
Sample weight (gms.):	1015.8	1029.5	1023.3
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	5	10
Expansion pressure (psf):	4	22	44
Ph at 2000 lbs.:	134	131	90
D turns:	4.53	4.07	3.85
R:	10	12	34
Height (in.):	2.55	2.52	2.49
Dry density (pcf):	94.1	97.4	99.4
Corrected R:	10	12	34

R-Value at 300 psi exudation pressure = 14
Expansion pressure at 300 psi = 26 psf

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Light Brown Sandy Clay W/ Gravel (CL)	46.7	27.3	19.4		64.3	CL

Project No. 6670.002.11.3 **Client:** NCE

Project: Lake County 2024

● **Source of Sample:** SU-1 **Depth:** 135-430mm

Remarks:

● NCE Project #: 1210.01.55 2B
Reported 12/13/23

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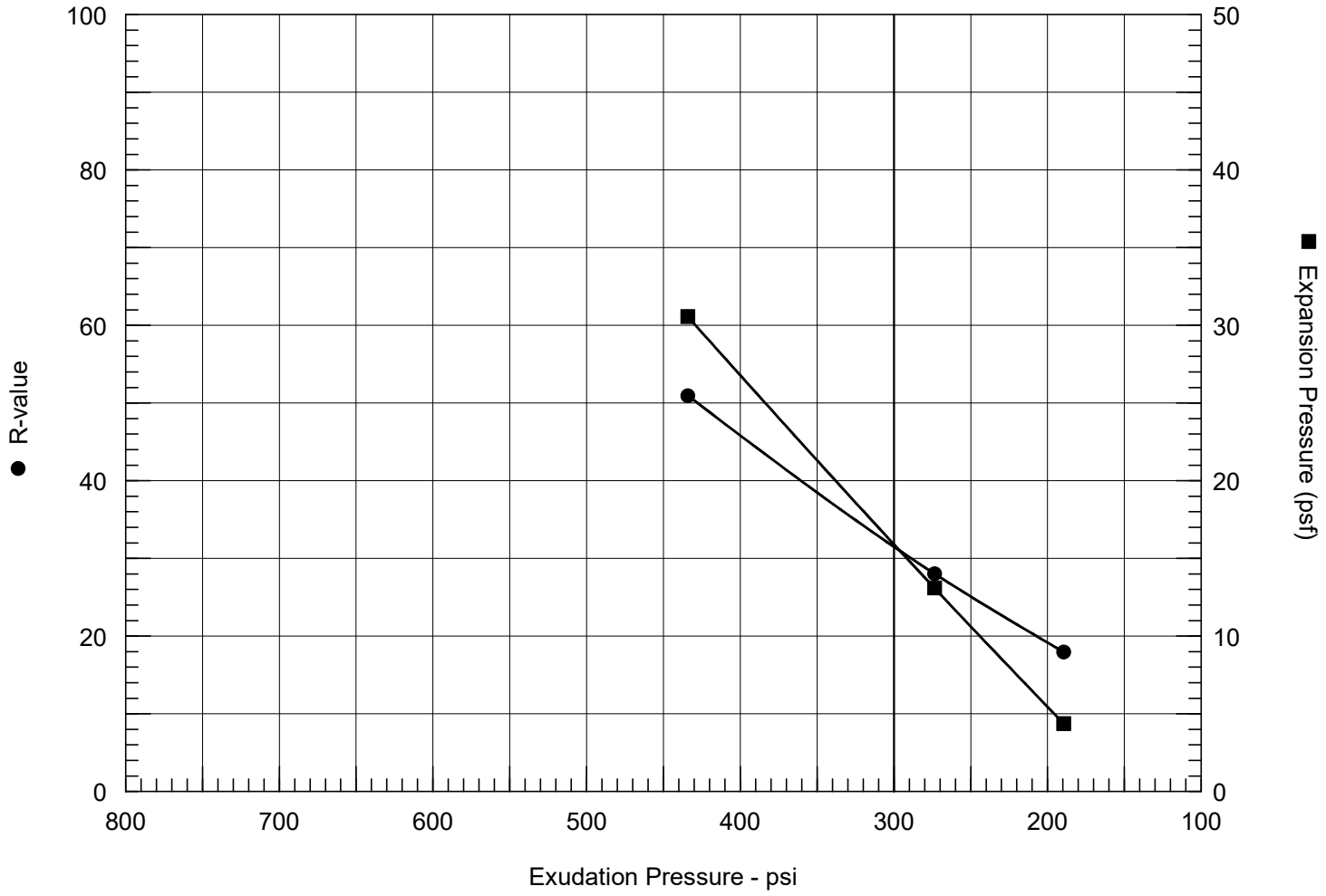
Figure

Tested By: SCW **Checked By:** SEF

R-VALUE TEST REPORT



Resistance R-Value and Expansion Pressure - Cal Test 301

No.	Compact. Pressure psi	Density pcf	Moist. %	Expansion Pressure psf	Horizontal Press. psi @ 160 psi	Sample Height in.	Exud. Pressure psi	R Value	R Value Corr.
1	55	91.8	28.5	4	119	2.57	190	17	18
2	75	95.0	26.8	13	100	2.55	274	28	28
3	125	100.6	24.3	31	61	2.42	434	53	51

Test Results	Material Description
R-value at 300 psi exudation pressure = 32 **Exp. pressure at 300 psi exudation pressure =** 16 psf	Brown Sandy Clay W/ Gravel (CH)

Project No.: 6670.002.11.3
Project: Lake County 2024
Source of Sample: SUM-1 **Depth:** 330-620mm

Date: 1/2/2024

Tested by: SEF
Checked by: TAW

Remarks:
NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

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Figure ____

RESISTANCE R-VALUE TESTING RESULTS
(Cal Test 301)

Project: Lake County 2024
Project Number: 6670.002.11.3
Location: SUM-1
Depth: 330-620mm
Material Description: Brown Sandy Clay W/ Gravel (CH)
Tested by:: SEF
Checked by:: TAW
Testing remarks:: NCE Proj. #: 1210.01.55 2B
Reported 1/2/24

Test specimen number	1	2	3
Compaction pressure (psi):	55	75	125
Wet weight (gms):	1129.9	1112.2	1084.7
Dry weight (gms):	901.7	899.1	891.9
Tare weight (gms):	101.4	103.2	99.8
% Moisture:	28.5	26.8	24.3
Exudation load (lbs.):	2382	3438	5456
Exudation pressure (psi):	190	274	434
Total weight (gms.):	2961.7	2976.2	2968.8
Mold weight (gms.):	1961.5	1963.0	1970.4
Sample weight (gms.):	1000.2	1013.2	998.4
Initial expansion (x10,000):	0	0	0
Final expansion (x10,000):	1	3	7
Expansion pressure (psf):	4	13	31
Ph at 2000 lbs.:	119	100	61
D turns:	4.16	3.85	3.59
R:	17	28	53
Height (in.):	2.57	2.55	2.42
Dry density (pcf):	91.8	95.0	100.6
Corrected R:	18	28	51

R-Value at 300 psi exudation pressure = 32
Expansion pressure at 300 psi = 16 psf