COUNTY OF IMPERIAL

DEPARTMENT OF PUBLIC WORKS

155 S. 11th Street
El Centro, CA
92243

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COUNTY OF IMPERIAL PUBLIC WORKS

Heffernan Avenue Improvements from 11th Street to 14th Street; State Aid Project No. ATPSB1L -5958(117); County Project No. 6516

ADDENDUM NO. 1 **September 1, 2023**

This *ADDENDUM* is hereby made part of the Contract Documents and specifications to the same extent as if originally included therein, and shall be signed by the Bidder and included with the proposal.

1. **Question:** Plans called for "modifying the rolling gate and adjusting the wheel"- bid item sheet only includes the, "replace 10 Lf of fence per plan" - should we add the cost of fixing the gate with the fence?"

   Response: The Bid Item List has been revised.
   REPLACE Page No. 2 "Bid Item List" with attached revised Page No. 2
   REPLACE Page No. 61 of Division XIV - DOCUMENTS TO BE EXECUTED BY BIDDER, BID ITEM LIST with attached revised Page No. 61.

2. **Question:** "The specifications and contract mentions DBE requirements but no forms to fill out. Is this a DBE required project? Also mentions Fed requirements but no Fed number or specifications attached."

   Response: No, this project does not have DBE requirements and there is no DBE Goal set for it. This project does not have any Federal Funding.

3. **Question:** "The specifications section on the Water Pollution Control plan says the contractor shall prepare a water pollution control plan but sheets 18 and 19 show a water pollution control plan already. Does this mean we are just required to follow this plan? And do we have to provide monitoring of water pollution control of this plan? "

   Response: Contractor is responsible to implement the Water Pollution Control Plan per State Water Resources Control Board requirements.

4. **Question:** "The specifications make reference to QA QC requirements for compaction and material testing but no bid item for that. Is the County going to provide the material and compaction testing for this project? And does the contractor have to provide that as well."

   Response: The County will provide Independent Quality Assurance Testing for the project in accordance to the County's Quality Assurance Plan.

5. **Question:** "I am inquiring about Bid Item 22: Removal, Disposal, and Replacement of Unsuitable Material quantity of 50 CY. Is this based on a particular area? We did not see any keynote location where this material may be located. Or is it based on possible lead or pH of the existing soil? And if it is a lead or pH issue then will all possible exports have to be tested?"

   Response: No lead or pH contamination was encountered within existing soils during the Aerially Deposited Lead-Contaminated (ADL) testing and survey completed for this project.
   Bid Item 22: Removal, **Disposal and Replacement of Unsuitable Material** is an allowance for material encountered below the natural ground surface in embankment areas or below the grading plane in excavation areas that the Engineer determines to be in any of the following conditions:

   1. Of such unstable nature that it cannot be compacted to the specified density using ordinary methods at optimum moisture content.
   2. Too wet to be properly compacted and cannot be dried before incorporating it into the work. Excessive moisture alone is not sufficient cause for determining that the material is unsuitable.
   3. Inappropriate for the planned use.

6. **Question:** "The AC Dike plans are a little blurry and cannot really identify how many lineal feet of AC dike shall be please, - If my take off is correct we will be installing around 445 LF of AC dike which is more than 3 CYD (per bid item list)."

   Response: The AC Dike approximate length is 230 lineal feet (3.4 CYD). Please note that the Bid Item No. 9 quantity has been revised (See Response No. 1).

7. **Question:** "page 52/132 call for a ICDPW sign specifically made for this project, will this be a temporary sign or permanent? - Bid item list does not call for it."

   Response: See Section 12 on the specifications page 40 and 41 "Payment".
   "Full compensation for furnishing, installing, and maintaining Construction Area Signs, including all temporary signs and object markers required for the direction of traffic through or within the project limits, Imperial County project identification signs, and project funding signs, shall be considered as included in the contract lump sum price paid for "Temporary Traffic Control" and no additional compensation shall be allowed therefor"

8. **Question:** "Plans call to verify per soil report- please send a copy if applicable"

   Response: Please refer to attached Geotechnical Study Report for Heffernan Street Improvements Report.

9. **Question:** "Sheet 5/19 from the bid set calls for demolition items such as bollards, fence,removal of existing striping by sandblasting and salvage/relocation of existing signs, will these have their own bid line item?"

   Response: Demolition of bollards and fence are included in Bid Item No. 5 Clearing and Grubbing as objectionable material under 17-2.03B of Caltrans Standard Specifications. For removal of existing striping and salvage/relocation of existing signs, see Section 82-3.04 and 84-2.04 of the project specifications:

John A. Gay, P.E.
Director of Public Works

Acknowledgement of Addendum No. 1

The general contractor is responsible for advising any and all subcontractors of this change. Each bidder must acknowledge receipt of this addendum in the noted space below and where indicated on the Bidder's Proposal Section of the Special Provisions. This Addendum must be attached to the proposal.

License No: _____

Print or Type Company Name: _____

Print or Type Authorized Name: _____

Authorized Signature of Contractor: _____

Date Signed: _____

BID ITEM LIST

Item No.	ITEM DESCRIPTION	Unit	Estimated Quantity
1	MOBILIZATION	LS	1
2	TEMPORARY TRAFFIC CONTROL	LS	1
3	SURVEYING AND CONSTRUCTION STAKING	LS	1
4	WATER POLLUTION CONTROL	LS	1
5	CLEARING AND GRUBBING	LS	1
6	MONUMENT PRESERVATION/PERPETUATION	LS	1
7	CLASS II AGGREGATE BASE	CY	730
8	HOT MIX ASPHALT (TYPE A)	TON	530
9	ASPHALT DIKE (TYPE A) 230 LF	CY	4
10	TACK COAT	TON	1
11	COLD PLANE ASPHALT CONCRETE PAVEMENT	SQYD	350
12	MINOR CONCRETE (CROSS GUTTER)	CY	16
13	MINOR CONCRETE (CURB AND GUTTER)	CY	68
14	MINOR CONCRETE (CURB AND GUTTER MODIFIED)	CY	16
15	MINOR CONCRETE (SIDEWALK)	CY	90
16	MINOR CONCRETE (CURB RAMP)	CY	40
17	DETECTABLE WARNING SURFACE	SQFT	88
18	ADJUST WATER VALVE COVER	EA	2
19	REPLACE FENCE PER PLANS	LF	10
20	SIGNING, STRIPING, AND PAVEMENT MARKINGS	LS	1
21	ROADWAY EXCAVATION	CY	1,200
22	REMOVAL, DISPOSAL AND REPLACEMENT OF UNSUITABLE MATERIAL	CY	50
23	MODIFY ROLLING GATE HEIGHT/TOP RAIL AND ADJUST GUIDE WHEELS	EA	2
24	TIME AND MATERIAL ALLOCATION	LS	1

Plans, specifications, and proposal forms (bid documents) for bidding this project can be obtained at the office of the Imperial County Department of Public Works; 155 South 11th Street, El Centro, CA 92243. A $100.00 fee is required (no refund will be made). Mail service is available at an additional cost of $15.00 per set of documents. Make checks payable to the County of Imperial Department of Public Works.

Alternately, the bid documents can be found on Imperial County Public Works website under "Projects Out to Bid" at www.co.imperial.ca.us/PublicWorks/Index.htm.

Imperial, in the form of the copy of the contract annexed hereto, to provide all necessary machinery, tools, apparatus and other means of construction, and to do all the work and furnish all the materials specified in the contract, in the manner and time therein prescribed, and according to the requirements of the Engineer as therein set forth, and that he will take in full payment therefore the following prices, to wit:

BID ITEM LIST

Item No.	ITEM DESCRIPTION	Unit	Quantity	ITEM PRICE	TOTAL
1	MOBILIZATION	LS	1		
2	TEMPORARY TRAFFIC CONTROL	LS	1		
3	SURVEYING AND CONSTRUCTION STAKING	LS	1		
4	WATER POLLUTION CONTROL	LS	1		
5	CLEARING AND GRUBBING	LS	1		
6	MONUMENT PRESERVATION/PERPETUATION	LS	1		
7	CLASS II AGGREGATE BASE	CY	730		
8	HOT MIX ASPHALT (TYPE A)	TON	530		
9	ASPHALT DIKE (TYPE A) 230 LF	CY	4		
10	TACK COAT	TON	1		
11	COLD PLANE ASPHALT CONCRETE PAVEMENT	SQYD	350		
12	MINOR CONCRETE (CROSS GUTTER)	CY	16		
13	MINOR CONCRETE (CURB AND GUTTER)	CY	68		
14	MINOR CONCRETE (CURB AND GUTTER MODIFIED)	CY	16		
15	MINOR CONCRETE (SIDEWALK)	CY	90		
16	MINOR CONCRETE (CURB RAMP)	CY	40		
17	DETECTABLE WARNING SURFACE	SQFT	88		
18	ADJUST WATER VALVE COVER	EA	2		
19	REPLACE FENCE PER PLANS	LF	10		
20	SIGNING, STRIPING, AND PAVEMENT MARKINGS	LS	1		
21	ROADWAY EXCAVATION	CY	1,200		
22	REMOVAL, DISPOSAL AND REPLACEMENT OF UNSUITABLE MATERIAL	CY	50		
23	MODIFY ROLLING GATE HEIGHT/TOP RAIL AND ADJUST GUIDE WHEELS	EA	2		
24	TIME AND MATERIAL ALLOCATION	LS	1	$50,000	$50,000.00

Total _____

GEOTECHNICAL STUDY REPORT

FOR HEFFERNAN AVENUE IMPROVEMENTS

LANDMARK
Geo-Engineers and Geologists

780 N. 4th Street
El Centro, CA 92243
(760) 370-3000
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October 6, 2021

Mr. Nicholas Oleskowicz
Kimley-Horn
401 B Street, Suite 600
San Diego, CA 92101

Proposed Pavement Improvements
Heffernan Avenue Improvements
11th to 14th Street
Heber, California
LCI Project No. LE21175

Dear Mr. Oleskowicz:

Landmark Consultants, Inc. is pleased to present this report of our geotechnical study for the Heffernan Avenue Improvements (Imperial County roadway limits) in Heber, California that will encompass small portions of 11th and 14th Street at the east end of the Heber Elementary School. The evaluation includes professional opinions regarding new roadway structural sections for the anticipated traffic and infiltration data for stormwater basin sizing.

Field Investigation

Subsurface exploration was performed on September 27, 2021 using a truck-mounted, CME 75 drill rig using 8-inch diameter, hollow-stem, continuous flight augers to advance two (2) borings to a maximum depth of 5 feet below existing pavement surface. Landmark marked the proposed boring locations and then contacted Underground Service Alert of Southern California to locate buried utilities at the boring locations within the proposed roadway prior to drilling. The borings were located approximately as shown on Plate A-2.

A professional engineer observed the drilling operations and maintained a log of the existing pavement structural sections encountered in each boring. The subgrade soils were visually classified during drilling in accordance with the Unified Soil Classification. The bore holes were backfilled with the auger cuttings and tamped into the bore holes. Asphaltic concrete cold mix (3 to 5 inches) was tamped into the bore holes to repair the pavement surface.

The existing roadways consists of a paved two-lane local street with no curbs and unpaved shoulders, aligned in a east-west and north-south directions. Heber Elementary School is located to the west of Heffernan (interior of the 3 roads). The north and south sides of the project are single family homes. To the east along Heffernan there are commercial and medium industrial businesses.

The existing pavement structural section consists of approximately 4.5 to 5.5 inches of asphaltic concrete overlying approximately 0 to 2.5 inches of aggregate base. The subsurface soils below the existing aggregate base consist of clays (CH). Logs of the test borings are provided in Appendix B. Groundwater was not encountered to a depth of 5 feet along the project route. Existing structural sections encountered are shown in the table below.

TABLE 1: EXISTING PAVEMENT STRUCTURAL SECTIONS

Boring	Structural Section
B-1	4.5" of AC over 2.5" of Aggregate Base
B-2	5.5" of AC over native clay subgrade (no base)

Traffic Loading and Pavement Structural Sections

The native subgrade sandy clay (CH) soils have a R-Value strength of 5 when tested in accordance with CALTRANS Test Method CAL 301. Based on the current State of California (CALTRANS) method, the existing pavement structural section was generally found to be inadequate for a Traffic Index (TI) of 6.0. This report provides conventional structural section options by the Caltrans Gravel Equivalent method.

Proposed Pavement Improvements

Table 2 provides different thicknesses for asphaltic concrete (AC) pavement structural sections when placed on native clay soils with R-Value of 5. Geogrid reinforcing may be used at the base of the aggregate base layer to reduce the structural section thickness. The public agency or design engineer should decide the appropriate traffic index for the site. Maintenance of proper drainage is necessary to prolong the service life of the pavements.

TABLE 2 (R-Value=5): CONVENTIONAL STRUCTURAL SECTION

Traffic Index	Flexible Pavements		Flexible Pavements (with geotextile or geogrid reinforcing)	
	Asphaltic Concrete Thickness (in.)	Aggregate Base Thickness (in.)	Asphaltic Concrete Thickness (in.)	Aggregate Base Thickness (in.)
6.0	4.0	11.5	4.0	7.5
7.0	4.0	15.5	4.0	10.0
8.0	5.0	17.5	5.0	11.5

Notes:

1) Asphaltic concrete shall be Caltrans, Type A HMA (Hot Mix Asphalt), ¾ inch maximum (½ inch maximum for parking areas), with PG70-10 asphalt concrete, compacted to a minimum of 95% of the Hveem density (CAL 308) or a minimum of 92% of the Maximum Theoretical Density (ASTM D2041).
2) Aggregate base shall conform to Caltrans Class 2 (¾ in. maximum), compacted to a minimum of 95% of ASTM D1557 maximum dry density.
3) Place pavements on 12 inches of moisture conditioned (minimum 4% above optimum clays) native clay soil compacted to a minimum of 90% (95% if sand subgrade) of the maximum dry density determined by ASTM D1557. Prewetting of subgrade soils (to 3.5 feet) may be required depending on moisture of subgrade at time of aggregate base placement. .
4) Typical Street Classifications (Imperial County).

Parking Areas:	TI = 4.0
Cul-de-Sacs:	TI = 5.0
Local Streets:	TI = 6.0
Minor Collectors:	TI = 6.5 (trash truck areas)
Major Collectors:	TI = 8.0

Geotextile, when used alone, shall consist of Mirafi RS380i or equivalent. Geogrid reinforcing, may also be used with addition of a geotextile fabric. The geogrid shall consist of Tensar TriAx 5 (or Greenbook Type S2 bi-axial geogrid) placed at the base of the aggregate base section with a 6 oz. non-woven geotextile fabric conforming to AASHTO M288 Class 2 Specification placed over the subgrade. Asphaltic concrete shall conform to Caltrans, ¾ inch HMA Type A, compacted to a minimum of 95% of the HVEEM Density (CAL 304/308).

The aggregate base shall conform to Caltrans Class 2 (¾ inch maximum), compacted to a minimum of 95% of ASTM D1557 maximum dry density. Place pavement structural section on 12 inches of moisture conditioned (4% above optimum) native clay soils compacted to a minimum of 90% of the maximum dry density determined by ASTM D1557.

Street Subgrade Preparation: The native clay soils in street areas should be removed and recompacted to 12 inches below the design subgrade elevation. If dry soils are encountered at 12 inches below the design subgrade elevation, an additional 12 inches of native soil shall be uniformly moisture conditioned to 4% above optimum moisture content. Engineered fill in street areas should be uniformly moisture conditioned to a minimum of 4% above optimum moisture, placed in layers not more than 6 inches in thickness and mechanically compacted to a minimum of 90% of the ASTM D1557 maximum dry density.

Sidewalk and Concrete Hardscape Areas: In areas which are to receive sidewalks or area concrete slabs, the ground surface should be presaturated (20% minimum moisture content) to a minimum depth of 24 inches and then scarified to 8 inches, moisture conditioned to a minimum of 5% over optimum, and recompacted to 85-90% of ASTM D1557 maximum density just prior to concrete placement.

Observation and Density Testing: All site preparation and fill placement should be continuously observed and tested by a representative of a qualified geotechnical engineering firm. Full-time observation services during the excavation and scarification process is necessary to detect undesirable materials or conditions and soft areas that may be encountered in the construction area. The geotechnical firm that provides observation and testing during construction shall assume the responsibility of "*geotechnical engineer of record*" and, as such, shall perform additional tests and investigation as necessary to satisfy themselves as to the site conditions and the geotechnical parameters for site development.

Concrete Mixes and Corrosivity

Selected chemical analyses for corrosivity were conducted on bulk samples of the near surface soil from the project site (Plate C-4). The native soils were found to have S2 (severe) levels of sulfate ion concentration (2,835 ppm). Sulfate ions in high concentrations can attack the cementitious material in concrete, causing weakening of the cement matrix and eventual deterioration by raveling. The following table provides American Concrete Institute (ACI) recommended cement types, water-cement ratio and minimum compressive strengths for concrete in contact with soils:

Concrete Mix Design Criteria due to Soluble Sulfate Exposure

Sulfate Exposure Class	Water-soluble Sulfate (SO_4) in soil, ppm	Cement Type	Maximum Water-Cement Ratio by weight	Minimum Strength f'c (psi)
S0	0-1,000	–	–	–
S1	1,000-2,000	II	0.50	4,000
S2	2,000-20,000	V	0.45	4,500
S3	Over 20,000	V (plus Pozzolon)	0.45	4,500

Note: From ACI 318-14 Table 19.3.1.1 and Table 19.3.2.1

A minimum of 6.0 sacks per cubic yard of concrete (4,500 psi) of Type V Portland Cement with a maximum water/cement ratio of 0.45 (by weight) should be used for concrete placed in contact with native soil on this project (sitework including streets, sidewalks, and driveways). Admixtures may be required to allow placement of this low water/cement ratio concrete. Thorough concrete consolidation and hard trowel finishes should be used due to the aggressive soil exposure.

The native soil has very severe levels of chloride ion concentration (1,780 ppm). Chloride ions can cause corrosion of reinforcing steel, anchor bolts and other buried metallic conduits.

Landmark does not practice corrosion engineering. We recommend that a qualified corrosion engineer evaluate the corrosion potential on metal construction materials and concrete at the site to obtain final design recommendations.

Infiltration Testing

Infiltration tests were conducted using the California Test 750 (Caltrans 1986) Method for Determining the Percolation Rate of Soils Using a 8-Inch-Diameter-Test Hole at two (2) total locations within the proposed basin. The percolation rates achieved by field tests were converted to infiltration rates using the approved Riverside County Flood Control Method. The tests were conducted by drilling 8-inch diameter borings to depths of 24 inches. After logging the soil, a 2-inch layer of 3/8" pea gravel was placed in the bottom of each hole.

Each test hole was presoaked with water at a height of at least 5 times the hole's radius above the gravel for a minimum of 2 hours. Presoaking occurred to achieve soil saturation and to allow for swelling of expansive soils.

After the presoaking was complete, the water level was returned to a minimum 20 inches above the pea gravel and measurement readings were then taken at 30 minute intervals. A minimum of eight readings were conducted with a 20-inch water depth re-established in the hole after each 30-minute reading.

The standard Riverside County flood control conversion calculations (Plates C-1 thru 2) were then applied to the percolation rates to determine the final infiltration rates for each location. The percolation rate measures the water level changes due to both vertical and lateral seepage. For the purpose of infiltration basin the vertical movement is of interest and therefore a conversion is applied to the percolation rate to reflect an infiltration rate that excludes water movement laterally through the bore hole sidewalls.

Tests No.	Depth	Infiltration Rate
I-1	24 in.	0.09 in/hour
I-2	24 in.	0.10 in/hour

Clay soils were found in the upper 3 feet of exploration. The infiltration rate for storm water basin design should include appropriate factors of safety. Please review the test information for infiltration testing at the proposed stormwater detention basins for the project and contact our office with any questions or comments.

The opportunity to provide professional services for project design is appreciated. Please contact our office with any questions or comments.

Respectfully Submitted,
Landmark Consultants, Inc.

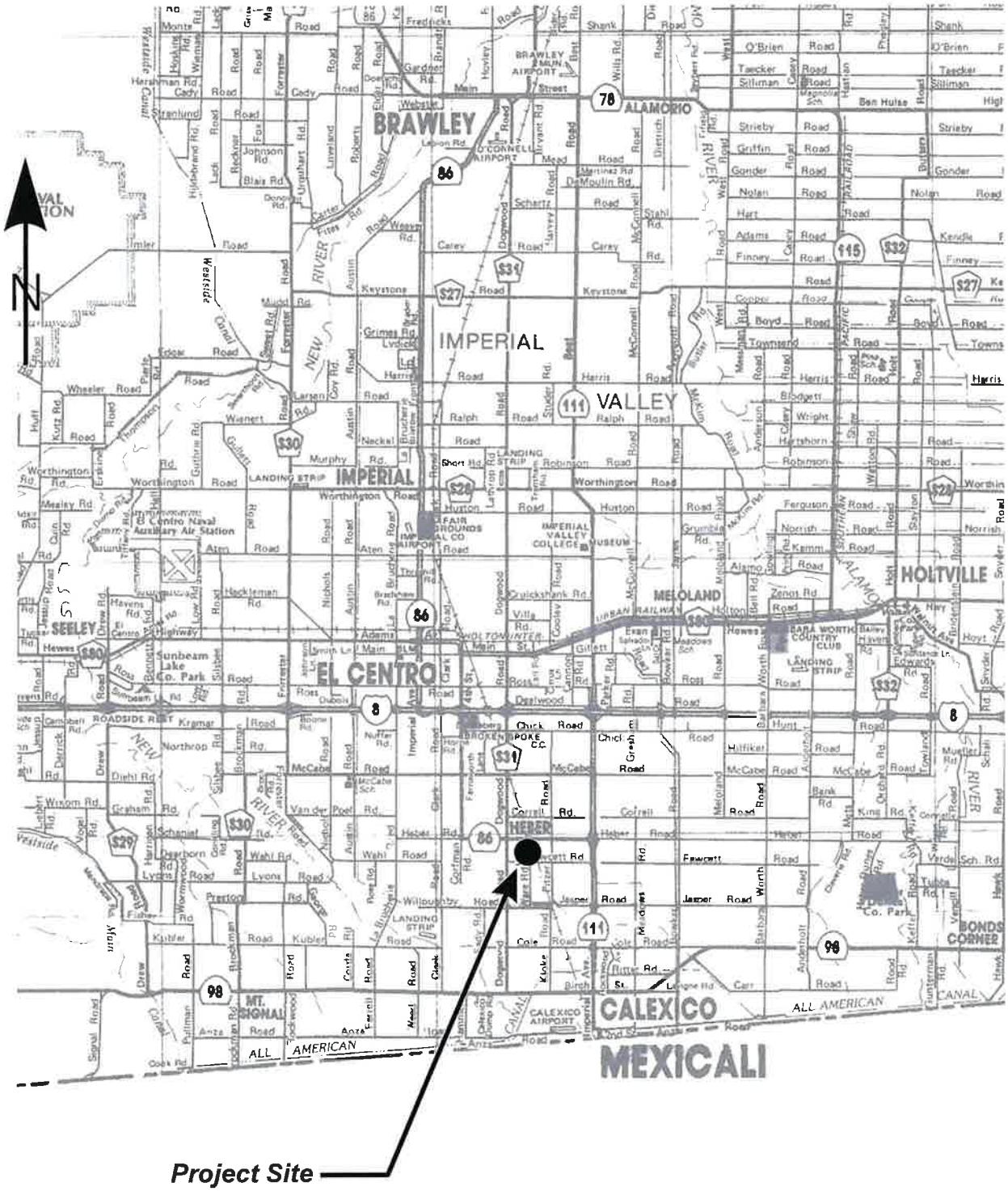
Peter E. LaBrucherie, PE
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
PETER E. LABRUCHERIE
No. 84812
CIVIL
STATE OF CALIFORNIA

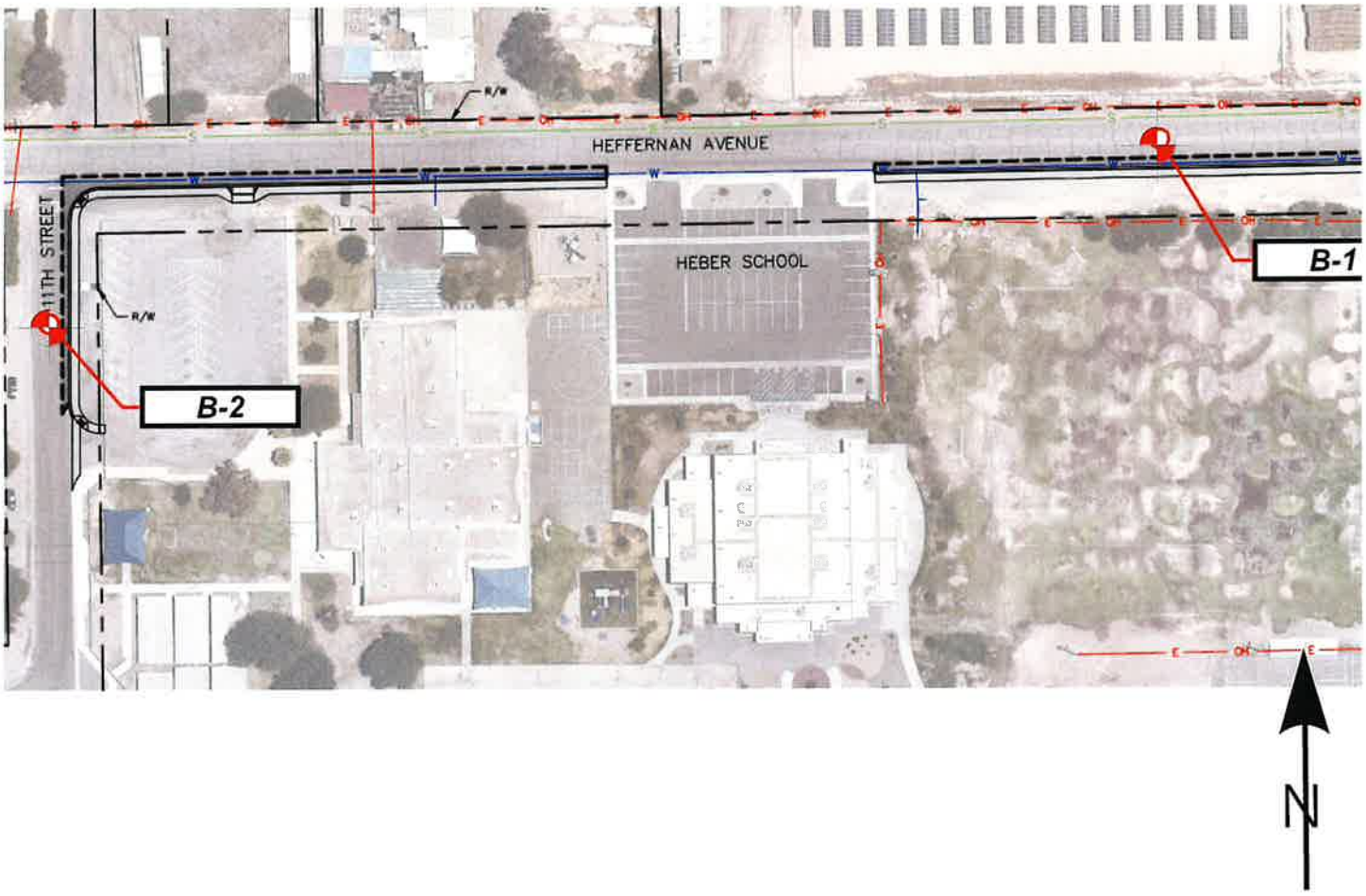
Appendices

APPENDIX A: Vicinity and Site Maps
APPENDIX B: Subsurface Soil Logs and Soil Key
APPENDIX C: Laboratory Test Results

APPENDIX A



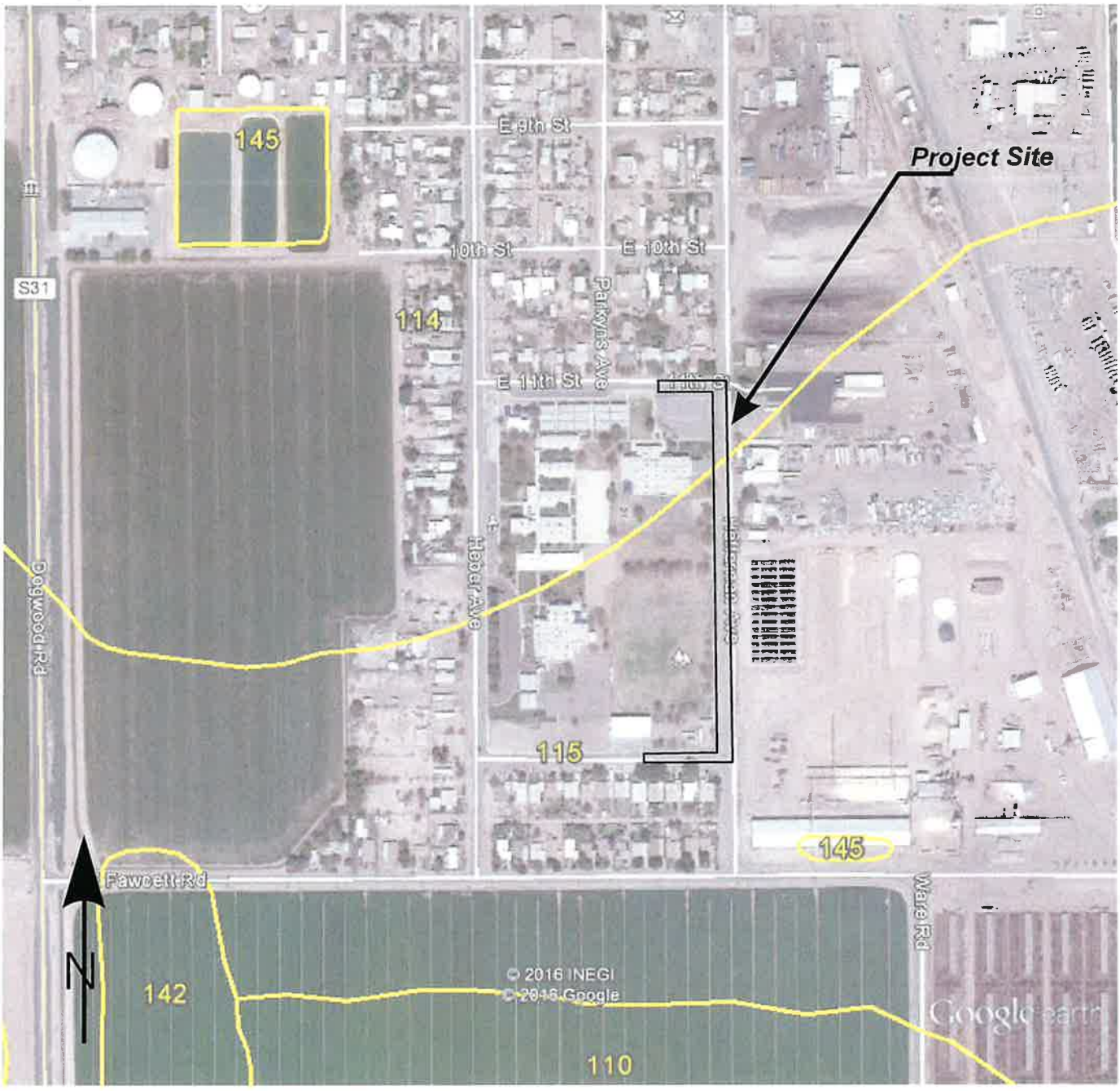
LANDMARK Geo-Engineers and Geologists Project No.: LE21175	Vicinity Map	Plate A-1



LANDMARK
Geo-Engineers and Geologists

Project No.: LE21175

Site and Exploration Map



LANDMARK Geo-Engineers and Geologists Project No.: LE21175	Soil Survey Map	Plate A-3

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
100----------	0-13	2.0-6.0	0.08-0.09	7.9-8.4	<4	Very low	0.17	5	2
Antho	13-60	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low-------	0.32		
101*:									
Antho----------	0-8	2.0-6.0	0.08-0.09	7.9-8.4	<4	Very low	0.17	5	2
	8-60	2.0-6.0	0.08-0.12	7.9-8.4	<4	Low-------	0.32		
Superstition----	0-6	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15	5	2
	6-60	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15		
102*.									
Badland									
103----------	0-10	6.0-20	0.03-0.06	7.4-8.4	<4	Low-------	0.10	5	1
Carsitas	10-60	6.0-20	0.03-0.06	7.4-8.4	<4	Low-------	0.10		
104*.									
Fluvaquents									
105----------	0-13	0.2-0.6	0.19-0.21	7.4-8.4	2-4	Moderate	0.37	5	4L
Glenbar	13-60	0.2-0.6	0.19-0.21	7.4-8.4	2-4	Moderate	0.37		
106----------	0-13	0.2-0.6	0.19-0.21	7.4-8.4	2-8	Moderate	0.37	5	4L
Glenbar	13-60	0.2-0.6	0.19-0.21	7.4-8.4	2-8	Moderate	0.37		
107*----------	0-13	0.6-2.0	0.13-0.15	8.5-9.0	4-8	Low-------	0.43	5	4L
Glenbar	13-60	0.2-0.6	0.16-0.18	8.5-9.0	>4	Moderate	0.43		
108----------	0-14	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low-------	0.43	5	4L
Holtville	14-22	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High------	0.32		
	22-60	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low-------	0.43		
109, 110---------	0-17	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High------	0.32	5	4
Holtville	17-24	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High------	0.32		
	24-35	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low-------	0.43		
	35-60	2.0-6.0	0.08-0.10	7.4-8.4	2-8	Low-------	0.28		
111*:									
Holtville-------	0-10	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High------	0.32	5	4
	10-22	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High------	0.32		
	22-60	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low-------	0.43		
Imperial--------	0-12	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43	5	4
	12-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43		
112----------	0-12	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43	5	4
Imperial	12-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43		
113----------	0-12	0.06-0.2	0.06-0.17	8.5-9.0	>8	High------	0.43	5	4
Imperial	12-60	0.06-0.2	0.06-0.17	8.5-9.0	>8	High------	0.43		
114----------	0-12	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43	5	4
Imperial	12-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43		
115*:									
Imperial--------	0-12	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43	5	4
	12-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43		
Glenbar----------	0-13	0.2-0.6	0.19-0.21	7.9-8.4	2-8	Moderate	0.37	5	4L
	13-60	0.2-0.6	0.19-0.21	7.9-8.4	2-8	Moderate	0.37		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

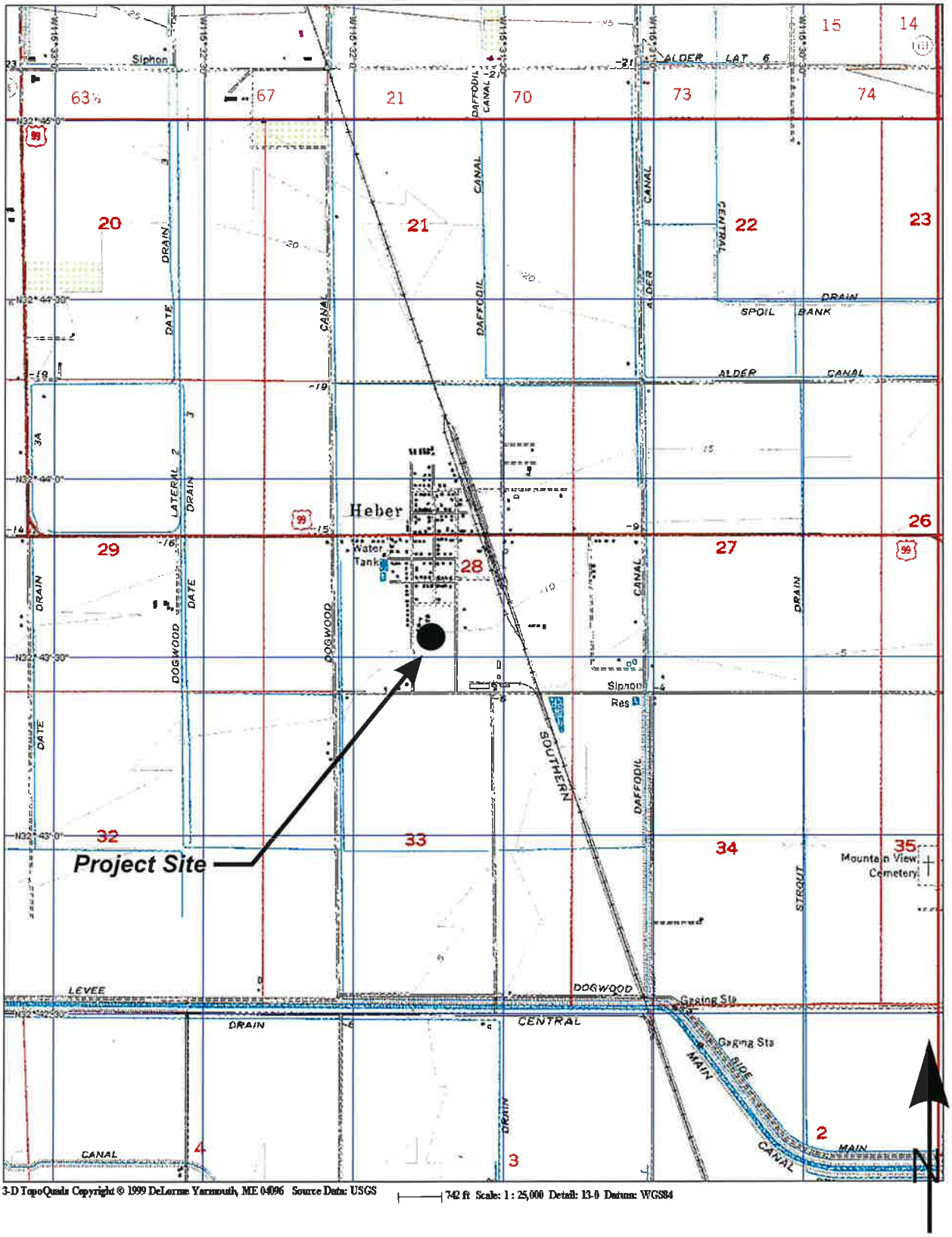
Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
116*:									
Imperial	0-13	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High	0.43	5	4
	13-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High	0.43		
Glenbar	0-13	0.2-0.6	0.19-0.21	7.9-8.4	2-4	Moderate	0.37	5	4L
	13-60	0.2-0.6	0.19-0.21	7.9-8.4	2-4	Moderate	0.37		
117, 118	0-12	0.6-2.0	0.18-0.20	7.9-8.4	<4	Low	0.55	5	4L
Indio	12-72	0.6-2.0	0.16-0.20	7.9-8.4	<4	Low	0.49		
119*:									
Indio	0-12	0.6-2.0	0.18-0.20	7.9-8.4	<4	Low	0.55	5	4L
	12-72	0.6-2.0	0.16-0.20	7.9-8.4	<4	Low	0.49		
Vint	0-10	2.0-6.0	0.09-0.11	7.9-8.4	2-4	Low	0.24	4	2
	10-60	2.0-6.0	0.09-0.11	7.9-8.4	2-4	Low	0.24		
120*	0-12	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	0.37	4	4L
Laveen	12-60	0.6-2.0	0.16-0.18	7.9-8.4	<4	Low	0.43		
121	0-12	2.0-6.0	0.08-0.09	7.4-8.4	2-8	Low	0.28	5	1
Meloland	12-26	0.6-2.0	0.08-0.25	7.4-8.4	2-8	Low	0.43		
	26-71	0.06-0.2	0.06-0.15	7.4-8.4	8-16	High	0.32		
122	0-12	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low	0.43	5	4L
Meloland	12-26	0.6-2.0	0.08-0.25	7.4-8.4	2-8	Low	0.43		
	26-71	0.06-0.2	0.06-0.15	7.4-8.4	8-16	High	0.32		
123*:									
Meloland	0-12	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low	0.43	5	4L
	12-26	0.6-2.0	0.08-0.25	7.4-8.4	2-8	Low	0.43		
	26-38	0.06-0.2	0.06-0.15	7.4-8.4	8-16	High	0.32		
	38-60	0.6-2.0	0.08-0.25	7.4-8.4	8-16	Low	0.43		
Holtville	0-12	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low	0.43	5	4L
	12-24	0.06-0.2	0.17-0.25	7.4-8.4	2-8	High	0.32		
	24-36	0.6-2.0	0.15-0.25	7.4-8.4	2-8	Low	0.43		
	36-60	2.0-6.0	0.08-0.10	7.4-8.4	2-8	Low	0.28		
124, 125	0-23	6.0-20	0.04-0.06	7.9-8.4	2-8	Low	0.24	5	1
Niland	23-60	0.06-0.2	0.10-0.16	7.9-8.4	2-16	High	0.32		
126, 127	0-23	6.0-20	0.06-0.08	7.9-8.4	2-8	Low	0.28	5	2
Niland	23-60	0.06-0.2	0.10-0.16	7.9-8.4	2-16	High	0.32		
128*:									
Niland	0-23	6.0-20	0.04-0.06	7.9-8.4	2-8	Low	0.24	5	1
	23-60	0.06-0.2	0.10-0.16	7.9-8.4	2-16	High	0.32		
Imperial	0-12	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High	0.43	5	4
	12-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High	0.43		
129*.									
Pits									
130, 131, 132,									
133, 134	0-9	6.0-20	0.05-0.07	7.9-8.4	2-4	Low	0.20	5	1
Rositas	9-60	6.0-20	0.05-0.08	7.9-8.4	2-4	Low	0.20		
135	0-9	6.0-20	0.05-0.07	7.9-8.4	2-8	Low	0.20	5	1
Rositas	9-60	6.0-20	0.05-0.08	7.9-8.4	2-8	Low	0.20		
136	0-4	6.0-20	0.06-0.08	7.9-8.4	2-4	Low	0.20	5	2
Rositas	4-60	6.0-20	0.05-0.08	7.9-8.4	2-4	Low	0.20		
137	0-12	0.6-2.0	0.20-0.25	7.9-8.4	2-4	Low	0.49	5	4L
Rositas	12-60	6.0-20	0.05-0.08	7.9-8.4	2-4	Low	0.20		
138*:									
Rositas	0-4	6.0-20	0.06-0.08	7.9-8.4	2-4	Low	0.20	5	2
	4-60	6.0-20	0.05-0.08	7.9-8.4	2-4	Low	0.20		

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group
							K	T	
	In	In/hr	In/in	pH	Mmhos/cm				
138*:									
Superstition----	0-6	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15	5	2
	6-60	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15		
139----------	0-6	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15	5	2
Superstition	6-60	2.0-6.0	0.05-0.11	7.9-8.4	<2	Low-------	0.15		
140*:									
Torriorthents									
Rock outcrop									
141*:									
Torriorthents									
Orthids									
142----------	0-10	2.0-6.0	0.10-0.20	7.9-8.4	2-8	Low-------	0.32	5	3
Vint	10-60	2.0-6.0	0.09-0.11	7.9-8.4	2-8	Low-------	0.17		
143----------	0-12	0.6-2.0	0.13-0.15	7.9-8.4	2-4	Low-------	0.37	4	3
Vint	12-60	2.0-6.0	0.09-0.11	7.9-8.4	2-4	Low-------	0.24		
144*:									
Vint----------	0-10	2.0-6.0	0.10-0.20	7.9-8.4	2-8	Low-------	0.32	5	3
	10-40	2.0-6.0	0.09-0.11	7.9-8.4	2-8	Low-------	0.17		
	40-60	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43	5	3
Indio----------	0-12	0.6-2.0	0.18-0.20	7.9-8.4	<4	Low-------	0.55	5	4L
	12-40	0.6-2.0	0.16-0.20	7.9-8.4	<4	Low-------	0.49		
	40-70	0.06-0.2	0.17-0.35	7.9-8.4	4-8	High------	0.43		

* See description of the map unit for composition and behavior characteristics of the map unit.



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 Source Data: USGS 742 ft Scale: 1 : 25,000 Detail: 13-0 Datum: WGS84

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Project No.: LE21175

Topographic Map

Plate A-4

APPENDIX B

LOG OF BORING NO. B-1

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
					4.5" Asphaltic Concrete over 2.5" Aggregate Base			
					CLAY (CH): Brown, moist to very moist, firm.		16.8%	
5					Total Depth = 5' Groundwater was not encountered at time of exploration Backfilled with excavated soil			
10								
15								
20								
25								
30								

DATE DRILLED: 9/27/21 TOTAL DEPTH: 5.0 Feet DEPTH TO WATER: NA

LOGGED BY: P. LaBrucherie TYPE OF BIT: Hollow Stem Auger DIAMETER: 8 in.

SURFACE ELEVATION: Approximately -10' HAMMER WT.: N/A DROP: N/A

PROJECT No. LE21175

LANDMARK Geo-Engineers and Geologists

PLATE B-1

LOG OF BORING NO. B-2

SHEET 1 OF 1

DEPTH	FIELD: SAMPLE	FIELD: USCS CLASS.	FIELD: BLOW COUNT	FIELD: POCKET PEN. (tsf)	DESCRIPTION OF MATERIAL	LABORATORY: DRY DENSITY (pcf)	LABORATORY: MOISTURE CONTENT (% dry wt.)	LABORATORY: OTHER TESTS
					5.5" Asphaltic Concrete with no Aggregate Base			
					CLAY (CH): Brown, very moist, firm.		22.2%	LL=56, PI=39
5					Total Depth = 5' Groundwater was not encountered at time of exploration Backfilled with excavated soil			
10								
15								
20								
25								
30								

DATE DRILLED: 9/27/21 TOTAL DEPTH: 5.0 Feet DEPTH TO WATER: NA

LOGGED BY: P. LaBrucherie TYPE OF BIT: Hollow Stem Auger DIAMETER: 8 in.

SURFACE ELEVATION: Approximately -10' HAMMER WT.: N/A DROP: N/A

PROJECT No. LE21175

LANDMARK Geo-Engineers and Geologists

PLATE B-2

APPENDIX C

PERCOLATION RATE CONVERSION

CLIENT: Kimley-Horn
PROJECT: Heffernan Ave. Improvements - Heber, CA
PROJECT NO.: LE21175
DATE: 10/4/2021

TEST HOLE NO: I-1

Time interval	**Δt :**	30	minutes	**Total Depth of Test Hole**	**Dt :**	24	inches
Initial Depth to Water	**Do :**	4	inches	**²Test Hole Radius**	**r :**	4	inches
Final Depth to Water	**Df :**	4.5	inches				

The conversion equation is used:

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t(r+2H_{avg}}$$

"H_o" is the initial height of water at the selected time interval

$H_o = D_T - D_0$ **Ho = 24 - 4 = 20 inches**

"H_f" is the final height of water at the selected time interval

$H_f = D_T - D_f$ **Hf = 24 - 4.5 = 19.5 inches**

"ΔH" is the change in height over the time interval

$\Delta H = \Delta D = H_o - H_f$ **ΔH = 20 - 19.5 = 0.5 inches**

"H_{avg}" is the average head height over the time interval

$H_{avg} = (H_o + H_f)/2$ **Havg = (20 - 19.5)/2 = 19.75 inches**

"I_t" is the tested infiltration rate

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})}$$

It = $\frac{0.5 \times 60 \times 4}{30 \times (4 + 2 \times 19.75)}$ **= 0.09 in/hr**

LANDMARK Geo-Engineers and Geologists **Project No.: LE21175**	**Percolation Rate Conversion**	**Plate C-1**

PERCOLATION RATE CONVERSION

CLIENT: Kimley-Horn
PROJECT: Heffernan Ave. Improvements - Heber, CA
PROJECT NO.: LE21175
DATE: 10/4/2021

TEST HOLE NO: I-2

Time interval	**Δt :**	30	minutes	**Total Depth of Test Hole**	**Dt :**	24	inches
Initial Depth to Water	**Do :**	6	inches	**²Test Hole Radius**	**r :**	4	inches
Final Depth to Water	**Df :**	6.5	inches				

The conversion equation is used:

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t(r+2H_{avg}}$$

"H_o" is the initial height of water at the selected time interval

$H_o = D_T - D_0$ **Ho = 24 - 6 = 18 inches**

"H_f" is the final height of water at the selected time interval

$H_f = D_T - D_f$ **Hf = 24 - 6.5 = 17.5 inches**

"ΔH" is the change in height over the time interval

$\Delta H = \Delta D = H_o - H_f$ **ΔH = 18 - 17.5 = 0.5 inches**

"H_{avg}" is the average head height over the time interval

$H_{avg} = (H_o + H_f)/2$ **Havg = (18 - 17.5)/2 = 17.75 inches**

"I_t" is the tested infiltration rate

$$I_t = \frac{\Delta H\ 60\ r}{\Delta t\ (r+2H_{avg})}$$

It = $\frac{0.5 \times 60 \times 4}{30 \times (4 + 2 \times 17.75)}$ = 0.10 in/hr

LANDMARK Geo-Engineers and Geologists **Project No.: LE21175**	**Percolation Rate Conversion**	**Plate C-2**

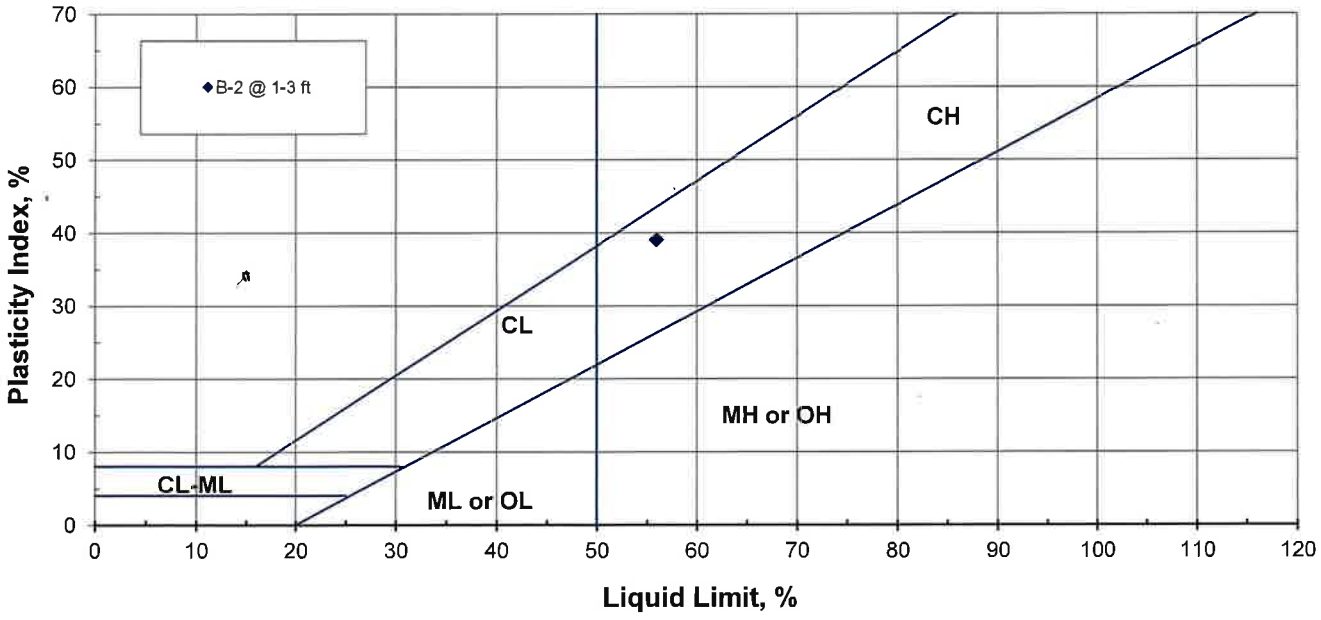
LANDMARK CONSULTANTS, INC.

CLIENT: Kimley-Horn
PROJECT: Heffernan Ave. Improvements - Heber, CA
JOB No.: LE21175
DATE: 10/06/21

ATTERBERG LIMITS (ASTM D4318)

Sample Location	Sample Depth (ft)	Liquid Limit (LL)	Plastic Limit (PL)	Plasticity Index (PI)	USCS Classification
B-2	1-3	56	17	39	CH

PLASTICITY CHART



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Project No.: LE21175

Atterberg Limits Test Results

Plate C-3

LANDMARK CONSULTANTS, INC.

CLIENT: Kimley-Horn
PROJECT: Heffernan Ave. Improvements - Heber, CA
JOB No.: LE21175
DATE: 10/06/21

CHEMICAL ANALYSIS

Boring:	B-1	**Caltrans Method**
Sample Depth, ft:	3-Jan	
pH:	7.18	**643**
Electrical Conductivity (mmhos):	--	**424**
Resistivity (ohm-cm):	--	**643**
Chloride (Cl), ppm:	1,780	**422**
Sulfate (SO4), ppm:	2,835	**417**

General Guidelines for Soil Corrosivity

Material Affected	Chemical Agent	Range of Values	Degree of Corrosivity
Concrete	Soluble Sulfates (ppm)	0 - 1,000	Low
		1,000 - 2,000	Moderate
		2,000 - 20,000	Severe
		> 20,000	Very Severe
Normal Grade Steel	Soluble Chlorides (ppm)	0 - 200	Low
		200 - 700	Moderate
		700 - 1,500	Severe
		> 1,500	Very Severe
Normal Grade Steel	Resistivity (ohm-cm)	1 - 1,000	Very Severe
		1,000 - 2,000	Severe
		2,000 - 10,000	Moderate
		> 10,000	Low

LANDMARK Geo-Engineers and Geologists

Project No.: LE21175

Selected Chemical Test Results

Plate C-4

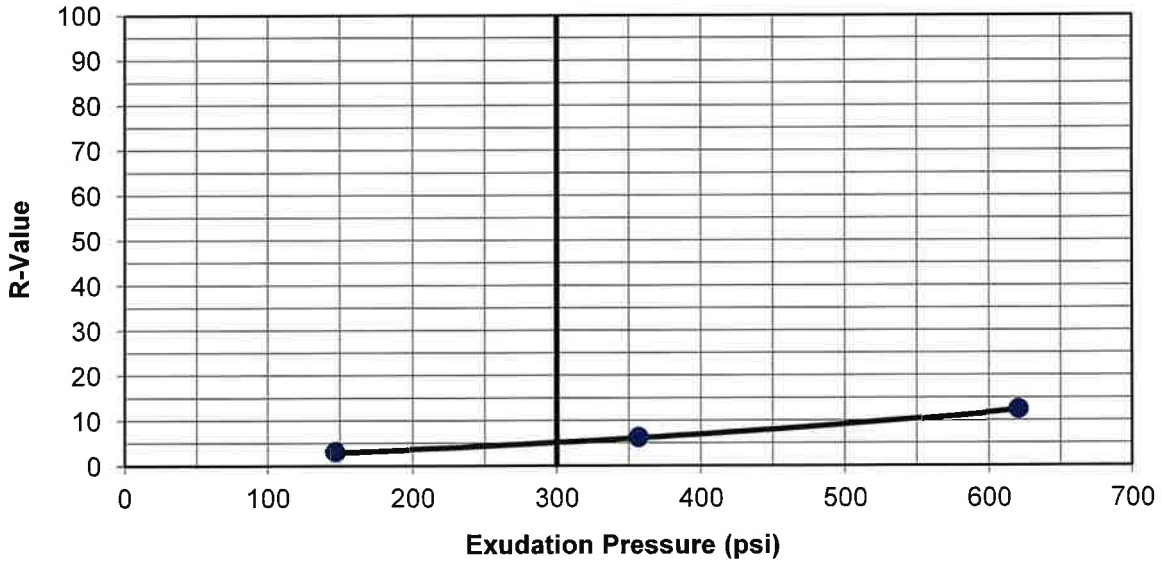
LANDMARK CONSULTANTS, INC.

Client: Kimley-Horn
Project: Heffernan Ave. Improvements - Heber, CA
Project No.: LE21175
Date: 10/4/2021 **Lab No.:** EC21-604

R-Value By Exudation Pressure (ASTM D2844/CAL 301)

Description: Clay (CH)
Sample Location: B-1
Sample Depth: 1.5-5.0 ft.

Sample	A	B	C
Moisture Content, %:	15.0%	14.0%	13.0%
Dry Density, pcf:	217.5	198.8	213.4
Compaction foot pressure, psi:	80	90	110
Specimen Height, in.:	2.53	2.61	2.61
Stabilometer, Ph @ 1000 lb:	70	65	54
Stabilometer, Ph @ 2000 lb:	152	145	133
Displacement:	4.83	3.82	3.50
Expantion pressure, psf:	100	100	100
Exudation pressure, psi:	147	357	621
Equilibrum R Value:	3	6	12
R-Value	5		



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Project No.: LE21175

R-Value Test

Plate
C-5