INFORMATION HANDOUT

For Contract No. 12-0M3404
At 12-Ora-73,133-PM 16.6, 4.2

Identified by
Project ID 1212000017

MATERIALS INFORMATION

Aerially Deposited Lead Site Investigation Report

Geotechnical Design Report

Materials Report

AERIALLY DEPOSITED LEAD SITE INVESTIGATION
STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA
TASK ORDER NO. 12-0H4401-34
EA NO. 0H4401, CONTRACT NO. 12A1139

PREPARED FOR:
State of California
Department of Transportation
District 12, Environmental Engineering
3347 Michelson Drive, Suite 100
Irvine, California 92612-1692

PREPARED BY:
Ninyo & Moore
Geotechnical and Environmental Sciences Consultants
475 Goddard, Suite 200
Irvine, California 92618

June 28, 2010
Project No. 207384034

AERIALLY DEPOSITED LEAD INVESTIGATION REPORT
Task Order No. 12-0H4401-34
E.A. 0H4401

This report was prepared by the staff of Ninyo & Moore Geotechnical and Environmental Sciences Consultants under the supervision of the Engineer and/or Geologist whose signature appears hereon.

The findings, recomendations, specifications, or professional opinions are presented within the limits described by the client, after being prepared in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

Walter R. Crone, P.G. 4350, R.E.A.
Principal Environmental Geologist

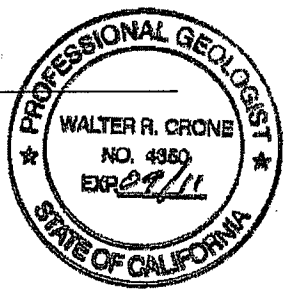


TABLE OF CONTENTS

Figures

Appendices

EXECUTIVE SUMMARY

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an Aerially Deposited Lead (ADL) Site Investigation (SI) along Sate Route 73 (SR-73) between Interstate 5 (I-5) and MacArthur Boulevard in Orange County, California (site). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0H4401-34 (TO 34), dated April 8, 2010. It is our understanding that the Department is planning to perform grading, temporary erosion measures, construct retaining walls, concrete v-ditches, asphalt paving, riprap dissipation, gravel access roads, asphalt curbs, concrete catchment walls, chain link fences, and planting along both directions of SR-73 at the site.

This ADL SI was performed to evaluate the background levels of lead along SR-73. Data collected during this investigation were used to develop recommendations for the potential reuse or disposal of soil excavated from the site and to inform the Department of potential health and safety issues concerning the presence of lead in soil for workers at the site during construction activities. Leaded gasoline has not been used since before SR-73 was constructed.

One hundred one samples were collected from fifty-one borings (B1 through B51). The surface samples from each boring were submitted for chemical testing; the remaining samples were held. None of the 51 analyzed samples contained a total lead concentration greater than or equal to 50 milligrams per kilogram (mg/kg) and subsequent analyses for soluble lead were not conducted. The detected concentrations of lead were less than the maximum background concentrations reported by others for Southern California (Kearney, 1996). Because the detected lead concentrations in the surface samples appear to be at background levels, and because leaded gasoline has not been used since before the SR-73 was constructed, it is reasonable to assume that the deeper soil (0.5 to 4 feet) contains similar background concentrations of lead. Six samples were analyzed for pH. The maximum detected pH level was 8.7. The minimum detected pH level was 7.1. The detected pH levels would not cause the site soil to be classified as Resource, Conservation, and Recovery Act (RCRA) hazardous waste and is greater than the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC) lower limit of 5.0.

Our recommendations for soil reuse on site are based on the guidelines set forth by the DTSC, Lead Variance issued to the Department on June 30, 2009 (DTSC Variance). Laboratory analytical results for lead were compared to the guidelines of the DTSC Variance for potential reuse of the soil as fill within the Department right-of-way (ROW).

Our recommendations for off-site disposal were based on the comparison of lead concentrations in soil samples to the DTSC Variance thresholds, the California Health and Safety Code thresholds, and Title 40 Code of Federal Regulations (CFR) 261.24 thresholds.

Based on the analytical results and the statistical data evaluation, the on-site reuse and the off-site disposal recommendations are summarized below.

Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A, soil in the surface layer (surface to 0.5 feet below ground surface [bgs]) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 1.5- to 4-foot layer (0.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario B, soil in the surface to 1.5-foot layer (surface to 1.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 3- to 4-foot layer (1.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario C, soil in the surface to 3-foot layer (surface to 3 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 4-foot layer (3 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario D, soil in the surface to 4-foot layer is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

Recommendations for Soil to be Disposed Off Site

If the Department elects to dispose the soil off site, the following restrictions apply:

- Scenario A, soil in the surface layer (surface to 0.5 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 1.5- to 4-foot layer (0.5 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario B, soil in the surface to 1.5-foot layer (surface to 1.5 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 3- to 4-foot layer (1.5 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario C, soil in the surface to 3-foot layer (surface to 3 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 4-foot layer (3 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario D, soil in the surface to 4-foot layer has no restrictions with respect to total lead concentrations.

The Department should notify the contractors performing the construction activities that elevated concentrations of lead may be present in on-site soil. Appropriate health and safety measures should be taken to minimize the potential exposure to lead.

1. INTRODUCTION

The State of California Department of Transportation (Department) authorized Ninyo & Moore to conduct an Aerially Deposited Lead (ADL) Site Investigation (SI) along Sate Route 73 (SR-73) between Interstate 5 (I-5) and MacArthur Boulevard in Orange County, California (site; Figure 1). Work was conducted in general accordance with the Department Contract No. 12A1139, Task Order No. 12-0H4401-34 (TO 34), dated April 8, 2010.

1.1. Project Description and Objective

It is our understanding that the Department is planning to perform grading, temporary erosion measures, construct retaining walls, concrete v-ditches, asphalt paving, riprap dissipation, gravel access roads, asphalt curbs, concrete catchment walls, chain link fences, and planting along both directions of SR-73. This report has been prepared by Ninyo & Moore to document the results of a study to compare detected lead concentrations to background levels along the unpaved shoulder and slope in the area of the site adjacent to SR-73. Fifty-one borings were hand augered at the site (Figures 2 through 13).

1.2. Scope of Work

Ninyo & Moore performed the tasks described in the following sections.

1.2.1. Prefield Activities

Prefield activities included:

- Preparing a site specific health and safety plan (HSP).
- Marking boring locations at the site.
- Notifying Underground Service Alert (USA) that Ninyo & Moore would be advancing soil borings in the area (USA ticket numbers A01321300, A01321311, 325, 343, 362, 365, 384, A01321388, A01321403, A01321412, A01321419, A01321423, and A01321427).
- Preparing a project schedule, and coordinating work with subcontractors.

1.2.2. Soil Sampling

Soil sampling was conducted on May 19 and 20, 2010. Fifty-one sampling locations (B1 through B51) were used, as shown on Figures 2 through 13. The borings were advanced and sampled using a hand auger. Two soil samples were attempted for collection from depths of surface to ½ foot and 1½ to 2 feet.

1.2.3. Laboratory Analysis

Ninyo & Moore submitted the soil samples under chain of custody to Advanced Technology Laboratories (ATL) of Signal Hill, California, a laboratory certified by the State of California Department of Health Services Environmental Laboratory Accreditation Program (ELAP).

1.2.4. Global Positioning System (GPS) Surveying

Approximate latitude and longitude (North American Datum [NAD] 83) of sampling locations were recorded with a handheld global positioning system (GPS) unit (GeoXT, Trimble). The latitude and longitude data for each boring are presented on Table 1.

1.2.5. Report Preparation

This report was prepared in general accordance with Department Contract No. 12A1139 and TO 34 dated April 8, 2010.

1.3. Previous Site Investigations

Ninyo & Moore has not performed previous investigations at this site. In addition, the Department has not notified Ninyo & Moore of previous investigations performed at the site.

2. BACKGROUND

The Department obtained a variance (V09 HQSCD006) from the California Environmental Protection Agency (Cal-EPA), Department of Toxic Substances Control (DTSC), on June 30, 2009 (DTSC Variance). The DTSC Variance allows for conditional reuse of lead-impacted soil within

the Department right-of-way (ROW). Background information regarding the source of ADL and the reuse or disposal of lead-impacted soil is discussed in the following sections.

2.1. Aerially Deposited Lead in Soil

Analyses for lead in soil along highways throughout the state of California have revealed that lead is commonly present along the shoulders of the highways constructed prior to approximately the mid-1980s as a result of automobile exhaust containing lead from the combustion of leaded gasoline. Elevated concentrations of lead are commonly found along the shoulders of these highways in the upper 2 feet of soil. Lead concentrations in soil are dependent on many variables; but in general, are a function of the age of the highway and the volume of traffic using the highway (DTSC, 2009).

2.2. Hazardous Waste Classification Criteria

Soil that exceeds the following limitations may be classified as hazardous waste with respect to lead concentrations:

- The soil contains more than 1,000 milligrams per kilogram (mg/kg) total lead, exceeding the Total Threshold Limit Concentration (TTLC) for California hazardous waste (Title 22 California Code of Regulations [CCR], Section 66261.24);
- The soil contains more than 5.0 milligrams per liter (mg/l) citric acid-extractable lead, exceeding the Soluble Threshold Limit Concentration (STLC) for California hazardous waste (Title 22 CCR, Section 66261.24);
- The soil contains more than 5.0 mg/l leachable lead using the Toxicity Characteristic Leaching Procedure (TCLP), exceeding the maximum concentration for the toxicity characteristic of the Resource, Conservation, and Recovery Act (RCRA; Title 40 Code of Federal Regulations [CFR] 261.24); or
- The soil pH is less than or equal to 2.0 or greater than or equal to 12.5, which exceeds the limits for the corrosivity characteristic of RCRA hazardous waste (40CFR 261.22) and California hazardous waste (Title 22 CCR, Section 66261.22).

2.3. DTSC Variance

In accordance with the DTSC Variance, soil that is subject to the guidelines presented below may be reused within the Department ROW. A chart presenting the different ADL soil type classifications is included in Appendix A.

2.3.1. Reuse – Condition 1

Soil containing less than 1.5 mg/l extractable lead by the Waste Extraction Test (WET) using de-ionized water as the extractant (WET-DI) and less than or equal to 1,411 mg/kg total lead (United States Environmental Protection Agency [EPA] Method 6010B) may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and covered with at least 1 foot of non-hazardous soil.

2.3.2. Reuse – Condition 2

Soil containing greater than or equal to 1.5 mg/l but less than 150 mg/l extractable lead by WET-DI method, or more than 1,411 mg/kg total lead but less than 3,397 mg/kg total lead, may be used as fill in the Department ROW provided the soil is placed a minimum of 5 feet above the maximum level of the water table and protected from infiltration by a paved structure that will be maintained by the Department.

2.3.3. Reuse – Condition 3

Lead-contaminated soil with a pH less than 5.5 but greater than 5.0 shall only be used as fill material under the paved portion of the roadway. Lead-contaminated soil with a pH at or less than 5.0 shall be managed as a hazardous waste.

2.4. Criteria for Disposal of Soil Not Intended for Reuse On Site

If the Department elects to dispose soil within the Department ROW that has been excavated during construction activities, the soil may be classified either as hazardous waste or non-hazardous waste. The distinction is based on the total and soluble lead concentrations compared to the TTLC and STLC criteria. As mentioned in Section 2.2, the TTLC for total lead

is 1,000 mg/kg and the STLC for citric acid extractable lead is 5.0 mg/l. Waste containing lead concentrations in excess of or equal to those listed must be disposed at a Class I hazardous waste disposal facility pursuant to State of California regulations.

3. INVESTIGATION METHODS

The investigation activities are described in the following subsections and were conducted in general accordance with TO 34 that was approved by the Department prior to beginning the field activities.

3.1. Health and Safety Plan (HSP)

A site-specific HSP dated May 13, 2010, was prepared by Ninyo & Moore and submitted to the Department for approval prior to commencing field work.

3.2. Utility Clearance

The boring locations were described to USA during the notification at least 48 hours prior to conducting the soil sampling. USA marked the member utilities known to be in the vicinity of the boring locations.

3.3. Hand-Auger Sampling

The field work was conducted on May 19 and 20, 2010. The boring locations were approved by the Department Task Order Manager and are shown on the attached Figures 2 through 13. Two samples were attempted for collection from each of 51 boreholes (B1 through B51) at depths of 0 to ½ foot and 1½ to 2 feet below ground surface (bgs) unless refusal was encountered.

Samples were placed into new, 4-ounce, glass jars; capped with Teflon-coated plastic lids; labeled; placed in a resealable plastic bag; and stored in a cooler. The sampling equipment was decontaminated between each boring. Soil samples were transferred under chain-of-

custody (COC) protocol to ATL within 24 hours of collection. In accordance with TO 34, soil sample homogenization was performed in the laboratory.

Hand augering was conducted by Ninyo & Moore personnel.

3.4. Investigative-Derived Wastes

Soil cuttings generated by hand-auger drilling were returned to their corresponding bore-holes after collection of soil samples. Decontamination water was transported to Ninyo & Moore's Irvine office and placed in a drum pending chemical characterization. Based on the result of the decontamination water sample (non-detect), the decontamination water was subsequently disposed in the sanitary sewer.

3.5. Laboratory Analyses

Once the samples were received by ATL, the samples selected for analyses were homogenized and analyzed for the following:

- Fifty-one soil samples were analyzed for total lead using EPA Method 6010B;
- Approximately 10 percent of the soil samples (6 samples) were analyzed for pH using EPA Method 9045; and
- One sample of the decontamination water was analyzed for total lead using EPA Method 6010B.

4. ANALYTICAL RESULTS

The results of this investigation are described in the following subsections. The analytical results of lead and pH are summarized in Table 1, and the sampling locations with their corresponding data are shown on Figures 14 through 28. Laboratory reports and COC records are included in Appendix B.

4.1. Total Lead

Fifty-one samples were analyzed for total lead. The maximum total lead concentration was 20 mg/kg. The minimum total lead concentration was less than the laboratory practical quantitation limit of 5.0 mg/kg (Table 1).

The decontamination water sample did not contain a reportable concentration of lead.

4.2. pH

Approximately 10 percent of the Group 2 samples collected (six samples) were analyzed for pH. The maximum detected pH level was 8.7. The minimum detected pH level was 7.1. The soil pH values are not characteristic of RCRA hazardous waste and are above the lower limit of 5.0 specified in the DTSC Variance.

5. STATISTICAL EVALUATION

Because no samples contained total lead concentrations in excess of 50 mg/kg, additional testing was not performed and statistical analyses were not performed.

6. CONCLUSIONS

Inspection of the data indicates that the detected concentrations of total lead are less than the maximum background lead in soil concentrations reported by others for Southern California (Kearney, 1996). Because the detected lead concentrations in the surface samples appear to be at background levels, and because leaded gasoline has not been used since before the SR-73 was constructed, it is reasonable to assume that the deeper soil (0.5 to 4 feet) contains similar background concentrations of lead.

7. RECOMMENDATIONS

Based on the findings of this study, recommendations are summarized on block diagrams in Appendix C and discussed below.

Group 2 Recommendations for Soil for Reuse by the Department

Soil at the site can be reused on site with the following restrictions:

- Scenario A, soil in the surface layer (surface to 0.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 1.5- to 4-foot layer (0.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario B, soil in the surface to 1.5-foot layer (surface to 1.5 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 3- to 4-foot layer (1.5 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario C, soil in the surface to 3-foot layer (surface to 3 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations. Soil in the 4-foot layer (3 to 4 feet bgs) is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

- Scenario D, soil in the surface to 4-foot layer is suitable for on-site reuse by the Department with no restrictions based on total lead concentrations.

Group 2 Recommendations for Soil to be Disposed Off Site

If the Department elects to dispose the soil off site, the following restrictions apply:

- Scenario A, soil in the surface layer (surface to 0.5 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 1.5- to 4-foot layer (0.5 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario B, soil in the surface to 1.5-foot layer (surface to 1.5 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 3- to 4-foot layer (1.5 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario C, soil in the surface to 3-foot layer (surface to 3 feet bgs) has no restrictions with respect to total lead concentrations. Soil in the 4-foot layer (3 to 4 feet bgs) has no restrictions with respect to total lead concentrations.

- Scenario D, soil in the surface to 4-foot layer has no restrictions with respect to total lead concentrations.

The Department should notify the contractors performing the construction activities that elevated concentrations of lead are present in on-site soil. Appropriate health and safety measures should be taken to minimize the potential exposure to lead.

8. HEALTH EFFECTS OF LEAD

Concentrations of lead in soil at the site represent a potential threat to the health of site workers performing earthwork activities.

Lead in its element form is a heavy, ductile, soft, gray metal. The permissible exposure limit for lead is 0.05 milligrams per cubic meter (mg/m^3) in air based on an eight-hour time-weighted average. The immediately dangerous to life and health exposure limit is 100 mg/m^3 as established by the National Institute of Occupational Safety and Health. Exposure may produce several symptoms including weakness, eye irritation, facial pallor, pale eyes, lassitude, insomnia, anemia, tremors, malnutrition, constipation, paralysis of the wrists and ankles, abdominal pain, colic, nephropathy, encephalopathy, gingival lead line, hypertension, anorexia, and weight loss. Target organs are the central nervous system, kidneys, eyes, blood, gingival tissue, and the gastrointestinal tract.

Because of the potential hazard from exposure to lead-contaminated soil, a lead HSP should be prepared by a Certified Industrial Hygienist (CIH). In addition, all site workers (earthwork) should have completed a training program meeting the requirements of 29 CFR 1910.120 and 8 CCR 1532.1. The plan developed by the CIH should include a hazard analysis, dust control measures, air monitoring, signage, work practices, emergency response plans, personal protective equipment, decontamination, and documentation.

9. LIMITATIONS

The services outlined in this report have been conducted in a manner generally consistent with current regulatory guidelines. No warranty, expressed or implied, is made regarding the professional opinions presented in this report. Ninyo & Moore's opinions are based on an analysis of observed conditions and on information obtained from third parties. It is likely that variations in soil conditions may exist.

The samples collected and chemically analyzed and the observations made are believed to be representative of the general area evaluated; however, conditions can vary significantly between

sampling locations. The interpretations and opinions contained in this report are based on the results of laboratory tests and analyses intended to detect the presence and measure the concentration of selected chemical or physical constituents in samples collected from the site. The analyses have been conducted by an independent laboratory certified by the State of California to conduct such analyses. Ninyo & Moore has no involvement in, or control over, such analyses and has no means of confirming the accuracy of laboratory results. Ninyo & Moore, therefore, disclaims any responsibility for inaccuracy in such laboratory results.

This document is intended to be used only in its entirety. No portion of the document, by itself, is designed to completely represent any aspect of the project described herein. Ninyo & Moore should be contacted if the reader wants any additional information, or has questions regarding content, interpretations presented, or completeness of this document. Opinions and judgments expressed herein, which are based on our understanding and interpretation of current regulatory standards, should not be construed as legal opinions.

For individuals with sensory disabilities, this document is available in alternate formats upon request. For any questions regarding this document, please call or write Wayne Chiou, Environmental Engineering, 3347 Michelson Drive, Suite 100, Irvine, California 92612-1692. Phone Number (949) 724-2221.

10. REFERENCES

Department of Toxic Substance Control (DTSC), 2009, Variance (V69HQSCD006), dated June 30.

Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, 1996, Background Concentrations of Trace Elements in California Soils, dated March.

TABLE 1 – SOIL ANALYTICAL RESULTS – AERIALLY DEPOSITED LEAD, pH, AND GPS COORDINATES

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH	Latitude	Longitude
B1-0.5	0.5	5/19/2010	ND<5.0					2146127.12892	6127425.71489
B2-0.5	0.5	5/19/2010	6.7					2146472.05447	6127359.42167
B3-0.5	0.5	5/19/2010	7.2				7.1	2146780.06226	6127301.49270
B4-0.5	0.5	5/19/2010	ND<5.0					2147129.93552	6127230.81509
B5-0.5	0.5	5/19/2010	ND<5.0					2149491.09995	6125653.31039
B6-0.5	0.5	5/19/2010	ND<5.0					2149611.43270	6125557.20440
B7-0.5	0.5	5/19/2010	5.1					2149537.13341	6125560.51124
B8-0.5	0.5	5/19/2010	13					2149726.98404	6125517.43074
B9-0.5	0.5	5/19/2010	ND<5.0					2162358.50737	6102919.19880
B10-0.5	0.5	5/19/2010	ND<5.0					2162393.60603	6102686.97975
B11-0.5	0.5	5/19/2010	ND<5.0					2162444.29856	6102501.32078
B12-0.5	0.5	5/19/2010	ND<5.0					2162490.18796	6102379.68920
B13-0.5	0.5	5/19/2010	ND<5.0				8.7	2162694.56999	6102531.97937
B14-0.5	0.5	5/19/2010	ND<5.0					2162800.66157	6102513.24269
B15-0.5	0.5	5/19/2010	ND<5.0					2162854.88556	6102412.58124
B16-0.5	0.5	5/19/2010	ND<5.0					2162961.62285	6102328.47356
B17-0.5	0.5	5/19/2010	ND<5.0					2161821.96068	6101909.86775
B18-0.5	0.5	5/19/2010	ND<5.0					2161668.87669	6101868.57356
B19-0.5	0.5	5/19/2010	20					2161426.64196	6101785.80966
B20-0.5	0.5	5/19/2010	ND<5.0					2166453.30272	6093965.20132
B21-0.5	0.5	5/19/2010	ND<5.0					2166608.55036	6093893.75887
B22-0.5	0.5	5/19/2010	ND<5.0					2166636.00059	6093740.86976
B23-0.5	0.5	5/19/2010	ND<5.0				8.7	2166630.83763	6093584.38286
B24-0.5	0.5	5/19/2010	ND<5.0					2166555.13605	6093577.08737
B25-0.5	0.5	5/19/2010	ND<5.0					2174016.07999	6081246.83418
B26-0.5	0.5	5/19/2010	6.1				8.3	2173820.20686	6081321.08935
B27-0.5	0.5	5/19/2010	ND<5.0					2173634.05317	6081389.87943
B28-0.5	0.5	5/19/2010	ND<5.0					2173393.68507	6081483.53909
B29-0.5	0.5	5/19/2010	ND<5.0					2174559.17247	6081489.51909
B30-0.5	0.5	5/19/2010	5.1					2174434.73847	6081626.31184
B31-0.5	0.5	5/19/2010	5.3					2174234.99565	6081579.76854
B32-0.5	0.5	5/19/2010	5.2					2174185.89105	6081400.98823
B33-0.5	0.5	5/19/2010	ND<5.0					2176075.41700	6079144.62784
B34-0.5	0.5	5/19/2010	ND<5.0					2176145.74228	6079030.96392
B35-0.5	0.5	5/19/2010	ND<5.0				8.7	2176228.83464	6078884.69438
B36-0.5	0.5	5/19/2010	ND<5.0					2176345.46751	6078636.36658
B37-0.5	0.5	5/19/2010	ND<5.0					2176584.12484	6078284.83385
B38-0.5	0.5	5/19/2010	ND<5.0					2176692.08375	6078125.53236
B39-0.5	0.5	5/19/2010	ND<5.0					2176790.27879	6078005.10818
B40-0.5	0.5	5/19/2010	7.8					2176872.69969	6077933.55933
B41-0.5	0.5	5/19/2010	ND<5.0					2176832.38717	6077914.58603
B42-0.5	0.5	5/19/2010	ND<5.0					2177029.89793	6077818.98920
B43-0.5	0.5	5/19/2010	ND<5.0					2181241.95028	6072157.16822
B44-0.5	0.5	5/20/2010	ND<5.0					2176474.87055	6077199.21682
B45-0.5	0.5	5/20/2010	ND<5.0					2166489.20359	6092194.41271

TABLE 1 – SOIL ANALYTICAL RESULTS – AERIALLY DEPOSITED LEAD, pH, AND GPS COORDINATES

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH	Latitude	Longitude
B46-0.5	0.5	5/20/2010	ND<5.0				8.7	2166245.95926	6093210.05485
B47-0.5	0.5	5/20/2010	ND<5.0					2155664.37543	6117332.87553
B48-0.5	0.5	5/20/2010	ND<5.0					2155458.85698	6117422.40323
B49-0.5	0.5	5/20/2010	ND<5.0					2155241.02252	6117488.87134
B50-0.5	0.5	5/20/2010	ND<5.0					2155142.96735	6117545.25694
B51-0.5	0.5	5/20/2010	ND<5.0					2145193.99923	6127421.13681
Maximum			20	--	--	--	8.7		
Average			3.6	--	--	--	8.4		
Minimum			ND<5.0	--	--	--	7.1		
Regulatory Limits			1411[1]	5[2]	1.5[3]	5[4]	5[5]		
Background Range[6]			12.4 - 97.1						
Decontamination Water (mg/l)									
DeconTO34		5/20/2010	ND<0.25						

Notes:
mg/kg – milligrams per kilogram
mg/l – milligrams per liter
TTLC – total lead for comparison to the Total Threshold Limit Concentration
WET – Waste Extraction Test
WET-citric – soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit Concentration
WET-DI – soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit Concentration
TCLP – soluble lead by the Toxicity Characteristic Leaching Procedure
ND – not detected above reporting limits presented in Appendix A
1 – Limit specified in addendum to Variance issued by the Department of Toxic Substance Control to Caltrans (DTSC) Variance, September 22, 2000; Addendum, December 2002; Addendum June 2008)
2 – STLC for California Hazardous Waste (California Code of Regulations [CCR] Title 22, Section 66261.24)
3 – Limit Specified by DTSC Variance
4 – Maximum concentration for the TCLP of Resource, Conservation, and Recovery Act (RCRA) hazardous waste (CCR Title 22, Section 66216.24)
5 – Minimum value specified by DTSC variance
6 – Minimum and maximum valued specified by Kearney Foundation of Soil Science, Division of Agriculture and Natural Resources, University of California, 1996, Background Concentrations of Trace and Major Elements in California Soils.

207384_A1.DWG

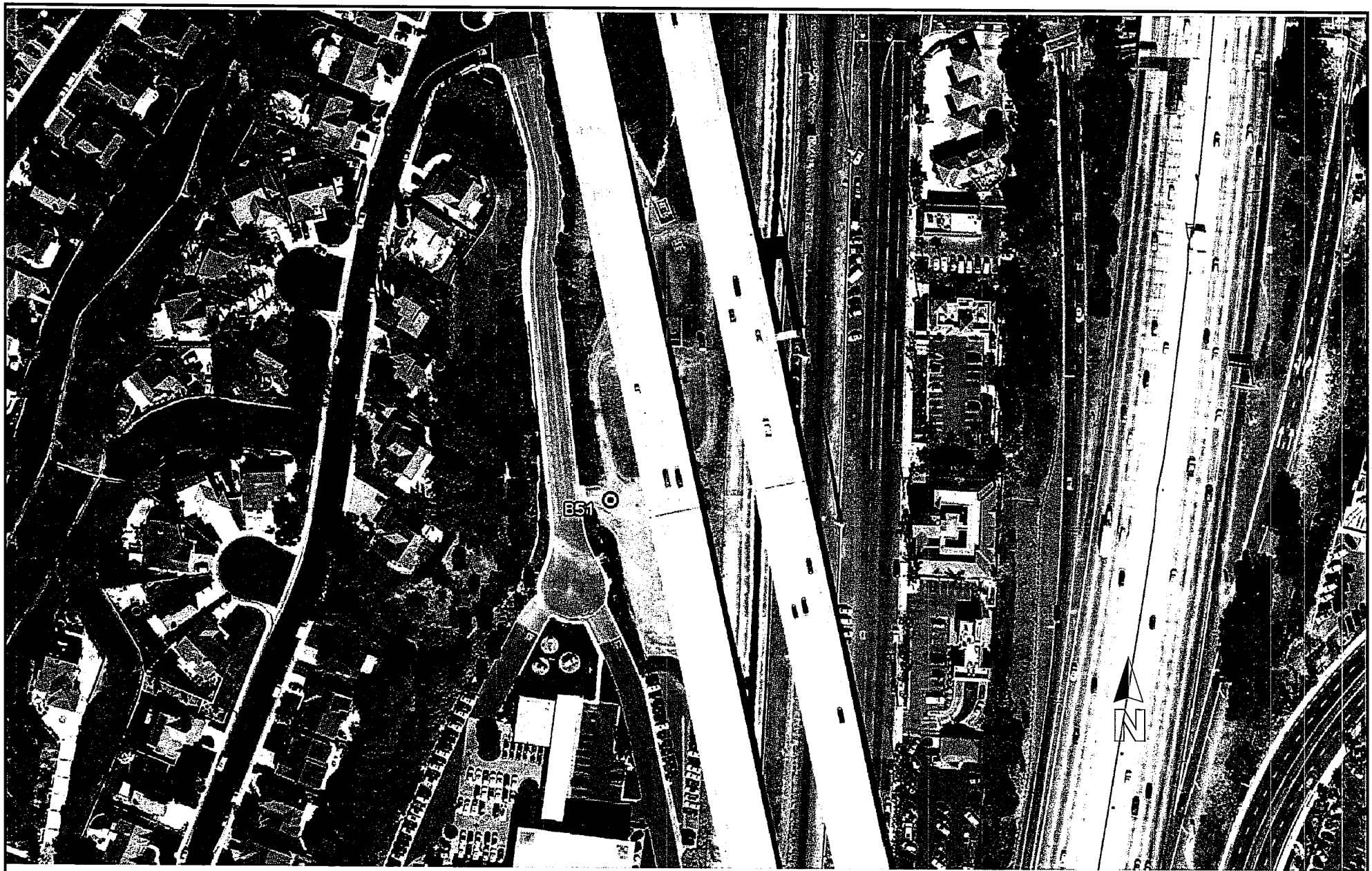
REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 8,000 16,000

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		SITE LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	1
207384034	6/10		



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

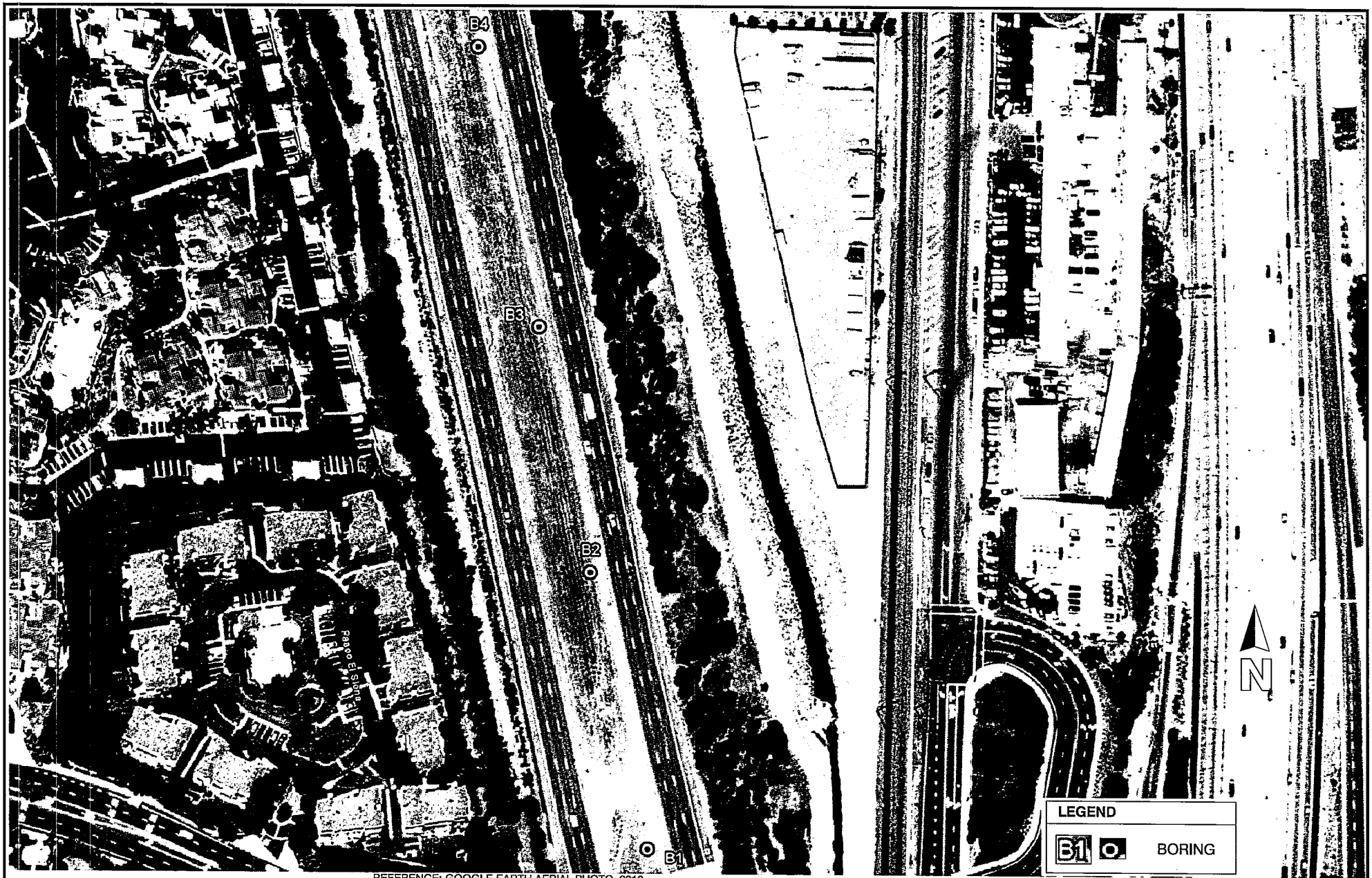
BORING LOCATION MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

2

207384_A2.DWG



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

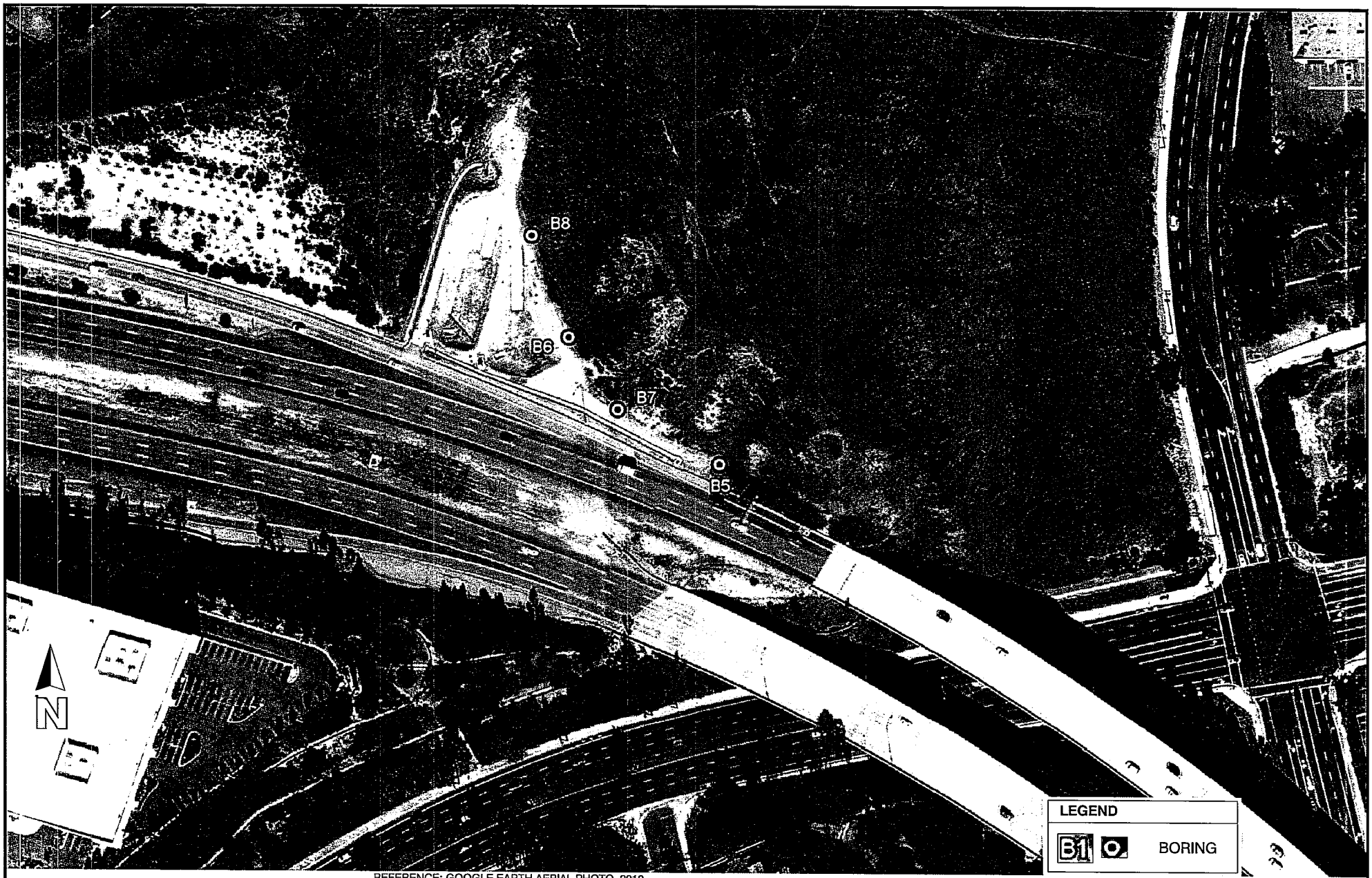
APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	3
207384034	6/10		

207384_A3.DWG



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

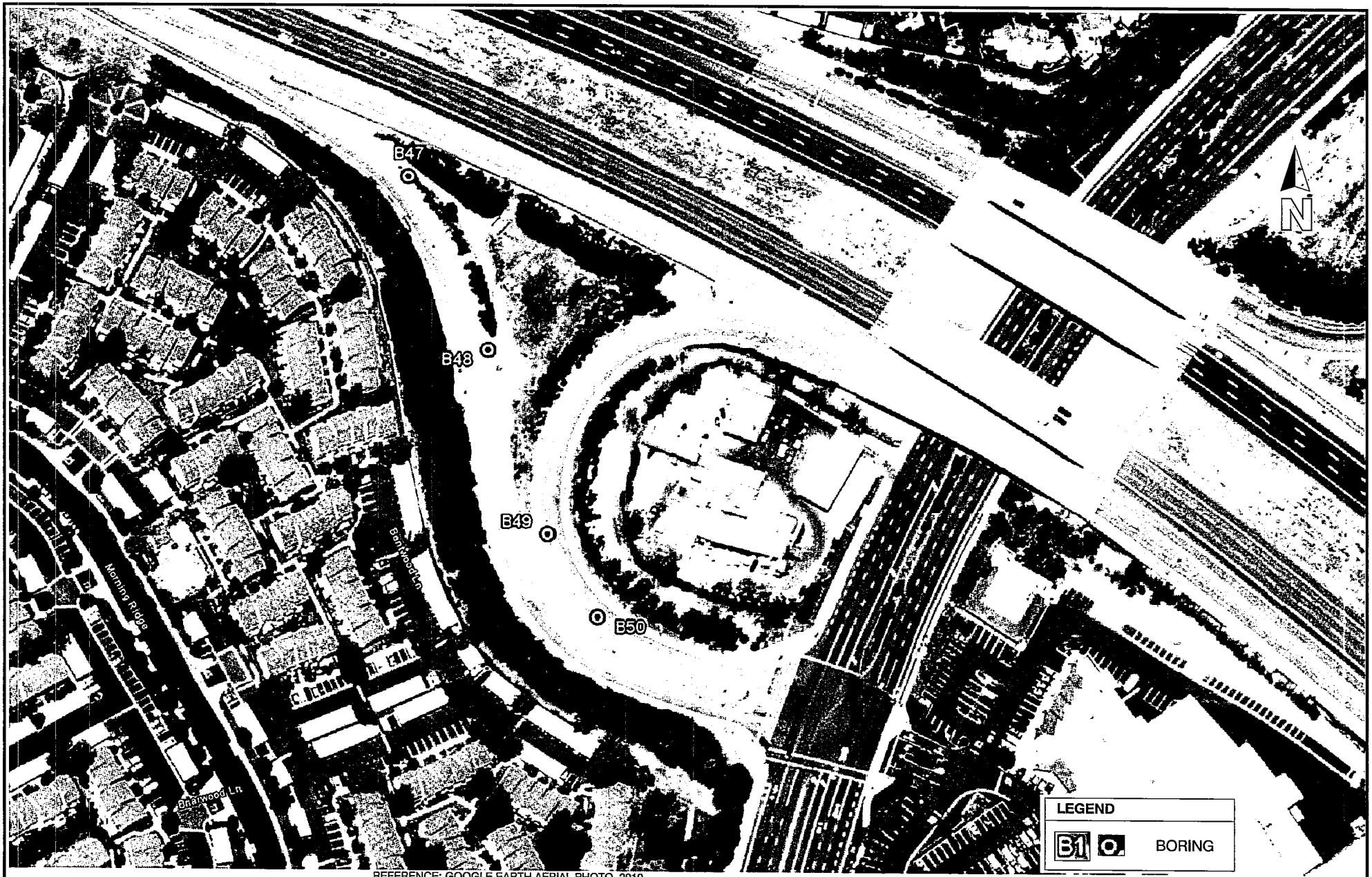
APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

207384_A4.DWG

Ninyo & Moore		BORING LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	4
207384034	6/10		



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

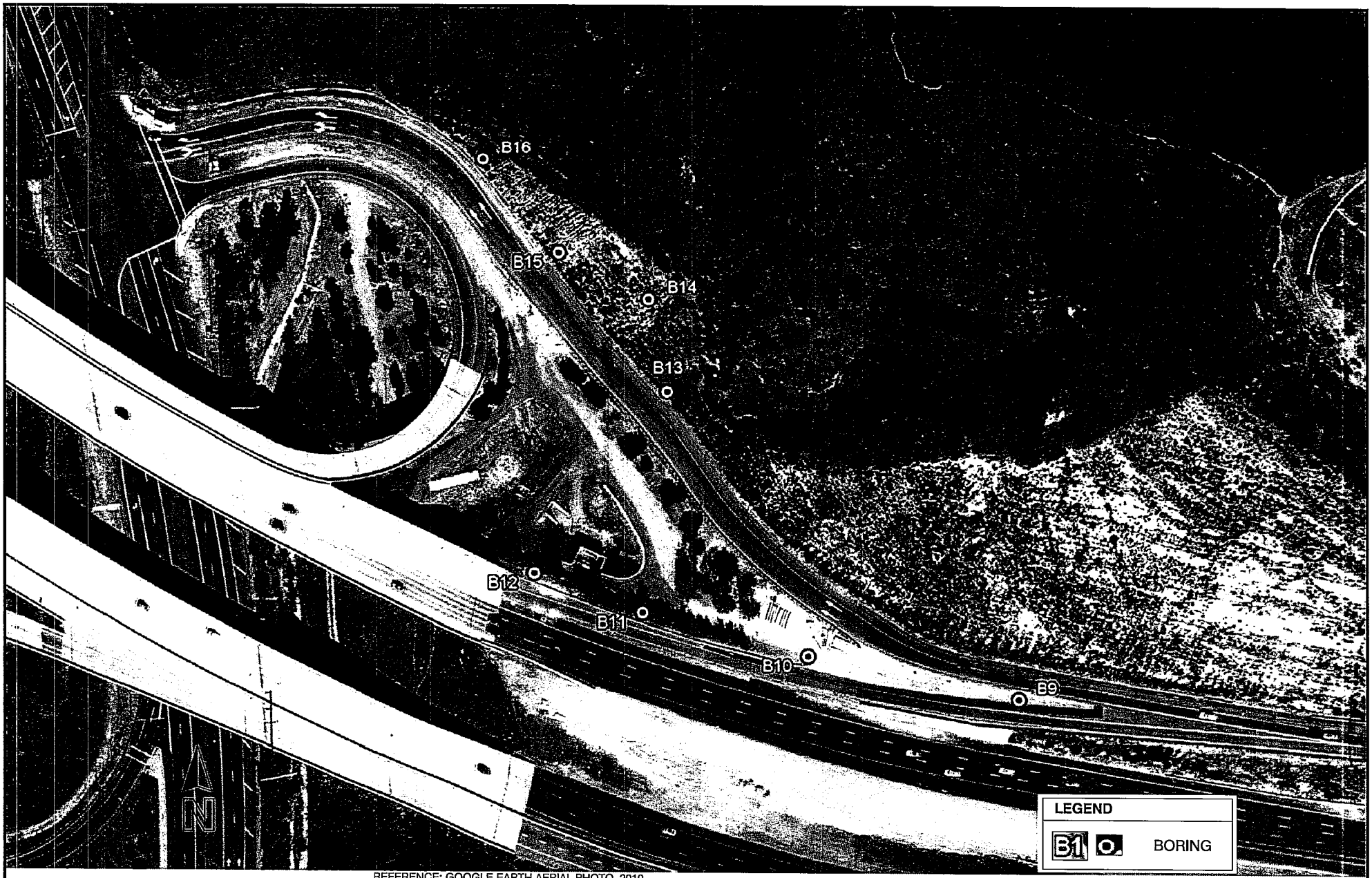
APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	5
207384034	6/10		

207384_A5.DWG



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	6
207384034	6/10		

207384_A6.DWG

REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

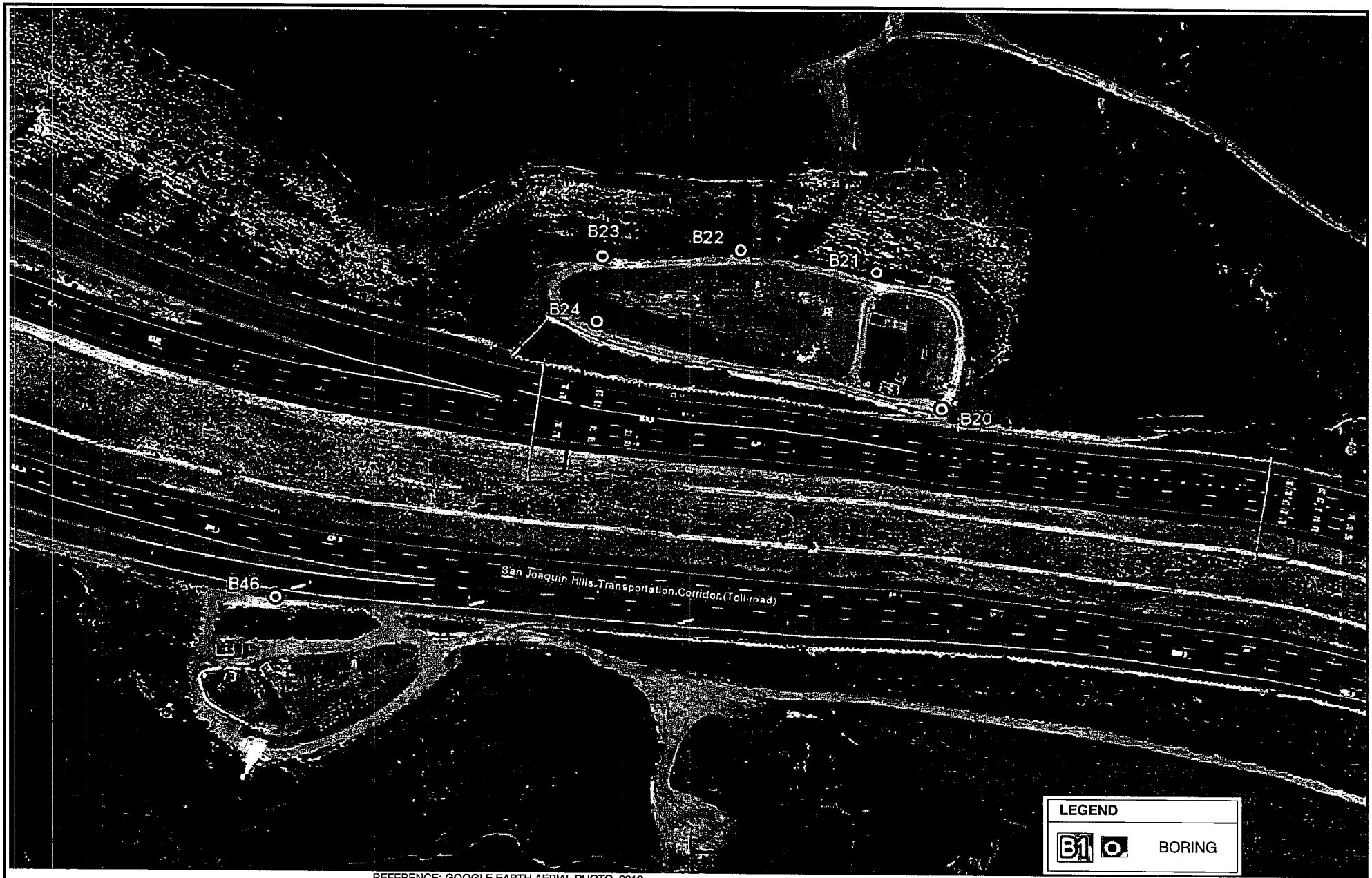
APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATION MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	7

207384_A7.DWG



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

BORING LOCATION MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

8

207384_A8.DWG

207384_A9.DWG

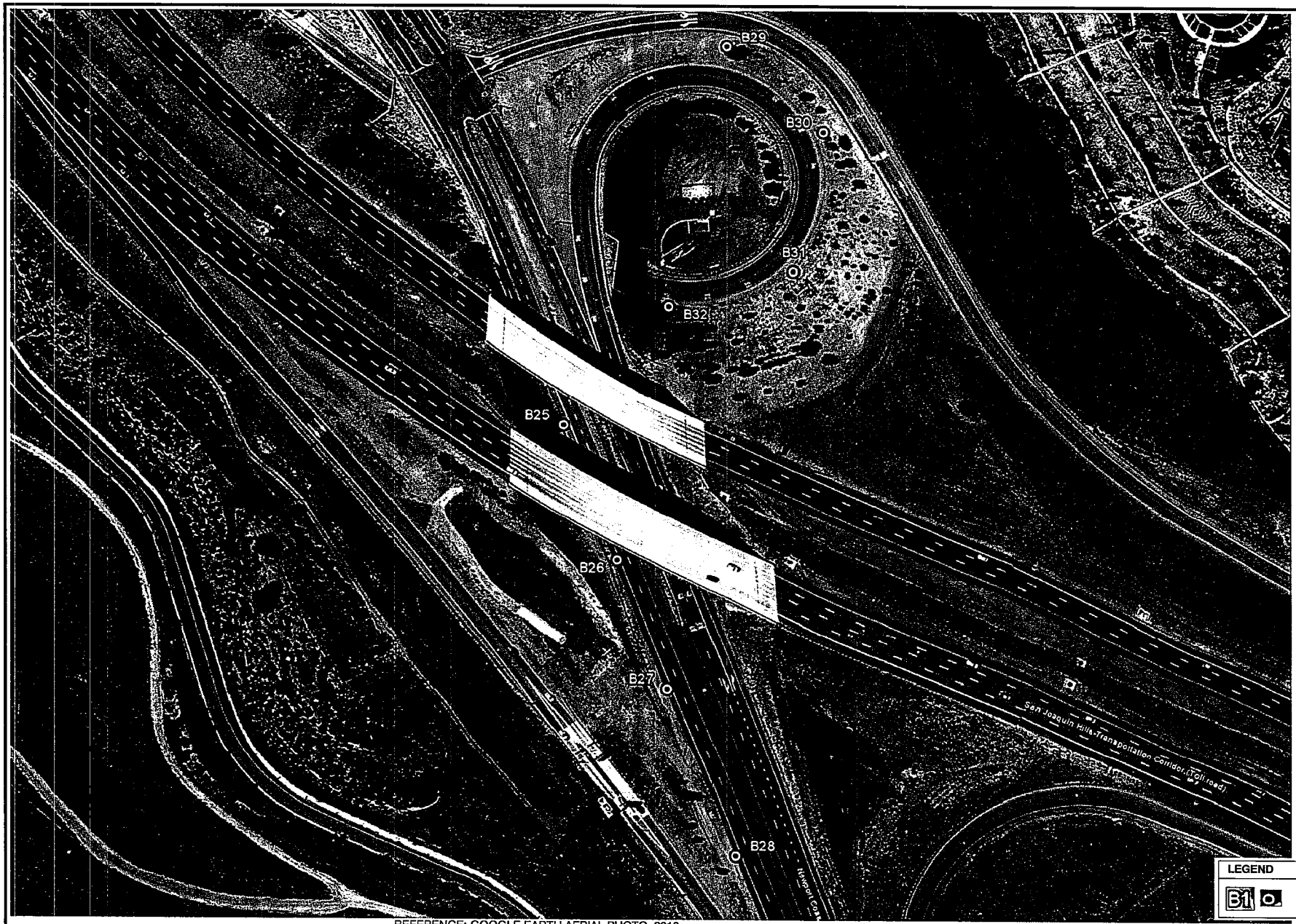
REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore		BORING LOCATION MAP	FIGURE
PROJECT NO.	DATE	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	9
207384034	6/10		



REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 200 400

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

BORING LOCATION MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

10

207384_A10.DWG

207384_A11.DWG

REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

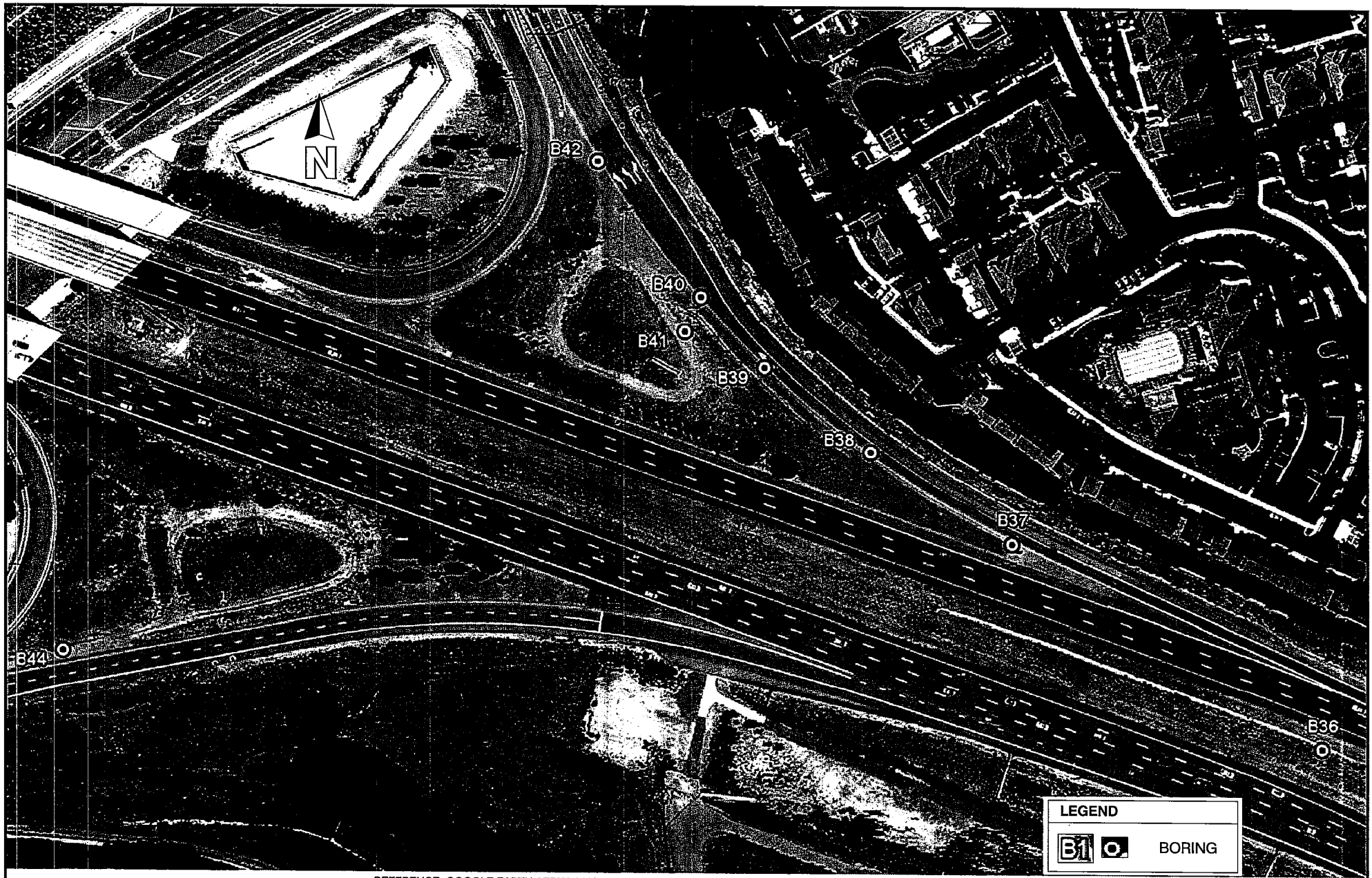
PROJECT NO.	DATE
207384034	6/10

BORING LOCATION MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

11



207384_A12.DWG

REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore

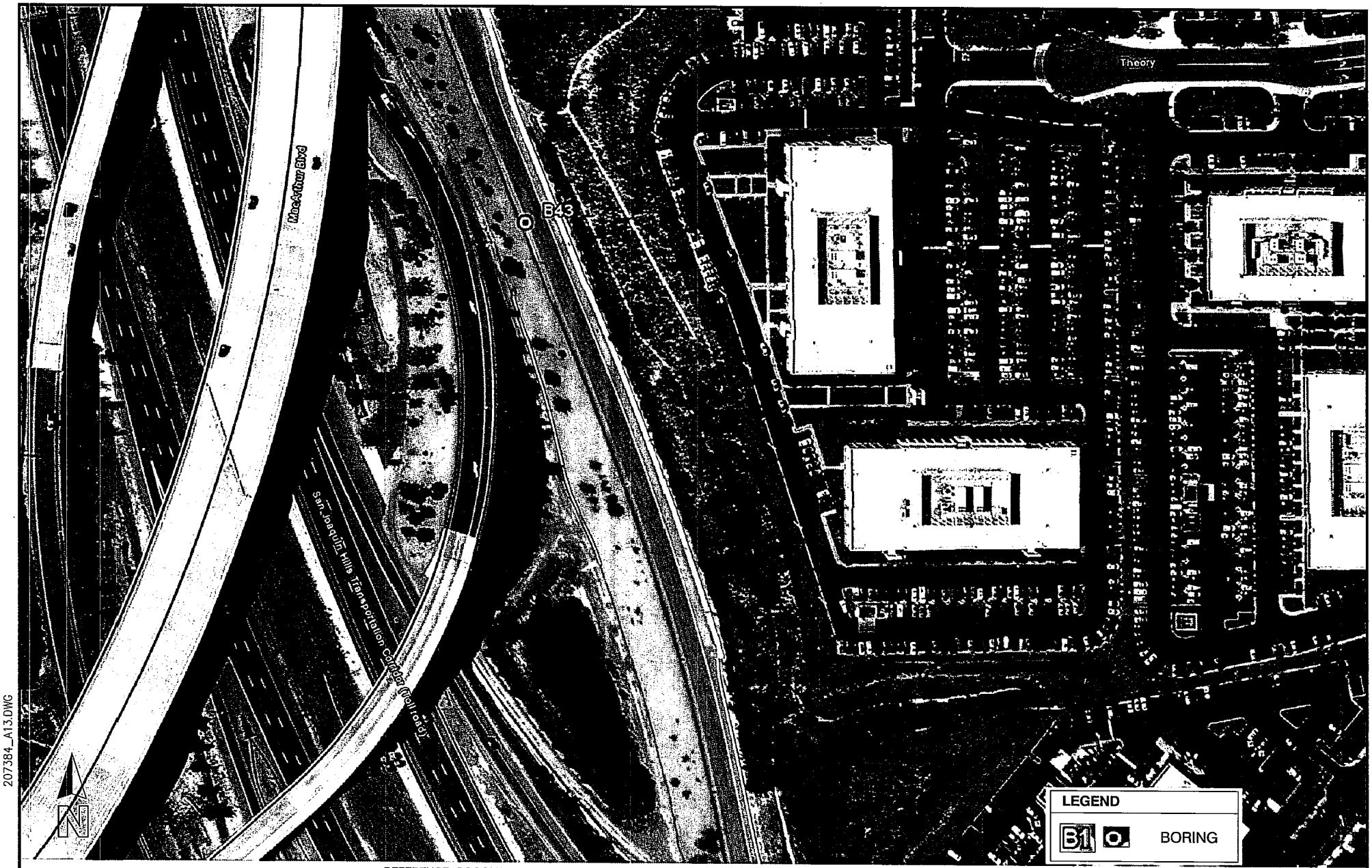
PROJECT NO.	DATE
207384034	6/10

BORING LOCATION MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

12



207384_A13.DWG

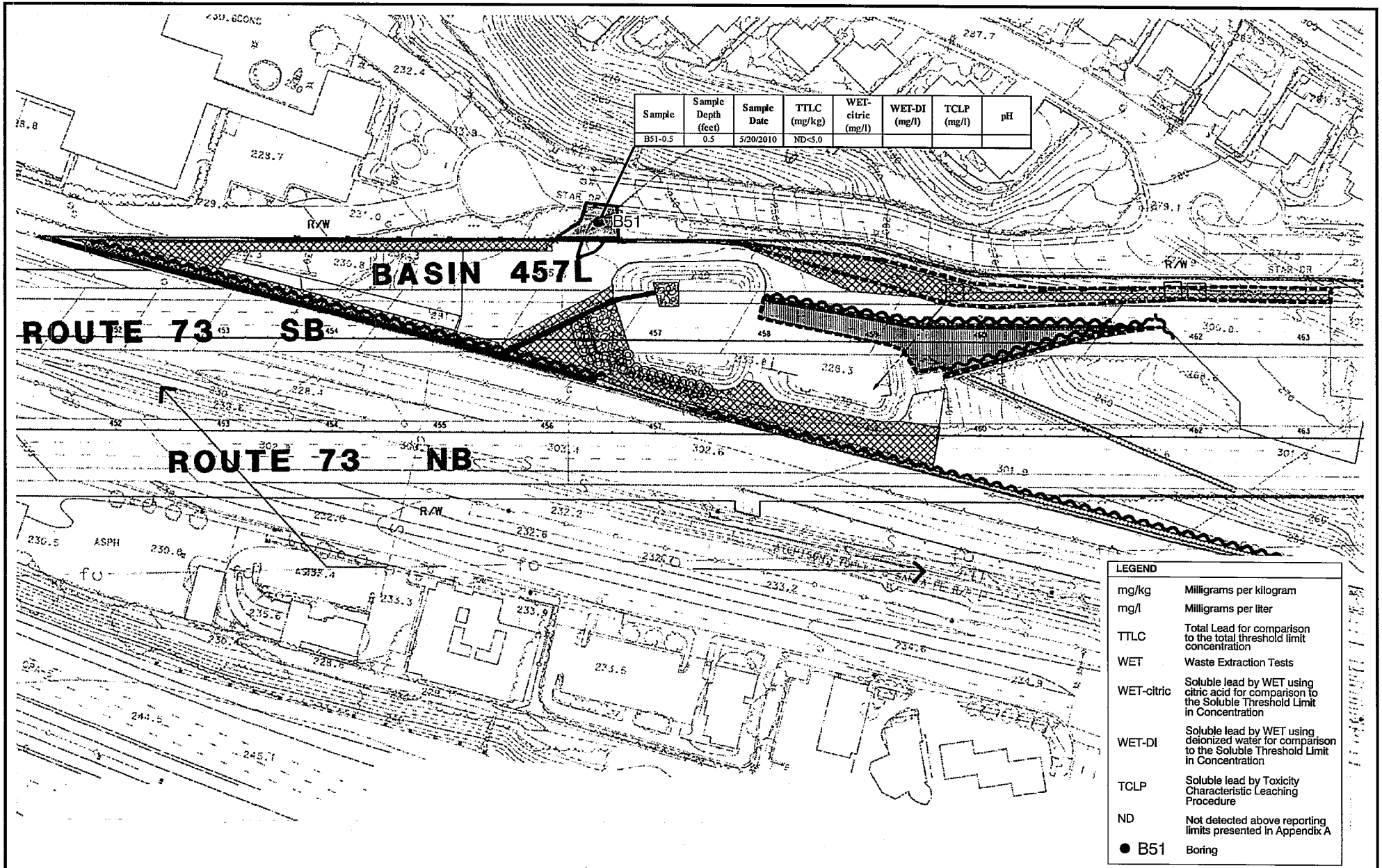
REFERENCE: GOOGLE EARTH AERIAL PHOTO, 2010.

APPROXIMATE SCALE IN FEET

0 150 300

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

Ninyo & Moore	BORING LOCATION MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	13



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B51-0.5	0.5	5/20/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B51	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

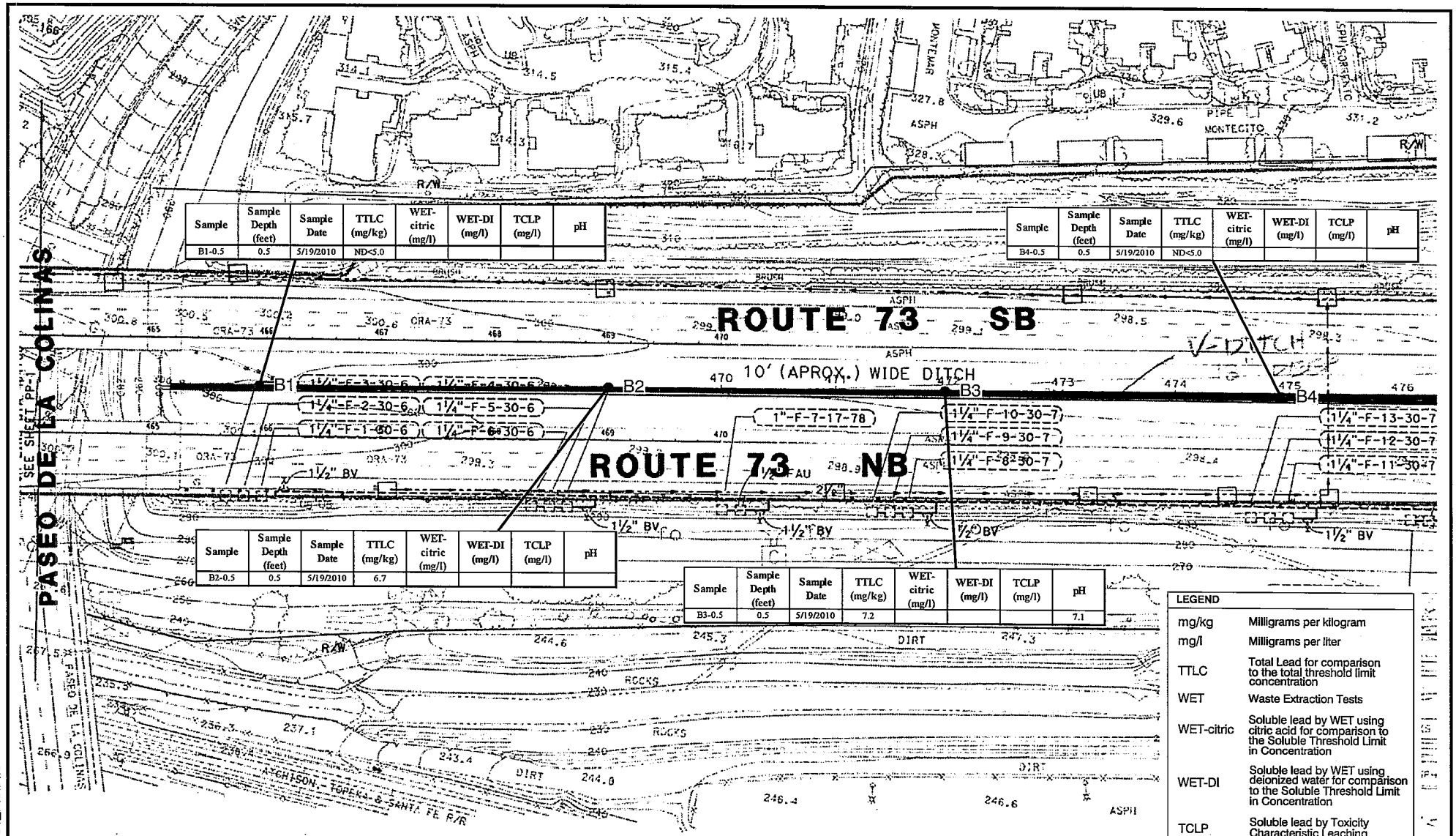
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

14

207384_A14.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B1-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B4-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B2-0.5	0.5	5/19/2010	6.7				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B3-0.5	0.5	5/19/2010	7.2				7.1

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B4	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

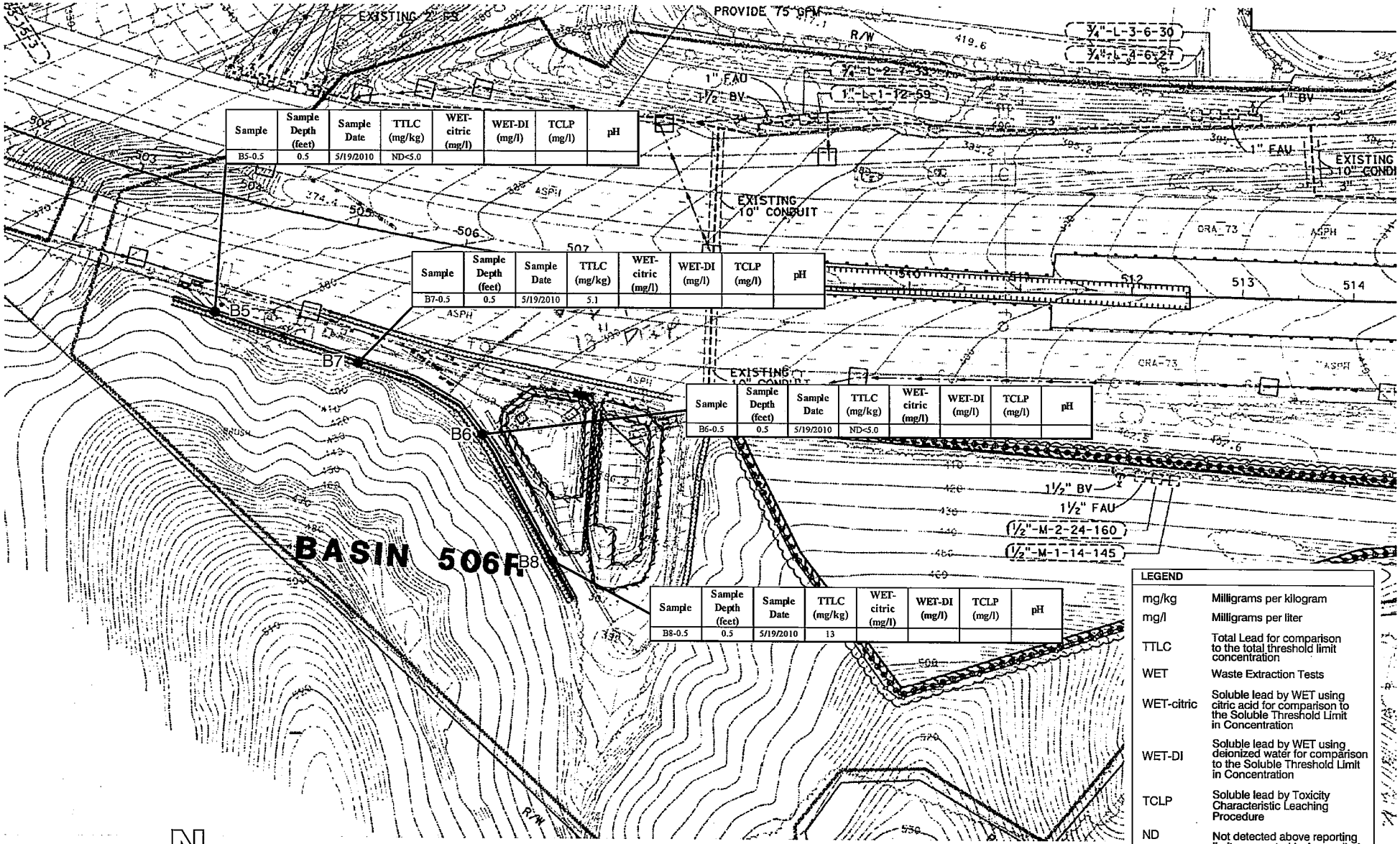
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

15

207384_A15.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B5-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B7-0.5	0.5	5/19/2010	5.1				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B6-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B8-0.5	0.5	5/19/2010	13				

LEGEND

mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B8	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

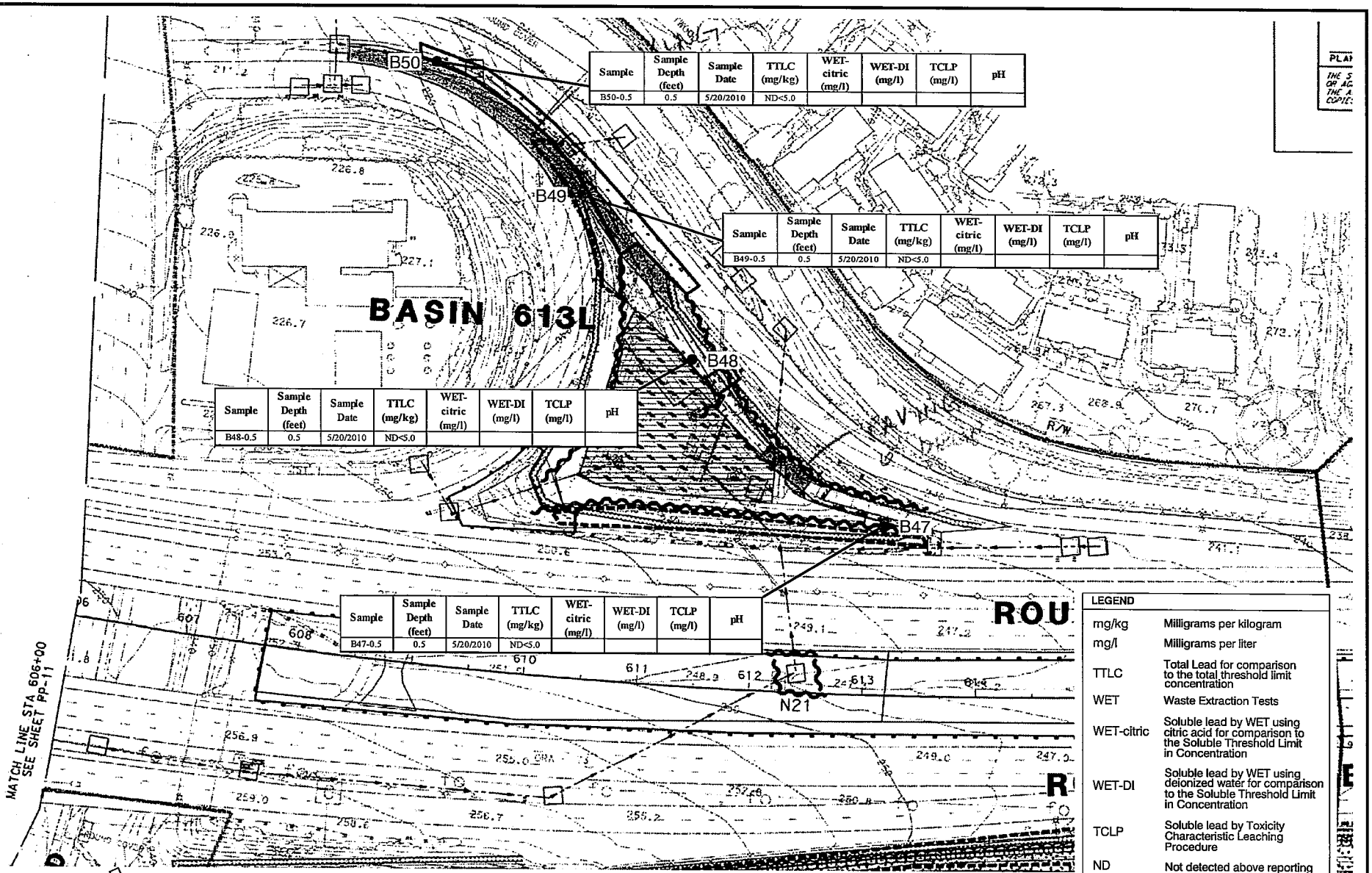
PROJECT NO.	DATE
207384034	6/10

BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE
16

207384_A16.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B50-0.5	0.5	5/20/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B49-0.5	0.5	5/20/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B48-0.5	0.5	5/20/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B47-0.5	0.5	5/20/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B50	Boring

APPROXIMATE SCALE IN FEET

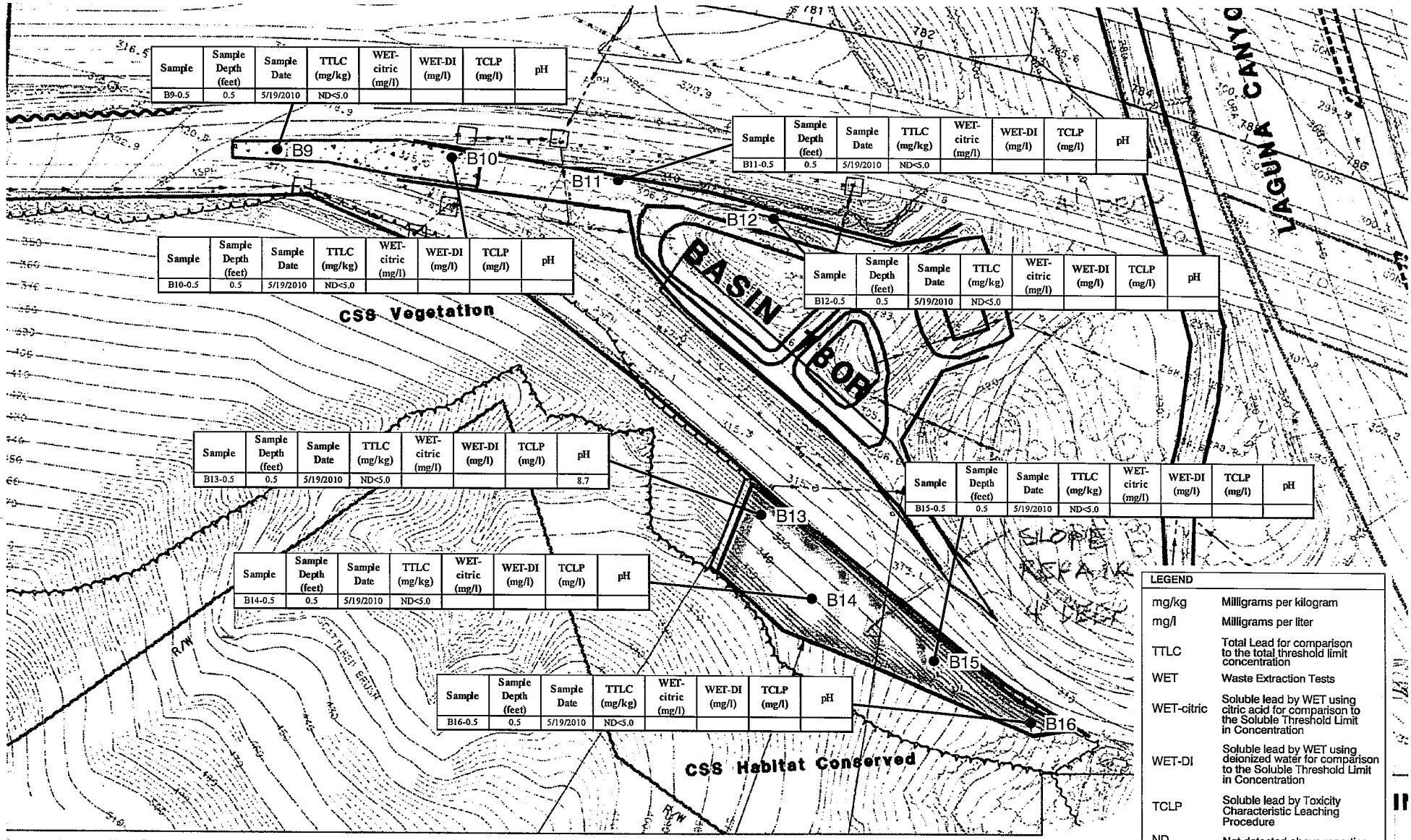
0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore	BORING DATA MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	17

207384_A17.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B9-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B10-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B11-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B12-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B13-0.5	0.5	5/19/2010	ND<5.0				8.7

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B14-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B15-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B16-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B16	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

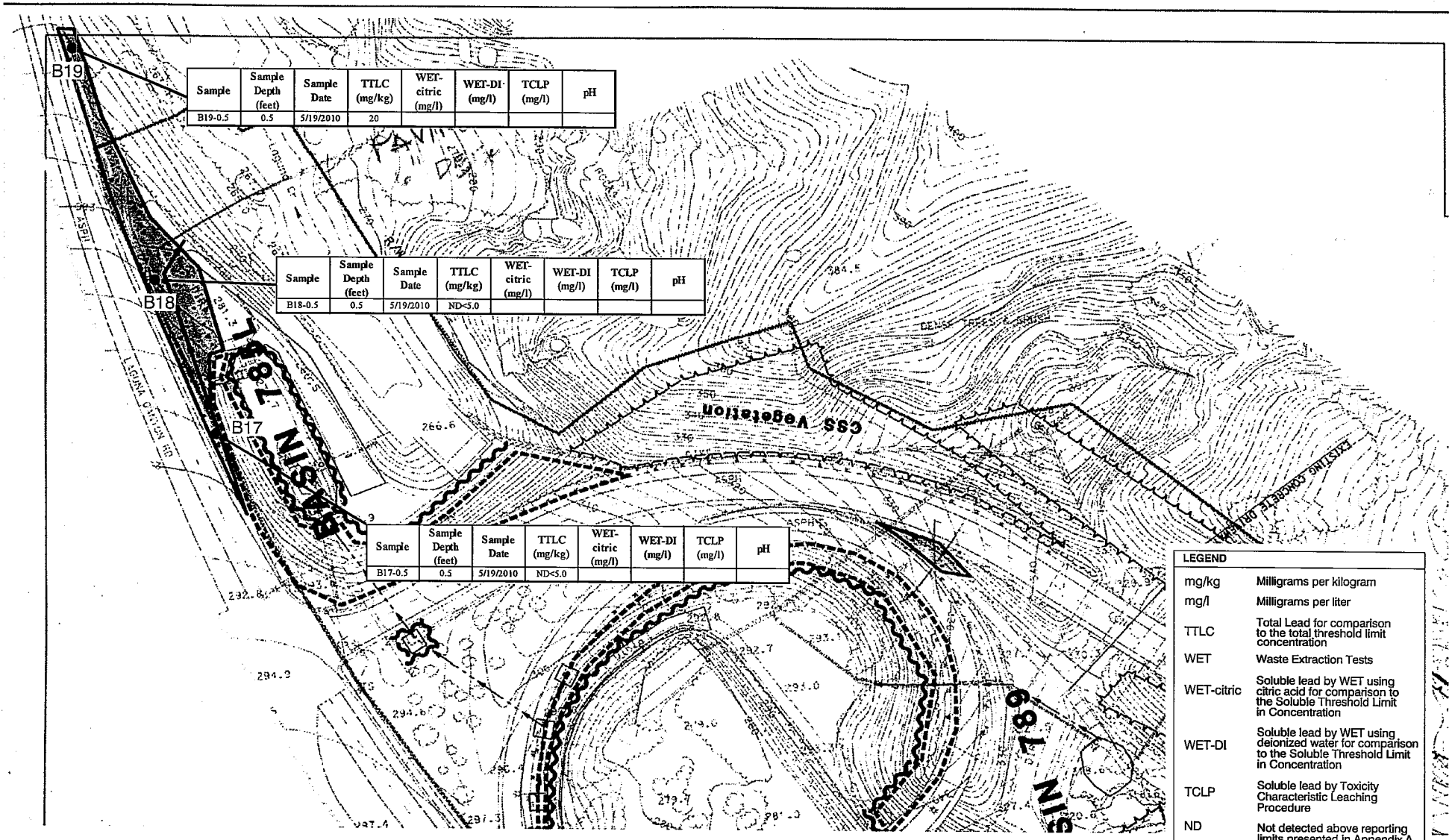
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

18

207384_A18.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B19-0.5	0.5	5/19/2010	20				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B18-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B17-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B19	Boring

N

APPROXIMATE SCALE IN FEET

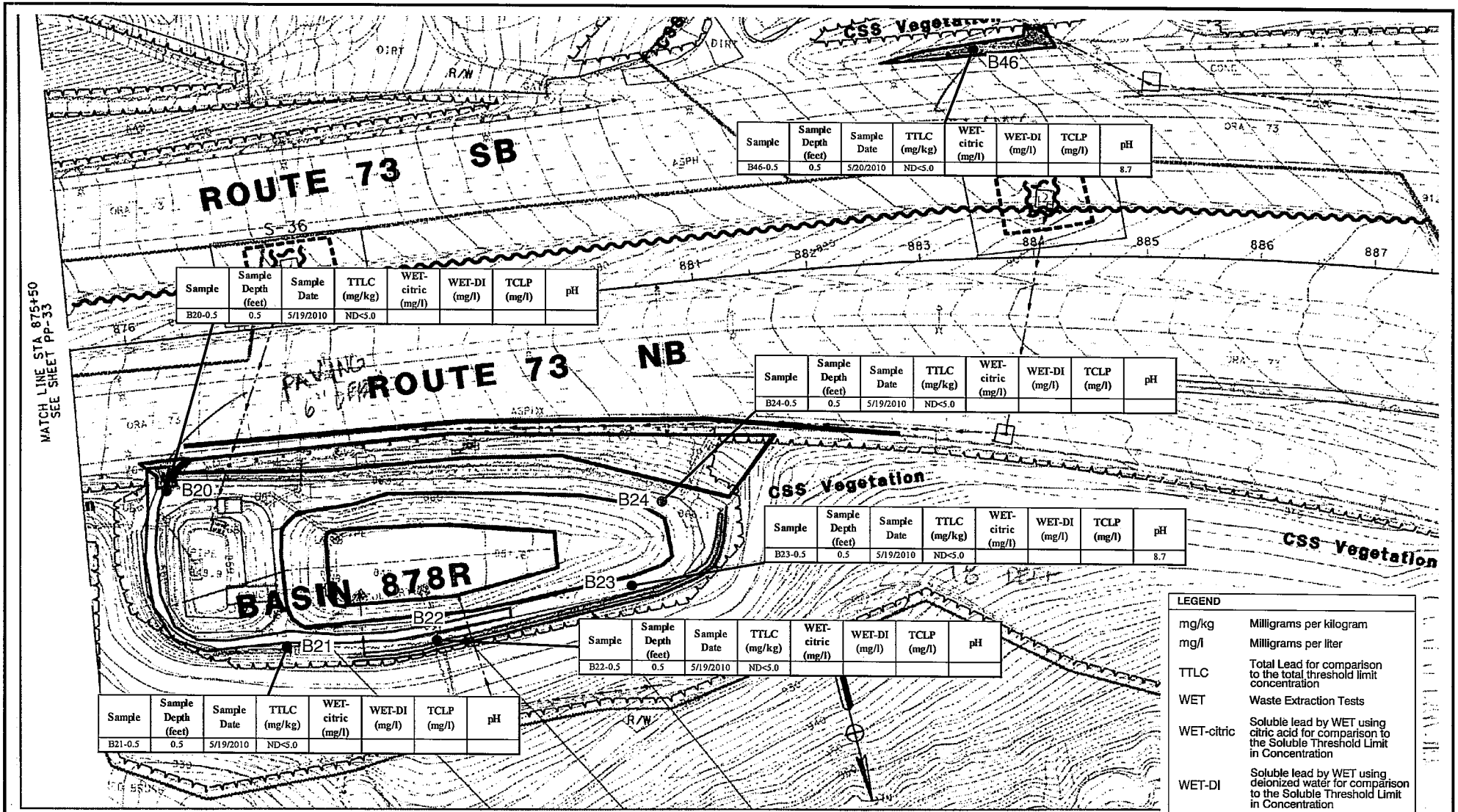
0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore	BORING DATA MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	19

207384_A19.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B20-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B21-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B22-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B23-0.5	0.5	5/19/2010	ND<5.0				8.7

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B24-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B46-0.5	0.5	5/20/2010	ND<5.0				8.7

LEGEND

mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B46	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

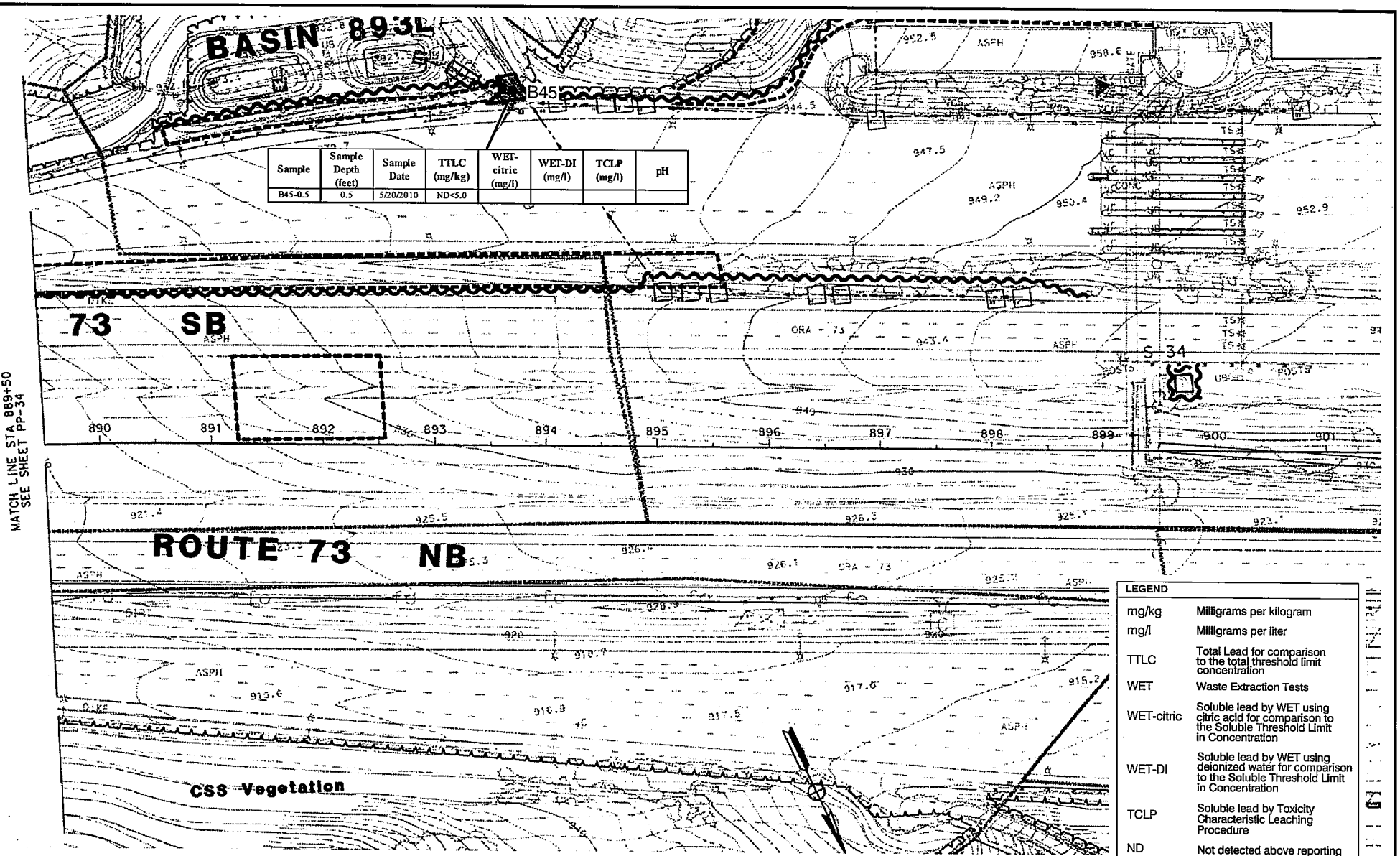
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

20

207384_A20.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B45-0.5	0.5	5/20/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B45	Boring

N

APPROXIMATE SCALE IN FEET

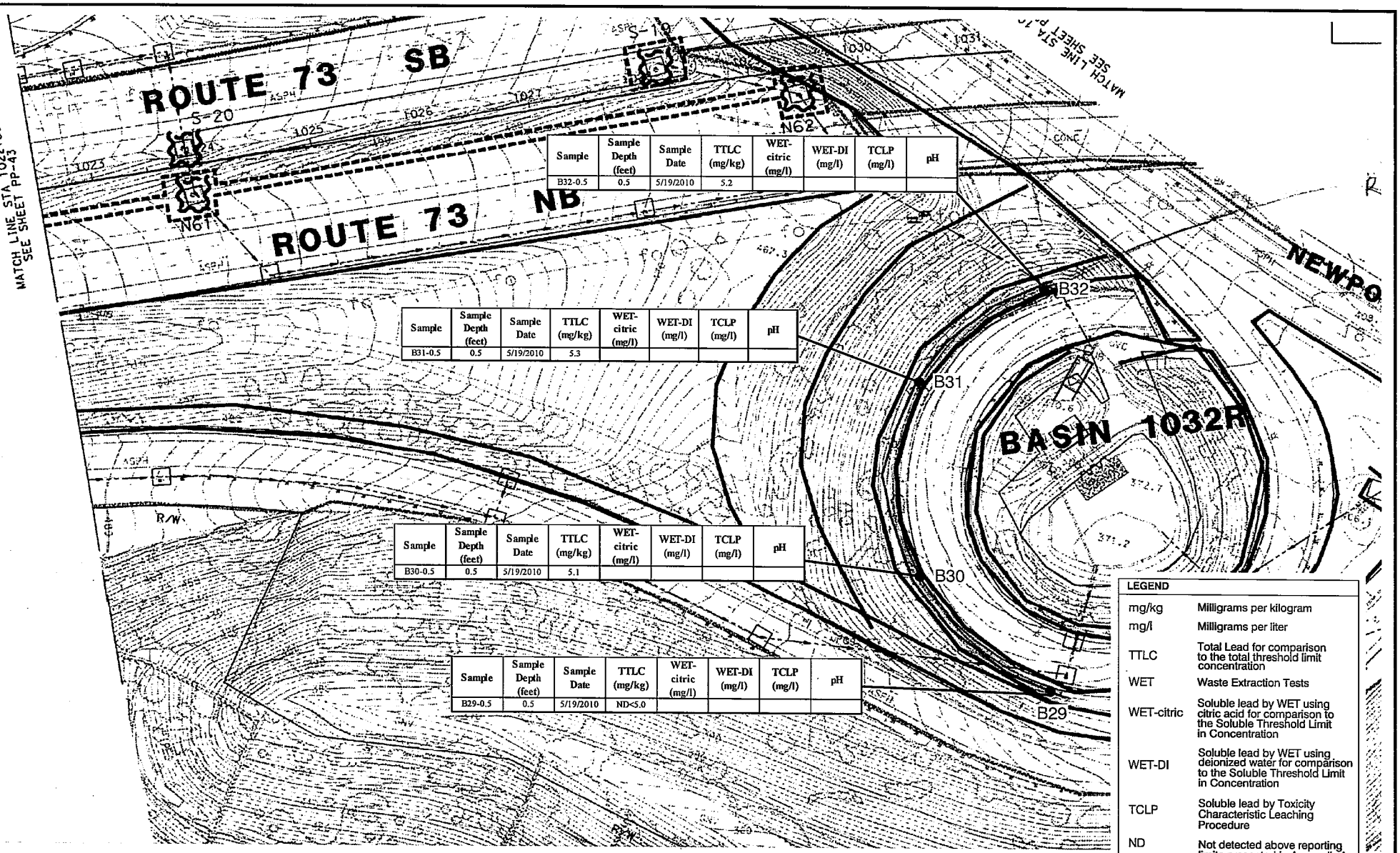
0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore	BORING DATA MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	21

207384_A21.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B32-0.5	0.5	5/19/2010	5.2				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B31-0.5	0.5	5/19/2010	5.3				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B30-0.5	0.5	5/19/2010	5.1				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B29-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B32	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

207384_A22.DWG

Ninyo & Moore

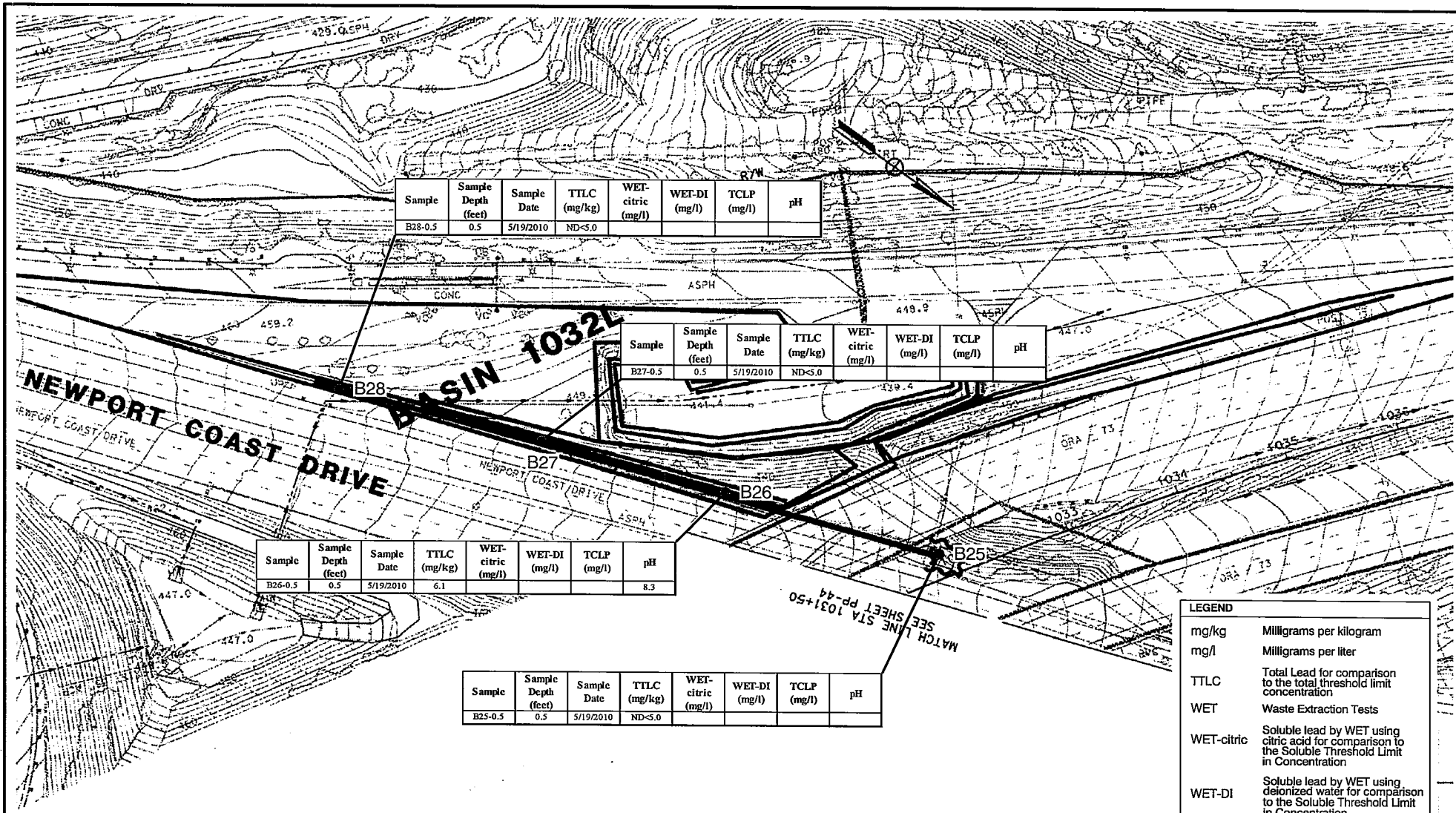
BORING DATA MAP

PROJECT NO.	DATE
207384034	6/10

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

22



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B28-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B27-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B26-0.5	0.5	5/19/2010	6.1				8.3

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B25-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B28	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

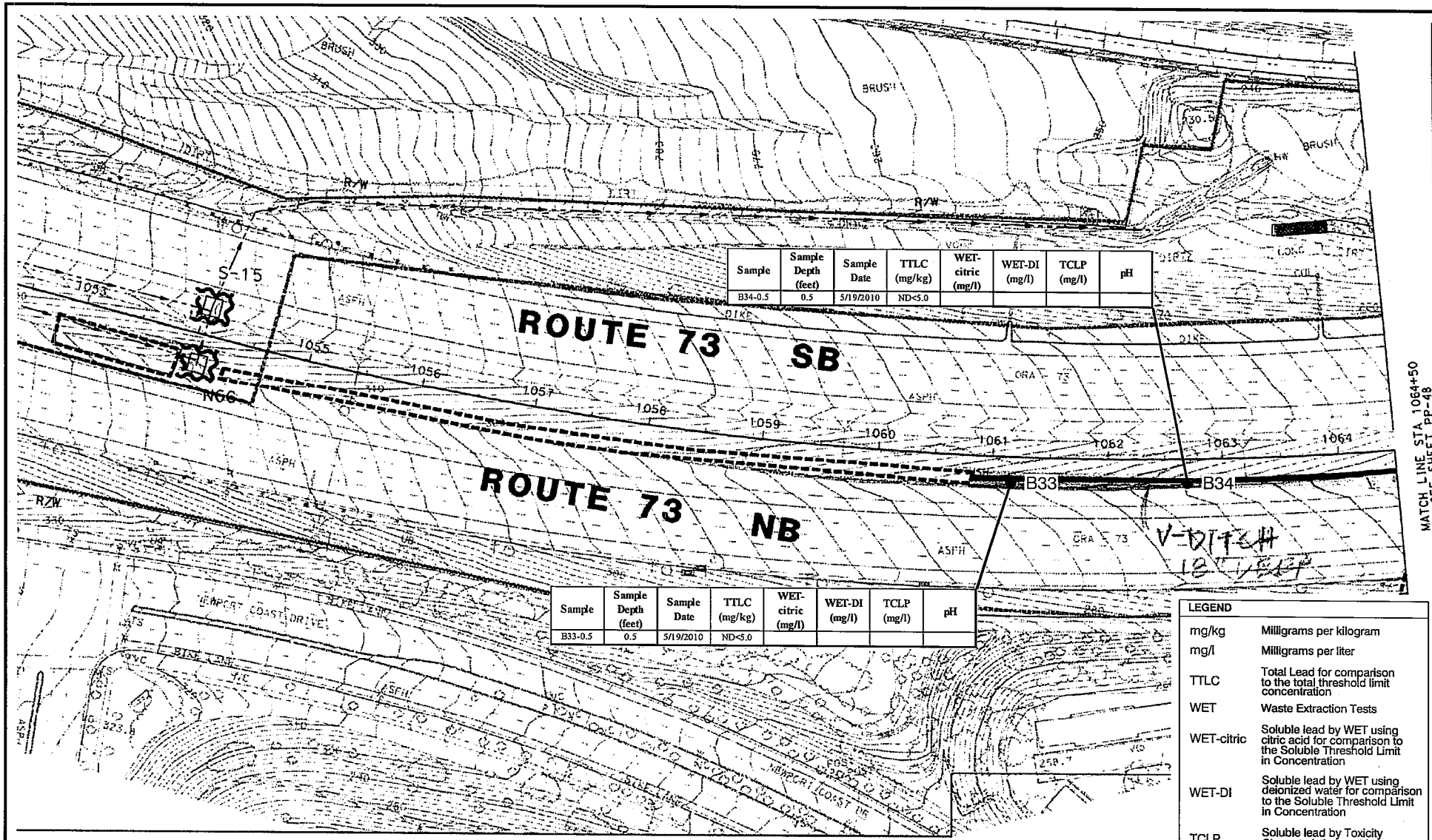
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

23

207384_A23.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B34-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B33-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B34	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

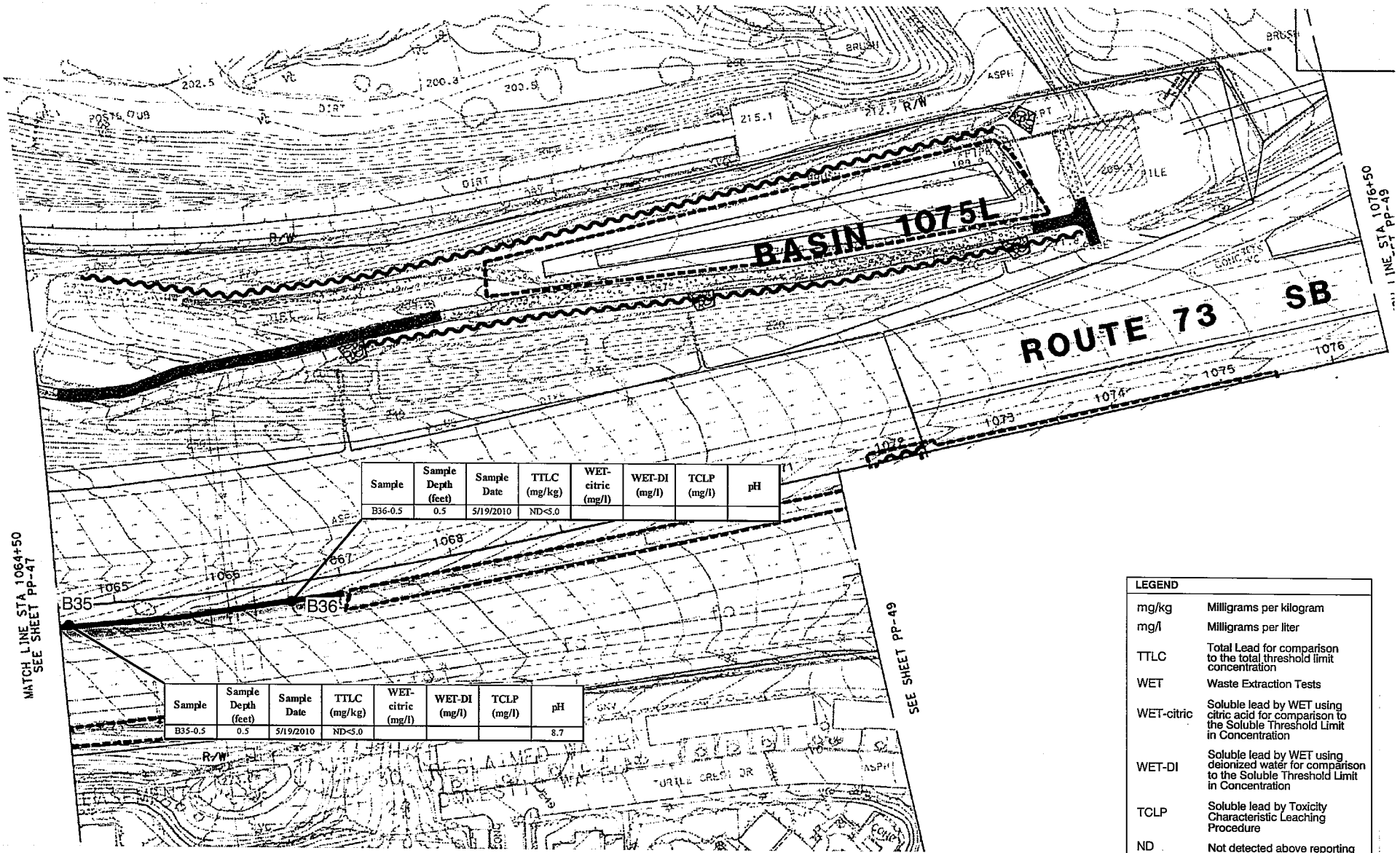
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

24

207384_A24.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B36-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B35-0.5	0.5	5/19/2010	ND<5.0				8.7

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B36	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

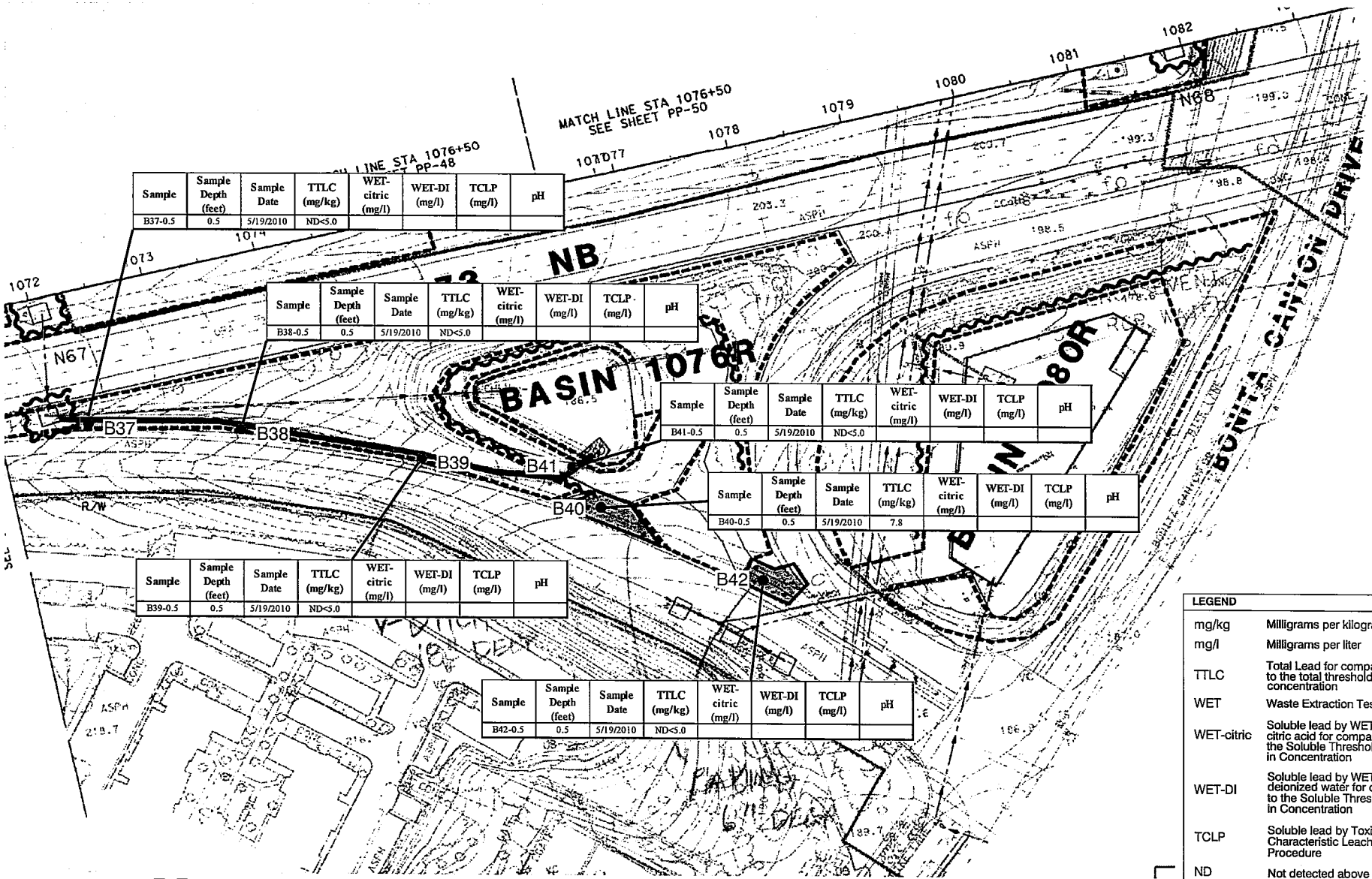
BORING DATA MAP

PROJECT NO.	DATE
207384034	6/10

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE
25

207384_A25.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B37-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B38-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B41-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B40-0.5	0.5	5/19/2010	7.8				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B39-0.5	0.5	5/19/2010	ND<5.0				

Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B42-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B42	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

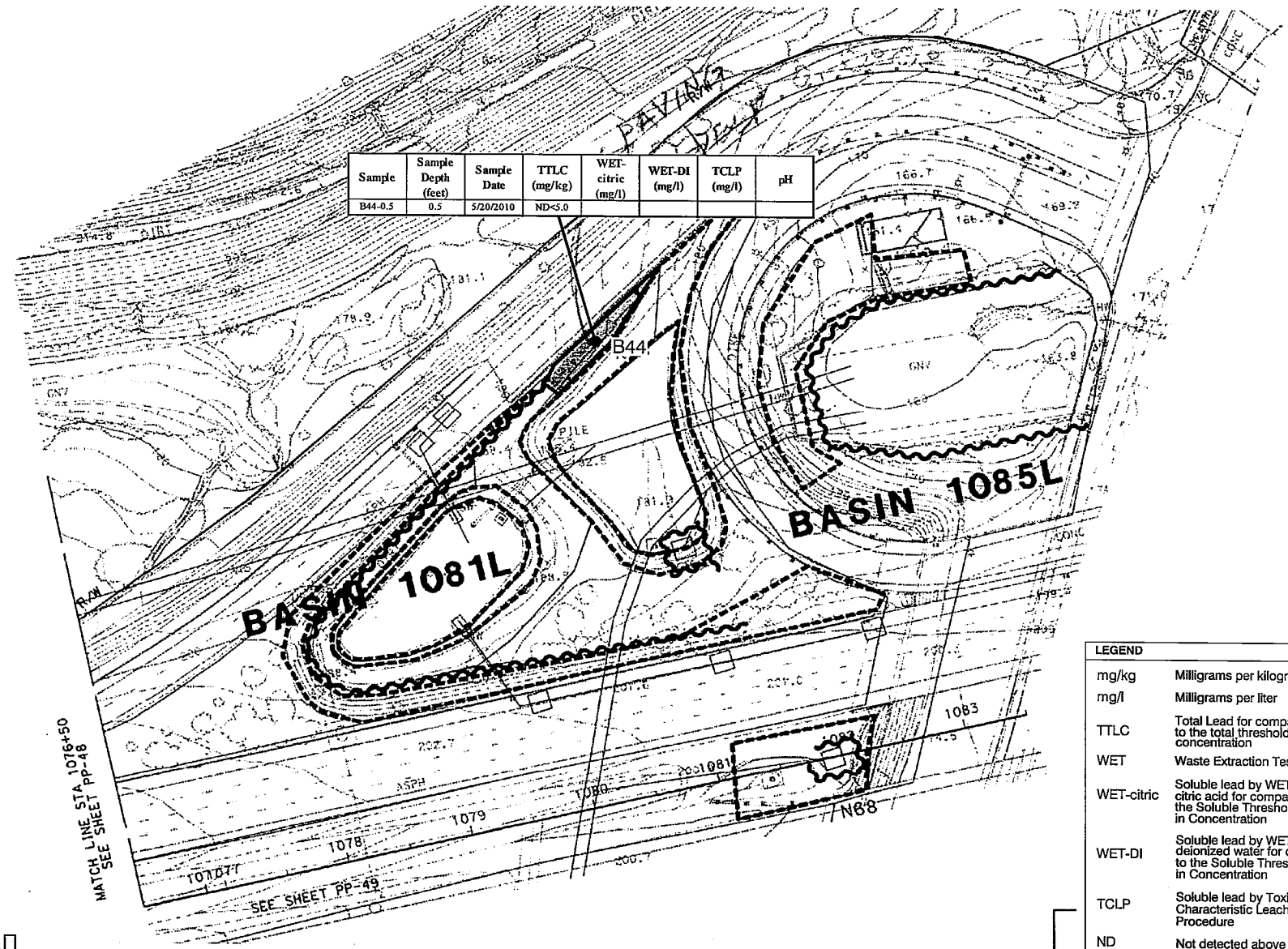
BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

26

207384_A26.DWG



LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B44	Boring

N

APPROXIMATE SCALE IN FEET

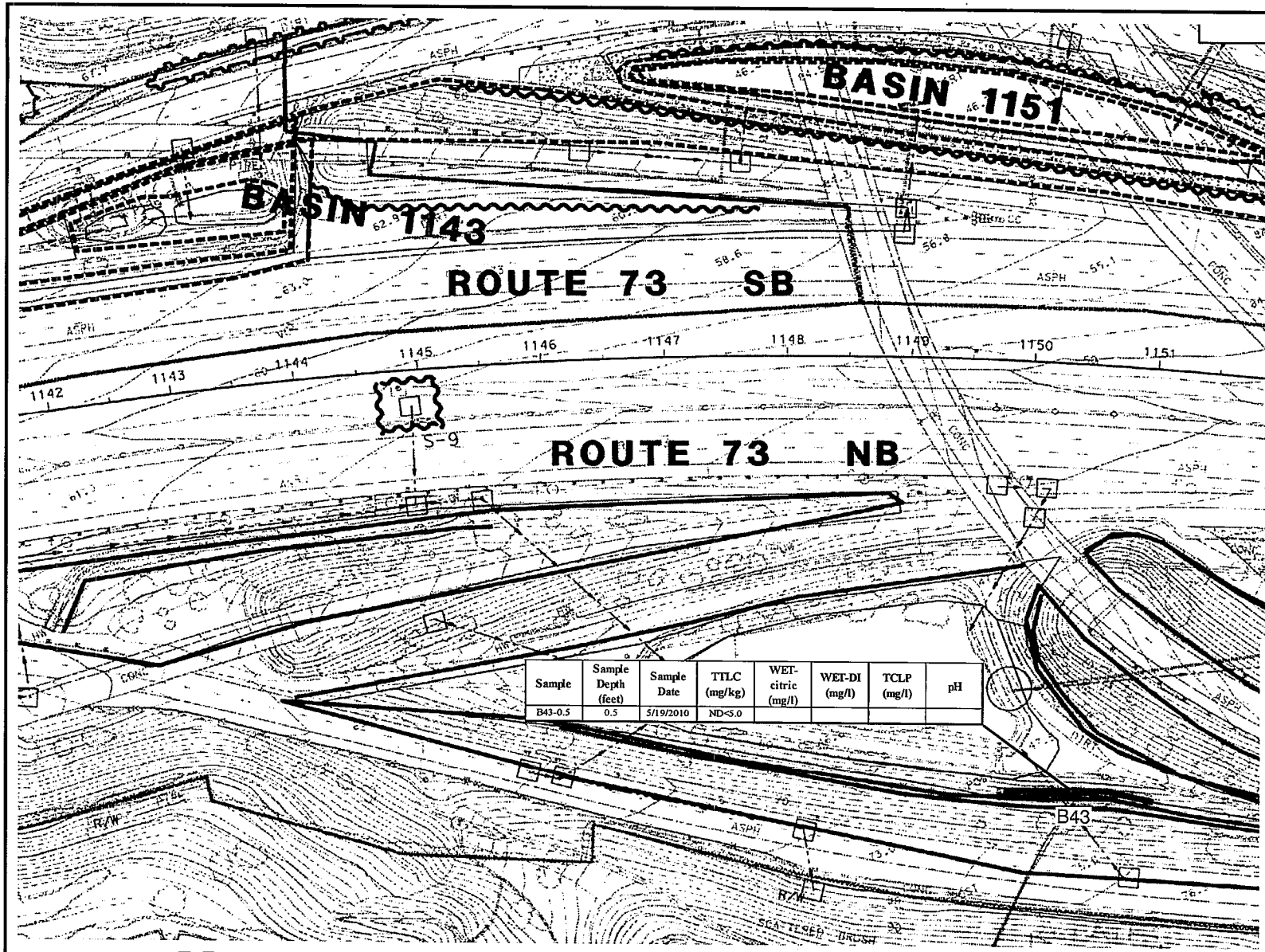
0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore	BORING DATA MAP	FIGURE
PROJECT NO. 207384034 / DATE 6/10	STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD ORANGE COUNTY, CALIFORNIA	27

207384_A27.DWG



Sample	Sample Depth (feet)	Sample Date	TTLC (mg/kg)	WET-citric (mg/l)	WET-DI (mg/l)	TCLP (mg/l)	pH
B43-0.5	0.5	5/19/2010	ND<5.0				

LEGEND	
mg/kg	Milligrams per kilogram
mg/l	Milligrams per liter
TTLC	Total Lead for comparison to the total threshold limit concentration
WET	Waste Extraction Tests
WET-citric	Soluble lead by WET using citric acid for comparison to the Soluble Threshold Limit in Concentration
WET-DI	Soluble lead by WET using deionized water for comparison to the Soluble Threshold Limit in Concentration
TCLP	Soluble lead by Toxicity Characteristic Leaching Procedure
ND	Not detected above reporting limits presented in Appendix A
● B43	Boring

N

APPROXIMATE SCALE IN FEET

0 120 240

NOTE: ALL DIMENSIONS, DIRECTIONS AND LOCATIONS ARE APPROXIMATE.

REFERENCE: BASE PROVIDED BY CALTRANS, DATED MARCH 2009.

Ninyo & Moore

PROJECT NO.	DATE
207384034	6/10

BORING DATA MAP

STATE ROUTE 73 BETWEEN INTERSTATE 5 AND MACARTHUR BOULEVARD
ORANGE COUNTY, CALIFORNIA

FIGURE

28

207384_A28.DWG

State of California **Business, Transportation and Housing Agency**
DEPARTMENT OF TRANSPORTATION

M e m o r a n d u m

Flex your power!
Be energy efficient!

To: Jose Higareda
Office of Bridge Design South 1-Branch 15

Date: April 23, 2015

File: 12-ORA-073 PM 16.6
EA 0M3401
1212000017
Geotechnical Recommendation for Proposed Retaining wall and Overhead Sign Structure

Attn.: Hung Po Yang

From: **DEPARTMENT OF TRANSPORTATION**
DIVISION OF ENGINEERING SERVICES
GEOTECHNICAL SERVICES
OFFICE OF GEOTECHNICAL DESIGN – SOUTH 1

Subject: Geotechnical Design Report

1. INTRODUCTION

This report presents the geotechnical recommendations for (1) the proposed retaining wall, (2) the proposed overhead sign structure, and (3) slope cut proposed from Station 80+68.11 to 85+57.07 on State Route 73 in Orange County. The project location is presented on Figure 1 in Appendix A.

1.1 Project Description

This project proposes to

- widen the State Route 73 Northbound Collector/Distributor El Toro-Laguna Canyon (CD ET-LC) exit ramp onto State Route 133 from one lane to two-lane

- widen the terminus section of the State Route 73 Northbound Collector/Distributor El Toro-Laguna Canyon at State Route 133 exit ramp from two-lane to three-lane.

1.2 Proposed Earth Retaining System, Overhead Sign Structure, and Slope Cut

A soil nail retaining wall with 5 to 14 feet design heights has been proposed to be constructed between Station 69+95 to Station 79+95 RW LOL (1000 feet along RW 69 LOL). The information on the proposed retaining wall is summarized in Table 1.1.

Table 1.1 Description of the Proposed Earth Retaining System (ERS)

ERS ID No.	ERS Type	Begin			End			Approx. Length	Design Height [feet]
		Station	Latitude	Longitude	Station	Latitude	Longitude	[feet]	Max
RW 69	Soil Nail Wall	69+95 RW LOL	Approx. 33.591848	Approx. -117.7543619	79+95 RW LOL	Approx. 33.5926849	Approx. -117.7575515	1000 along RW LOL	14

An overhead sign structure has been also proposed to be constructed at Station 769+50.00 "B" Line on State Route 73 Northbound Collector/El Toro-Laguna Canyon exit ramp. The information on the proposed sign structure provided by the District is summarized in Table 1.2

Table 1.2 Information on the Proposed Overhead Sign structure

Sign No.	Station	Direction	Post Type	Post length	Pedestal Type	Foundation Type
OH-101	769+50 "B" Line	FNBT	III-S	16.37'/18.78'	Round	54" CIDH

The structural loads for the proposed sign structures provided by a Signs & OH Structures Specialist from Office of Design & Technical Services are presented in Table 1.3.

Table 1.3 Postulated Structural Loads for the Proposed Overhead Sign Structure

OH-101	Post length [feet]	Axial Force [kips]	Shear Force [kips]	Bending Moment [kip-ft]
Right Post	16.37	13.7	13.5	309
Left Post	18.78	14.2	13.7	369

In addition, slope cut has been proposed between Stations 80+68.11 to 85+57.07 to secure enough space for the proposed widening.

2. SCOPE OF WORK

The work performed for this project includes:

- Site Visit on July 1, 2014
- Discussion with the District (i.e., field meeting, phone and email conversations)
- Discussion with the Structure Design (i.e., meeting, phone and email conversations)
- Discussion with the Office of Design and Technical Services (i.e., phone and email conversations)
- Review of the preliminary geotechnical design report for 12-ORA-73 PM 10.0/24.8 EA 12-0H4400 preliminary geotechnical recommendation for slope erosion mitigation and stabilization dated August 15, 2008 by the Office of Geotechnical Design South 1.

- Review of the geotechnical design report for storm water mitigation for 12-ORA-73 PM 10.0/24.8 EA 12-0H4400 preliminary geotechnical recommendation for slope erosion mitigation and stabilization project ID 1200000217 EA 0H4400 dated November 13, 2012 including LOTB (A-11-001) by the Office of Geotechnical Design South 1.
- Review of a LOTB by URS (2002) for the nearby Detention Basin 780R
- Review of LOTBs by M&T AGRA (1990) for the nearby Laguna Canyon Road Undercrossing (Bridge No. 55-745R/L)
- Review of the geologic map by USGS (http://ngmdb.usgs.gov/maps/mapview)
- Review of the topographic map by USGS (http://ngmdb.usgs.gov/maps/TopoView/)
- Evaluation of site conditions
- Evaluation of groundwater
- Ground motion study and liquefaction potential

It should be noted that due to the time constraint, no subsurface exploration has been conducted for this project.

3. SITE CONDITION FOR THE PROPOSED EARTH RETAINING SYSTEM AND OVERHEAD SIGN STRUCTURE

3.1 Evaluation of Site Conditions

The site conditions at the proposed retaining wall location and overhead sign location were evaluated based on (1) observation during site visit on July 1, 2014, (2) review of topographic maps, (3) review of geologic map, (4) review of the cross-sections provided by the District Design, and (5) the engineering judgment.

- According to the existing topography observed during site visit on July 1, 2014, the proposed retaining wall and overhead sign structure are to be constructed in previously excavated area with exposed formational materials.

- The review of topographic maps downloaded from the USGS website (http://ngmdb.usgs.gov/maps/TopoView/) has confirms our observation.

- According to the Geologic Map of the San Bernardino and Santa Ana 30'X60' Quadrangle, California by Morton and Miller (2006), the proposed retaining wall and overhead sign structure are to be constructed on the Sespe Formation consisting of conglomeratic sandstone, and clayey and silty sandstone.

- According to the cross-sections provided by the District Design and the Structure Design, the slope behind the proposed Retaining Wall is about 2H:1V or flatter.

- According to the sign structure details and the cross-sections provided by the District, both sign posts for the proposed sign are to be constructed on sloping ground (about 2H:1V).

- The engineering properties for the Sespe Formation were estimated based on the evaluations described above, and engineering judgment and are presented in Table 3.1. It should be noted that the estimated engineering properties are appropriate only for design purpose.

Table 3.1 Estimated Engineering Properties for Sespe Formation (for Design Purpose Only)

Material	Unit Weight [pcf]	Friction Angle [degree]	Cohesion [psf]
Sespe Formation	120	34	200

3.2 Laboratory Testing

Corrosivity

Surficial materials were collected for the corrosivity tests and tested in accordance with CTM 532, 643, 417, and 422. The test results indicated that the materials in the project area are non-corrosive. The results of the corrosion testing are presented as follows:

Table 3.2 Corrosion Test Result Summary

Sample Number	Depth Interval (ft)	Lab Sample Number	pH	Minimum Resistivity (ohm-cm)	Sulfate Content (ppm)	Chloride Content (ppm)
1	0 – 1	NA(1)	5.88	2300	N/A(2)	N/A(2)
2	0 - 1	NA(1)	8.25	2552	N/A(2)	N/A(2)

Note:

For Corrosion definitions refer to Caltans Division of Engineering Services "Memo to Designers" 3-1.

(1) Lab Sample Number is assigned when resistivity is less than 1000 ohm-cm and further testing for sulfate and chloride is required.

(2) Caltrans Corrosion Technology Section police states that if the minimum resistivity is greater than 1000 ohm-cm the sample is considered to be noncorrosive and testing to determine sulfate and chloride is not performed.

3.3 Groundwater

During the site visit on July 1, 2014, no sign of groundwater was observed at the project site.

As stated in Section 2, no subsurface exploration was performed for this project. However, the groundwater information obtained from the boring records for the nearby past project sites were reviewed. Table 3.3 summarizes the existing groundwater information obtained from the nearby past projects.

Table 3.3 Summary of Groundwater Information from Nearby Past Project Boring Records

Borehole ID	Approximate Surface Elevation [feet]	Approximate Bottom of Boring Elevation [feet]	Date of Boring	Approximate Groundwater Elevation [feet]	Date of Groundwater Measurement	Drilled by
A-11-001	308.0	286.5	7/19/2011	Not Encountered	N/A	Caltrans
B-780	303.5	283.1	10/18/2001	Not Encountered	N/A	URS
H746	320.0	279.0	8/28/1990	Not Encountered	N/A	M&T AGRA
H759	298.0	282.0	10/24/1990	Not Encountered	N/A	M&T AGRA
B718	290.0	272.0	7/27/1990	275.0	7/27/1990	M&T AGRA
H760	292.0	241.0	10/23/1990	276.0	10/24/1990	M&T AGRA
H748	287.0	242.0	8/28/1990	278.0	8/29/1990	M&T AGRA
H745	292.0	261.0	8/28/1990	267.0	8/28/1990	M&T AGRA
H747	277.0	231.0	8/29/1990	268.5	8/30/1990	M&T AGRA
H749	278.0	193.0	8/28/1990	270.0	8/30/1990	M&T AGRA
H758	275.0	224.0	10/22/1990	268.7	10/23/1990	M&T AGRA

Based on the findings and observation described above, groundwater should not be a major concern during construction. However, it should be noted that groundwater can fluctuate due to various reasons such as climate variations.

3.4 Ground Motion

To develop the ARS curve at the project site, (1) the seismic design recommendation procedure for ground motion presented in '*Methodology for Developing Design Response Spectrum for Use in Seismic Design Recommendations*' dated November 2012, (2) the Caltrans ARS online (version 2.3.06) (http://dap3.dot.ca.gov/ARS_Online/) together with the Caltrans Fault Database dated December 2012, and (3) 2008 USGS interactive deaggregation tool (http://geohazards.usgs.gov/deaggint/2008/) have been used.

An upper 30m shear wave velocity (Vs_{30m}) of 380 m/sec has been estimated based on the site condition and the engineering judgment.

The result of deterministic seismic hazard analysis (DSHA) governs at the spectral period T=0.01 sec (i.e., peak ground acceleration). The San Joaquin Hills fault with a maximum magnitude of 7 is

the controlling fault, and the postulated peak ground acceleration (PGA) is 0.745g. Accordingly, a PGA of 0.745 g is recommended as the design peak ground acceleration for the proposed retaining wall.

3.5 Liquefaction Potential

Based on the subsurface condition and the groundwater condition evaluated above, the potential of liquefaction is negligible.

4. ANALYSIS AND DESIGN

4.1 Retaining wall: Soil Nail Wall

For the design of the recommended soil nail wall, the computer program SNAIL was used. Following are the geotechnical design criteria for the soil nail wall:

- **Static Case**

Minimum Factor of Safety: 1.5

- **Seismic Case**

Minimum Factor of Safety: 1.0
Non-dimensional horizontal seismic coefficient k_h: = 0.25
Expected deformation: less than 4 inches

The soil nail wall design is summarized in the following tables.

Table 4.1 Soil Nail Wall Design

Design Wall Height (ft)	Maximum Nail Spacing Vertical (ft)	Maximum Nail Spacing Horizontal (ft)	Nail Bar Size (inches)	Nail Length (ft)
Up to 10	5	5	1.0	16
Up to 15	5	5	1.0	16

Note:

1. Square nail layout pattern should be used.
2. The wall height is the vertical distance from the original ground behind the wall to the bottom of excavation of the wall.
3. Inclination angle of nails is 15 degree measured from horizontal.
4. The first row of the nails should be placed no more than 2.5 feet below the ground surface behind the wall.
5. The bottom row of the nails should be placed no more than 2.5 feet above the bottom of excavation of the wall.

Table 4.2 Soil Nail Resistance Information

Station (RW69 LOL)	Wall Zone 1, 2, 3 and 4	Nail Bar Yield Strength (ksi)	Factored Facing Resistance[2] (kips)
	Nominal Pullout Resistance[1] (pound per feet)		
69+95.00 to 79+95.00	2720	75	28.0[2]/38.1[3]

Note:

[1]The pullout resistance of the soil nail should be verified during soil nail wall construction.

[2]Factored facing resistance for the permanent-static facing design: appropriate structural factor of safety should be applied to this value.

[3]Factored facing resistance for the permanent-Seismic facing design: appropriate structural factor of safety should be applied to this value.

For seismic stability analysis, pseudo-static method was used. In the pseudo-static method, the earthquake-induced inertial forces varying in time are simplified as equivalent pseudo-static force acting on the center of gravity of the analyzed block.

4.2 Overhead Sign Structure

A recently published Caltrans Geotechnical Manual for '*Standard Plan Overhead and Changeable Message Signs*' dated October 2014 was used.

Design of pile foundations for sign structures is primarily governed by lateral capacities of the piles. It should be noted that the Standard Plan pile depths were determined using (1) the Broms method and (2) the assumed minimum design material properties (i.e., Unit Weight = 120 pcf, Friction Angle = 30 degree or Su = 1200 psf).

Since the estimated strength parameters at the proposed sign structure location (i.e., Sespe Formation) as presented in Table 3.1 exceed the assumed design parameters, no lateral resistance analysis is necessary according to Caltrans Geotechnical Manual for '*Standard Plan Overhead and Changeable Message Signs*'.

5. GEOTECHNICAL RECOMMENDATIONS

5.1 Retaining Wall: Soil Nail Wall

- Based on the site condition evaluated above, the information on the proposed soil nail wall provided to us, and the results of the engineering analyses presented in the previous section, the proposed soil wall should be feasible.

5.2 Overhead Sign Structure

- Based on the site condition evaluated above and the information on the proposed sign structure provided to us, the standard plan for the post type III-S, as presented on Caltrans

Standard Plan 2010 S-15 (i.e., round pedestal pile foundation) should be adequate for the design of proposed CIDH piles with exception of the foundation depth.

- Since the proposed CIDH piles will be installed on the sloping ground (about 2H:1V), the foundation depth should be increased by 3 feet for both CIDH piles.

5.3 Slope Cut (Station 80+68.11 to 85+57.07)

- During the site visit on July 1, 2014, the slope appeared to be stable. Accordingly, it is our recommendation that the angle of the proposed slop cut needs to remain the same as those of the current the slope or flatter (i.e., 2H:1V or flatter).

- Erosion mitigation/protection measures should be implemented.

6. CONSTRUCTION CONSIDERATION

According to the information provided by the Structure Design, the 24 inch-drainage pipes will be installed in front of the proposed soil nail walls. The depths of the drainage pipes vary from about 4 feet to 10 feet from the finished grade of the wall. In order to avoid the adverse effect of the pipe installations on the wall integrity, we recommend the drainage pipes should be installed prior to the proposed soil nail wall construction. In case that the drainage pipes need to be installed after the wall construction, appropriate temporary shoring system should be provided along with the monitoring of the wall movement.

6.1 Notes for Specification Development

SS Section 19-3 Structure Excavation

Section 90-3.01A (3)(b) Soil Nail Wall and Ground Anchor Wall Zone.

Wall Zone	Beginning Station	End Station	Upper Elevation (feet)	Lower Elevation (Feet)
1	69+95.00 "RW69" LOL	72+85.00 "RW69" LOL	Top of wall	Bottom of wall
2	72+85.00 "RW69" LOL	75+25.00 "RW69" LOL	Top of wall	Bottom of wall
3	75+25.00 "RW69" LOL	77+25.00 "RW69" LOL	Top of wall	Bottom of wall
4	77+25.00 "RW69" LOL	79+95.00 "RW69" LOL	Top of wall	Bottom of wall

SS Section 46-3 Soil Nails

Section 46-3.01D (2)(b)(iii) Two Percent of Total Number of Production Soil Nails.

The value equal to two percent of the total number of production soil nails for this wall should be shown on the specification.

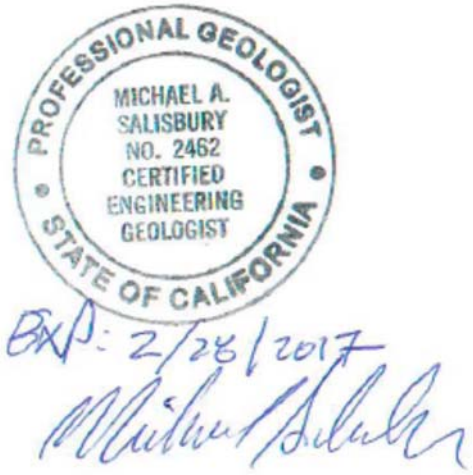
Section 46-3.03A Geotechnical Issues during Soil Nail Installation

Due to the presence of the sedimentary rock materials, and interbeded soft layers, difficult drilling and caving should be expected during construction.

SS Section 49 Piling

Due to the presence of the sedimentary rock materials, and interbeded soft layers, difficult drilling and caving should be expected during construction.

If you have any questions, please call Seungwoon Han at (916) 227-4533 in the Office of Geotechnical Design South 1, Branch A.



SEUNGWOON HAN, PH.D., P.E.
Transportation Engineer - Civil
Branch A

MICHAEL SALISBURY, C.E.G
Engineer Geologist
Branch A

cc: Digital Archive of Geotechnical Data (GeoDog)

Appendix A. Figure

Figure 1 Project Location

State of California
DEPARTEMNT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Serious Drought!
Help Save Water!

To: MATHEW CUGINI
Branch Chief,
Design C

Date: March 10, 2015

File: 12-Ora 73 / 133
PM 16.61 / 4.17
EA 0M3401
ID 1212 0000 17

From: KAMBIZ ZANJANI
Materials and Research Branch

Subject: **Materials Letter Report: Route 73 (SR-73) NB Collector/Distributer El Toro-Laguna Canyon (CD ET-LC) onto Route 133 (SR-133) Exit Ramp Widening (PM16.61) and SR-73 NB CD ET-LC onto SR-133 Terminus Section Widening (PM4.17) of the Exit Ramp, City of Laguna Beach, Orange County, California.**

In accordance with your recent request, Materials and Research (M&R) Branch has reviewed the submitted June 2013 Project Study Report- Project Report Safety Project for the above-referenced project. As part of this Materials Letter Report (MLR) M&R Branch has conducted field investigation, sampling and laboratory testing in order to provide you with pavement structural sections recommendations for the proposed widening.

1. Purpose and Scope of Study

The purpose of this MLR is to provide pavement and materials related recommendations and assist the Design Branch in preparing Project Plans, Specifications, and Estimates (PS&E). This MLR presents the findings, conclusions and recommendations for subject area in accordance with Topic 114 of Highway Design Manual (2012). The scope of work provided for this project included the following tasks:

- Field exploration consisting of exploratory borings (shallow drilling) and sampling;
- Laboratory testing of bulk soil sample;
- Engineering analysis to develop design and construction recommendations; and
- Preparation of this report, Presenting our findings, conclusions and recommendations.

2. Existing Facility

El Toro and the Rte 73 NB off-ramp form a 4-legged signalized intersection. The Rte 73 NB off-ramp at El Toro Road sets the southernmost and northernmost boundaries of the intersection, which consists of two exclusive left-turn lanes one through lane and one optional through/right lane in the SB direction and the 2-lane collector road in the NB direction of the intersection. El Toro Road at the NB ramps sets the easternmost and westernmost of the intersection, which consists of two through lanes in the eastbound (EB) direction and one exclusive right-turn lane, one optional right/through lane and one through lane in the westbound (WB) direction. The existing 2-lane CD ET-LC, which runs parallel to NB Rte 73 NB, Travels northwesterly from El Toro and then splits. The inside lane continues and ends at the Rte 73 on-ramp and the outside lane continues onto the exit ramp and ends at the Rte 133 (Laguna Canyon Road). The CD ET-LC which travels northwesterly from El Toro Road onto Rte 133 ends at an existing 3-legged signalized intersection on Rte 133 at the 73 NB on/off-ramps. This segment of Rte 133 was recently widened from a 2-lane to 4-lane Conventional Highway between Rte 405 and Rte 73. The project limits begins at PM 16.61 (Rte 73 NB exit ramp) and ends at PM 4.17 (the terminus section at the Rte 133). The exit ramp has one 12-ft wide lane at St 71+40 that opens to two 12-ft wide lanes from St 80+24.65 to 82+80, and to two 14-ft wide lanes at the terminus section from St 84+40 to 87+90. The section has standard 4-ft paved left and 8-ft paved right shoulders.

3. Proposed Project Improvement

This safety project proposes widening of existing Route 73 NB CD ET-LC onto Rte 133 from a one-lane exit ramp to a two-lane exit ramp, widening the terminus section to NB CD ET-LC at Rte 133 from two-lanes to three-lanes (two exclusive right-turn and one left-turn) and modifying signal operations at the Rte 73 NB CD ET-LC Rte 133 and Rte 73 SB on/off-ramp / Rte 133 intersections.

4. Terrain and Surface Drainage

The project site is located within the limits of Caltrans right-of-way in City of Laguna Beach. Route 73 NB CD ET-LC off-ramp is mostly downhill that turns flat at Rte 133 freeway level. Any possible surface water within the ramp shall drain per design along super-elevation and toward inlets at low point.

5. Summary of Field Investigation

Our field investigation was conducted on September 24, 2014 and consisted of total six coring and borings, MB-1 through MB-6. We cored AC at two locations and drilled soils to a depth of 6ft at other four locations. Testing was conducted by Southern Regional Lab (SRL) crew. A hand held auger was utilized for soil drilling. The purpose of coring AC was to measure the thickness of various pavement sections within existing paved shoulders. We also collected subsurface soils samples within unpaved shoulder and median areas for laboratory testing and evaluation. All bulk samples were shipped to SRL for testing. Table 1 presents summary of testing locations, AC coring data and soil testing results.

6. Subsurface and Groundwater Conditions

We did not encounter any groundwater during our shallow drilling (6 to 7 ft deep) and have no information regarding the groundwater elevations in this area. For groundwater issues please consult with Office of Geotechnical Design-South 1. However, it is required that groundwater levels to be kept a minimum of 5 ft below the pavement structural section.

7. Cut and Fill Construction

Construction of the proposed widening requires some cut-fill operation within project limits. From Sta 76+50 to 79+30, along the 600-ft radius horizontal curve, the existing hill side will be excavated to provide the required horizontal clearance of 17-ft and the required stopping sight distance of 300-ft. A 6-ft high, Type 1 retaining wall will be constructed from Sta 769+25 to Sta 771+70 (LC-1 71+70) of the CD DT-LC, continuing from Sta 71+70 to Sta 79+30 of LC-1. The import fill material (if any) that might be going to be placed within 4 ft of finished grade shall have an R-value of greater that 40 and an Expansion Index of less than 50 or PI less than 12. Materials shall be non-corrosive to metals and concrete especially if any underground utilities or structures are planned to be constructed within project limits.

8. Seismic Considerations

Office of Geotechnical Design-South shall provide recommendations for seismic design including liquefaction/seismic settlement and lateral spreading as applicable.

9. Earthwork Factors

All earthwork shall conform to requirements of Section 19 Standard Specifications (2010), and project Standard Special Provisions. Imported borrow could be the major source of materials needed for widening of the road. Source of imported borrow is unknown at this time. Therefore, earthwork factors cannot yet be determined. If the contractor is planning to use import borrow to replace the in-situ soils, they should provide pertinent information such as Classification, R-value, Gradation, SE, Compaction Curves, expansive, and corrosive properties to the District Materials Branch prior to their acceptance for use. ***This information needs to be verified on the jobsite.***

10. Construction Observation and Testing

It is recommended that inspection and testing be performed during the following stages of construction:

- Grading operations, including excavation and placement of compacted fill;
- Partial removal of existing pavement structural sections;
- Preparation of pavement subgrade;
- Placement of aggregate base;
- Placement of Pavement sections;
- Excavations for utility trenches (if any); and
- When any unusual conditions are encountered.

For all flexible pavements, it is imperative that special attention be given to mix design and compaction requirements. A copy of the approved mix design (field samplings/ laboratory test results) for Rubberized and conventional Hot Mix Asphalt (RHMA or HMA) and summary of all field compaction records (HMA, Aggregate Base (AB), Aggregate Subbase (AS), and subgrade shall be provided to our office at the conclusion of the construction activities and during the project closeout. ***We also request a copy of all field temperature measurements for AC (hauled and placed) and ambient to be submitted to our office at project closeout***

11. Corrosion Testing

Caltrans Corrosion Guidelines (November 2012), defines a corrosive environment as one where the soil has electrical resistivity of less than 1000 Ω-cm, sulfate content of greater than 2,000 ppm, chloride content of greater than 500 ppm, or pH of less than 5.5. All bulk sample obtained from job site were sent to SRL for pH and resistivity testing (chemical testing are done in Headquarters). Table 3 presents summary of corrosion potential test results.

12. Site Corrosion Recommendations

Based on results of corrosion tests, the minimum resistivity of three of samples, MB-1, 3, and 6 are greater than 1000 Ω-cm with pH greater than 5.5. As a result no further chemical testing (Sulfate and Chloride content) were needed. In general existing soil can be none to slightly corrosive to concrete or steel elements. For design purposes, it is recommended that Type IP (MS) Modified or Type II modified cement be used for concrete in contact with on-site soils. Various reinforced concrete pipes (RCP, RCB, CIPCP) design shall be suitable under the site soil corrosion level. Based on Figure 855.3A of Highway Design Manual (HDM Aug 2011) the minimum thickness of the steel pipe for a design life of 50 years shall be 0.109 inch (Gage No.12) galvanized steel pipe (CSP, SSRP, SSPP). Aluminum pipes (CAP, ASRP, SAPP) and Corrugated Aluminized Steel Pipe (CASP) cannot be used. Approved plastic pipe, for 50-yr service life can be used with abrasion resistance.

13. Traffic Index

In accordance with Topic 613.5 -2, Table 613.5A of Highway Design Manual (Nov 2012) a TI value for ramp with "Heavy Truck Traffic" (20-year design life) is 12. Proposed shoulder will be also designed with same TI value as the ramp pavement section.

14. Laboratory Testing

The following laboratory tests were performed on all four samples collected from the borings:

- Sieve Analysis (CTM 202)
- Mechanical Analysis (CTM 203)
- Atterberg Limits (CTM 204)
- R-Value (CTM 301)
- Expansion Index (UBC 29.2)
- Resistivity and pH (CTM 643)

Tests were conducted in general accordance with California Test Methods (CTM) and Uniform Building Code (UBC). Tables 1 and 2 at the end of report present test locations and summary of laboratory test results for all samples.

15. Subsurface Conditions

The subsurface conditions within the proposed ramp and mainline lane widening were classified based on site exploration and laboratory testing. The material within upper 5 ft of finished grade consists of Silty Sand (SM/SP) in location near proposed cut area of Rte 73 off-ramp and Silty Sand (SM) to Clayey Sand (SC) within median area by Rte 133. Overall results of Plasticity Index (PI) and Expansion Index (EI) tests on three samples in Table 2 came as non-factor. Please see section 20 (Recommended Materials Specifications), Item 2, on page 7 of this report for in-situ soils requirements.

16. Surface Drainage

Test results of core samples indicate presence of a permeable layer (Asphalt Treated Permeable Base – ATPB 0.25ft thick) within both sides shoulder of structural section profiles. It is our recommendation to eliminate the permeable layer (ATPB) and edge drain as part of proposed structural section for entire ramp. No edge drain system is needed to be reinstalled. However new outlets shall be properly installed to pick up any surface water due to run-off (no standing water) and accommodating the existing closed out edge drain system. Please see section 20 (Recommended Materials Specifications) Comments 9 and 10 for proper saw cutting and tack coat application on any exposed vertical AC sections.

17. Findings, Conclusions and Recommendations

The existing pavement structural sections based on core results are as follow (See also Table 2):

- ***Right side Shoulder Near Gore Area (existing)***
  0.1ft RHMA-O / 0.45ft HMA / 0.25ft ATPB / AB
- ***Left side Shoulder Near Ramp Terminus Section (existing)***
  0.1ft RHMA-O / 0.55ft HMA / 0.25ft ATPB / AB

Based on TI value of 12 and R-value of 31, we recommend Rubberized Hot Mix Asphalt Gap Graded (RHMA-G), Hot Mix Asphalt Concrete (HMA Type A) over Class 2 Aggregate Base (AB) and Aggregate Subbase (AS) without permeable layer (ATPB) for the entire ramp. A final layer of 0.1 ft Rubberized-Hot Mix Asphalt Concrete -Open Graded (R-HMA -O) will be placed to match the existing condition. The Option 2 also provides a Full Depth asphalt design. A same structural section as the ramp shall be used for the shoulder area as well (Section 613.5-2, HDM September 2006). Our recommendations:

- ***Entire Ramp/Shoulder Widening (no ATPB*)*** ***(TI_{20}=12, R=31)***

Option 1: 0.1ft RHMA-O /0.2ft RHMA-G / 0.4ft HMA-Type A / 0.8ft AB Class 2 / 0.75ft AS Class 2
Option 2: A Full-Depth, 0.1ft RHMA-O / 0.2ft RHMA-G / 1.05ft HMA-Type A /0.5ft AS Class 2 (workability),

- ***Proposed paved area between shoulder and AC dike*** ***(TI_{20}=7 **, R=31)***

0.2ft RHMA-G / 0.35ft HMA Type A / 0.35ft AS Class 2

Legends: RHMA O: Rubberized Hot Mix Asphalt -Open Graded; RHMA-G: Rubberized HMA Type G (Crumb Robber Usage, Per New Department Policy – February 10, 2015 Memo); HMA: Hot Mix Asphalt Concrete Type A; AB: Aggregate Base – Class 2; AS: Aggregate Subbase – Class 2 ***Note:** The *ATPB* (Asphalt Treated Permeable Base) layer is not included as part of proposed structural section (See Section 16 of this report for additional information) ** **Note**: The TI was calculated based on 2 percent of the projected ESALs of the adjacent traffic lane.

The existing AC pavement section shall be removed properly by sawcutting to full depth to provide a neat and straight pavement break. The join between the existing pavement and the new pavement shall be sealed. It is critical that to avoid: A) a Wheel-path falling along the sawcutting line, and B) create a cold joint along the saw cutting line where a new pavement will be placed against exiting roadway. To reduce potential drainage risks (water percolating down to foundation) it is recommended to cold plain 0.1ft within the existing pavement in area 2ft wide. It is therefore important that the final lift (0.1ft RHMA-O, Open Graded) is placed at milled and widened areas at the same time (See Item 14, Section 20 of this report). The AC pavement coring results show an overlay of 0.1ft RHMA-O has been placed on existing roadway in the past. Due to pavement restriping within subject ramp it is our recommendation to mill and replace 0.1 ft RHMA-O to match the existing condition across all lanes affected. Positive drainage shall be maintained for the roadway. The existing AC dike shall be restored to its original condition (Section 39-1.14 Standard Spec – Revised).

18. Materials Available

Imported borrow will be required for replacement of unsuitable soils within the project limits. Materials are available from several commercial suppliers throughout Orange, Los Angeles, Riverside and San Bernardino Counties. Furthermore, the Web-Site of Department of Conservation on the Internet contains a current listing of mining operations eligible to sell materials to the State of California. The page can be accessed at: http://www.consrv.ca.gov/omr/index.htm

19. Limitations

This report is intended for the use of Caltrans for the proposed widening in City of Laguna Hills, California. This report is based on the project as described and the information obtained from the exploratory borings at the approximate locations indicated in Table 1. The findings and recommendations contained in this report are based on the results of the field investigation, laboratory tests, and engineering analyses. In addition, soils and subsurface conditions encountered in the exploratory borings are presumed to be representative of the project site. However, subsurface conditions and characteristics of soils between exploratory borings can vary. The findings reflect an interpretation of the direct evidence obtained. The recommendations presented in this report are based on the assumption that an appropriate level of quality control and quality assurance (inspections and tests) will be provided during construction. District Materials and Research (M&R) Branch should be notified of any pertinent changes in the project plans or if subsurface conditions are found to vary from those described herein. Such changes or variations may require a re-evaluation of the recommendations contained in this report. The data, opinions, and recommendations contained in this report are applicable to the specific design elements and locations which are the subject of this report. They have no applicability to any other design elements or to any other locations and any and all subsequent users accept any and all liability resulting from any use or reuse of the data, opinions, and recommendations without the prior written consent of the District M&R Branch.

20. Recommended Materials Specifications

The following requirements shall be included in the project specifications:

1) If the Contractor is planning to use import borrow to replace the in-situ soils, they should provide pertinent information such as Classification, R-value, Gradation, SE, Compaction Curves, expansive, and corrosive properties to the District Materials Branch prior to their acceptance for use. This information **needs to be verified on the jobsite.**

2) Following exposing subgrade and prior to placement of pavement section on native soils, the native soils within upper 4 ft to the finished grade shall have a minimum R-value of 8, be non-corrosive to metal and concrete, have an expansive index of less than 51 or plasticity index of less than 12. If the existing native soils (within upper 4.0 ft to the finished grade) is determined to be not meeting the above requirements, the existing native soils shall be over-excavated and replaced with imported borrow to meet the imported fill recommendations herein. Borrow materials shall conform to Section 19-7 Caltrans Standard Spec (2010).

3) For pavement section on imported fill areas (if any), the engineering fill within the upper 4 ft to the finished grade shall have an R-value of at least 40, be non-corrosive to metal and concrete and have an expansive index (EI) of less than 51 or plasticity index (PI) of less than 12. Non-corrosive requirements shall be based on Caltrans Corrosion Guidelines (Nov 2012).
4) For metal pipes and concrete structures, site specific corrosion tests of the soils surrounding the pipe or structure be performed to verify the corrosivity of the soils along the pipe alignment or the structure
5) Prior to the placement of pavement sections, the subgrade soils shall be compacted in accordance with Section 19-5.03 Caltrans Standard Specification (2010).
6) Rubberized and Conventional Hot Mix Asphalt concrete (RHMA and HMA) shall be Type G and Type A respectively, Aggregate Base (AB), and Aggregate Subbase (AS) shall be Class 2. Extreme care must be taken to ensure moisture sensitive aggregates are not used for HMA mix design.
7) Compatible structural section as the roadway shall be used for the shoulder area in order to compensate for truck off-tracking on the shoulder area and where the width is less than 5 ft (See Section 613.5-2 HDM Nov 2012).
8) It is imperative that special attention is given to the mix design, compaction and temperature requirements for flexible pavement as stated in Caltrans Standard Specifications and Project Standard Special Provisions (SSPs).
9) The existing AC pavement section shall be removed properly by sawcutting to full depth to provide a neat and straight pavement break. The join between the existing pavement and the new pavement shall be sealed.
10) The tack coat application shall follow Sections 39-1.09C Caltrans Standard Specifications (2010). Tack Coat shall be also applied to all vertical faces of existing pavement, curbs, gutters and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced and to other surfaces designated in the Special Provisions.
11) Specifications are required for asphalt pavement treatment by applying Tack Coat on AB prior to the placement of HMA.
12) Special attention is required to be given to the following sections of 2010 Standard Specifications:

Section 19: Earthwork;
Section 25: Aggregate Subbases;
Section 39: Asphalt Concrete;
Section 61: Culvert and Drainage Pipe Joints;
Section 63: Cast-In-Place Concrete Pipe;
Section 64: Plastic Pipe;
Section 65: Reinforced Concrete Pipe;
Section 66: Corrugated Metal Pipe;
Section 68: Subsurface Drains;
Section 92: Asphalts;
Section 93: Liquid Asphalts;
Section 94: Asphaltic Emulsion.

13) All Standard Special Provisions (SSPs) to be included in the project shall be submitted to the Materials and Research Branch for review and approval.
14) It is critical that to avoid a cold joint along the saw cutting line where a new pavement will be placed against exiting roadway. To reduce potential risks (water and drainage percolating down to foundation) it is recommended to cold plain 0.1ft within the existing pavement for two foot wide. It is therefore important that the final lift (0.1ft RHMA-O) is placed at milled and widened areas at the same time. Efforts shall be also made to avoid a wheel path falling along the cold joint within proposed widened section.

If you have any questions, please call Ken Zanjani at x-7806 or Behdad Baseghi at x-2485.

Prepared by:

Kambiz (Ken) Zanjani, PE
Materials & Research Branch
Division of Project Delivery
RCE# 64311

Concurred by:

Behdad Baseghi, Ph.D, PE, GE, PMP
Chief, Materials & Research Branch
Division of Project Delivery
RCE # 47051

Attachments: Table 1: Summary of Testing Locations
Table 2: Summary of Laboratory Test Results,
Table 3: Corrosivity Test Results,

Cc: Tam Nguyen, Office Chief, Design
Shawn Ziaie, Transportation Engineer, Design C

Table 1: Summary of Testing Locations

Route Direction	Bore Hole No.	Location (Exit Ramp Onto NB Rte-133)	Station No.	Position	Distance off of Shoulder	Location
Northbound SR-73	MB-1	Right Shoulder	70+50	Slope Face (future cut)	18ft North of ES	1725 ft East of Traffic Signal (SR-133)
NB SR-73	MB-2	Right Shoulder	70+35	Paved Shoulder	4ft North of ETW	1775 ft East of Traffic Signal
NB SR-73	MB-3	Right Shoulder	71+25	Slope Face (future cut)	17ft North of ES	1475 ft East of Traffic Signal
NB SR-73	MB-4	Right Shoulder	73+00	Slope Face (future cut)	16 ft North of ES	1650 ft East of SR-133
NB SR-73	MB-5	Left Shoulder	84+85	Paved Shoulder	2ft South of ETW	325 ft East of Traffic Signal
NB SR-73	MB-6	Median	86+50	Non Paved Area	8 ft South of ES	170 ft East of Traffic Light

Table 2: Summary of Field and Lab Testing

Sample No.	Location: NB SR-73 Exit Ramp onto Rte-133	Sample Depth (ft)	Soils Type (USCS) (1)	Plasticity Index (2)			Percent Fine (Passing #200) (3)	Expansion Index (EI) (4)	Sand Equivalent (5)	R-Value (6)
				L.L.	P.L.	P.I.				
MB-1	Right shoulder - Cut slope	1 - 3	SM	NP	NP	NP	19	0	31	74
MB-2	Right Shoulder	Pavement Core Result: 0.1ft RHMA O / 0.45ft HMA /0.25ft ATPB/ AB								
MB-3	Right Shoulder – Cut Slope	1 - 5	SM	NP	NP	NP	28.5	0	24	67
MB-5	Left Shoulder	Pavement Core Result: 0.1ft RHMA O / 0.55ft HMA / 0.25ft ATPB/ AB								
MB-6	Median (Unpaved area)	1 - 5	SM	NP	NP	NP	31.5	0	16	30

NOTE: ***RHMA O***: *Rubberized Hot Mix Asphalt - Open Graded,*
HMA: *Hot Mix Asphalt,*
ATPB: *Asphalt Treated Permeable Base,*
AB: *Aggregate Base*

(1) Classification is based on ASTM D2487 and ASTM 2488 test Methods, USCS: Unified Soil Classification System
(2) Caltrans Test Method (CTM) – 204, LL: Liquid Limit, PL: Plasticity Limit, PI: Plasticity Index
(3) CTM – 202
(4) UBC – 29 Designations: 0-20 Very Low, 21-50 Low, 51-90 Medium, 91-130 High, and >131 Very High
(5) CTM 217 Sand Equivalent
(6) CTM – 301
NB: Northbound

Table 3: Summary of Corrosion Potential Test Results

Sample Number	Sample Depth (ft)	Soil pH (1)	Minimum Resistivity (ohm-cm) (2)	Sulfate Content (ppm) (3)	Chloride Content (ppm) (4)
MB-1	1 – 3	8.41	1265	N/A	N/A
MB-3	1 – 5	7.95	3105	N/A	N/A
MB-6	1 – 5	8.40	3713	N/A	N/A

Note: Normally Samples with Resistivity > 1000 ohm – cm are not tested for Sulfate and Chloride contents according to Caltrans Guidelines (2010).

(1) California Test Method (CTM) – 532
(2) CTM – 532,
(3) CTM – 417
(4) CTM – 422
(5) N/A: Not Applicable