GEOTECHNICAL INVESTIGATION AND FOUNDATION RECOMMENDATION

for

PROJECT NO. N6330(1)1,2&4 and N6331(1)2&4

KAIBITO CREEK BOX CULVERT AND KAIBITO ROADWAY

NAVAJO NATION

COCONINO COUNTY, ARIZONA

CONTRACT NO. MOO2400517

Prepared for

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6501 Americas Parkway
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And the

BUREAU OF INDIAN AFFAIRS, NAVAJO REGIONAL OFFICE

DIVISION OF TRANSPORTATION

GALLUP, NEW MEXICO

July 12, 2007
Revised August 21, 2007

Prepared By

TERRACON
Terracon Project No 66045049D

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August 21, 2007

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Mike Zwolinski P.E.
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Re: Geotechnical Investigation and Foundation Recommendation
N6330(1)1,2&4 and N6331(1)2&4
Navajo Nation
Coconino County, Arizona
Terracon Project No. 66045049D

Dear Mr. Zwolinski:

Terracon has completed the geotechnical engineering exploration for the proposed project to be located within the Navajo Nation Reservation, at Kaibito, in Coconino County, Arizona. This study was performed in general accordance with Terracon proposal P04-170A in reference to the project.

This report presents the results of our engineering analyses and discussions with ASCG regarding foundation alternatives and provides recommendations needed to aid in the construction of the foundations and other earth connected phases of the project.

We appreciate being of service to you in the geotechnical engineering phase of this project, and are prepared to assist you during the construction phases as well. If you have any questions concerning this report or any of our testing, inspection, design and consulting services, please do not hesitate to contact us.

Sincerely,
TERRACON

Michelle Mann for
Meagan J. Duneman, E.I.
Project Engineer

Kevin J. Scott, P.E.
Geotechnical Department Manager

Copies to: Addressee (3)

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AND FOUNDATION RECOMMENDATION

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KAIBITO CREEK BOX CULVERT

TERRACON PROJECT NO. 66045049D
JULY 12, 2007
REVISED AUGUST 21, 2007

INTRODUCTION

This Geotechnical Investigation and Foundation Recommendation (GIFR) report contains the results of our geotechnical engineering exploration for the proposed concrete box culvert structure and roadway to be located at Kaibito, in Coconino County, Arizona. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions,
- groundwater conditions,
- foundation design and construction,
- lateral earth pressures,
- pavement design and construction,
- earthwork, and
- drainage.

The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, discussions with ASCG, and experience with similar soil conditions, structures and our understanding of the proposed project.

PROPOSED CONSTRUCTION

We understand that the new Kaibito Creek Box Culvert and Kaibito Roadway will cross Kaibito Creek on the Navajo Nation Reservation in Coconino County, Arizona. The approximate location of the bridge is shown on the Site Location Map, Figure A1 in Appendix A. The new bridge is anticipated to be a concrete box culvert structure with an earth embankment cover overlain by aggregate base course and an asphalt concrete surface. A maximum service load of 82 kPa is anticipated for the structure. In addition, we also understand that approximately 4260 meters of existing roadway will be improved along N6330 and N6331. Roadway improvements are anticipated to consist of grade and drain earthwork, installation of minor drainage structures, placement of aggregate base course and an asphalt concrete pavement surface, and other miscellaneous construction.

Information provided by the client indicates that the Average Daily Traffic (ADT) projected for the year 2025 will be 32 vehicles per day (vpd) for N6330 and 536 vpd for N6331.

SITE EXPLORATION

The scope of the services performed for this project included site reconnaissance by Terracon's field engineer, a subsurface exploration program, laboratory testing, and engineering analyses.

Field Exploration: A total of 20 test borings (designated B-1 through B-20) were drilled on May 8 and 9, 2007. The borings were drilled to approximate depths of about 2.6 to 11.1 meters below existing site grades, as indicated in the table below. The borings were located in the field from the alignment provided by representatives of ASCG. In some situations, the borings were moved due to accessibility for the drilling rig. The approximate stationing and surface elevation at each boring location was provided by ASCG. The approximate boring locations, as referenced to a station and offset from the centerline and the elevation, are shown in the following table.

Boring Designation	Approximate Boring Station (meters)	Approximate Offset	Approximate Elevation (meters)	Approximate Drilled Depth (meters)
B-01	1+050	0	1744	2.6
B-02	1+110	8 Meters Right	1740	11.1
B-03	1+110	0	1740	11.1
B-04	1+110	9 Meters Left	1740	11.1
B-05	1+360	0	1755	2.6
B-06	1+630	0	1772	2.6
B-07	33+900	10 Meters Left	1832	2.6
B-08	34+200	5 Meters Left	1830	2.6
B-09	34+500	0	1826	2.6
B-10	34+800	0	1821	2.6
B-11	35+100	0	1811	2.6
B-12	35+400	0	1795	2.6
B-13	35+700	0	1779	2.6
B-14	36+000	0	1759	2.6
B-15	36+320	0	1752	2.6
B-16	36+600	0	1747	2.6
B-17	36+900	5 Meters Right	1750	2.6
B-18	37+200	10 Meters Right	1744	2.6
B-19	37+380	0	1744	2.6
B-20	37+560	10 Meters Right	1739	2.6

The borings were performed at the approximate locations shown on the Boring Location Diagram, Figure A2. Penetration resistance measurements were obtained by driving the sampler into the subsurface materials with a 63.5-kilogram (kg) (140 pound) hammer falling 76.2 cm (30 inches). The number of blows required to drive the sampler the last 30 cm (12 inches) of the total 45 cm (18 inches) is referred to as the SPT blow count or "N-value". The penetration resistance value is a useful index in estimating the consistency, relative density or hardness of the materials encountered.

Logs of each boring were recorded by the Terracon field engineer during the drilling operations. At selected intervals, samples of the subsurface materials were taken by driving either split-barrel or ring-barrel samplers.

Groundwater conditions were evaluated in each boring at the time of site exploration, and upon completion of drilling. The groundwater elevations reflect the conditions at the time of the exploration. These may vary with time and season of the year.

Laboratory Testing: Samples retrieved during the field exploration were returned to the laboratory for observation by the project geotechnical engineer and were classified in general accordance with the Unified Soil Classification System described in Appendix C. At that time, an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials and the field descriptions were confirmed or modified as necessary. Logs of Borings were prepared and are presented in Appendix A.

Laboratory tests were conducted on selected soil samples and are presented on the Logs of Borings and in Appendix B. The test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable local or other accepted procedures.

Selected soil samples were tested for the following engineering properties:

- Water Content
- Hveem R-Value
- Grain Size
- Plasticity Index

SITE CONDITIONS

The project site is located in Kaibito, Arizona, on Navajo Routes N6330 and N6331. N6330 is a dirt road that intersects N6331 and goes east across Kaibito Creek and up a steep hill to a residential area. N6331 is a dirt road that goes north from the intersection with Navajo

Route N21 through a residential area and intersects with AZ 98. The elevation generally decreases from south to north.

Soil and Rock Conditions: As presented on the Logs of Borings, the subsurface soil conditions encountered in the roadway soil borings generally consisted of poorly graded sands with varying amounts of silt (SP-SM, SM) to the boring termination depth. A layer of clayey sand (SC) was encountered in borings B-01 and B-20 below the sandy layer and a layer of lean clay (CL) was encountered in B-10 above the sand layer. The subsurface conditions at the box culvert generally consisted of a poorly graded sand with silt and gravel (SP-SM) layer with a thickness of approximately 1.2 meters (4 feet) underlain by poorly graded sands with varying amounts of silt (SP-SM, SM) to the boring termination depth. A majority of the sand materials appeared to be weathered sandstone and the clayey sand material in B-01 appeared to be shale. Hollow-stem auger drilling was able to penetrate the weathered sandstone bedrock and well-cemented soils. In general, the bedrock appeared to be weathered sandstone,

Field and Laboratory Test Results: Field penetration test results, as correlated to the Standard Penetration Test (N-value), indicate the coarse grained soils are generally loose to very dense in relative density while the fine grained soils are generally very stiff in consistency. The very dense, coarse grained, materials probably represent weathered sandstone.

Groundwater Conditions: Groundwater was not observed in the roadway borings at the time of drilling and was observed in borings B-02, B-03, and B-04 at depths of 5.2 meters, 4.6 meters, and 4.6 meters, respectively. These observations represent groundwater conditions at the time of the field exploration, and may not be indicative of other times, or at other locations. Groundwater conditions can change with varying seasonal and weather conditions, and other factors.

Zones of perched and/or trapped groundwater may also occur at times in the subsurface soils. The location and amount of perched water is dependent upon several factors, including hydrologic conditions, type of site development, irrigation demands on or adjacent to the site, fluctuations in water features, seasonal and weather conditions.

Fluctuations in groundwater levels can best be determined by implementation of a groundwater monitoring plan. Such a plan would include installation of groundwater monitoring wells, and periodic measurement of groundwater levels over a sufficient period of time. The possibility of groundwater fluctuations should be considered when developing design and construction plans for the project.

ENGINEERING ANALYSES AND RECOMMENDATIONS

The analyses and recommendations presented in this report have been prepared in general accordance with the guidelines established in Division 1 of the *Standard Specifications for Highway Bridges, 2002, 17th Edition* as prepared by the American Association of State Highway and Transportation Officials (AASHTO). Recommendations pertaining to the construction and installation of the various foundation elements, abutments, and approach slabs should be in accordance with Division 2 of the Standard Specifications.

Geotechnical Considerations: The subsurface conditions at the box culvert location generally consisted of a loose poorly graded sand with silt and gravel layer with a thickness of a 1.2 to 2.0 meters (4 to 6 ½ feet) underlain by very dense poorly graded sand with varying amounts of silt (weathered sandstone).

It should be noted that the project site is identified as having a low to moderately low seismic risk in accordance with AASHTO guidelines.

Design and construction recommendations for the recommended foundation system were evaluated and other earth related phases of the project are outlined below.

Shallow Foundations: We recommend the proposed box culvert structure be supported on 61 centimeters (24 inches) of engineered fill. We further recommend that the cutoff walls either extend to the very dense native soils or extend a minimum of 0.5 meters below scour depth if adequate protection is provided at the upstream and downstream faces of the box culvert to prevent erosion and/or scour at the cutoff walls. A maximum bearing pressure of 143 kPa (3,000 psf) may be used. The design bearing pressure applies to dead load plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions.

Maximum total settlement resulting from the assumed structural loads is estimated to be on the order of 19 millimeters (¾ inch). Differential settlement should be on the order of ½ to ¾ of the estimated total settlement.

Foundation excavations should be observed by the geotechnical engineer. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

Lateral Earth Pressures: For soils above a free water surface, recommended equivalent fluid pressures for unrestrained foundation elements (i.e. abutments and wing walls) are:

- Active:
  Cohesionless soil backfill (on-site sand)..... 6.0 kPa/m

Compacted granular backfill..... 5.5 kPa/m

- At Rest:
  Cohesionless soil backfill (on-site sand)..... 9.5 kPa/m

- Passive:
  Provided the channel is armored per Federal Highway Guidelines to minimize scour at the entry and exit of the box culvert, a passive resistance for on-site soils of 64 kPa/m can be utilized for abutment and wing walls.

- Coefficient of base friction..... 0.37

The active lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/long-term hydrostatic loading. Additional recommendations may be necessary if submerged conditions are to be included in the design. Short-term hydrostatic loading as typically associated with flooding and/or short-term saturation due to storm water run-off/snow melt does not require additional recommendations.

Fill against cutoff walls and wing walls should be compacted to densities specified in the Earthwork section of this report. Medium to high plasticity clay soils or shale should not be used as backfill against wing walls. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction and use of medium to high plasticity clay soils or silt/claystone/shale may cause excessive lateral earth pressures which could result in wall movement.

Scour: As requested, we have provided the gradation results of the soil materials encountered in the existing wash that we expect to be representative of the potential scour material. The materials were obtained by excavating a small pit with a shovel to a depth of about 0.6 meters (2 feet) below existing grades on the boundary and within the limits of the existing wash. The scour gradation results, labeled Scour, may be found in Appendix B on the grain size distribution curves.

Below Grade Wall Drainage: To reduce hydrostatic loading on below grade walls, such as wing walls, a permeable backfill should be placed behind the wall in accordance with Section 210, *Permeable Backfill*, of FP-96. The free-draining granular material should be graded to prevent the intrusion of fines or encapsulated in a suitable filter fabric. A drainage system consisting of either weep holes or perforated drain lines (placed near the base of the wall) should be used to intercept and discharge water that may saturate the backfill. Where used, drain lines should be provided with adequate clean-outs for periodic maintenance. An impervious soil should be used in the upper layer of backfill to reduce the potential for water infiltration. As an alternative, a prefabricated drainage structure, such as geocomposite,

may be used as a substitute for the granular backfill adjacent to the wall. Materials used for drainage should conform to Sections 714.01, *Geotextile,* 714.02, *Geocomposite Drains*, and 703.04, *Permeable Backfill*, of FP-96.

Pavement Subgrade Preparation: As construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, or rainfall. As a result, the pavement subgrade may not be suitable for pavement construction and corrective action will be required. The subgrade should be carefully evaluated at the time of pavement construction for signs of disturbance or excessive rutting. If disturbance has occurred, pavement subgrade areas should be reworked, moisture conditioned, and properly compacted to the recommendations in this report immediately prior to paving.

Pavement Section Designs: Design of pavements for the project was based on the procedures outlined in the 1993 *Guideline for Design of Pavement Structures by the American Association of State Highway and Transportation Officials (AASHTO)*. Information provided by the client indicates that the Average Daily Traffic (ADT) projected for the year 2025 will be 536 vpd for N6331 and 32 vpd for N6330. The projection assumes that buses will account for five percent of the traffic for N6331 and none of the traffic for N6330. These values generally correspond to those recommended by the *Asphalt Institute IS-181 (MS-1)* for Traffic Categories Class I and Class III. Class I describes typical traffic on light farm roads, whereas Class III describes traffic associated with urban and rural minor collectors. The classes address ADTs of between 50 to 100 vpd and 200 to 700 vpd, respectively. Because 32 vpd is considered too light for AASHTO methods, we used 50 vpd for calculations for N6330. Based on these data, previous experience with similar type roads and anticipated usage, the pavement sections have been designed for a 20 year life using an equivalent single 80 kN axle load (ESAL) of about 5,000 for N6330 and 138,000 for N6331.

Local drainage characteristics of proposed pavements areas are considered to vary from fair to good. For purposes of this design analysis, fair drainage characteristics are considered to control the design.

Asphalt concrete should be obtained from an approved mix design stating the Marshall properties, optimum asphalt content, job mix formula, and recommended mixing and placing temperatures. Aggregate used in asphalt concrete should meet a particular gradation. Materials meeting Section 401, *Hot Asphalt Concrete,* FP-96 criteria for Class B Asphaltic Concrete as defined in Table 401-1 should be used. The mix design should be submitted prior to construction to verify its adequacy. The asphalt materials should be placed and compacted in accordance with Sections 702, *Asphalt Material,* 703 and 401 requirements.

Aggregate base course should consist of a blend of sand and gravel, which meets strict specifications for quality and gradation. Use of materials meeting Section 703, *Aggregate,*

of FP-96, is required. Aggregate base course material should be tested to determine compliance with these specifications prior to importation to the site. Aggregate base course should be placed and compacted in accordance with Section 301, *Untreated Aggregate Courses,* of FP-96.

Pavement design recommendations for this project have been based on procedures outlined in the *AASHTO Guide for Design of Pavement Structures*, 1993, coupled with our local experience and understanding of the project. Using an average laboratory-obtained R-value of 69, ESALs of 5,000 and 138,000, and appropriate asphalt and aggregate base course equivalency factors, we designed the pavement section shown in the table below. Our design calculations are provided in Appendix D.

PAVEMENT THICKNESS RECOMMENDATIONS

MATERIAL	N6330 THICKNESS* (millimeters)	N6331 THICKNESS* (millimeters)
Aggregate Base	102	152
Asphalt Surface	51	64
Total Pavement Section	**153**	**216**

*recommended minimum thicknesses

Although the design calculations resulted in a smaller pavement section, we recommend using a thicker section to account for construction tolerances.

The recommendations provided are based on an R-value of 69. This is an average of the R-values obtained along the road. Appropriate use of these recommendations requires that soils having an R-value of less than 69 must be removed and replaced with materials having an R-value of at least 69. We recommend a minimum removal and replacement thickness of about 0.6 meters. Replacement materials can be imported or obtained from grading of the road in areas where the R-value exceeds 69. Based on the results of the estimated R-values, it is likely that removal and replacement will occur at the following location due to clayey soils:

Beginning Station	Ending Station
Station 34+700	Station 34+900

Prior discussions with the BIA Navajo Regional office, and comments provided by them indicate that removal and replacement will be too costly and they do not agree with this recommendation. During our discussions, it was indicated that they have alternative

methods that they have used in the past, and as such, since the BIA Navajo Regional Office is the owner of the project, they may elect to alter our recommendations based on past experience. Since these alternative methods are unknown at this time, Terracon does not assume responsibility for the performance of the subgrade or roadway section of the areas modified by the BIA Navajo Regional Office that are not outlined in this report.

Pavement Maintenance: Service life of the pavement is based on periodic pavement maintenance, adequate drainage, and traffic consistent with the stated assumptions in this report. Preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g. crack and joint sealing and patching) and global maintenance (e.g. surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance.

Long term pavement performance depends on several factors, including maintaining subgrade moisture levels and providing for preventive maintenance. The following recommendations should be considered the minimum:

- Site grading at a minimum 2% grade away from the pavements;
- Install joint sealant and seal cracks immediately.

The pavement section outlined above was determined based on the laboratory test results and post-construction traffic loading conditions for this type of road. This pavement section does not account for heavy construction traffic during the early stages of road construction. A partially constructed structural section may be subjected to heavy construction traffic that can result in pavement deterioration and premature failure. Our experience indicates that this pavement construction practice can result in pavements that will not perform as intended. Considering this information, several alternatives are available to mitigate the impact of heavy construction traffic on the pavement construction. These include using thicker sections to account for the construction traffic, using some method of soil stabilization to improve the support characteristics of the pavement subgrade, or by routing heavy construction traffic around paved streets. We are available to discuss these alternatives with you.

Corrosion Protection: Chemical laboratory testing was not performed for this project. Based on our knowledge of the site and our experience in similar foundation conditions, it is our opinion that chemical testing for sulfate, chloride, pH and resistivity is not required under

existing / present

the extant conditions. It is unlikely that concrete or steel used in the foundation elements or culverts will be significantly affected by chemical attack.

Earthwork:

- **General Considerations:** The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section.

  - Site clearing shall be performed in accordance with Sections 201, *Clearing and Grubbing,* and 203, *Removal of Structures and Obstructions,* of FP-96.
  - Roadway, embankment, and earthwork pertaining to foundation element preparation, excavation, filling and backfilling should be performed in accordance with Section 204, *Excavation and Embankment,* of FP-96. Materials used in the construction of the roadway subgrade should be in accordance with Section 704, *Soil,* of FP-96.
  - Drainage structure and wing wall preparation, excavation, filling and backfilling should be performed in accordance with Section 208, *Structure Excavation and Backfill for Selected Major Structures,* of FP-96. Materials used in the backfilling around the drainage structures should be in accordance with Sections 703.04, Permeable Backfill, and 704 of FP-96.
  - Recommendations for pavement elements supported on compacted fills or prepared subgrade depend upon compliance with the "Earthwork" recommendations.
  - To assess compliance, observation and testing should be performed under the direction of the geotechnical engineer and in accordance with Section 106, *Acceptance of Work,* of FP-96. Testing for compliance should be in accordance with Table 204-1 of Section 204, *Excavation and Embankment*, of FP-96
  - We recommend soil shrinkage factors of about 5 to 7 percent for the sand materials in the borings and 7 to 10 percent for the clayey soils encountered in Borings B-01 and B-10.

Slopes: For permanent slopes in native soils or in compacted fill a
on-site material, the recommended maximum slope for on-site
(Horizontal:Vertical). If steeper slopes are required for site dev
analyses should be completed to design the grading plan.

Agreed to concur.

The face of all fill slopes should be compacted to the minimum s
embankments. Alternately, fill slopes can be over-built and trimmed to compacted material. If any slope in cut or fill will exceed 7.5 m in height, the grading design should include mid-height benches to intercept surface drainage and divert flow from

the face of the embankment. If the slope contains erosion protection, slopes of 10 m in height with no benching is acceptable.

Excavation and Trench Construction: Excavations into the on-site soils may encounter caving soils, depending upon the final depth of excavation. The individual contractor(s) should be made responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards.

The soils to be penetrated by excavations may vary across the site. The soil classifications presented in this report are based solely on the materials encountered in the test borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

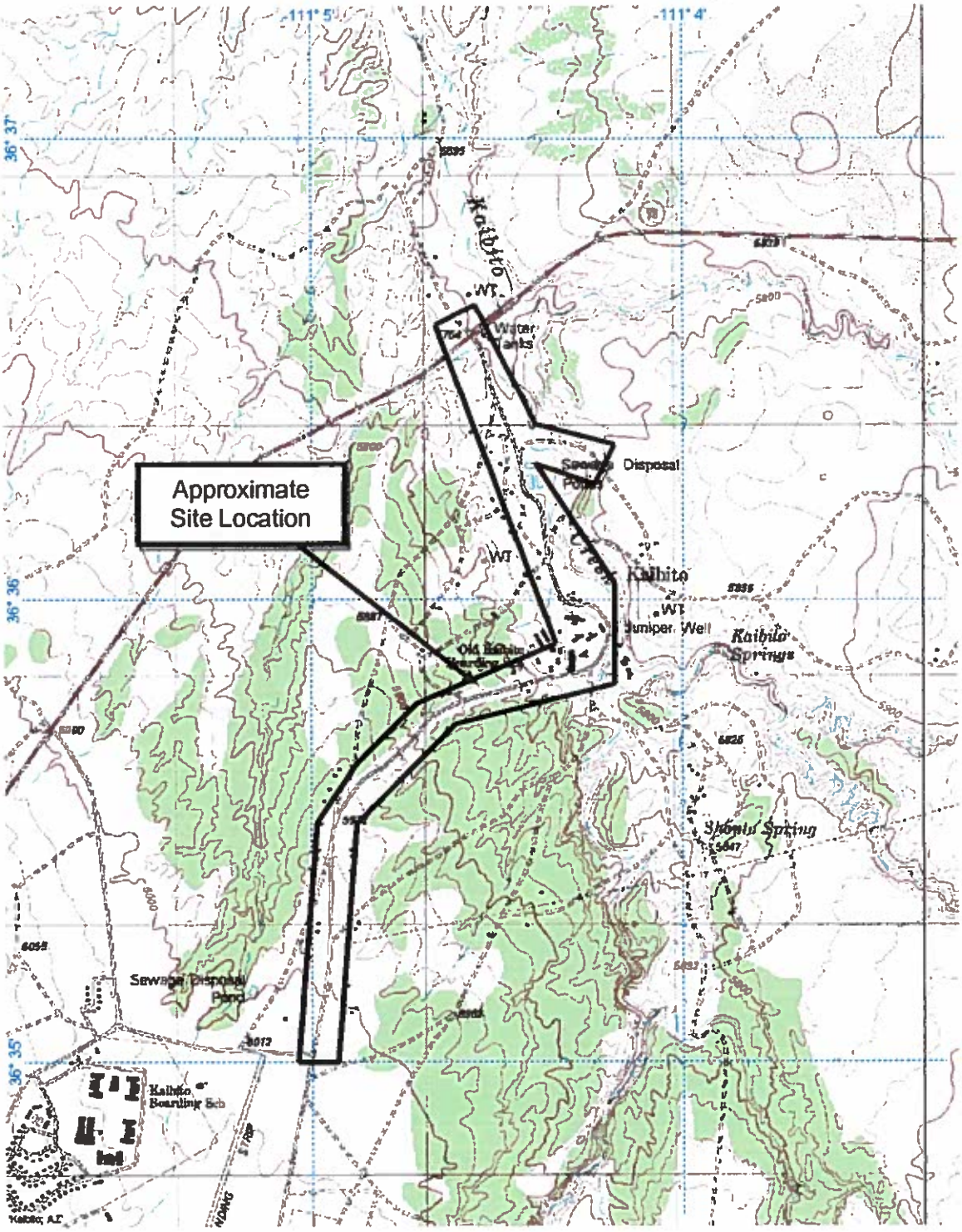
GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide testing and observation during excavation, grading, foundation and construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings or across the site. The nature and extent of such variations may not become evident until construction. If variations appear, it will be necessary to reevaluate the recommendations of this report.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. In the event that changes in the nature, design, or location of the project as outlined in this report, are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes, and either verifies or modifies the conclusions of this report in writing.



SOURCE: USGS Topographic Map, Kaibito, Arizona.- 7.5 Minute Quadrangle, 1981.

Terracon 4905 Hawkins Northeast Albuquerque, New Mexico 87109 (505) 797-4287 Fax (505) 797-4288	**AREA MAP** Kaibito Creek N6330(1) 1, 2 & 4 and N6331(1) 2 & 4 Kaibito, Arizona	Project No. 66045049D Date: June 19, 2007 Scale: 1 in. = 1500 ft. (approx.) **FIGURE A1**

LOG OF BORING NO. B-01

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+050, centerline

Approx. Surface Elev.: 1744 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, dense									
			SM	1	SS	0.15	49	2		
	1.4 1742.6	1								
	CLAYEY SAND; red, very dense									
			SC	2	SS	0.46	50	7		
	2.1 1741.9	2								
	SILTY SAND; reddish brown, very dense		SM	3	SS	0.46	64	7		
	2.6 1741.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-02

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+110, R 8 meters

Approx. Surface Elev.: 1740 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt and gravel; brown, very dense	0								
		1	SP SM	1	SS	0.41	68/.28	6		
	1.2 1738.8									
	SILTY SAND; white, very dense (Weathered Sandstone)		SM	2	SS	0.03	50/.03	3		
		2								
		3	SM	3	SS	0.03	50/.03	12		
	3.8 1736.2									
	SILTY SAND; white to light brown, very dense (Weathered Sandstone) ▽	4								
			SM	4	SS	0.03	50/.08	11		
		5								
		6	SM	5	SS	0.05	50/.13	22		
		7								
			SM	6	SS	0.08	50/.08	20		
	8.4 1731.6	8								
	SILTY SAND; red brown, very dense (Weathered Sandstone)	9								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 5.2	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-02

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; red brown, very dense (Weathered Sandstone)		SM	7	SS	0.05	50/.05	15		
	9.9 1730.1	10								
	SILTY SAND; white to light brown, very dense (Weathered Sandstone)		SM	8	SS	0.08	50/.08	24		
	11.1 1728.9	11								
	Boring Terminated at 36.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 5.2	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-03

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+110, centerline

Approx. Surface Elev.: 1740 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt and gravel; brown, medium dense to very dense	0								
		1	SP SM	1	SS	0.46	12	7		
		2	SP SM	2	SS	0.08	50/.1	5		
	2 1738									
	SILTY SAND; white, very dense (Weathered Sandstone)	3	SM	3	SS	0.05	50/.05	10		
	▽	4	SM	4	SS	0.05	50/.05	21		
	5.3 1734.7	5								
	SILTY SAND; light brown, very dense (Weathered Sandstone)	6	SM	5	SS	0.08	50/.08	21		
		7	SM	6	SS	0.05	50/.05	21		
	8.4 1731.6	8								
	SILTY SAND; white, very dense (Weathered Sandstone)	9								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 4.6	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

LOG OF BORING NO. B-03

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; white, very dense (Weathered Sandstone)		SM	7	SS	0.03	50/.03	20		
	9.9 1730.1									
	SILTY SAND; red brown, very dense (Weathered Sandstone)	10								
			SM	8	SS	0.03	50/.03	12		
	11.1 1728.9	11								
	Boring Terminated at 36.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 4.6	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-04

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+110, L 9 meters

Approx. Surface Elev.: 1740 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt and gravel; brown, medium dense to very dense	0								
		1	SP SM	1	SS	0.41	15	5		
		2	SP SM	2	SS	0.03	50/.03	5		
	2 1738									
	SILTY SAND; white, very dense (Weathered Sandstone)	3	SM	3	SS	0.08	50/.08	7		
	▽	4								
		5	SM	4	SS	0.05	50/.05	16		
	5.3 1734.7									
	SILTY SAND; white to red, very dense (Weathered Snadstone)	6								
	6.9 1733.1		SP SM	5	SS	0.1	50/.1	22		
	POORLY GRADED SAND with silt; light brown, very dense (Weathered Sandstone)	7								
		8	SM	6	SS	0.05	50/.08	24		
		9								

Continued Next Page

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 4.6	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-04

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; light brown, very dense (Weathered Sandstone)		SM	7	SS	0.08	50/.08	14		
		10								
			SM	8	SS	0.08	50/.08	11		
	11.1 1728.9	11								
	Boring Terminated at 36.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ 4.6	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-05

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+360, centerline

Approx. Surface Elev.: 1755 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; white, very dense (Weathered Sandstone)	1	SM	1	SS	0.25	50/.1	6		
		2	SM	2	SS	0.08	50/.08	3		
	2 1753									
	SANDY LEAN CLAY; red, hard (Shale)		CL	3	SS	0.41	55	16		
	2.6 1752.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-06

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 1+630, centerline

Approx. Surface Elev.: 1772 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, medium dense to very dense									
			SM	1	SS	0.46	20	2		
		1								
			SM	2	SS	0.46	62	5		
		2								
			SM	3	SS	0.36	50/.15	5		
	1.5 1770.5 Weathered Sandstone									
	2.6 1769.4 Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-07

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 33+900, L 10 meters

Approx. Surface Elev.: 1832 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; red brown									
	0.6 1831.4									
	POORLY GRADED SAND with silt; white, very dense		SP SM	1	SS	0.1	50/.13	4		
	1.2 (Weathered Sandstone) 1830.8	1								
	SILTY SAND; red brown, very dense (Weathered Sandstone)		SM	2	SS	0.08	50/.1	8		
	2 1830	2								
	SILTY SAND; red, very dense (Weathered Sandstone)		SM	3	SS	0.05	50/.08	8		
	2.6 1829.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

LOG OF BORING NO. B-08

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 34+200, L 5 meters

Approx. Surface Elev.: 1830 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; white, very dense (Weathered Sandstone)									
	1.2 1828.8	1	SP SM	1	SS	0.08	50/.08	4		
	POORLY GRADED SAND with silt; red brown, very dense (Weathered Sandstone)									
	2.6 1827.4	2	SP SM	2	SS	0.08	50/.08	4		
	Boring Terminated at 8.5 Feet.		SP SM	3	SS	0.1	50/.1	4		

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-09

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 34+500, centerline

Approx. Surface Elev.: 1826 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; white, very dense (Weathered Sandstone)									
	1.2 1824.8	1	SP SM	1	SS	0.1	50/.1	3		
	POORLY GRADED SAND with silt; red brown, very dense (Weathered Sandstone)									
	2.6 1823.4	2	SP SM	2	SS	0.08	50/.08	3		
			SP SM	3	SS	0.08	50/.08	4		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-10

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 34+800, centerline

Approx. Surface Elev.: 1821 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	LEAN CLAY; red brown,very stiff									
			CL	1	SS	0.46	26	12		
		1								
	1.4 1819.6									
	POORLY GRADED SAND with silt; white, very dense (Weathered Sandstone)		SP SM	2	SS	0.15	50/.08	7		
		2								
	2.6 1818.4		SP SM	3	SS	0.15	50/.08	2		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-11

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 35+100, centerline

Approx. Surface Elev.: 1811 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; white, very dense (Weathered Sandstone)									
		1	SP SM	1	SS	0.41	76/.25	2		
		2	SP SM	2	SS	0.08	50/.08	2		
	2.6 1808.4		SP SM	3	SS	0.1	50/.1	2		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: In-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-12

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 35+400, centerline

Approx. Surface Elev.: 1795 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; white, very dense (Weathered Sandstone)									
		1	SP SM	1	SS	0.13	50/.13	3		
	1.2 1793.8									
	SILTY SAND; red brown, very dense (Weathered Sandstone)									
			SM	2	SS	0.1	50/.1	7		
		2								
			SM	3	SS	0.1	50/.1	5		
	2.6 1792.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-13

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 35+700, centerline

Approx. Surface Elev.: 1779 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	POORLY GRADED SAND with silt; red brown, very dense (Weathered Sandstone)									
		1	SP SM	1	SS	0.08	50/.08	4		
		2	SP SM	2	SS	0.08	50/.08	3		
	2.6 1776.4		SP SM	3	SS	0.1	50/.1	2		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-14

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 36+000, centerline

Approx. Surface Elev.: 1759 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, loose									
			SM	1	SS	0.46	5	6		
	1.2 1757.8	1								
	POORLY GRADED SAND with silt; very dense (Weathered Sandstone)		SP SM	2	SS	0.41	91/.25	1		
		2								
			SP SM	3	SS	0.13	50/.13	1		
	2.6 1756.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-15

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 36+320, centerline

Approx. Surface Elev.: 1752 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY, CLAYEY SAND; red brown, very loose									
	1.2 1750.8	1	SC SM	1	SS	0.46	3	7		
	SILTY SAND; brown, medium dense									
		2	SM	2	SS	0.46	10	4		
	2.6 1749.4		SM	3	SS	0.46	21	6		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-16

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 36+600, centerline

Approx. Surface Elev.: 1747 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; white, very dense (Weathered Sandstone)									
		1	SM	1	SS	0.05	50/.05	4		
			SM	2	SS	0.18	50/.03	4		
		2	SM	3	SS	0.08	50/.08	4		
	2.6 1744.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-17

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 36+900, R 5 meters

Approx. Surface Elev.: 1750 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, very dense (Weathered Sandstone)									
	1.1 1748.9	1	SM	1	SS	0.43	53/.28	6		
	SILTY SAND; white, very dense (Weathered Sandstone)									
			SM	2	SS	0.05	50/.05	3		
		2								
	2.6 1747.4		SM	3	SS	0.1	50/.1	3		
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

LOG OF BORING NO. B-18

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 37+200, R 10 meters

Approx. Surface Elev.: 1744 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, medium dense to very dense									
			SM	1	SS	0.36	13	6		
		1								
	1.5 1742.5									
	Weathered Sandstone		SM	2	SS	0.46	52	6		
		2								
			SM	3	SS	0.13	50/.13	5		
	2.6 1741.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▽		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-19

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 37+380, centerline

Approx. Surface Elev.: 1744 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; brown, very loose to dense									
		1	SM	1	SS	0.46	3	7		
			SM	2	SS	0.46	8	7		
		2	SM	3	SS	0.46	30	5		
	2.6 1741.4									
	Boring Terminated at 8.5 Feet.									

The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▼
WL	▼		▼
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07

LOG OF BORING NO. B-20

CLIENT: ASCG, Inc.

SITE: Kaibeto, Arizona

PROJECT: N310 Kaibeto

Boring Location: STA 37+560, R 10 meters

Approx. Surface Elev.: 1739 m

GRAPHIC LOG	DESCRIPTION	DEPTH, m.	USCS SYMBOL	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY, m.	SAMPLES SPT - N BLOWS / 0.3m.	TESTS WATER CONTENT, %	TESTS DRY UNIT WT kN/m³	TESTS UNCONFINED STRENGTH, kPa
	SILTY SAND; red brown, medium dense to loose									
		1	SM	1	SS	0.46	11	10		
			SM	2	SS	0.46	4	10		
	2 1737	2								
	CLAYEY SAND; red brown, medium dense		SC	3	SS	0.46	15	8		
	2.6 1736.4									
	Boring Terminated at 8.5 Feet.									

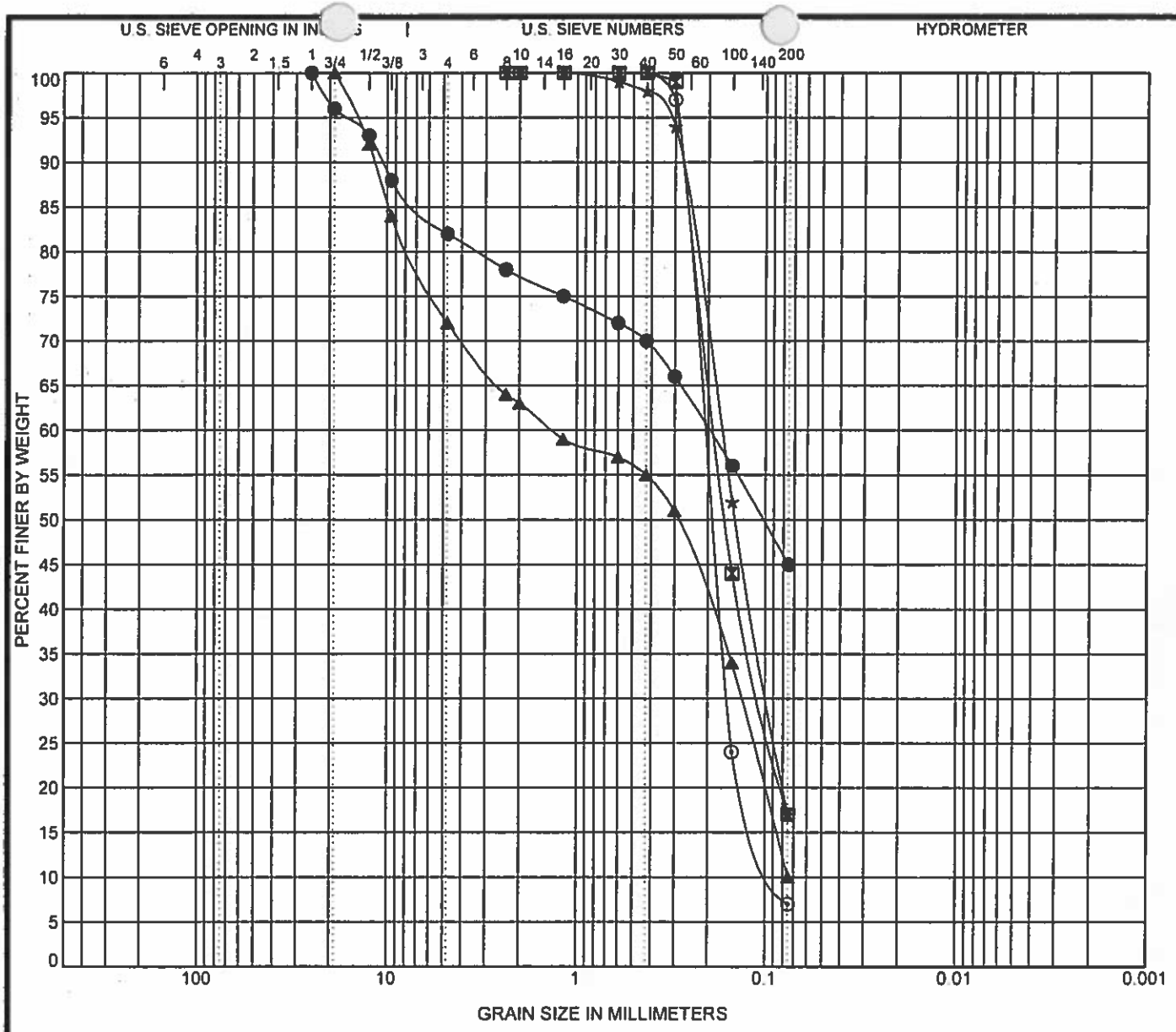
The stratification lines represent the approximate boundary lines between soil and rock types: in-situ, the transition may be gradual.

WATER LEVEL OBSERVATIONS, m			
WL	▽ NE	WD	▽
WL	▽		▽
WL			

Terracon

BORING STARTED	05-08-07		
BORING COMPLETED	05-08-07		
RIG	CME-75	FOREMAN	MD
APPROVED	KJS	JOB #	66045049D

BOREHOLE 99 66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-01	5.0ft	CLAYEY SAND with GRAVEL(SC)	33	16	17		
⊠	B-02	10.0ft	SILTY SAND(SM)	NP	NP	NP		
▲	B-03	2.0ft	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.18	17.95
★	B-03	30.0ft	SILTY SAND(SM)	NP	NP	NP		
⊙	B-04	20.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.41	2.49

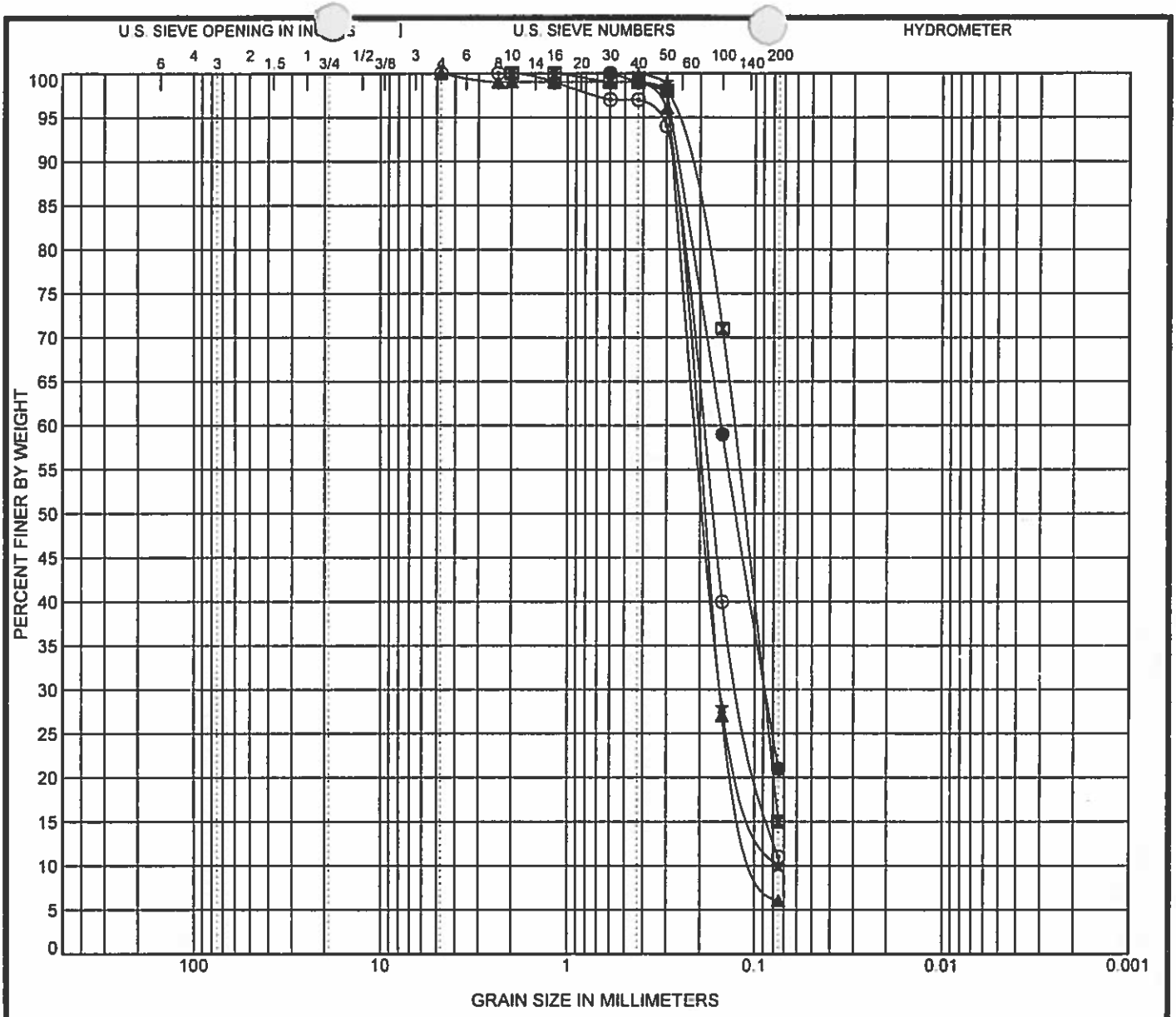
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-01	5.0ft	25	0.198			18.0	37.0	45.0	
⊠	B-02	10.0ft	2.36	0.184	0.105		0.0	83.0	17.0	
▲	B-03	2.0ft	19	1.346	0.134	0.075	28.0	62.0	10.0	
★	B-03	30.0ft	2.36	0.171	0.097		0.0	83.0	17.0	
⊙	B-04	20.0ft	2	0.211	0.159	0.085	0.0	93.0	7.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC GRAIN SIZE 66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-05	2.0ft	SILTY SAND(SM)	NP	NP	NP		
⊠	B-06	5.0ft	SILTY SAND(SM)	NP	NP	NP		
▲	B-07	2.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.34	2.44
★	B-08	2.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.52	2.73
⊙	B-09	5.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	0.98	2.65

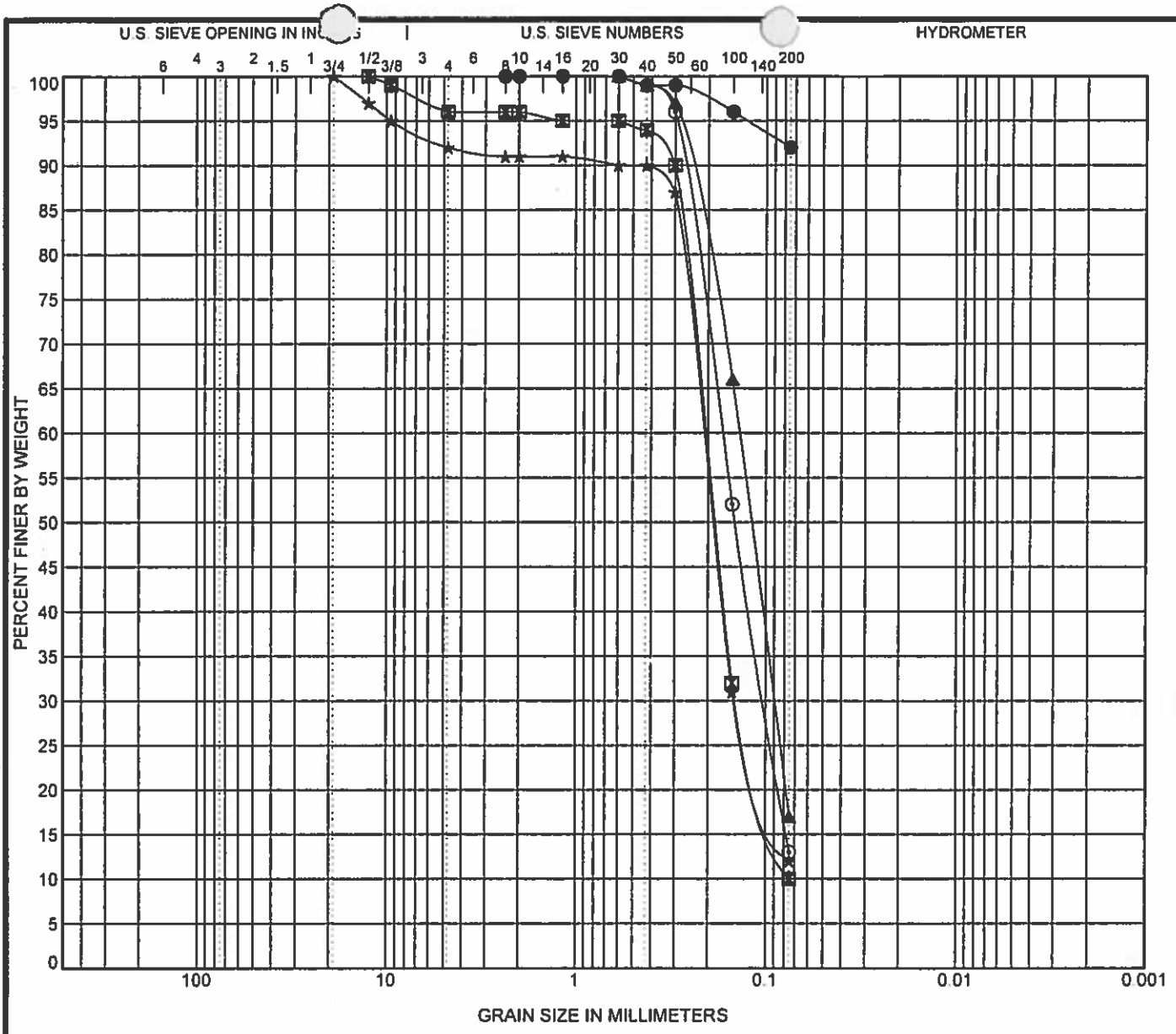
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-05	2.0ft	0.6	0.153	0.088		0.0	79.0	21.0	
⊠	B-06	5.0ft	2	0.131	0.09		0.0	85.0	15.0	
▲	B-07	2.0ft	4.75	0.209	0.155	0.086	0.0	94.0	6.0	
★	B-08	2.0ft	2	0.205	0.153	0.075	0.0	90.0	10.0	
⊙	B-09	5.0ft	4.75	0.194	0.118		0.0	89.0	11.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC_GRAIN SIZE 66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-10	2.0ft	LEAN CLAY(CL)	36	17	19		
⊠	B-11	2.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.26	2.79
▲	B-12	5.0ft	SILTY SAND(SM)	NP	NP	NP		
★	B-13	2.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.40	3.08
⊙	B-14	2.0ft	SILTY SAND(SM)	NP	NP	NP		

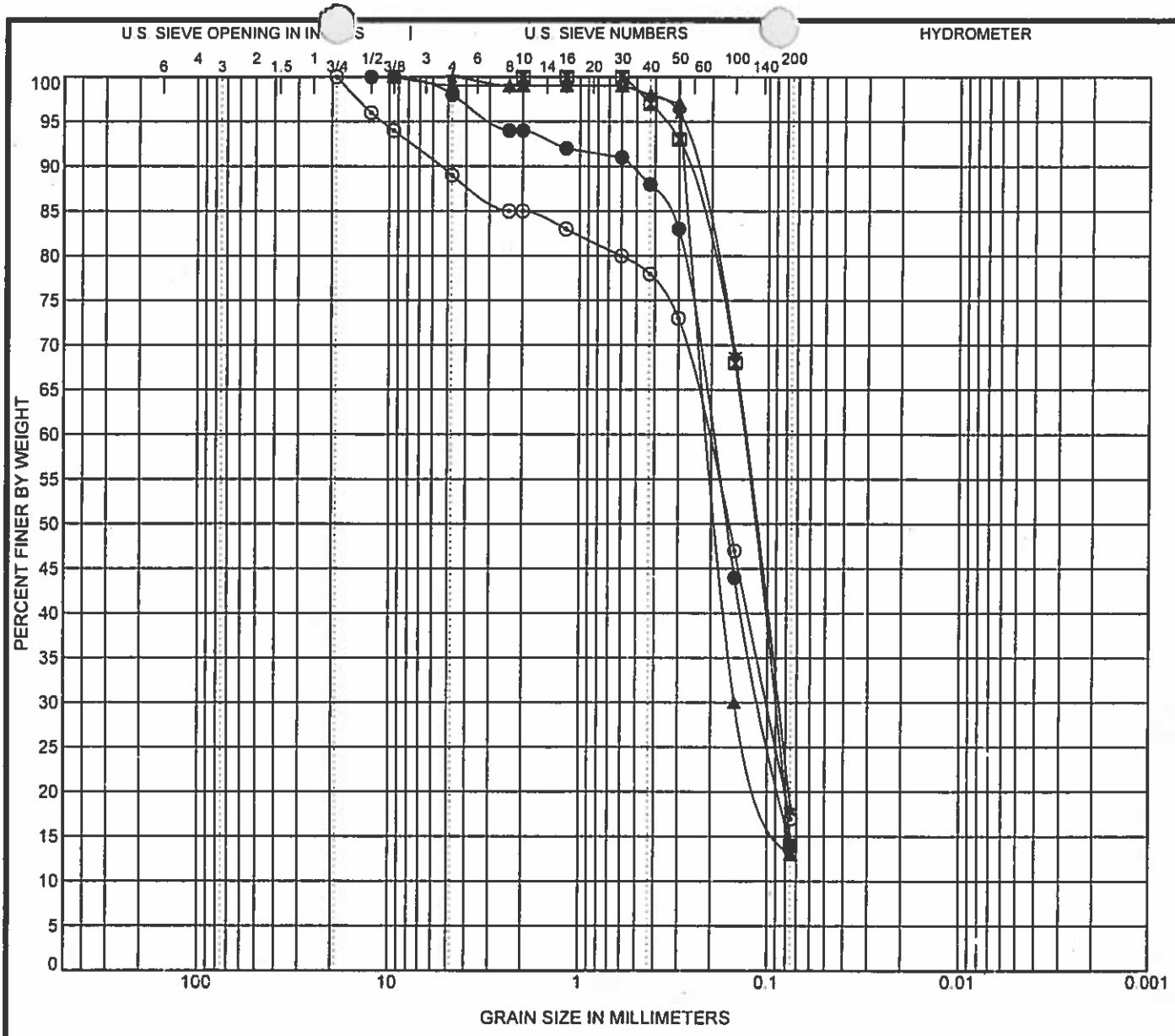
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-10	2.0ft	2.36				0.0	8.0	92.0	
⊠	B-11	2.0ft	12.5	0.21	0.141	0.075	4.0	86.0	10.0	
▲	B-12	5.0ft	0.6	0.138	0.09		0.0	83.0	17.0	
★	B-13	2.0ft	19	0.215	0.145		8.0	80.0	12.0	
⊙	B-14	2.0ft	2.36	0.17	0.101		0.0	87.0	13.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC GRAIN SIZE 66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B-14/15	0.0ft	SILTY SAND(SM)	NP	NP	NP		
⊠ B-15	5.0ft	SILTY SAND(SM)	NP	NP	NP		
▲ B-16	5.0ft	SILTY SAND(SM)	NP	NP	NP		
★ B-17	2.0ft	SILTY SAND(SM)	NP	NP	NP		
⊙ B-18	5.0ft	SILTY SAND(SM)	NP	NP	NP		

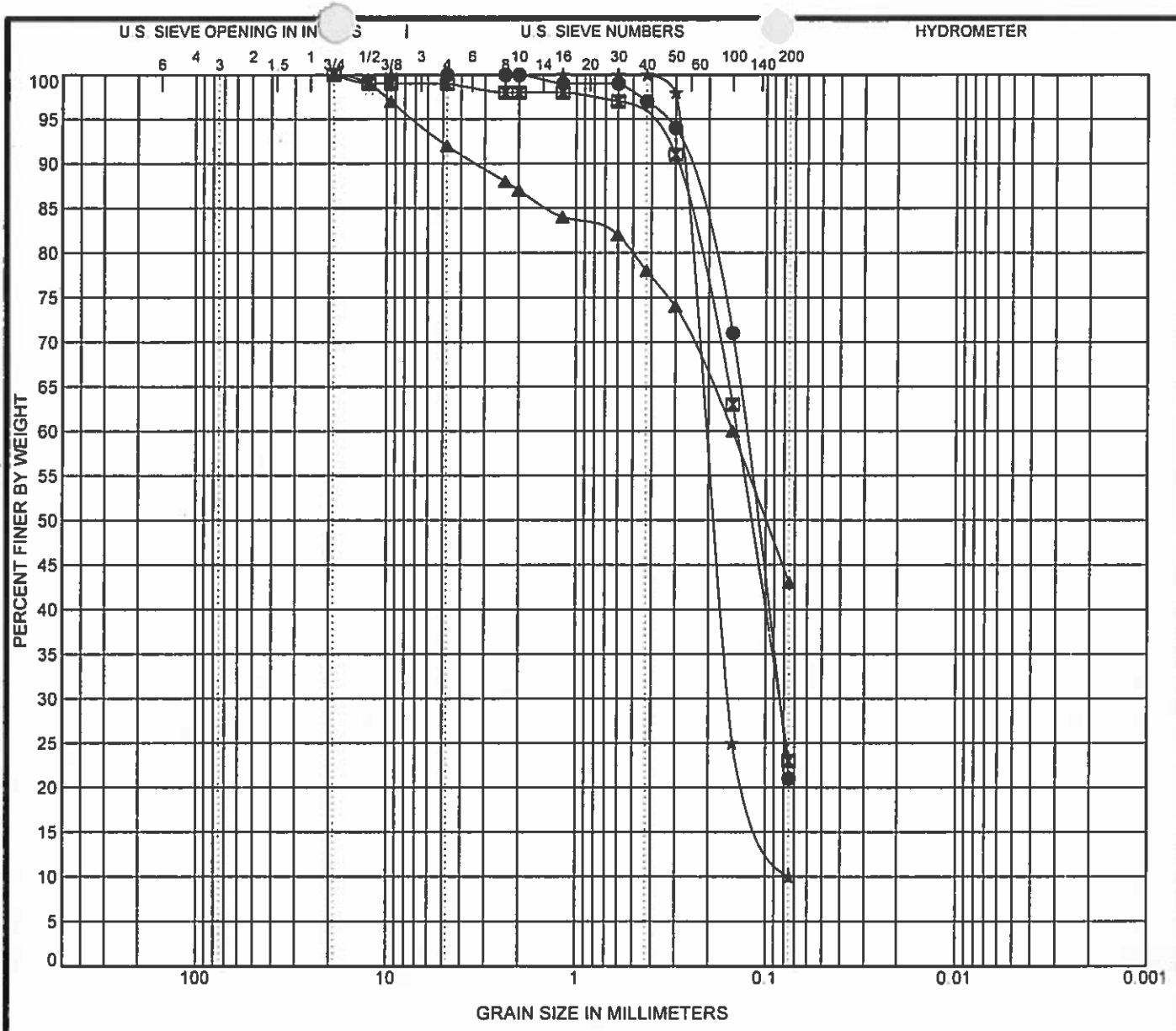
Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-14/15	0.0ft	12.5	0.199	0.109		2.0	84.0	14.0	
⊠ B-15	5.0ft	2	0.135	0.092		0.0	86.0	14.0	
▲ B-16	5.0ft	9.5	0.205	0.15		1.0	86.0	13.0	
★ B-17	2.0ft	9.5	0.133	0.088		0.0	82.0	18.0	
⊙ B-18	5.0ft	19	0.212	0.101		11.0	72.0	17.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC_GRAIN_SIZE_66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-19	5.0ft	SILTY SAND(SM)	NP	NP	NP		
⊠	B-19/20	0.0ft	SILTY SAND(SM)	NP	NP	NP		
▲	B-20	7.0ft	CLAYEY SAND(SC)	29	16	13		
★	B-7/8	0.0ft	POORLY GRADED SAND with SILT(SP-SM)	NP	NP	NP	1.58	2.79

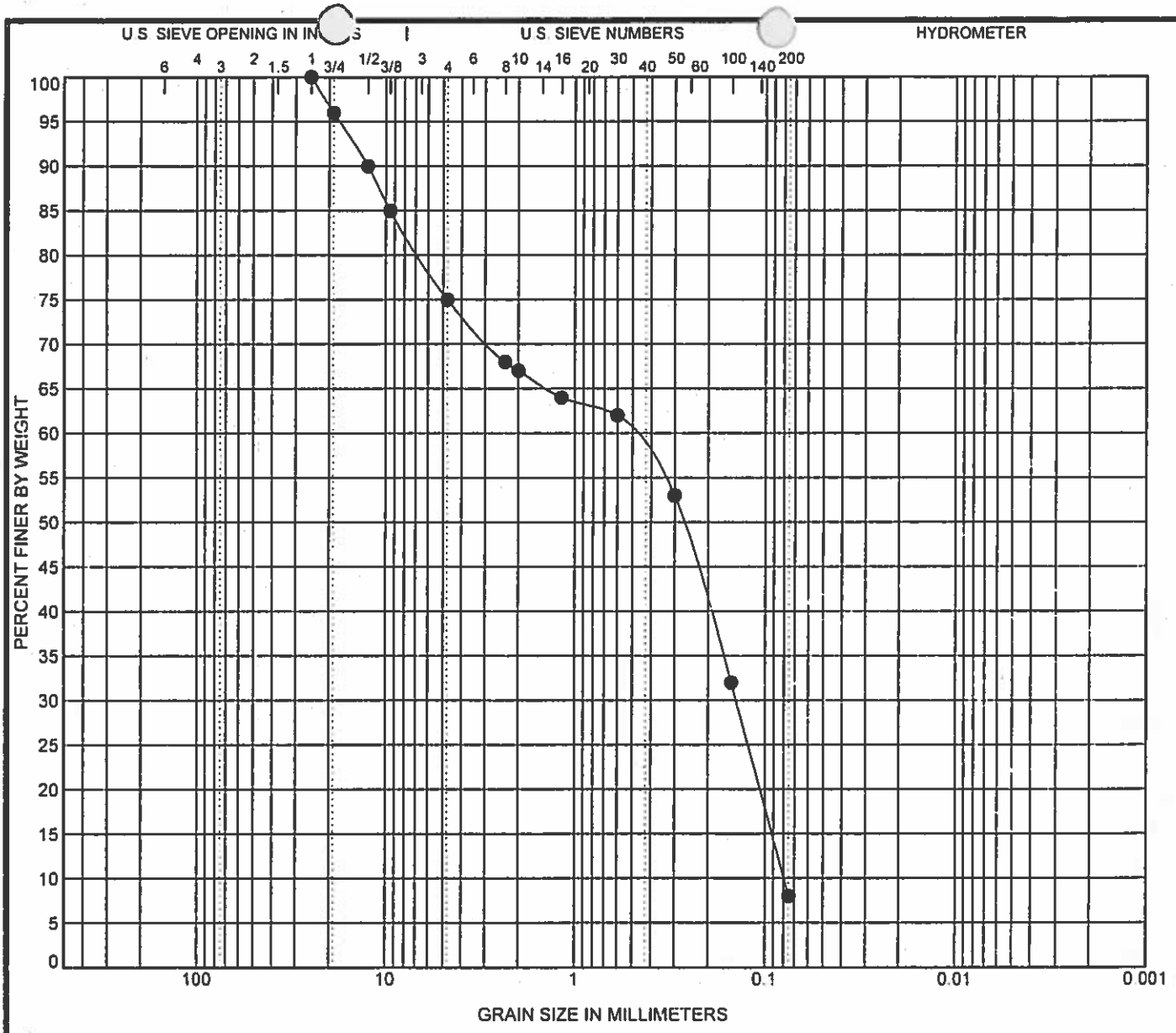
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-19	5.0ft	4.75	0.129	0.085		0.0	79.0	21.0	
⊠	B-19/20	0.0ft	19	0.142	0.085		1.0	76.0	23.0	
▲	B-20	7.0ft	19	0.15			8.0	49.0	43.0	
★	B-7/8	0.0ft	9.5	0.209	0.157	0.075	0.0	90.0	10.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC GRAIN SIZE 66045049D.GPJ TERRACON.GDT 07/12/07



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● Scour	0.0ft	POORLY GRADED SAND with SILT and GRAVEL(SP-SM)	NP	NP	NP	0.49	6.47

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● Scour	0.0ft	25	0.514	0.142	0.079	25.0	67.0	8.0	

Terracon

GRAIN SIZE DISTRIBUTION

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

TC_GRAIN_SIZE 66045049D.GPJ TERRACON.GDT 07/12/07

Borehole	Depth ft	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	USCS Class-ification	Water Content (%)	Dry Unit Weight (pcf)	Satur-ation (%)	Void Ratio
B-01	2.0							2			
B-01	5.0	33	16	17	25	45	SC	7			
B-01	7.0							7			
B-02	2.0							6			
B-02	5.0							3			
B-02	10.0	NP	NP	NP	2.36	17	SM	12			
B-02	15.0							11			
B-02	20.0							22			
B-02	25.0							20			
B-02	30.0							15			
B-02	35.0							24			
B-03	2.0	NP	NP	NP	19	10	SP-SM	7			
B-03	5.0							5			
B-03	10.0							10			
B-03	15.0							21			
B-03	20.0							21			
B-03	25.0							21			
B-03	30.0	NP	NP	NP	2.36	17	SM	20			
B-03	35.0							12			
B-04	2.0							5			
B-04	5.0							5			
B-04	10.0							7			
B-04	15.0							16			
B-04	20.0	NP	NP	NP	2	7	SP-SM	22			
B-04	25.0							24			
B-04	30.0							14			
B-04	35.0							11			
B-05	2.0	NP	NP	NP	0.6	21	SM	6			
B-05	5.0							3			
B-05	7.0							16			
B-06	2.0							2			
B-06	5.0	NP	NP	NP	2	15	SM	5			
B-06	7.0							5			
B-07	2.0	NP	NP	NP	4.75	6	SP-SM	4			
B-07	5.0							8			
B-07	7.0							8			
B-08	2.0	NP	NP	NP	2	10	SP-SM	4			
B-08	5.0							4			
B-08	7.0							4			
B-09	2.0							3			
B-09	5.0	NP	NP	NP	4.75	11	SP-SM	3			
B-09	7.0							4			

Terracon

SUMMARY OF LABORATORY RESULTS

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

Borehole	Depth ft	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	USCS Class-ification	Water Content (%)	Dry Unit Weight (pcf)	Satur-ation (%)	Void Ratio
B-10	2.0	36	17	19	2.36	92	CL	12			
B-10	5.0							7			
B-10	7.0							2			
B-11	2.0	NP	NP	NP	12.5	10	SP-SM	2			
B-11	5.0							2			
B-11	7.0							2			
B-12	2.0							3			
B-12	5.0	NP	NP	NP	0.6	17	SM	7			
B-12	7.0							5			
B-13	2.0	NP	NP	NP	19	12	SP-SM	4			
B-13	5.0							3			
B-13	7.0							2			
B-14	2.0	NP	NP	NP	2.36	13	SM	6			
B-14	5.0							1			
B-14	7.0							1			
B-14/15	0.0	NP	NP	NP	12.5	14	SM	1			
B-15	2.0							7			
B-15	5.0	NP	NP	NP	2	14	SM	4			
B-15	7.0							6			
B-16	2.0							4			
B-16	5.0	NP	NP	NP	9.5	13	SM	4			
B-16	7.0							4			
B-17	2.0	NP	NP	NP	9.5	18	SM	6			
B-17	5.0							3			
B-17	7.0							3			
B-18	2.0							6			
B-18	5.0	NP	NP	NP	19	17	SM	6			
B-18	7.0							5			
B-19	2.0							7			
B-19	5.0	NP	NP	NP	4.75	21	SM	7			
B-19	7.0							5			
B-19/20	0.0	NP	NP	NP	19	23	SM	2			
B-20	2.0							10			
B-20	5.0							10			
B-20	7.0	29	16	13	19	43	SC	8			
B-7/8	0.0	NP	NP	NP	9.5	10	SP-SM	1			

Terracon

SUMMARY OF LABORATORY RESULTS

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

Borehole	Depth ft	Liquid Limit	Plastic Limit	Plasticity Index	Maximum Size (mm)	%<#200 Sieve	USCS Class-ification	Water Content (%)	Dry Unit Weight (pcf)	Satur-ation (%)	Void Ratio
Scour	0.0	NP	NP	NP	25	8	SP-SM	5			

Terracon

SUMMARY OF LABORATORY RESULTS

Project: N310 Kaibeto
Site: Kaibeto, Arizona
Job #: 66045049D
Date: 07-12-07

Terracon

301 North Howes Street
FORT COLLINS, COLORADO 80521
(970) 484-0359 FAX (970) 484-0454

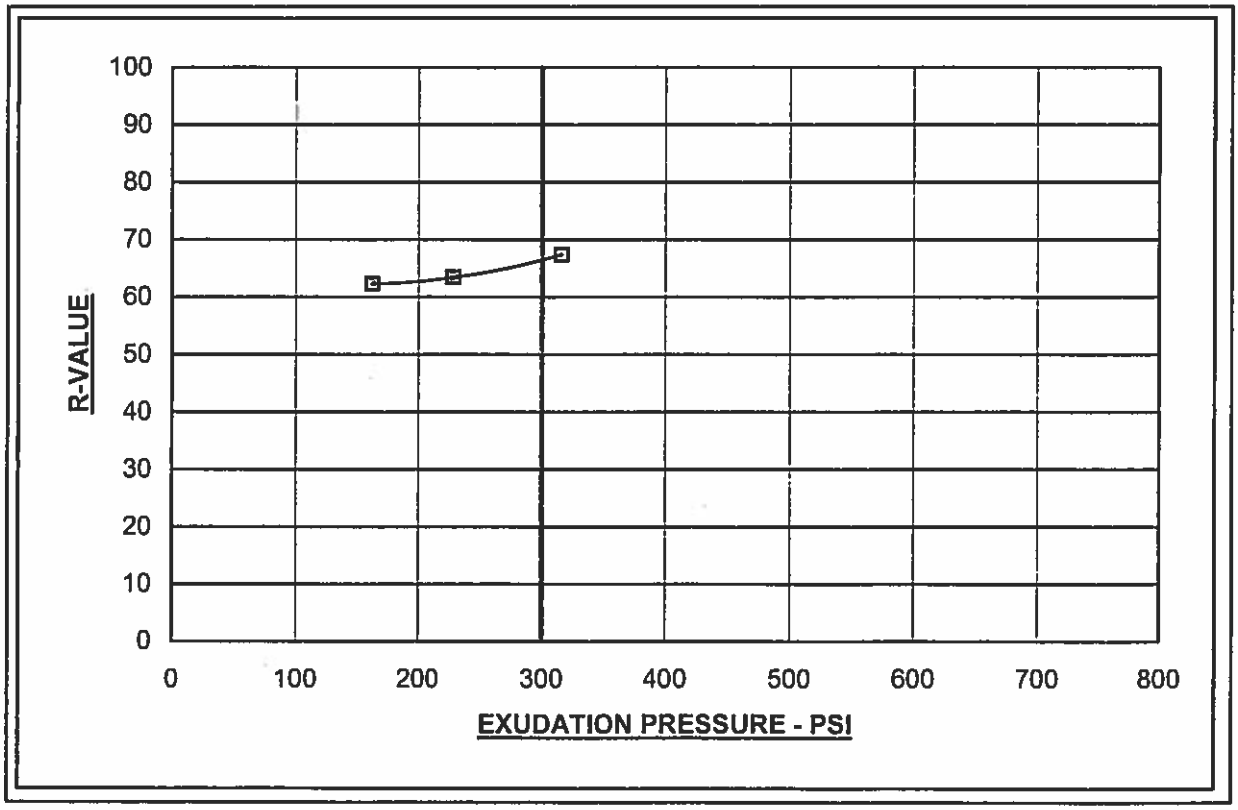
RESISTANCE R-VALUE & EXPANSION PRESSURE OF COMPACTED SOIL ASTM D2844

CLIENT:	ASCG Inc.	**DATE OF TEST:**	17-May-07
PROJECT:	Kaibito Creek N6330(1)1,2&4 and N6331(1)2&4		
LOCATION:	B-7 & B-8		
TERRACON NO.	66045049D	**CLASSIFICATION:**	SP-SM

SAMPLE DATA TEST RESULTS

TEST SPECIMEN NO.	1	2	3
COMPACTION PRESSURE (PSI)	350	350	350
DENSITY (PCF)	109.3	112.2	111.5
MOISTURE CONTENT (%)	14.8	13.7	12.4
EXPANSION PRESSURE (PSI)	-0.19	-0.06	-0.03
HORIZONTAL PRESSURE @ 160 PSI	41	37	36
SAMPLE HEIGHT (INCHES)	2.61	2.54	2.59
EXUDATION PRESSURE (PSI)	162.3	228.3	315.8
CORRECTED R-VALUE	62.3	63.4	67.4
UNCORRECTED R-VALUE	59.6	63.4	65.0

R-VALUE @ 300 PSI EXUDATION PRESSURE = 67



Terracon

301 North Howes Street
FORT COLLINS, COLORADO 80521
(970) 484-0359 FAX (970) 484-0454

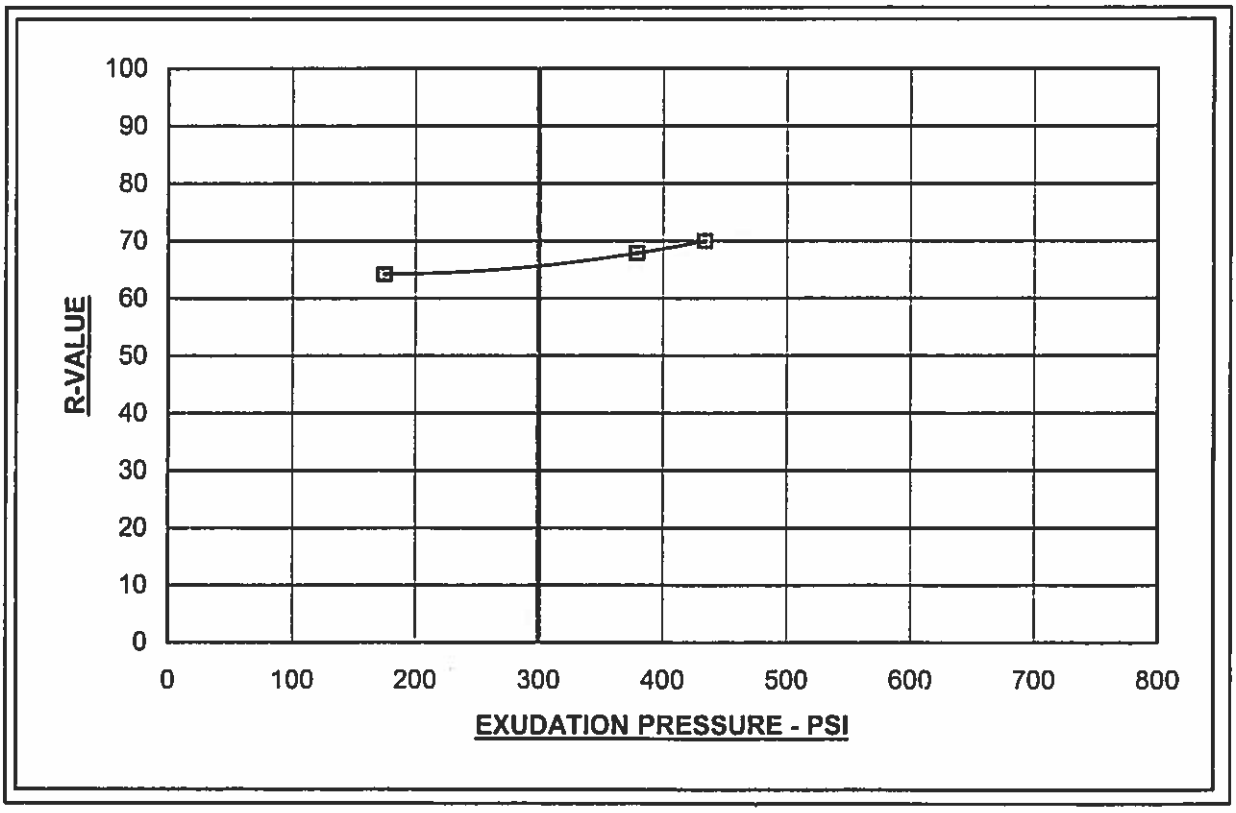
RESISTANCE R-VALUE & EXPANSION PRESSURE OF COMPACTED SOIL ASTM D2844

CLIENT:	ASCG Inc.	DATE OF TEST:	16-May-07
PROJECT:	Kaibito Creek N6330(1)1,2&4 and N6331(1)2&4		
LOCATION:	B-14 & B-15		
TERRACON NO.	66045049D	CLASSIFICATION:	SM

SAMPLE DATA TEST RESULTS

TEST SPECIMEN NO.	1	2	3
COMPACTION PRESSURE (PSI)	350	350	350
DENSITY (PCF)	119.0	118.4	120.4
MOISTURE CONTENT (%)	12.0	10.8	10.2
EXPANSION PRESSURE (PSI)	-0.12	-0.06	-0.03
HORIZONTAL PRESSURE @ 160 PSI	40	36	34
SAMPLE HEIGHT (INCHES)	2.49	2.52	2.50
EXUDATION PRESSURE (PSI)	175.0	379.5	433.6
CORRECTED R-VALUE	64.2	67.9	70.0
UNCORRECTED R-VALUE	64.2	67.9	70.0

R-VALUE @ 300 PSI EXUDATION PRESSURE = **66**



Terracon

301 North Howes Street
FORT COLLINS, COLORADO 80521
(970) 484-0359 FAX (970) 484-0454

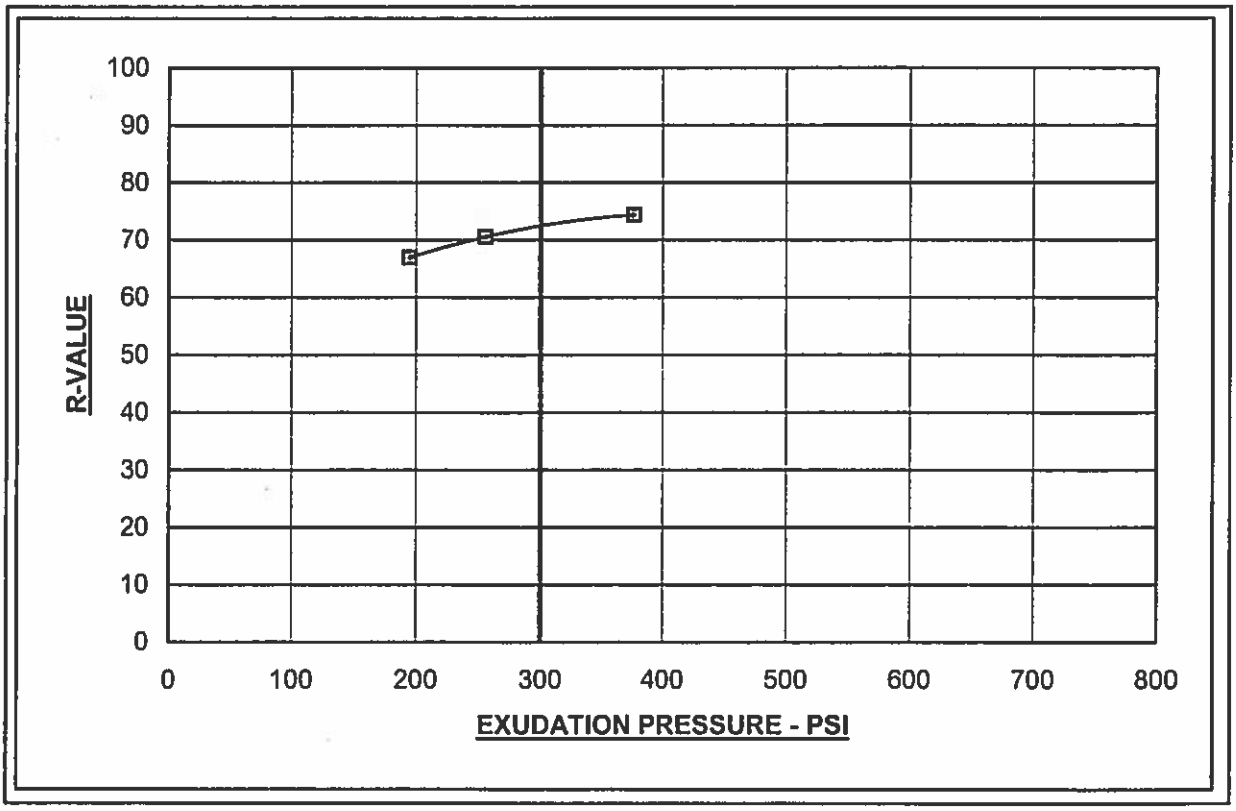
RESISTANCE R-VALUE & EXPANSION PRESSURE OF COMPACTED SOIL ASTM D2844

CLIENT:	ASCG Inc.	**DATE OF TEST:**	17-May-07
PROJECT:	Kaibito Creek N6330(1)1,2&4 and N6331(1)2&4		
LOCATION:	B-19 & B-20		
TERRACON NO.	66045049D	**CLASSIFICATION:**	SM

SAMPLE DATA TEST RESULTS

TEST SPECIMEN NO.	1	2	3
COMPACTION PRESSURE (PSI)	350	350	350
DENSITY (PCF)	121.4	117.0	123.2
MOISTURE CONTENT (%)	11.7	17.2	10.7
EXPANSION PRESSURE (PSI)	-0.03	-0.16	-0.06
HORIZONTAL PRESSURE @ 160 PSI	42	39	36
SAMPLE HEIGHT (INCHES)	2.52	2.51	2.53
EXUDATION PRESSURE (PSI)	194.9	255.4	376.3
CORRECTED R-VALUE	66.9	70.5	74.4
UNCORRECTED R-VALUE	66.9	70.5	74.4

R-VALUE @ 300 PSI EXUDATION PRESSURE = 72



UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]					Soil Classification	
					Group Symbol	Group Name[B]
Coarse Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3^E$		GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3^E$		GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH		GM	Silty gravel[F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3^E$		SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3^E$		SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH		SM	Silty sand[G,H,I]
			Fines Classify as CL or CH		SC	Clayey sand[G,H,I]
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays Liquid limit less than 50	inorganic	PI > 7 and plots on or above "A" line[J]		CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]		ML	Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line		CH	Fat clay[K,L,M]
			PI lots below "A" line		MH	Elastic Silt[K,L,M]
		organic	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
Highly organic soils	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-in. (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

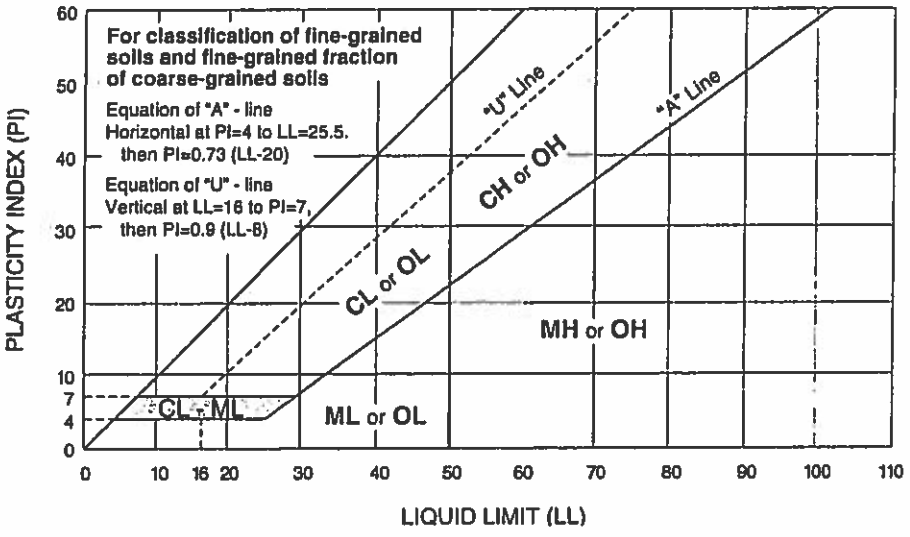
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

GENERAL NOTES

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1-3/8" I.D., 2" O.D., unless otherwise noted	HS:	Hollow Stem Auger
ST:	Thin-Walled Tube - 2" O.D., unless otherwise noted	PA:	Power Auger
RS:	Ring Sampler - 2.42" I.D., 3" O.D., unless otherwise noted	HA:	Hand Auger
DB:	Diamond Bit Coring - 4", N, B	RB:	Rock Bit
BS:	Bulk Sample or Auger Sample	WB:	Wash Boring or Mud Rotary

The number of blows required to advance a standard 2-inch O.D. split-spoon sampler (SS) the last 12 inches of the total 18-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value".

WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling
WCI:	Wet Cave in	WD:	While Drilling
DCI:	Dry Cave in	BCR:	Before Casing Removal
AB:	After Boring	ACR:	After Casing Removal

Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. Groundwater levels at other times and other locations across the site could vary. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of groundwater levels may not be possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION: Soil classification is based on the Unified Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

CONSISTENCY OF FINE-GRAINED SOILS

Unconfined Compressive Strength, Qu, psf	Standard Penetration or N-value (SS) Blows/Ft.	Consistency
< 500	<2	Very Soft
500 – 1,000	2-3	Soft
1,001 – 2,000	4-6	Medium Stiff
2,001 – 4,000	7-12	Stiff
4,001 – 8,000	13-26	Very Stiff
8,000+	26+	Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Standard Penetration or N-value (SS) Blows/Ft.	Relative Density
0 – 3	Very Loose
4 – 9	Loose
10 – 29	Medium Dense
30 – 49	Dense
50+	Very Dense

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 – 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300mm)
Cobbles	12 in. to 3 in. (300mm to 75 mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Silt or Clay	Passing #200 Sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 – 12
Modifiers	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1-10
Medium	11-30
High	30+

Terracon

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	Heavy
Design Life (years)	20
Equivalent Axle Loads/Day	
Total EAL's	138,000
Seasonal Variation Factor	2.5
Reliability	85%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

AASHTO Classification	A-2-4
% Passing #200 Sieve	15
Plasticity Index	0
Correlated R-Value	69
Resilient Modulus MR (psi)	27,668
Design Modulus (psi)	26,000

SERVICEABILITY

Present (2.5 to 5.0)	4.0
Terminal (1.5 to 4.1)	2.0

LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete Surface Course	0.44	N/A
Aggregate Base Course	0.11	0.92
Plant-Mixed Bituminous Base	0.25	0.92

Design Calculations

Target Structural Number SN: **1.47**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Concrete Surface	Aggregate Base Course	Plant-Mixed Bituminous Base	Total		
A	4.0			4.0	1.76	0.29
B	2.5	4.0		6.5	1.50	0.03
C	2.0		2.5	4.5	1.46	-0.02

Conversion Factor = 25.4 millimeters/inch

Flexible Pavement Design Analysis

Design Criteria

PROJECT DATA

Pavement Classification	Light
Design Life (years)	20
Equivalent Axle Loads/Day	
Total EAL's	5,000
Seasonal Variation Factor	2.5
Reliability	85%
Overall Standard Deviation	0.45

SUBGRADE CONDITIONS

AASHTO Classification	A-2-4
% Passing #200 Sieve	15
Plasticity Index	0
Correlated R-Value	69
Resilient Modulus MR (psi)	27,668
Design Modulus (psi)	26,000

SERVICEABILITY

Present (2.5 to 5.0)	4.0
Terminal (1.5 to 4.1)	2.0

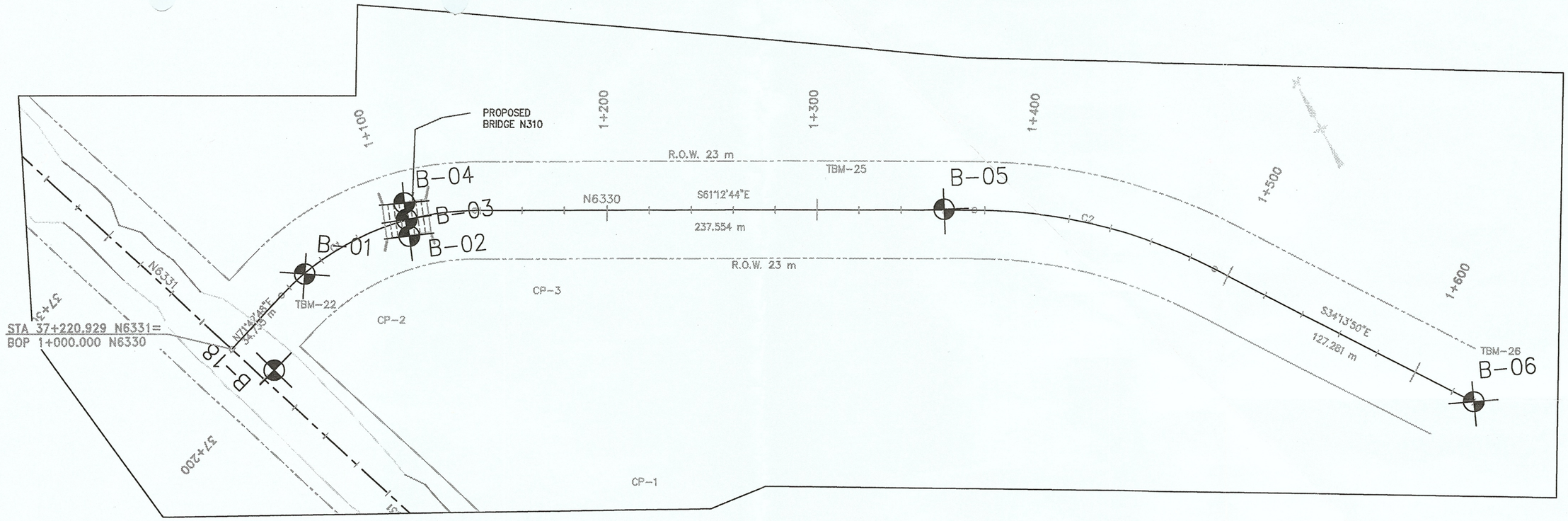
LAYER COEFFICIENTS	Structural	Drainage
Asphalt Concrete Surface Course	0.44	N/A
Aggregate Base Course	0.11	0.92
Plant-Mixed Bituminous Base	0.25	0.92

Design Calculations

Target Structural Number SN: **0.73**

Alternative	Recommended Pavement Section Thickness Inches				Total Structural Number	Δ Structural Number
	Asphalt Concrete Surface	Aggregate Base Course	Plant-Mixed Bituminous Base	Total		
A	4.0			4.0	1.76	1.03
B	2.0	4.0		6.0	1.28	0.55
C	2.0		2.0	4.0	1.34	0.61

Conversion Factor = 25.4 millimeters/inch



Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6330
Kaibito, Arizona

Project Mngr: KJS	Terracon	Project No.	66045049D
Designed By: MJD		Scale:	Not to Scale
Checked By: KJS	4905 Hawkins NE	Date:	6-25-2007
Approved By: KJS	Albuquerque, NM 87109	Drawn By:	Unknown
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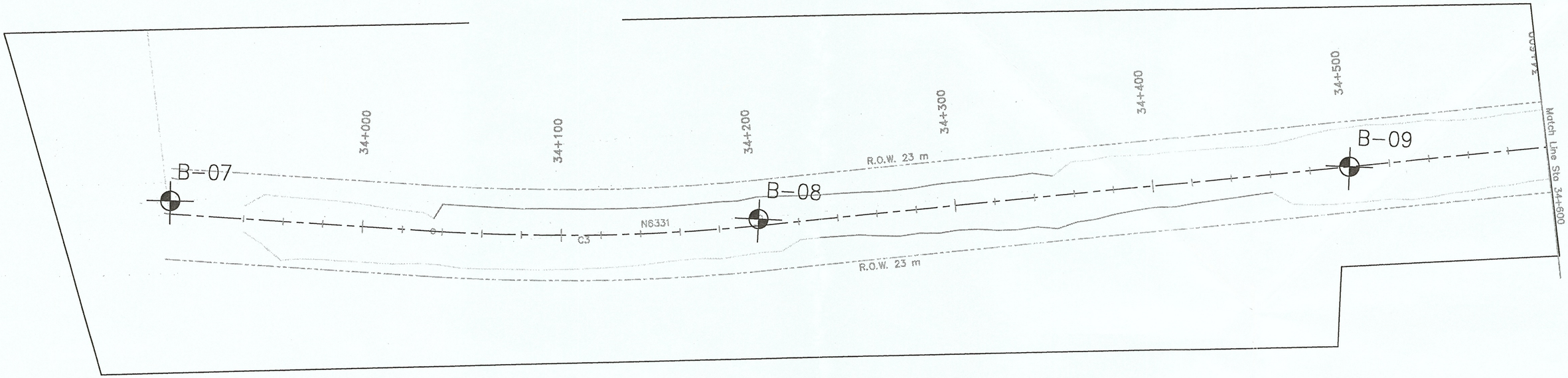

Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6331
Kaibito, Arizona

Project Mngr:	KJS	Terracon	Project No. 66045049D
Designed By:	MJD		Scale: Not to Scale
Checked By:	KJS	4905 Hawkins NE Albuquerque, NM 87109	Date: 6-25-2007
Approved By:	KJS		Drawn By: Unknown
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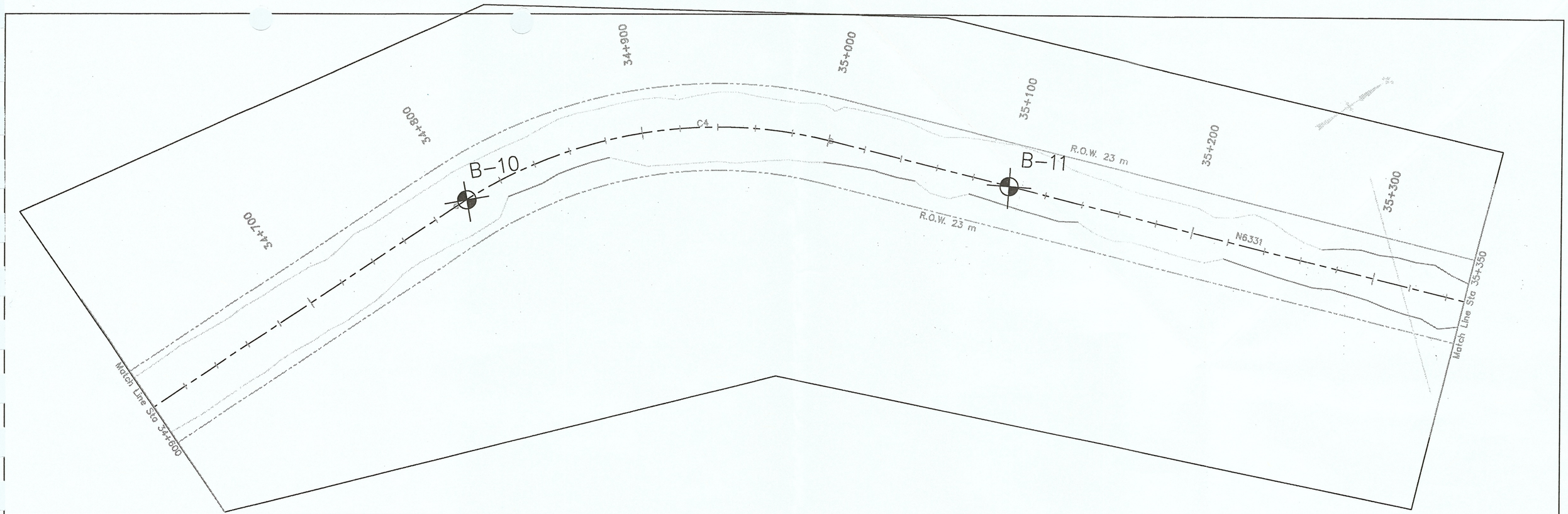

Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6331
Kaibito, Arizona

Project Mngr: KJS	Terracon		Project No. 66045049D
Designed By: MJD			Scale: Not to Scale
Checked By: KJS	4905 Hawkins NE Albuquerque, NM 87109		Date: 6-25-2007
Approved By: KJS			Drawn By: Unknown
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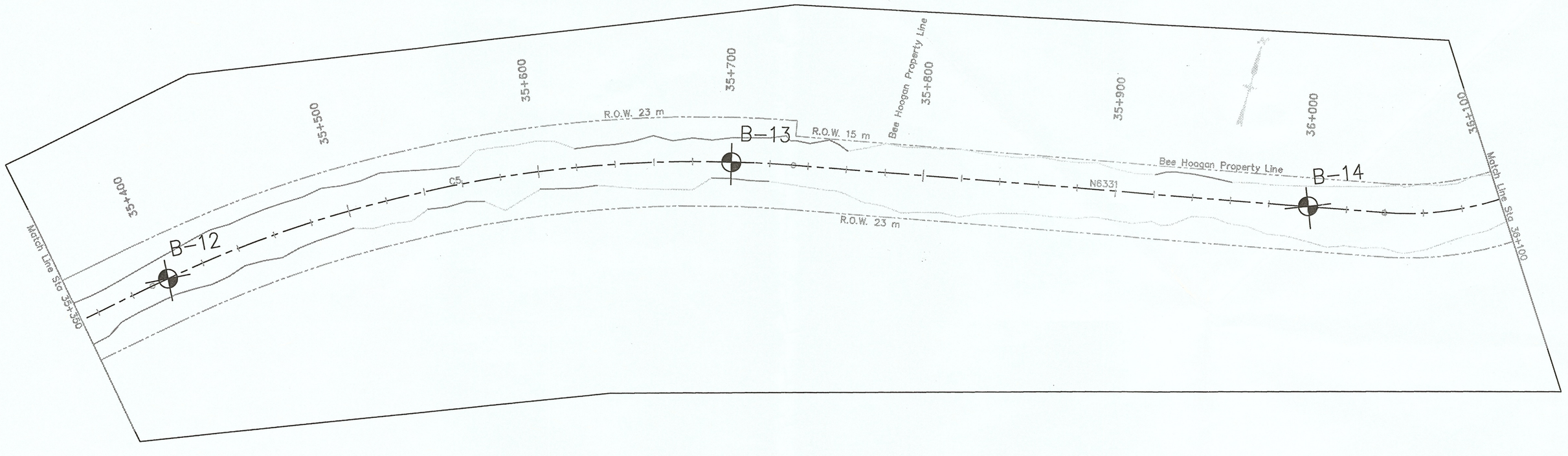

Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6331
Kaibito, Arizona

Project Mngr: KJS	Terracon	Project No.	66045049D
Designed By: MJD		Scale:	Not to Scale
Checked By: KJS	4905 Hawkins NE Albuquerque, NM 87109	Date:	6-25-2007
Approved By: KJS		Drawn By:	Unknown
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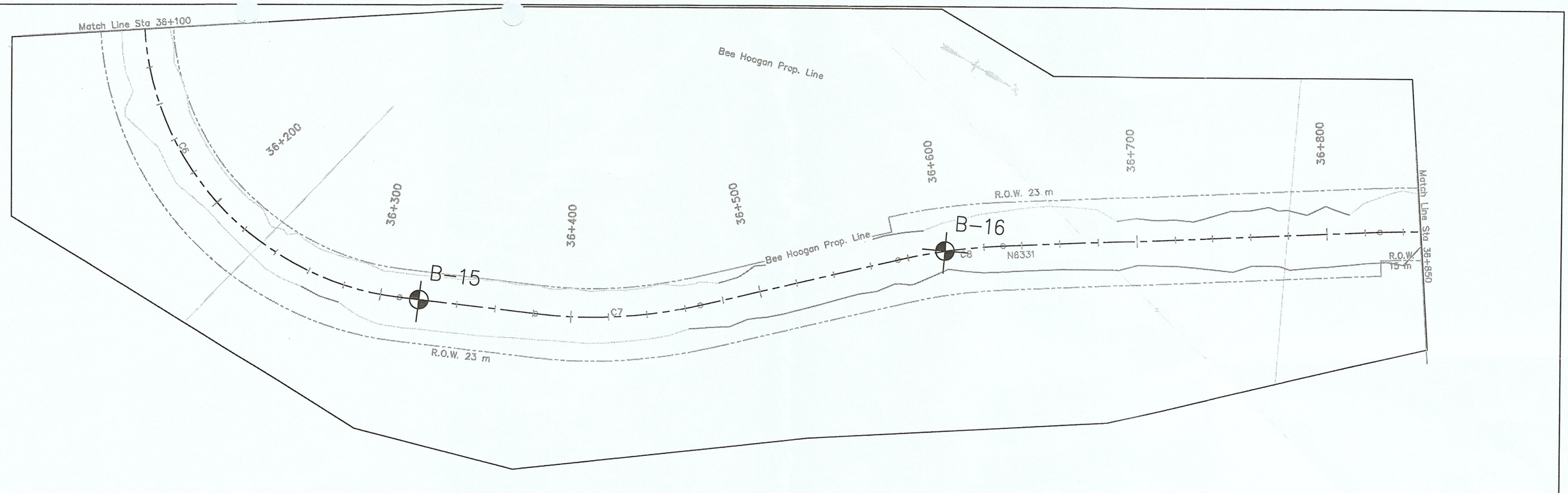

Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6331
Kaibito, Arizona

Project Mngr: KJS	Terracon		Project No. 66045049D
Designed By: MJD			Scale: Not to Scale
Checked By: KJS	4905 Hawkins NE Albuquerque, NM 87109		Date: 6-25-2007
Approved By: KJS			Drawn By: Unknown
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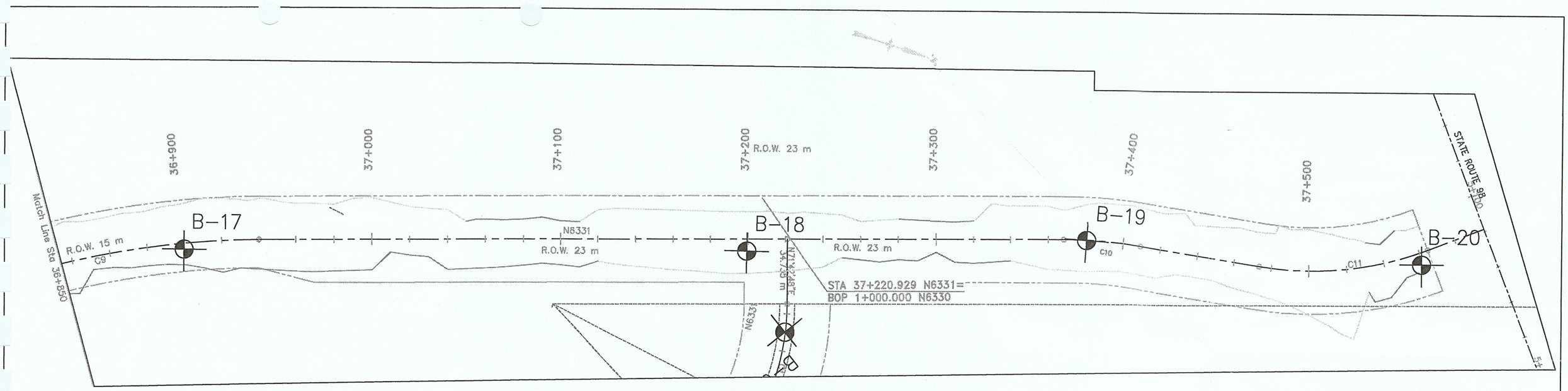

Drawing provided by ASCG, Inc. Project No. N6330(1) 1,2&4 and N6331(1) 2&4. Not for construction drawings.

Legend

Approximate Boring Location

BORING LOCATION DIAGRAM

N6331
Kaibito, Arizona

Project Mngr: KJS	Terracon	Project No.	66045049D
Designed By: MJD		Scale:	Not to Scale
Checked By: KJS	4905 Hawkins NE Albuquerque, NM 87109	Date:	6-25-2007
Approved By: KJS		Drawn By:	Unknown
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