PRELIMINARY
GEOTECHNICAL EVALUATION REPORT

PIMA-MARICOPA IRRIGATION PROJECT
PRICE/PECOS ALIGNMENT
GILA RIVER INDIAN COMMUNITY
MARICOPA, ARIZONA

JOB NO. 2127JL003

Western Technologies Inc.
The Quality People
Since 1955

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PHOENIX – ARIZONA
3737 East Broadway Road
Phoenix, Arizona 85040-2966
(602) 437-3737 • fax 470-1341

Prepared for:

GILA RIVER INDIAN COMMUNITY

May 20, 1997

Registered Professional Engineer (Civil) CERTIFICATE NO. 28453 JEFF M. BOYD Date Signed 5-20-97 ARIZONA, U.S.A.

Jeff M. Boyd, P.E.
Principal

Registered Professional Engineer (Civil) CERTIFICATE NO. 27547 RANDOLPH MARWIG Date Signed 5/20/97 ARIZONA, U.S.A.

Randolph Marwig, P.E.
Principal

FAX Transmittal

Engineering, Inc.

HDR

Suite 250 Telephone
2141 E. Highland Ave. (602) 508-6600
Phoenix, Arizona 85016-4736

Date: May 4, 1998

ADOT Contract No. 97-16
RAM 600-7-305 202L MA 050
H4314 01D Phase 2
SEVRDS/Santan Channel Project

To: **Don Rerick, FCDMC**

From: Jerry Zovne, Project Manager

Copy: Harry Millsaps, P-MIP
Javier Guana, ADOT
Dave Buras, HDR

We Are Sending You: Attached **Via:** **Hand Deliver**
The Following Items:

Copies	Date	No.	Description
1	May 20 1997	Rep.	*Preliminary Geotechnical Evaluation Report, Pima-Maricopa Irrigation Project, Price/Pecos Alignment, Gila River Indian Community* Western Technologies, Inc.

These are transmitted as indicated below:

At your request, for the project file.

Remarks:
Attached is the latest Geotechnical report for the P-MIP project for your records. We understand the report will be made available to the Contractor.

Sincerely,
HDR Engineering, Inc.

Jerome J. Zovne, P.E.

Western Technologies Inc.
The Quality People
Since 1955

3737 East Broadway Road
Phoenix, Arizona 85040-2966
(602) 437-3737 • fax 470-1341

May 20, 1997

Gila River Indian Community
Department of Land and Water Resources
P.O. Box E
Sacaton, Arizona 85247

Attn: Harry Millsaps

Re: Preliminary Geotechnical Evaluation Report
Pima-Maricopa Irrigation Project
Price/Pecos Alignment - Pre-Design Phase
Gila River Indian Community
Maricopa County, Arizona

Job No. 2127JL003

Western Technologies Inc. has completed the preliminary geotechnical evaluation report for the proposed Price/Pecos Alignment of the Pima-Maricopa Irrigation Project in Maricopa County, Arizona. This study was performed in general accordance with the Authorization of Services #1, under the Contract Agreement Amendment #1, dated October 15, 1996. The results of our evaluation, including the boring location diagram, boring logs, laboratory test results, and the preliminary geotechnical recommendations are attached.

We appreciate being of service to you in the pre-design phase of this project and are prepared to assist you during the pre-design phase of the other projects as well as the design phases. If design conditions change, or 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. We look forward to working with you on the other phases of this project.

Sincerely,
WESTERN TECHNOLOGIES INC.
Geotechnical Engineering Services

Jeff M. Boyd, P.E.
Principal

Randolph Marwig, P.E.
Principal

Copies to: Addressee (8)
HDR, Inc. (3)

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TABLE OF CONTENTS

PRELIMINARY GEOTECHNICAL EVALUATION REPORT

PIMA-MARICOPA IRRIGATION PROJECT
PRICE/PECOS ALIGNMENT
GILA RIVER INDIAN COMMUNITY
MARICOPA, ARIZONA

JOB NO. 2127JL003

1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the pre-design phase of the proposed Price/Pecos Alignment of the Pima-Maricopa Irrigation Project in Maricopa County, Arizona. The purpose of these services is to provide information and recommendations regarding:

- general regional geology
- seismic considerations
- subsidence and earth fissure considerations
- soil erosion potential, dispersive soil conditions
- corrosivity, soluble sulfates and salts
- general foundation types and preliminary design parameters
- geotechnical design parameters for pipes, thrust blocks, and bored or tunneled crossings
- preliminary slope stability
- preliminary earthwork recommendations
- excavation conditions

2.0 PROJECT DESCRIPTION

The project will include the pipeline, junction structures, standpipes, siphons, inlet and outlet structures, control gates and turnout structures to convey Central Arizona Project (CAP) water from the Santan Canal to the Broadacres Canal.

The pipeline will begin near the mid-section of Section 5, Township 3 South, Range 5 East, and proceed west along the south side of Goodyear Road to a point approximately 3/4-mile south of Hunt Highway, where it intersects the extension of Old Price Road for about 1/2-mile. At that point, a bifurcation structure will divert a portion of the flow due west, to cross two parallel El Paso Natural Gas lines and continue under Interstate Highway 10 (I-10), to serve the irrigated lands in the North and South Lone Butte Areas.

The main pipeline continues north, just west of the Old Price Road alignment, to Pecos Road, crossing numerous roadways. At Pecos Road, the pipeline will turn 90 degrees due west, and will parallel Pecos Road to I-10. Near I-10, the pipeline will cross the Price Expressway/Santan Freeway drainage outfall system and parallel this system under I-10. On the west side of I-10, at Pecos Road, the pipeline turns southeast and continues to the Broadacres Canal to outlet.

3.0 SCOPE OF SERVICES

Thirty-two borings were drilled to depths ranging from 15.5 to 31.5 feet below existing site grade along the proposed alignment. The borings were at the approximate locations shown on the attached Boring Location Diagram. A field log was prepared for each boring. These logs contain visual classifications of the materials encountered during drilling as well as interpolation of the subsurface conditions between samples. Final logs, included in Appendix A, represent our interpretation of the field logs and may include modifications based on laboratory observations and tests of the field samples. The final logs describe the materials encountered, their thicknesses, and the locations where samples were obtained.

The Unified Soil Classification System was used to classify the soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A. Local and regional geologic characteristics were used to estimate the seismic design criteria and evaluate subsidence zones.

The subsurface soils encountered in the borings were relatively uniform and generally consisted of clayey sands, silty sands, and sandy clays with lessor amounts of clean sands. The soil encountered in borings south of Santan Road (Boring Nos. 1 thorough 16) generally contained a higher clay content, while a greater occurrence of silty sandy soil was observed in borings north of Santan Road (Boring No. 17 on). Some lenses of clean, poorly graded sand were encountered in the borings at depths ranging from 8 to 26 feet. The borings which encountered the clean sands were generally from the Pecos Road/Old Price Road intersection south. Generally, the density and resistance to penetration (ASTM D1586) increased with depth. A light carbonate type cementation was observed in the soils at depths starting at 5 feet below existing site grades. The surface soils of the upper 5 feet were loose to medium density, while the deeper soils exhibited medium to high density. The clayey soils exhibited low to moderate plasticity. The gravel content of all soils was very low, visually estimated to be less than 5 percent.

Laboratory analyses were performed on representative soil samples to aid in material classification and to estimate pertinent engineering properties of the on-site soils for preparation of this report. Testing was performed in general accordance with applicable ASTM specifications. The following tests were performed and the results are presented on the boring logs and in Appendix B.

- Water content
- Moisture/Density relations
- Direct shear
- pH
- Minimum Resistivity
- Dry density
- Gradation
- Permeability
- Crumb
- Chemical
- Consolidation/compression
- Plasticity
- Soluble Salts
- Pinhole dispersion

Available maps, reports and other publications were reviewed for information regarding regional geology, seismicity, and land subsidence and earth fissuring.

This report is for the exclusive purpose of providing geotechnical engineering and/or testing information and recommendations. 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.

4.0 SITE CONDITIONS

4.1 Geologic Setting

The site is located in the Salt River Valley which is positioned within the Basin and Range physiographic province of south-central Arizona. The Basin and Range province is characterized by a modern landscape consisting of broad alluvial valleys bound by steep, relatively rugged mountain ranges. The trend of the valleys and mountain ranges is generally in a north-south to northwest-southeast direction. The modern landscape was formed primarily by middle and late Cenozoic extensional tectonism (Slaff, Jackson, & Pearthree, 1989), which resulted in high angle normal faults. The normal faulting resulted in uplifted blocks (horsts) and downdropped blocks known as grabens (Davis, 1984). Physical erosion of the horsts/mountains typically occurs along surfaces roughly parallel to the fault planes (Curran, et al., 1984) and resulted in broad alluvial fans which filled the valleys with sediments.

The mountains in the project vicinity generally consist of igneous and metamorphosed igneous rocks. The Salt River (or South) Mountains and Sierra Estrella Mountains are located to the northwest and west, respectively, of the site, and consist of older Precambrian granite and gneiss. The Santan Mountains are located on the north side of the Gila River, south-southeast of the project, and consist of older Precambrian granite and schist, Tertiary rhyolite, and some Quaternary basalt flows are located on the southwest end of the range.

The Sacaton and Picacho Mountains are located on the south side of the Gila River south of the project. The Sacaton and northern portion of the Picacho Mountain ranges consist of older Precambrian granite. The southern portion of the Picacho Mountains consists of older Precambrian gneiss, a metamorphic rock.

Depth to bedrock in the project area is estimated to be in excess of 500 feet below the ground surface from stratigraphic cross sections prepared by the Arizona Bureau of Mines (July 1962). The bedrock underlying the basin alluvial materials is older Precambrian granite.

Surficial soils in the project area generally consist of late Pleistocene Gila and Salt River terrace deposits. Terrace deposits represent periods of overbank flooding by the Salt and Gila River resulting in a heterolithic mixture of sand, silt, and clay deposits with minor gravel and cobbles (alluvium) deposited on the flood plain.

4.2 Regional Seismic Considerations

According to the report "Development of Seismic Acceleration Contour Maps for Arizona", Number AZ92-344, prepared by Euge, Schell, and Po Lam, 1992 for the Arizona Department of Transportation, the closest known or mapped fault to the project site is the China Wash Fault located approximately 3 miles northeast of Florence, Arizona. The authors state that this area of the state, which they classify as the Sonoran Zone, is relatively aseismic, and earthquakes in this region are rare and of relatively small magnitude. The authors have estimated that the maximum credible event for this fault, and this entire region, to have a moment magnitude of 6.5, ". . . although events this large should be exceedingly rare." (pp. 179).

The project site is located in Seismic Risk Zone 1, of the Seismic Zone Map of the United States as indicated by the 1994 Uniform Building Code. Based upon the nature of the subsurface materials, we recommend using a seismic site coefficient "s" of 1.2 for the design of buildings and other occupied structures for the proposed development (Uniform Building Code, Table No. 16-J). The *Map of Horizontal Velocity at Bedrock For Arizona with a 90 Percent Probability of Non-Exceedance in 50 Years*, by Euge, Schell, and Po Lam, 1992, presents a horizontal bedrock velocity in the site vicinity of approximately 0.04g. Attenuation of this acceleration should occur in the very dense, older alluvium. The anticipated ground surface acceleration should be about 0.03g (Seed and Idriss, 1988).

Based upon the information related above, seismic concerns in the project vicinity are relatively minor, and will not govern site selection or have a significant impact to the design of structures.

4.3 Regional Land Subsidence and Earth Fissuring

Land subsidence and earth fissures are caused by consolidation or compaction of deep subsurface soil which have had an increase in the effective overburden stress caused by a lowering of the groundwater due to pumping for agricultural, industrial, and residential use. When the tensile forces in the soil, caused by the settlement and lowering of the ground surface, are greater than the strength of the soil, a crack is formed and is called an earth fissure (Epstein, 1987).

Most of the land subsidence and earth fissuring in Arizona has occurred in the alluvial valleys of the Basin and Range province of southern and western Arizona (Slaff, et al. 1989). As discussed in the general geology section of this report, the project site is located in the Basin and Range province of the state. The project area is located in the northern part of the Salt River Valley. Land subsidence and earth fissuring has been widely documented in Maricopa and Pinal County, particularly the Chandler Heights area approximately 15 miles to the east of the site (Harris, 1994), and additionally, in the Eloy area south of the project area; and the

Picacho basin in general, from the late 1950s to present. Between 1952 and 1985 a site near Eloy, Arizona, has been documented to have subsided more than 15 feet (Slaff, 1993).

A review of available maps and literature has failed to document any known earth fissures in the project vicinity. The closest mapped earth fissures to the project are located 15 miles to the east near Higley Road and the Pima/Maricopa County line (H.H. Schumann, 1974, & H.H. Schumann and R.B. Genualdi, 1986). The closest fissures to the northeast, northwest, and southwest are approximately 20, 30, and 20 miles away, respectively.

Many of the mapped fissures are located in native desert areas. Since agricultural land usage constantly disturbs the land surface, mapping fissures in agricultural areas is difficult. It is probable that many earth fissures have been and are being disced over by farming activities.

The map *Land Subsidence and Earth Fissures in Alluvial Deposits in the Phoenix Area, Arizona* (Schumann, 1974) indicates that about 1 foot of subsidence has occurred in the project area. In addition, groundwater elevations have dropped about 100 feet (Schumann and Genualdi, 1986). Typically, as indicated on the referenced maps, earth fissures generally tend to form adjacent to the boundaries of a basin, near the bedrock of the bounding mountains, and in areas of relatively high groundwater declines. The project site is not located next to bedrock highs, or in an area of mapped extreme drops in the elevation of groundwater.

4.4 General Soil Information

The following information on the surface and near surface soils in the project area is derived from the *Soil Survey of Eastern Maricopa and Northern Pinal Counties Area*, Soil Conservation Service, US Department of Agriculture, November 1974. The Soil Conservation Service (SCS), has identified five surface/near surface soil types in the project area. Although this particular map does not officially cover the Gila River Indian Reservation, the report does include the area immediate adjacent to the site from the Maricopa/Pinal County boundary north to the Price Road-Pecos Road intersection thence west to I-10 and Pecos Road. The discussion below provides a generalization of the soils in the project vicinity. The information contained in the Soil Survey Report generally was confirmed by our borings.

The soils within the project vicinity are generally alluvial soil derived from the granitic parent materials found within the adjacent mountain ranges. Typically the soil ranges from fine sandy loam to clay loam with some zones of gravelly sand. According to the SCS, the soil generally has a low to moderate permeability and moderately high available water capacity. The potential for water erosion and wind erosion is slight.

4.5 Groundwater

Several borings were left open overnight, but most of the borings were backfilled immediately after drilling. No groundwater was encountered or developed in any boring. The range of groundwater levels as indicated on the 1992 Groundwater Conditions in the Phoenix Active Management Area map (1992) prepared by the State of Arizona, Department of Water Resources, is from 80 to 100 feet below the ground surface. Groundwater levels should be expected to fluctuate due to seasonal variations but the regional groundwater level should not impact the project during construction.

4.6 Surface

At the time of our exploration, the alignment is currently land ranging from native desert to agricultural land. The alignment will cross Riggs Road, Maricopa Road, I-10, Queen Creek, and Goodyear, along with numerous farm-to-market type roads. The pipeline will also cross the Southern Pacific Rail Road at 56th Street, and the El Paso Natural Gas line south of Riggs Road.

4.7 Subsurface

The subsurface soils encountered in the borings were relatively uniform and generally consisted of clayey sands, silty sands, and sandy clays with lessor amounts of clean sands. The soil encountered in borings south of Santan Road (Boring Nos. 1 thorough 16) generally contained a higher clay content, while a greater occurrence of silty sandy soil was observed in borings north of Santan Road (Boring No. 17 on). Some lenses of clean, poorly graded sand were encountered in the borings at depths ranging from 8 to 26 feet. The borings which encountered the clean sands were generally from the Pecos Road/Old Price Road intersection south. Generally, the density and resistance to penetration (ASTM D1586) increased with depth. A light carbonate type cementation was observed in the soils at depths starting at 5 feet below existing site grades. The surface soils of the upper 5 feet were loose to medium density, while the deeper soils exhibited medium to high density. The clayey soils exhibited low to moderate plasticity. The gravel content of all soils was very low, visually estimated to be less than 5 percent.

4.8 Testing

Laboratory test results indicate that native subsoils near shallow foundation level exhibit low to moderate compressibility at existing water contents. When the water content was increased, one of the undisturbed samples (Boring No. 2, 5 to 6 feet) expanded slightly (0.5 percent) under a load of 2200 pounds per square foot. No indications of significant collapse susceptible soils were evident in the laboratory test results. The consolidation testing indicates that settlements will be tolerable for structures founded on shallow footings using low to moderate bearing pressures.

The soil encountered in the borings generally classify as silty sands (SM), clayey sands (SC), and sandy clays (CL), with poorly graded sands (SP) encountered in some of borings south of the Pecos Road/Old Price Road intersection. One sample from Boring No. 5 classified as a high plasticity clay (CH). The SC, Cl, and CH soils had liquid limits ranging from 19 to 54 with plasticity indices ranging from non-plastic to 35. The majority of the soils have low to moderate plasticity. The silt and clay fraction of these soils, defined as the amount of material passing the number 200 standard U.S. Sieve size, ranged from 17 to 69 percent.

Moisture-Density Relationships were performed on selected soils in accordance with ASTM D698, Method A, test procedure. The maximum dry density ranged from 109 to 126 pounds per cubic foot (pcf). The optimum moisture content ranged from 10.5 to 16.0 percent.

Direct shear testing was performed on selected undisturbed and remolded samples. The internal angle of friction from direct shear tests ranged from 31 to 37 degrees. The cohesion from the direct shear tests ranged from 0.2 to 0.9 kips per square foot (ksf).

Six selected samples were subjected to the crumb and pinhole dispersion test to provide indications of potential dispersive properties. Two of the samples were identified as having dispersive characteristics. Both of these samples classify as SM soil.

Soluble salt testing indicates that native soils will exhibit low to moderate sulfate attack on buried concrete structures. Recommended types of cement to be used for concrete structures are presented in Sections 5.2 and 5.6 of this report.

Minimum resistivity (Arizona 236) and pH testing was performed on eleven selected samples. The minimum resistivity ranged from 320 to 2061 Ohm/cm. The pH values ranged from 7.9 to 8.9. Additionally, ten samples were tested for calcium, magnesium, sodium, potash, salinity, nitrates, phosphorus and sodium.

The results of all of the laboratory testing are presented in Appendix B.

5.0 PRELIMINARY RECOMMENDATIONS

5.1 General

Our preliminary recommendations are based on the assumption that the soil conditions are similar to those disclosed by the borings. Once the preliminary design has been established WT should be provided the opportunity to review the design concepts and recommend further exploration, laboratory testing, and engineering analysis as necessary.

5.2 Construction Materials

The soils at the site are generally considered to be fair to good materials for general fill, for use in fills or dikes and embankments. Some of the near surface soils at the site exhibit moderate plasticity and therefore would have some shrink or swell tendencies for lightly loaded structures such as slabs-on-grade.

Most of the near surface soils have too much silt and clay, and not enough sand and gravel, to be considered for sand and gravel producing operations. Based upon the borings we performed, it does not appear that there is a large quantity of gravel available along the alignment of the pipeline.

United Metro Materials (UMM) currently has a concrete batch plant between the towns of Florence and Coolidge. It is our understanding from verbal communications with UMM personnel that they are obtaining their sand and gravel from operations at that site. It has been our experience that aggregates obtained from Gila River deposits are generally good in quality and suitable for use in the manufacture of portland cement concrete and asphalt concrete. Gila River sand and gravel should be crushed for use as aggregates in structural concrete and asphalt concrete. Aggregates need not be crushed for use as general fill or soil-cement, but may be used as "pit run" with some screening of oversized materials.

While no specific borrow areas were identified for the investigation, generally the Gila River aggregates, as mentioned above, are good quality for use in making concrete, asphalt concrete, and aggregate base course. Most of the soil along the alignment of the pipe line are not suitable for making aggregates, but are suitable for general fill and backfill. Care should be taken when using high plasticity clay (CH) soil for backfill.

Soluble salt testing indicates that native soil will exhibit low to moderate sulfate attack to buried concrete. Therefore, Type II or IIA cement should be used in below grade concrete structures.

On-site native soil does not exhibit significant dispersive or erosion potential properties.

5.3 Foundations

Structures along the alignment are anticipated to include the pipeline, junction structures, standpipes, siphons, inlet and outlet structures, control gates and turnout structures, and thrustblocks. Currently, it is our understanding that the invert of pipeline will range from 7 to 18 feet below existing site grade. Based upon our exploration, laboratory testing, and preliminary analysis, the new structures could be founded on shallow spread footings. No significant potential for collapse susceptible soils is anticipated. Once the actual location, type, and loading condition of each structure is better defined, further recommendations can

be made. Typically, allowable bearing capacities for shallow spread footings will range from 3000 to 5000 pounds per square foot (psf) for the existing soil conditions, for embedment depths ranging from 7 to 18 feet below lowest adjacent grade.

The allowable bearing capacities may be increased by one-third when considering total loads that include wind, seismic, or other dynamic loads.

Test Boring No. 16 encountered a relatively soft clay at a depth of 6 feet. This material underscores the need to provide for site specific geotechnical recommendations once the design is complete, along with observations by the geotechnical engineer of the actual foundation conditions during construction to verify that the soil encountered is similar to that anticipated and used for design purposes. Depending on the loading conditions, soft soil may be required to be overexcavated down to more suitable soil. The overexcavation typically would be backfilled with lean concrete or engineered fill.

5.4 Preliminary Lateral Design Criteria

The only anticipated retaining walls for the project are walls enclosing the different structures such as pump stations and siphons, and possibly temporary walls for drive shafts installed for trenchless pipe installation at selected crossing points, i.e., I-10 crossings. For cantilevered retaining walls above any free water surface with level backfill and no surcharge loads, recommended equivalent fluid pressures are:

- Active:
  Native near-surface soil (undisturbed or reworked) . . . . . 40 psf/ft
  Heavily cemented soil or granular backfill . . . . . 30 psf/ft

- Passive:
  Wall footings . . . . . 300 psf/ft
  Column footings or thrust blocks . . . . . 400 psf/ft
  Drive Shafts (jacking pits) . . . . . 350 psf/ft

Where the design includes restrained retaining walls, the following equivalent fluid pressures are recommended:

- At-Rest . . . . . 65 psf/ft

These equivalent fluid pressures are not applicable for submerged soil and do not include the effects of any surcharge loadings. Our firm should be consulted if such conditions are to be part of the design.

Fill against footings, thrust blocks, stem walls, and retaining walls should be compacted to densities specified in **Earthwork**. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Overcompaction may cause excessive lateral earth pressures which could result in wall movements. Flooding or jetting should not be allowed.

5.5 Friction Coefficients for Steel/Iron Pipe, Concrete Pipe and Foundations

A friction coefficient of 0.30 should be used for the interface between soil/pipe and soil/foundation materials is recommended.

5.6 Modulus of Soil Reaction, E'

Modulus of soil reaction, E', values for the different type of soils encountered along the pipeline alignment are presented in the following table. These values are based on an estimated degree of compaction of bedding material between 85% to 95% of the Standard Proctor.

Soil Type - Pipe Bedding Material	E' (psi)
Fine-Grained Soils with Medium to High Plasticity (CL to CH)	50
Fine-Grained Soils with Medium to No Plasticity (ML to CL)	400
Coarse-Grained Soils with Fines (SM, SC, GC)	1,000
Coarse-Grained Soils with Little or No Fines (SP)	2,000

5.7 Major Road/Utility Crossings

For the crossing of the pipeline through these natural and man-made obstacles, the use of trenchless technology (i.e., microtunneling/pipe-jacking or directionally drilling) may be considered. This technology may be safer and less expensive, depending on the pipe size and depth, than cut-and-cover techniques. The final decision should be made by the pipeline designer with consultation from qualified contractors in the various fields.

In microtunneling, a remotely controlled tunneling machine is used to install a pipeline to accurate line-and-grade tolerances using pipe-jacking techniques. Pipe-jacking is a system of directly installing pipes behind a shield machine by hydraulic jacking from a drive shaft such

that the pipes form a continuous string in the ground. The shield machine can be of the open-face, closed-face, or pressurized-face type. For the conditions at the site, a closed-face shield machine could be adequate. This type of shield allows for controlled excavation of the heading without excessive loss of ground of marginally stable conditions such as granular soils above the groundwater table. Recommended lateral pressures for the trench and jacking pit shoring are presented in Section 5.3.

Directionally drilling is a steerable system for the installation of pipes, conduits, and cables in a shallow arc using a surface launched drilling rig. The term applies to large scale crossings in which a fluid filled pilot bore is drilled without rotating the drill string, and this is then enlarged by a washover pipe and back reamer to the size of the designed pipe.

In addition to the above methods, for minor roadway and utility crossings the cut-and-cover method should also be considered due to ease of construction and economics.

5.8 Seismic Considerations

Based on a study completed for the Arizona Department of Transportation (1992), the maximum anticipated horizontal accelerations and velocities of bedrock for the site are 0.04g and 1.5 inches/second respectively. These values assume a 90 percent probability of non-exceedance within 50 years. For the design of buildings, a site coefficient of 1.2 is generally recommended for the buildings and other occupied structures.

5.9 Excavations

We anticipate that shallow excavations into the surface clayey sand/sandy clay soils can be accomplished with conventional equipment.

Temporary unsurcharged construction excavations should be sloped or shored. The overburden clayey sand/sandy clay soil and the moderately cemented sandy gravel with clay/silt can be considered Type B soils when applying the OSHA regulations. The sand and silty sand can be considered Type C soil. OSHA recommends a maximum slope inclination of 1:1 (horizontal:vertical) for Type B soil and 1.5:1 for Type C soil. Sloping or benching for excavations greater than 20 feet should be designed by a registered professional engineer. The more heavily cemented deeper soils can be considered as caliche when applying OSHA standards.

The individual contractor 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 the proposed excavations may vary significantly across the alignment. Our soil classifications are based on the materials encountered in widely spaced exploratory test borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are found at the time of construction, we should be contacted immediately to evaluate the conditions encountered.

As a safety measure, it is recommended that all vehicles and soil piles be kept a minimum lateral distance back from the crest of the slope of at least 8 feet. The exposed slope face should be protected against the elements. If traffic will be allowed adjacent to the excavations, additional shoring or flatter side slopes may be required. If traffic will be allowed within 8 feet of the slope face, our firm should be consulted for additional recommendations.

The soil encountered along the pipeline alignment could be used as backfill material in the pipeline trenches if it is free of debris and other deleterious material. A mechanical compaction method is more suitable for this kind of soil than a jetting and/or water consolidation method. The backfill should be placed in lifts the height of which shall not exceed that which can be effectively compacted depending on the type of equipment.

We recommend that the contractor retain a geotechnical engineer to observe the soils exposed in all excavations. This will provide an opportunity to classify the soil types encountered, and to modify the excavation slopes if necessary.

5.10 Corrosivity

Based upon the concentrations of soluble salts obtained in the laboratory testing, the on-site soil will exhibit a low to moderate sulfate attack potential. We recommend a Type II or Type IIA portland cement be used for all concrete on and below grade. Type II or IIA Portland cement provides for resistance to moderate sulfate attack. The test results do not indicate that Type V sulfate resistant Portland cement is necessary for concrete within this alignment.

For metal items such as gates, valves, and other buried items, the pipe manufacturer should be consulted for specific corrosivity recommendations.

6.0 EARTHWORK

6.1 General

Presented herein are preliminary earthwork recommendations. Once the preliminary design is established we should be consulted for additional recommendations as necessary.

Once the actual locations and types of structures are identified, additional recommendations may be required. At each major structure, such as the bridges, additional borings and laboratory testing may be required. For typical drop and gate structures the recommendations contained herein regarding corrosivity and dispersive characteristics may be used; however, additional testing will be required during final design and/or during construction. Allowable bearing capacities should be determined for each structure, based upon its loading, configuration, location, and soil conditions.

6.2 Site Clearing

Strip and remove existing vegetation, organic topsoils, debris, dredging spoils and any other deleterious materials. All exposed surfaces should be free of mounds and depressions which could prevent uniform compaction.

6.3 Foundation Preparation

At this time, no special foundation preparation is anticipated for the deeper structures. Shallow foundations for surface structures may require shallow overexcavation and recompaction to limit settlement potentials. Once detailed plans are available, this firm should be consulted for additional recommendations.

6.4 Materials

Clean on-site native soils within the existing right-of-way or imported materials from outside of the right-of-way may be used as fill or backfill material for the following:

- foundation areas
- slab areas
- backfill

Imported soils from outside the project right-of-way and not derived from the immediate project vicinity should generally conform to the following:

- Gradation (ASTM C136):

	percent finer by weight
6"	100
4"	70-100
No. 4 Sieve	50-100
No. 200 Sieve	50 (max)

- Maximum expansive potential(%)* 1.5

- Maximum soluble sulfates(%) 0.10

* Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at about 3 percent below optimum water content. The sample is confined under a 100 psf surcharge and submerged.

Base course should conform to the MAG specifications.

6.5 Placement and Compaction

a. Place and compact fill in horizontal lifts, using equipment and procedures that will produce recommended water contents and densities throughout the lift.

b. Uncompacted fill lifts should not exceed 10 inches.

c. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D698)
On-site soils, reworked and fill:	95
Imported fill:	95
Aggregate base	95
Miscellaneous backfill	90

On-site clay soils should be compacted with a water content in the range of 1 percent below optimum to 4 percent above optimum. On-site granular and silty soils and imported soils should be compacted with a water content in the range of 3 percent below to 3 percent above optimum.

6.6 Compliance

The recommendations contained in this report are preliminary in nature. Prior to final design, WT should be retained for a general review of the project. Additional exploration, laboratory testing, and engineering may be necessary. Additional specific recommendations will be necessary for any new structures or modification to existing structures.

7.0 OTHER SERVICES

It is recommended that the Geotechnical Engineer be provided the opportunity for a general review of preliminary design plans and specifications. Any additional exploration, laboratory testing, and engineering analysis needed to complete the design will be recommended at that time.

The Geotechnical Engineer should be retained to provide services during excavation, grading, foundation and construction phases of the work. Examination of foundation excavations should be performed prior to placement of reinforcing and concrete to confirm that satisfactory bearing materials are present. It would be logical for Western Technologies Inc. to provide these services since we are most qualified to determine consistency of field conditions with those data used in our analysis.

8.0 CLOSURE

We prepared this report as an aid to the owners and designers of the proposed project. The comments, statements, recommendations and conclusions set forth in this report reflect the opinions of the authors. These opinions are based upon conditions at the location of specific tests, observations and data developed to satisfy the scope of services defined by the contract documents. Work on your project was performed in accordance with generally accepted industry standards and practices by professionals providing similar services in this locality. No other warranty, express or implied, is made.

WT should be retained during the pre-design and design phase to supplement the information contained in this report as necessary. During those phases the conclusions and recommendations contained in this report should be reviewed and the report should be modified or supplemented as necessary. Variations from the field conditions represented by the borings may become evident during construction. If variations appear, we should be contacted to reevaluate our recommendations. We believe the findings in our report address the requirements for this project and are responsive to your concerns.

This report is not a bidding document. Any contractor reviewing this report must draw his own conclusions regarding site conditions and specific construction techniques to be used on this project.

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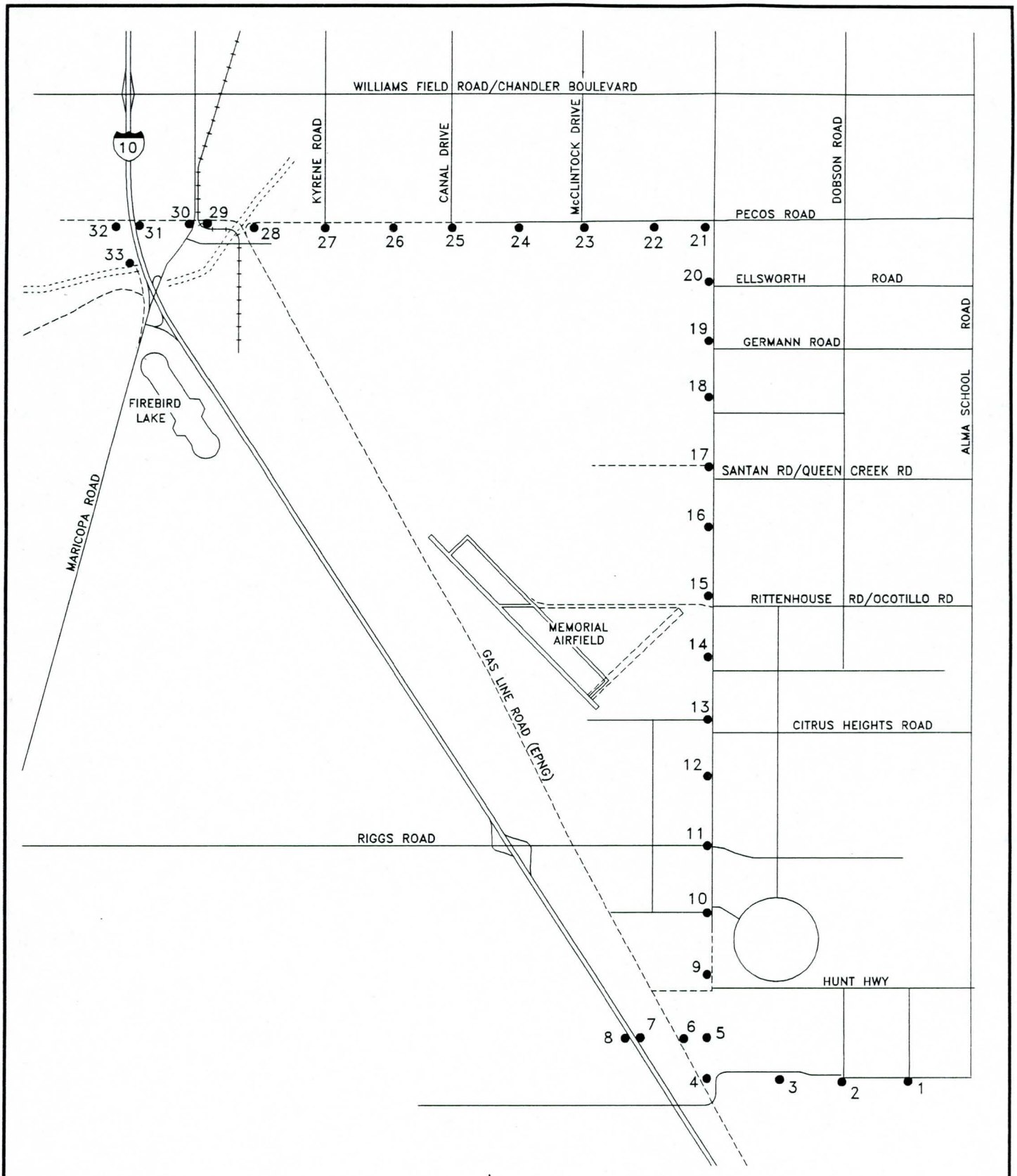

LEGEND:

● APPROXIMATE LOCATION OF TEST BORING

N

NOT TO SCALE

PRICE/PECOS ALIGNMENT

Boring Location Diagram

Western Technologies Inc.

Job No.: 2127JL003 | Plate: 1

Allowable Soil Bearing Capacity	The recommended maximum contact stress developed at the interface of the foundation element and the supporting material.
Backfill	A specified material placed and compacted in a confined area.
Base Course	A layer of specified material placed on a subgrade or subbase.
Base Course Grade	Top of base course.
Bench	A horizontal surface in a sloped deposit.
Caisson	A concrete foundation element cast in a circular excavation which may have an enlarged base. Sometimes referred to as a cast-in-place pier.
Concrete Slabs-on-Grade	A concrete surface layer cast directly upon a base, subbase or subgrade.
Crushed Rock Base Course	A base course composed of crushed rock of a specified gradation.
Differential Settlement	Unequal settlement between or within foundation elements of a structure.
Engineered Fill	Specified material placed and compacted to specified density and/or moisture conditions under observations of a representative of a soil engineer.
Existing Fill	Materials deposited through the action of man prior to exploration of the site.
Existing Grade	The ground surface at the time of field exploration.
Expansive Potential	The potential of a soil to expand (increase in volume) due to absorption of moisture.
Fill	Materials deposited by the actions of man.
Finished Grade	The final grade created as a part of the project.
Gravel Base Course	A base course composed of naturally occurring gravel with a specified gradation.
Heave	Upward movement
Native Grade	The naturally occurring ground surface.
Native Soil	Naturally occurring on-site soil.
Rock	A natural aggregate of mineral grains connected by strong and permanent cohesive forces. Usually requires drilling, wedging, blasting or other methods of extraordinary force for excavation.
Sand & Gravel Base	A base course of sand and gravel of a specified gradation.
Sand Base Course	A base course composed primarily of sand of a specified gradation.
Scarify	To mechanically loosen soil or break down existing soil structure.
Settlement	Downward movement.
Soil	Any unconsolidated material composed of discrete solid particles, derived from the physical and/or chemical disintegration of vegetable or mineral matter, which can be separated by gentle mechanical means such as agitation in water.
Strip	To remove from present location.
Subbase	A layer of specified material placed to form a layer between the subgrade and base course.
Subbase Grade	Top of subbase.
Subgrade	Prepared native soil surface.

PRICE/PECOS ALIGNMENT

Definition of Terminology

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-1

COARSE-GRAINED SOILS
LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No. 4 sieve size
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 12% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 12% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 12% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 12% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5 to 12% fines (e.g. SW-SM, GP-GC, etc.)

FINE-GRAINED SOILS
MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limits less than 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILT-CLAYS OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit more than 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE: Fine-grained soils may receive dual classification based upon plasticity characteristics

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	ABOVE 12 in.
COBBLES	3 in. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	3/4 in. to 3 in.
Fine	No. 4 to 3/4 in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to No.40
*Fines (Silt or Clay)	BELOW No. 200

NOTE: Only sizes smaller than three inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS/FOOT*
VERY SOFT	0-2
SOFT	2-4
FIRM	4-8
STIFF	8-16
VERY STIFF	16-32
HARD	Over 32

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS/FOOT*
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	Over 50

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O.D. (1 3/8" ID) split spoon (ASTM D1586)

PLASTICITY OF FINE GRAINED SOILS

PLASTICITY INDEX	TERM
0	Non-Plastic
1 - 7	Low
8 - 25	Medium
Over 25	High

DEFINITION OF MOISTURE CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

PRICE/PECOS ALIGNMENT

Method of Soil Classification

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-2

The number shown in "**BORING NO.**" refers to the approximate location of the same number indicated on the "Boring Location Diagram" as positioned in the field by pacing from property lines and/or existing features.

"**TYPE SIZE BORING**" refers to the exploratory equipment used in the boring wherein **HSA = hollow stem auger.**

"**N" in Blows/Foot**" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a two-inch-outside-diameter split-barrel sampler a distance of 1 foot, Standard Penetration Test (ASTM D1586). Refusal to penetration is defined as more than 100 blows per foot.

"**R" in Blows/Foot**" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 2.42-inch-inside-diameter ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per foot.

"**Sample Type**" refers to the form of sample recovery, in which **N = Split-barrel sample, R = Ring sample, G = Grab Sample.**

"**Dry Density, pcf**" refers to the laboratory-determined dry density in pounds per cubic foot. The symbol "**NR**" indicates that no sample was recovered. The symbol "**DU**" indicates that determination of dry density was not possible.

"**Water Content, %**" refers to the laboratory-determined moisture content in percent (ASTM D2216).

"**Unified Classification**" refers to the soil type as defined by "Method of Soil Classification". The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the locations and on the date(s) noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

The stratification lines shown on the boring logs represent our interpretation of the approximate boundary between soil types based upon visual field classification. The transition between materials is approximate and may be far more or less gradual than indicated.

GENERAL SOIL PROFILE

The subsurface soils encountered in the borings were relatively uniform and generally consisted of clayey sands, silty sands, and sandy clays with lessor amounts of clean sands. The soil encountered in borings south of Santan Road (1 thorough 16) generally contained a higher clay content, while a greater occurrence of silty sand soil was observed in borings north of Santan Road (17 on). Some lenses of clean, poorly graded sand were encountered in the borings at depths ranging from 8 to 26 feet. The borings which encountered the clean sands were generally from the Pecos Road/Old Price Road intersection south. Generally, the density and resistance to penetration (ASTM D1586) increased with depth. A light carbonate type cementation was observed in the soils at depths starting at 5 feet below existing site grades. The surface soils of the upper 5 feet were loose to medium density, while the deeper soils exhibited medium to high density. The clayey soils exhibited low to moderate plasticity. The gravel content of all soils was very low, visually estimated to be less than 5 percent.

Details of each boring are presented on the following plates.

PRICE/PECOS ALIGNMENT	
Boring Log Notes	
Western Technologies Inc.	
Job No.: 2127JL003	Plate: A-3

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 1

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0			CLAYEY SAND; brown, medium dense, slightly moist, trace gravel
							CL		CLAY; brown, firm, slightly moist
15.5	108	R	■	25		5			
13.7	112	R	■	27		10	ML		SANDY SILT; brown, medium dense, slightly moist
22.8	101	R	■	27		15			
17.1	110	R	■	50/10"		20			very dense
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-4

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 2

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	CL		SANDY CLAY; red brown, firm, slightly moist
12.2	108	R		15		5	SC		CLAYEY SAND; red brown, trace gravel, medium dense, slightly moist
12.6	110	R		38		10			
						15	SP		SAND; poorly graded, with gravel, medium dense, slightly moist
4.9	98	R		11					
		R		29		20			
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-5

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 3

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; brown, medium dense, slightly moist
		N		15		5			grades with more clay
									very dense
		N		63		10			
						15	SP		SAND; poorly graded, red brown, medium dense, trace gravel
		N		30					grades with more gravel
						20			grades with less gravel
		N		27					**Stopped At 21.5 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-6

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 4

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; brown, medium dense, slightly moist
									grades with light cementation
7.2	101	R	■	25		5			
									trace gravel
5.8	116	R	■	24		10			
									very dense, with spots of heavy cementation
9.9	124	R	■	50/4"		15			
						20			**Stopped At 20 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-7

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 5

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; brown, medium dense, slightly moist, trace gravel
5.5	121	R		50		5			very dense
		R		50		10	CH		SANDY CLAY; brown, very stiff, slightly moist
17.5	93	R		50/10"		15			tan
						20			**Stopped At 21 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-8

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 6

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	CL		SANDY CLAY; brown, medium dense, slightly moist, trace gravel
									dense
13.8	114	R		47		5			very dense
9.4	128	R		60/8"		10			grades with more sand, medium dense
	DU	N		24		15			grades with moderate to heavy cementation, with gravel, dense
9.2	110	R		40		20			very dense with more sand
		R		60/8"		25			
									Stopped At 26 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-9

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 7

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
6.0	DU	R		50		5	SC		CLAYEY SAND; with gravel, brown, medium dense, slightly moist
									very dense
		R		16		10	SP		SAND; poorly graded, with gravel, brown, medium dense, slightly moist
		R		60/10"		15	SC		CLAYEY SAND; brown, trace gravel, trace cobble, very dense, slightly moist
		N		75		20			
		N		14		25	SP		SAND; poorly graded, trace gravel, brown, medium dense, slightly moist
							SC		CLAYEY SAND; brown, dense, slightly moist
		N		29		30			
						35			**Stopped At 31.5 Feet**
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 Plate: A-10

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 8

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	SC		CLAYEY SAND; brown, trace gravel, very dense, slightly moist
		N		8		10	SP		SAND; brown, poorly graded, medium dense, slightly moist
		N		18		15			
		N		66/6"		20			
		N		35/5"		30	SC		CLAYEY SAND; brown, very dense, slightly moist grades with more clay
									Stopped At 31 Feet

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-11

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-13-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 9

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	CL		CLAY; brown, firm, slightly moist
									very stiff
14.2	96	R		50/9"		5			
									grades with spots of moderate to heavy cementation
9.5	116	R		50/6"		10			
									with more sand, less cementation
7.6	104	R		40		15			with gravel
5.8	114	R		50/9"		20			**Stopped At 21 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-12

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 10

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; brown, medium dense, slightly moist
5.3	107	R	■	29		5			
									grades with more sand
5.4	107	R	■	15		10			less sand
							SP		SAND; poorly graded, brown, medium dense, slightly moist
5.2	104	R	■	35		15			
							SC		CLAYEY SAND; brown, very dense, slightly moist, with moderate to heavy cementation
18.0	95	R	■	50/5"		20			**Stopped At 20.5 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-13

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 11

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red brown, medium dense, slightly moist
8.3	102	R		50/10"		5			
									grades with more sand
3.1	108	R		20		10			
							SP		SAND; brown, medium dense, slightly moist, with gravel
		R		21		15			
									grades with more gravel
		N		69/8"		20			
							SC		CLAYEY SAND; and gravel, red brown, very dense, slightly moist
		N		58		25			trace gravel
									Stopped At 26.5 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-14

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: 02-12-1997

DRILL RIG TYPE: CME 75

BORING TYPE/SIZE: 8"/ HSA

BORING NO. 12

LOCATION: See Boring Location Diagram

ELEVATION: Not Determined

FIELD ENGR: Frank Dickerson

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red brown, medium dense, slightly moist
									very dense
8.0	119	R	■	50/8"		5			
						10	CL		CLAY; brown, very stiff, slightly moist
15.1	112	R	■	50/6"					
						15	SM		SILTY SAND; brown, medium dense, slightly moist
11.8	100	R	■	24					
						20	CL		CLAY; brown, very stiff, slightly moist
24.3	98	R	■	50/7"					
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-15

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 13

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	CL		SANDY CLAY; tan, firm, slightly moist
							SC		CLAYEY SAND; brown, very dense, slightly moist, trace gravel
8.0	119	R		50/8"		5			
									grades to red brown
15.1	112	R		50/6"		10			
							SM		SILTY SAND; brown, dense, slightly moist
11.8	100	R		24		15			
									grades with more sand
24.3	98	R		50/7"		20			
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-16

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 14

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		red brown, medium dense, slightly moist
12.0	100	R	■	13		5			
									grades with light cementation
9.0	123	R	■	50/10"		10			
									with more sand
6.7	105	R	■	33		15			grades with more clay, very dense, trace gravel
11.9	116	R	■	50/6"		20			**Stopped At 20.5 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 Plate: A-17

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 15

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		brown, medium dense, slightly moist
18.0	103	R	■	29		5			
									dense
14.1	114	R	■	41		10			
									grades with more sand, medium dense, red brown
9.9	107	R	■	22		15			
									very dense
13.1	108	R	■	46/7"		20			
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-18

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/ HSA**

BORING NO. 16

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	CL		SANDY CLAY; brown, soft, moist
22.2	99	R		4		5			
						10	SP		SAND; brown, medium dense, slightly moist, with gravel, poorly graded
	DU	R		20					grades with larger gravel
						15			grades with finer sand, less gravel
7.5	109	R		42					
						20			very dense, with spots of moderate to heavy cementation
22.4	98	R		50/6"					**Stopped At 20.5 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-19

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 17

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
9.5	114	R	■	9		0	SM		SILTY SAND; brown, medium dense, moist, trace gravel
6.5	97	R	■	13		5	SP		SAND; poorly sorted, brown, medium dense, slightly moist, trace gravel
									grades with more gravel and coarse sand
2.5	DU	R	■	14		10			with large gravel
									with small gravel
6.2	118	R	■	45		15	SC		CLAYEY SAND; red-brown, dense, slightly moist
									grades with gravel
									grades with no gravel
10.6	108	R	■	37		20			
									very dense with spots of heavy cementation
10.0	DU	R	■	50/6"		25			
									Stopped At 26 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-21-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-20

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 18

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SILTY SAND; red-brown, medium dense, slightly moist, trace gravel
9.0	106	R		15		5			
10.6	108	R		39		10			
							SP		SAND; poorly sorted, tan, with gravel, medium dense, slightly moist
2.9	111	R		33		15			
							SC		CLAYEY SAND; red-brown, very dense, slightly moist, with spots of heavy cementation
19.1	91	R		50/11"		20			
						25			**Stopped At 25 Feet**
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-21-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-21

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-12-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 19

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red-brown, medium dense, slightly moist
6.9	99	R		28		5			
									trace gravel
8.7	92	R		17		10			
									very dense
22.7	101	R		50/8"		15			
									with spots of heavy cementation
20.1	93	R		31		20	SM		SILTY SAND; red-brown, medium dense, slightly moist
						25			**Stopped At 25 Feet**
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-12-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-22

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 20

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	SC		CLAYEY SAND; red-brown, medium dense, slightly moist
									tan
10.5	112	R		50/8"		5			red-brown, very dense
							SP		SAND; poorly sorted, with gravel, tan, medium dense, slightly moist
3.9	99	R		18		10			with heavy cementation
							SC		CLAYEY SAND; red-brown, very dense, slightly moist, with light-moderate cementation
11.9	96	R		50/7"		15			with moderate-heavy cementation
29.4	DU	R		50/8"		20			
						25			**Stopped At 25 Feet**
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-23

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 21

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red-brown, medium dense, slightly moist
5.2	91	R	■	12					
5.1	118	R	■	15		5			grades with more sand, with gravel
									grades with more clay, no gravel
10.1	112	R	■	48		10			with moderate cementation
6.7	106	R	■	50/11"		15			grades with gravel and light-moderate cementation
7.3	93	R	■	50/9"		20			grades with less gravel
15.6	107	R	■	50/9"		25			**Stopped At 26 Feet**
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-24

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 22

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G				0	SM		SILTY SAND; red-brown, medium dense, slightly moist
5.1	118	R		16		5			grades with more sand and gravel, very dense
14.7	105	R		50/8"		10	SP		SAND; poorly sorted, trace clay, tan, medium dense, slightly moist, with gravel
17.0	DU	R		18		15	SC		CLAYEY SAND; red-brown, very dense, slightly moist, trace gravel
21.8	92	R		50/9"		20			with spots of heavy cementation
	NR	R		50/11"		25			grades with less cementation
						26			**Stopped At 26 Feet**
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-25

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 23

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red-brown, medium dense, slightly moist
									grades with more clay
									grades with more sand
11.0	106	R	■	13		5			
									grades with trace gravel
9.6	117	R	■	18		10			
14.5	108	R	■	44		15			
							SM		SILTY SAND; brown, medium dense, slightly moist, trace gravel
									grades with less gravel
17.5	104	R	■	26		20			
									Stopped At 21 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-26

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 24

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SM		SILTY SAND; red-brown, medium dense, slightly moist
5.7	DU	R	■	13					
11.7	92	R	■	10		5			
									grades with trace gravel
11.1	97	R	■	34		10			
							CL		SANDY CLAY; with gravel, brown, firm, slightly moist, with spots of heavy cementation
27.6	92	R	■	36		15			
						20			**Stopped At 20 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-27

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 25

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		R		11		0	SM		SILTY SAND; red-brown, medium dense, slightly moist, trace gravel
									grades with spots of moderate cementation
6.9	103	R		15		5			
									grades with heavy cementation
		R		50/6"		10			
							CL		SANDY CLAY; brown, firm, slightly moist
		R		34		15			
									with gravel
		R		40/6"		20			
									Stopped At 20.5 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-28

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 26

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SILTY SAND; red-brown, medium dense, slightly moist
6.3	107	R		10		5			
									grades with moderate-heavy cementation
9.4	110	R		50/10"		10			
6.5	107	R		47		15			
									Stopped At 16 Feet
						20			
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-29

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 27

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					SM		SILTY SAND; red-brown, medium dense, slightly moist, trace gravel
									grades with more sand
9.5	102	R		20		5			
									grades with moderate-heavy cementation, tan
	NR	R		40/2"		10			
							CL		SANDY CLAY; brown, very stiff, slightly moist, with spots of heavy cementation
15.6	110	R		50/10"		15			
									Stopped At 16 Feet
						20			
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-30

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-11-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 28

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0			SILTY SAND; and gravel, grey, medium dense, slightly moist
4.2	102	R		19			SC		CLAYEY SAND; red-brown, medium dense, slightly moist, trace gravel
8.1	124	R		24		5			grades with more gravel and clay
		R		23		10	CL		SANDY CLAY; brown, firm, slightly moist
11.9	118	R		50/10"		15			very stiff, trace gravel
	NR	R		30/2"		20			**Stopped At 20.5 Feet**
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-11-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-31

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-10-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 29

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					CL		SANDY CLAY; red-brown, stiff, slightly moist
7.2	109	R		44					
									grades with moderate cementation
7.2	109	R		50/6"		5			
							SM		SILTY SAND; brown, medium dense, moist
		R		35		10			
									grades with heavy cementation
	NR	R		20/3"		15			**Stopped At 15.5 Feet**
						20			
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-10-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-32

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-10-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 30

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red-brown, dense, slightly moist
12.7	108	R	■	43					
26.7	96	R	■	50/6"		5			grades with spots of moderate-heavy cementation, very dense
									trace gravel, less cementation
12.5	102	R	■	42		10			
									with more sand, less cementation
		R	■	50/10"		15			
									grades with heavy cementation
15.4	103	R	■	50/8"		20			
21.5	97	R	■	34		25			
									Stopped At 26 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-10-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-33

DATE DRILLED: **02-10-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 31

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	CL		SANDY CLAY; red-brown, dense, slightly moist
9.2	95	R		40					
5.2	100	R		33		5			grades with more sand, trace gravel, medium dense
	DU	R		50/10"		10			grades with spots of heavy cementation, very dense
									with heavy cementation
9.5	DU	R		38/2"		15			
16.2	109	R		50/8"		20			
15.0	118	R		50/9"		25			
									Stopped At 26 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-10-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-34

DATE DRILLED: **02-10-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 32

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
						0	SC		CLAYEY SAND; red-brown, medium dense, slightly moist
8.7	88	R	■	24					
8.1	99	R	■	25		5			grades with more sand
									very dense
6.3	101	R	■	50/6"		10			
									grades with gravel
18.4	91	R	■	50/6"		15			with heavy cementation
									with less cementation
15.4	103	R	■	50/11"		20			
		R	■	46		25			
									Stopped At 26 Feet
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-10-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-35

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

DATE DRILLED: **02-10-1997**

DRILL RIG TYPE: **CME 75**

BORING TYPE/SIZE: **8"/HSA**

BORING NO. 33

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **Frank Dickerson**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		G					CL		SANDY CLAY; trace gravel, tan, medium dense, slightly moist
		R		24					
						5			very dense
6.9	DU	R		50/6"					
13.8	115	R		50/11"		10			
							SC		CLAYEY SAND; with gravel, medium dense, slightly moist
11.0	102	R		36		15			
									Stopped At 16 Feet
						20			
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-10-1997

NOTES

PRICE/PECOS ALIGNMENT

Boring Log

Western Technologies Inc.

Job No.: 2127JL003 | Plate: A-36

THIS SUMMARY APPLIES ONLY AT THIS LOCATION AND AT THE TIME OF LOGGING. CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH TIME. DATA PRESENTED IS A SIMPLIFICATION.

PHYSICAL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Particle Size Distribution (%) Passing by Weight					Atterberg Limits		Moisture-Density Relationship			R-Value	Remarks
			3"	#4	#10	#40	#200	LL	PI	Dry Density (pcf)	Optimum Moisture (%)	Method		
1	15 - 16	ML					59	30	6					2,3
2	0 - 5	CL		100	93	85	55	27	12					2
5	10 - 11	CH					62	54	35					2,3
6	0 - 5	CL	100	97	96	88	62	36	19	109	16.0	A		2,4
8	0 - 5	SC		100	93	71	38	28	11					2
9	0 - 5	CL		100	99	89	54	26	10	118	13.0	A		2,4
14	20 - 21	SC					33	40	20					2,3
16	0 - 5	CL		100	99	94	66	32	17					2
17	10 - 11	SP	100	85	65	22	2.4	NA	NP					2
18	0 - 5	SM		100	100	90	20	NA	NP	119	12.0	A		2,4
19	20 - 21	SM					17	NA	NP					2,3
20	0 - 5	SC		100	99	91	47	37	18					2
22	0 - 5	SM	100	95	92	68	31	19	4	126	10.5	A		2,4
24	10 - 11	SM					25	40	9					2,3
24	15 - 16	ML					74	43	14					2,3
25	10 - 11	SM					15	41	11					2,3
25	20 - 21	CL					57	41	24					2,3
26	0 - 5	SM		100	96	78	33	NA	NP					2
27	0 - 5	SM	100	97	96	92	43	19	NP	119	12.5	A		2
28	10 - 11	CL					56	41	21					2,3
29	0 - 2	CL		100	92	83	56	26	7					2
31	20 - 21	CL					52	37	18					2
33	0 - 2	CL		100	98	93	69	30	12					2

REMARKS

Classification/Particle Size

1. Visual
2. Laboratory Tested
3. Minus #200 Only

Moisture-Density Relationship

4. Tested ASTM D698/AASHTO T99
5. Tested ASTM D1557/AASHTO T180

NOTE: NP - nonplastic

PRICE/PECOS ALIGNMENT

Physical Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-1

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Compression/ Consolidation		Expansion			Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Surcharge (ksf)	Total Comp. (%)	Surcharge (ksf)	Expansion (%)	Max. Swell Pressure (ksf)	
2	5 - 6	SC	108	12.2	0.56	-0.6				3
					1.10	-1.1				
					2.22	-2.0				2
					2.22	-1.5				
14	5 - 6	SC	100	12.0	0.56	-0.7				3
					1.10	-1.1				
					2.22	-1.8				2
					2.22	-3.6				
16	5 - 6	CL	99	22.2	0.56	-2.2				3
					1.10	-3.4				
					1.10	-3.4				2
					2.22	-4.6				

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

REMARKS

1. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum)
2. Submerged to approximate saturation
3. Dry Density determined from one ring of a multi-ring sample
4. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-2

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Shear Strength		Minimum Resistivity	pH	Water Soluble Matter (ppm)		Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	C (ksf)	φ (Deg)	(Ohm/cm)		Salts	Sulfates	
1	20 - 21	ML	111	17.1	0.9	31					DS
17	10 - 11	SP	104	5.9	0.2	35					1,DS
27	5 - 6	SM	99	8.1	0.3	37					DS
32	20 - 21	SC	115	7.4	0.6	34					DS
2	0 - 5	CL					540	8.2	843		
8	0 - 5	SC					320	8.6	500		
16	0 - 5	CL					427	7.9	683		
20	0 - 5	SC					814	8.3	1272		
22	0 - 5	SM					1134	8.9	1772		
26	0 - 5	SM					1321	8.7	2064		
27	0 - 5	SM					2061		3220		
29	0 - 2	CL					834	8.7	1303		
33	0 - 2	CL					1227	8.3	1917		
32	10 - 15	SC					1350	8.6	2110		
32	20 - 25	SC					1161	8.8	1814		

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

LEGEND

Shear Strength Test Method

- DS Direct Shear
- DS Direct Shear (Saturated)
- UC Unconfined Compression
- UU Unconsolidated Undrained
- CU Consolidated Undrained w/pore pressure
- CU Consolidated Undrained
- CD Consolidated Drained

REMARKS

1. Compacted density (approximately 95% of ASTM D698 at moisture value slightly below optimum)
2. Visual Classification
3. Constant head
4. Falling head

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-3

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Pinhole Dispersion			Crumb Test Grade	Water Soluble Matter (ppm)		Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Class Method C	Final Flow Rate (ml/sec)	Final Hole Diameter (mm)		Salts	Sulfates	
5	10 - 11	CH			ND-1	1.5	1.0	1			1
6	0 - 5	CL			ND-1	1.5	1.0	1			1
14	20 - 21	SC			ND-1	1.5	1.0	1			1
18	0 - 5	SM			ND-4	2.2	2.0	2			1
25	10 - 11	SM			ND-3	1.3	1.5	2			1
27	0 - 5	SM			D-2	1.2	2.0	2			1

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

LEGEND

Pinhole Dispersion - Method C

NonDispersive - ND1 and ND2
Intermediate - ND3 and ND4
Dispersive - D1 and D2

Crumb Test

NonDispersive - Grade 1
Intermediate - Grade 2
Dispersive - Grades 3 and 4

REMARKS

1. Compacted density (approximately 95% of ASTM D698 at optimum moisture content)
2. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-4

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Compression/ Consolidation		Expansion			Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Surcharge (ksf)	Total Comp. (%)	Surcharge (ksf)	Expansion (%)	Max. Swell Pressure (ksf)	
1	5 - 6	CL	108	15.5						
1	10 - 11	CL/ML	112	13.7						
1	15 - 16	ML	101	22.8						
1	20 - 21	ML	110	17.1						
2	5 - 6	SC	108	12.2						
2	10 - 11	SC	110	12.6						
2	15 - 16	SP	98	4.9						
4	5 - 6	SC	101	7.2						
4	10 - 11	SC	116	5.8						
4	15 - 15.3	SC	124	9.9						
5	5 - 6	SC	121	5.5						
5	20 - 21	CH	93	17.5						
6	5 - 6	CL	114	13.8						
6	10 - 11	CL	128	9.4						
6	20 - 21	CL	110	9.2						
9	5 - 6	CL	96	14.2						
9	10 - 10.5	CL	116	9.5						
9	15 - 16	CL	104	7.6						
9	20 - 21	CL	114	5.8						
10	5 - 6	SC	107	5.3						
10	10 - 11	SC	107	5.4						
10	15 - 16	SP	104	5.2						
10	20 - 20.5	SC	95	18.0						
11	5 - 6	SC	102	8.3						
11	10 - 11	SC	108	3.1						
12	5 - 6	SC	119	8.0						
12	10 - 11	CL	112	15.1						
12	15 - 16	SM	100	11.8						
12	20 - 21	CL	98	24.3						
13	5 - 6	SC	119	8.0						
13	10 - 11	SC	112	15.1						
13	15 - 16	SM	100	11.8						
13	20 - 21	SM	98	24.3						
14	5 - 6	SC	100	12.0						

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

REMARKS

1. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum)
2. Submerged to approximate saturation
3. Dry Density determined from one ring of a multi-ring sample
4. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-5

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Compression/ Consolidation		Expansion			Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Surcharge (ksf)	Total Comp. (%)	Surcharge (ksf)	Expansion (%)	Max. Swell Pressure (ksf)	
14	10 - 11	SC	123	9.0						
14	15 - 16	SC	105	6.7						
14	20 - 20.5	SC	116	11.9						
15	5 - 6	SC	103	18.0						
15	10 - 11	SC	114	14.1						
15	15 - 16	SC	107	9.9						
15	20 - 21	SC	108	13.1						
16	5 - 6	CL	99	22.2						
16	15 - 16	SP	109	7.5						
16	20 - 20.5	SP	98	2.2						
17	2 - 3	SM	114	9.5						
17	5 - 6	SP	97	6.5						
17	10 - 11	SP	NA	2.5						
17	15 - 16	SP/SC	118	6.2						
17	20 - 21	SC	108	10.6						
17	25 - 26	SC	NA	10.0						
18	5 - 6	SM	106	9.0						
18	10 - 11	SM	108	10.6						
18	15 - 16	SP	111	2.9						
18	20 - 21	SC	91	19.1						
19	5 - 6	SC	99	6.9						
19	10 - 11	SC	92	8.7						
19	15 - 16	SC	101	22.7						
19	20 - 21	SM	93	20.1						
20	5 - 6	SC	112	10.5						
20	10 - 11	SP	99	3.9						
20	15 - 16	SC	96	11.9						
20	20 - 21	SC	NA	29.4						
21	2 - 3	SC	91	5.2						
21	5 - 6	SC	118	5.1						
21	10 - 11	SC	112	10.1						
21	15 - 16	SC	106	6.7						
21	20 - 21	SC	93	7.3						
21	25 - 26	SC	107	15.6						

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

REMARKS

1. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum)
2. Submerged to approximate saturation
3. Dry Density determined from one ring of a multi-ring sample
4. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-6

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Compression/ Consolidation		Expansion			Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Surcharge (ksf)	Total Comp. (%)	Surcharge (ksf)	Expansion (%)	Max. Swell Pressure (ksf)	
22	5 - 6	SM	118	5.1						
22	10 - 11	SM	105	14.7						
22	15 - 16	SP	NA	17.0						
22	20 - 21	SC	92	21.8						
23	5 - 6	SC	106	11.0						
23	10 - 11	SC	117	9.6						
23	15 - 16	SC	108	14.5						
23	20 - 21	SM	104	17.5						
24	2 - 3	SM	NA	5.7						
24	5 - 6	SM	92	11.7						
24	10 - 11	SM	97	11.1						
24	15 - 16	CL	92	27.6						
25	5 - 6	SM	103	6.9						
26	5 - 6	SM	107	6.3						
26	10 - 11	SM	110	9.4						
26	15 - 16	SM	107	6.5						
27	5 - 6	SM	102	9.5						
27	15 - 16	CL	110	15.6						
28	2 - 3	SC	102	4.2						
28	5 - 6	SC	124	8.1						
28	15 - 16	CL	118	11.9						
29	2 - 3	CL	109	7.2						
29	5 - 6	CL	109	7.2						
30	2 - 3	SC	108	12.7						
30	5 - 6	SC	96	26.7						
30	10 - 11	SC	102	12.5						
30	20 - 21	SC	103	15.4						
30	25 - 26	SC	97	21.5						
31	2 - 3	CL	95	9.2						
31	5 - 6	CL	100	5.2						
31	15 - 16	CL	NA	9.5						
31	20 - 21	CL	109	16.2						
31	25 - 26	CL	118	15.0						

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

REMARKS

1. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum)
2. Submerged to approximate saturation
3. Dry Density determined from one ring of a multi-ring sample
4. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-7

SOIL PROPERTIES

Boring No.	Depth (ft)	Soil Class.	Soil Property		Compression/ Consolidation		Expansion			Remarks
			Initial Dry Density (pcf)	Initial Water Content (%)	Surcharge (ksf)	Total Comp. (%)	Surcharge (ksf)	Expansion (%)	Max. Swell Pressure (ksf)	
32	2 - 3	SC	88	8.7						
32	5 - 6	SC	99	8.1						
32	10 - 11	SC	101	6.3						
32	15 - 16	SC	91	18.4						
32	20 - 21	SC	103	15.4						
33	5 - 6	CL	NA	6.9						
33	10 - 11	CL	115	13.8						
33	15 - 16	SC	102	11.0						

NOTE: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.

REMARKS

1. Compacted density (approximately 95% of ASTM D698 maximum density at moisture content slightly below optimum)
2. Submerged to approximate saturation
3. Dry Density determined from one ring of a multi-ring sample
4. Visual Classification

PRICE/PECOS ALIGNMENT

Soil Properties

Western Technologies Inc.

Job No.: 2127JL003 | Plate: B-8

IAS Laboratories

2515 East University Drive
Phoenix, Arizona 85034
(602) 273-7248
Fax (602) 275-3836

SOIL ANALYSIS REPORT

Today's Date: 3/6/97
Grower: 2127JL003
Submitted By: Brent Conner
Send Report To: Western Technologies
Report Number: 6602244
Crop: Landscape
Date: 2/28/97

VL = Very Low
L = Low
M = Medium
H = High
VH = Very High

Sender Sample Number	Depth	Lab	pH	Calcium (Ca) PPM	Magnesium (Mg) PPM	Sodium (Na) PPM	Potash (K) PPM	Iron (Fe) PPM	Zinc (Zn) PPM	Manganese (Mn) PPM	Copper (Cu) PPM	Salinity (EC x K) dS/M	Nitrate Nitrogen (NO3-N) PPM	Phosphorus (Bicarb - Soluble P) PPM	Computed % Sodium (ESP)	Sulfur (SO4-S) PPM	Boron (B) PPM	Free Lime Level
TB-2(0-5		867	8.2	6200 VH	530 VH	610 VH	860 VH					6.5 VH	44.2 H	12 M	6.6			High
TB-16(0-		868	7.9	4000 VH	580 VH	560 VH	750 VH					9.5 VH	32.8 H	13 M	8.3			Low
TB-8(0-5		869	8.6	5700 VH	320 VH	1800 VH	290 VH					11.8 VH	11.4 M	6.5 L	19.7			High
TB-20(0-		870	8.3	6100 VH	480 VH	620 VH	280 VH					4.7 H	45.7 H	7.3 L	7.1			High
TB-22(0-		871	8.9	5000 VH	350 VH	520 VH	340 VH					2.3 M	22.0 H	7.6 L	7.3			High
TB-26(0-		872	8.7	5100 VH	390 VH	310 VH	1900 VH					4.5 H	12.8 M	8 L	3.9			High
TB-29(0-		873	8.0	5900 VH	510 VH	170 M	470 VH					4.5 H	84.2 VH	15 M	2.1			High
TB-33(0-		874	8.3	6000 VH	650 VH	240 H	550 VH					2.0 L	33.0 H	15 M	2.8			High
TB-31(10		875	8.6	4900 VH	640 VH	220 H	130 M					1.4 L	4.4 VL	5.5 L	3.1			High
TB-31(20		876	8.7	4700 VH	590 VH	180 M	120 M					1.1 L	2.8 VL	4.5 VL	2.7			High