GEOTECHNICAL EVALUATION

HAMILTON PROPERTIES SUBDIVISION
NEAR 12340 SOUTH 2700 WEST
RIVERTON, UTAH
JOB NO. 2154JT020

ORIGINAL

Prepared for:

RICHMOND AMERICIAN HOMES OF UTAH, INC

March 1, 2004

Warren D. Clyde, P.E.
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March 1, 2004

Richmond American Homes of Utah, Inc.
849 West LaVoy Drive, Suite 100
Salt Lake City, Utah 84123

Attn: Mr. Benson Whitney, Director of Land Development

Re: Geotechnical Evaluation
Hamilton Properties Subdivision
Near 27340 South 2700 West
Riverton, Utah

Job No. 2154JT020

Western Technologies Inc. has completed the geotechnical evaluation for the proposed Hamilton Properties subdivision to be located in Riverton, Utah. This study was performed in general accordance with our proposal number 2154PT032 dated February 4, 2004 and February, 16, 2004. The results of our study, including the boring location diagram, laboratory test results, boring logs, and the geotechnical recommendations are attached.

We have appreciated being of service to you in the geotechnical engineering phase of this project and are prepared to assist you during the construction phases as well. If 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 future projects.

Sincerely,
WESTERN TECHNOLOGIES INC.
Geotechnical Engineering Services

Warren D. Clyde, P.E.
Senior Geotechnical Engineer

Copies to: Addressee (5)

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GEOTECHNICAL EVALUATION
HAMILTON PROPERTIES SUBDIVISION
NEAR 12340 SOUTH 2700 WEST
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1.0 PURPOSE

This report contains the results of our geotechnical evaluation for the proposed Hamilton Properties Subdivision to be located near 12430 South 2700 West, Riverton, Utah. The purpose of these services is to provide information and recommendations regarding:

- Foundation design parameters, including footing types, depths, allowable bearing capacities, and estimated settlements
- Lateral earth pressures
- Seismic considerations
- Earthwork, including site preparation, fill placement, and suitability of existing soils for fill materials
- Drainage
- Pavements
- Excavation conditions
- Slabs-on-grade

Our services included obtaining information on site conditions, performing field and laboratory testing, performing engineering analyses, providing recommendations for use in foundation, floor slab, and on-site pavement design, and presenting earthwork guidelines. Results of the field exploration, field tests, and laboratory testing program are presented in the Appendices.

2.0 PROJECT DESCRIPTION

Based on information supplied by Mr. Benson Whitney on February 3, 2004, we understand that the development will consist of single family homes. Construction will be 1 to 2 story homes with full basement foundations. The ground floor level will be within 3 feet of the existing grade. Maximum wall and column loads are assumed to be 2 klf and 75 kips respectively, and that no extraordinary slab criteria are required.

We understand that the site streets will be paved with asphalt concrete and Portland cement used for concrete curbs and sidewalks.

Final site grading plans were not available prior to preparation of this report. Should any of this information be incorrect, we request that the Client notify WT immediately.

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3.0 SCOPE OF SERVICES

3.1 Field Exploration

Eighteen (18) borings were drilled to depths ranging from 15 to 30 feet below existing site grade in proposed building and pavement areas. In addition 3 borings were drilled to depths of 5 to 10 feet in the proposed park/storm water detention area for percolation tests. The borings were at the approximate locations shown on the attached boring location diagram. Logs of the borings are presented in Appendix A. Subsoils encountered during drilling were examined visually and sampled at selected depth intervals.

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 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 soils. The soil classification symbols appear on the boring logs and are briefly described in Appendix A.

3.2 Laboratory Analyses

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 in Appendix B.

- Water content
- Dry density
- Consolidation
- Compression
- Expansion
- Gradation
- Plasticity
- California Bering Ratio (CBR)

3.3 Analyses and Report

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. If the owner is concerned about the potential for such contamination, other studies should be undertaken. We are available to discuss the scope of such studies with you.

4.0 SITE CONDITIONS

4.1 Surface

At the time of our exploration, the site was open undeveloped land covered with up to 18 inches of snow. Current land use was agricultural hay/grain production. The ground surface was relatively flat. Site drainage was to the east, although shallow depressions existed. Other site features included an existing pressurized irrigation system. Surrounding land uses were single family housing and a public high school.

4.2 Subsurface

As presented on Logs of the Borings, surface soils to a depth of 1 foot were found to be organic topsoil of soft consistency. The materials underlying the surface soils and extending to a depth of 4 to 12 feet consisted of stiff to very stiff clay of moderate plasticity underlain by dense to very dense gravel and sand to the total depth explored of 31.5 feet.

The logs in Appendix A show details of the subsurface conditions encountered during the field exploration.

4.3 Groundwater

Groundwater was not encountered in any test boring at the time of exploration. These observations represent the groundwater conditions at the time of measurements and may not be indicative of other times. Groundwater levels can be expected to fluctuate with varying seasonal and weather conditions.

4.4 Geology

The site is located in the Jordan Valley east of the Oquirrh Mountain range in the Wasatch Range section of the Middle Rocky Mountains Province. The Wasatch Range trends

north-south and includes broad alluvial valley bottoms and low hills in the north and rugged mountains cut by deep valleys in the south. The Property is in an area bounded by the Great Salt Lake to the north and northeast, the Oquirrh Mountains to the west, and the Wasatch Mountains to the east. Most of the area is a plane gently sloping down to the east. The site is located on Quaternary Provo Formation and Younger Shore Facies, which include chiefly sand and gravel, silts and clays in beach deposits, bars, spits, and deltas and possibly Alluvial Deposits consisting of stream alluvium, alluvial fans, and locally, mudflows (Utah Geological Survey, 1983).

The nearest fault is located approximately 3 miles to the east. The maximum credible earthquake that can be generated would have a Richter magnitude of 7. Surface rupture is not expected at this site.

This report does not encompass the effects, if any, of underlying geologic hazards or regional groundwater withdrawal and expresses no opinion regarding their effects on surface movements at the project site.

5.0 GEOTECHNICAL PROPERTIES AND ANALYSIS

5.1 Laboratory Tests

Laboratory test results indicate that native subsoils near shallow foundation level exhibit slight to moderate compressibility at existing water contents. Slight to moderate additional compression occurs when the water content is increased.

Near-surface soils are of low to moderate plasticity. These soils typically do not exhibit a significant expansion potential when recompacted and confined by loads approximating floor loads.

However, if soils of medium to high plasticity are encountered on site and these are used as engineered fill for floor slab support, interior and exterior slabs-on-grade supported on these soils have a potential for heaving if the water content of the soil increases. Overcompaction or densification of soils of this nature by the passage of construction equipment will increase the expansion potential.

5.2 Field Tests

Native subsoils near basement foundation level in the building areas exhibited a high resistance to penetration using the standard penetration test method (ASTM D1586) and test

method ASTM D3550. Native subsoils near the basement foundation levels exhibited a moderate to high resistance to penetration using the standard penetration test method (ASTM D1586) and test method ASTM D3550. This corresponds to a high bearing capacity for native soils in their present condition at the basement elevation. However, penetration resistances were low to moderate at the shallow (garage) foundation level. This corresponds to a moderate to low bearing capacity for the near-surface soils at these locations. The penetration resistances at the shallow foundation level also exhibited substantial variability between test locations. This represents a potential for differential settlements within structures supported on native soils in their existing condition.

6.0 RECOMMENDATIONS

6.1 General

Recommendations contained in this report are based on our understanding of the project criteria described in Section 2.0, Project Description, and the assumption that the soil and subsurface conditions are those disclosed by the borings and test pits. Others may change the plans, final elevations, number and type of structures, foundation loads, and floor levels during design or construction. Substantially different subsurface conditions from those described herein may be encountered or become known. Any changes in the project criteria or subsurface conditions shall be brought to our attention in writing.

6.2 Foundations

If the recommendations contained in this report are followed, the proposed structure can be supported by conventional shallow spread footing type foundations bearing on medium dense to dense, stiff to verry stiff native undisturbed soils and/or properly compacted engineered fill. Footings may be designed to impose a maximum dead plus live-load pressure according to the following footing depths and design bearing capacities are presented in the following tabulation:

Footing Depth Below Existing Grade (ft)[1]	Design Bearing Capacity (psf)[2]
3	1500
8	2500

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[1] Finished grade is the lowest adjacent grade for perimeter footings and (floor level)(crawl space elevation) for interior footings (in heated areas).

[2] Design bearing capacities assume fulfillment of **Earthwork** recommendations.

[3] Minimum footing depth based on anticipated frost penetration is 30 inches.

We anticipate that settlement of the proposed structures, supported as recommended, should be less than one (1) inch. Differential settlement should be less than 1/2 inch.

Footings should have minimum widths in accordance with local building codes or 16 inches for continuous walls and 24 inches for isolated column loads. Governing building codes may require greater widths. A one-third increase in the bearing value for wind or seismic loads is allowable. The bearing values given are net bearing values and the weight of the concrete in the footings may be ignored.

All footings, stem walls, and masonry walls should be reinforced to reduce the potential for distress caused by differential foundation movements. The use of joints at openings or other discontinuities in masonry walls is recommended.

We recommend that the geotechnical engineer or his representative observe the footing excavations before reinforcing steel and concrete are placed. It should be determined whether the soils exposed are similar to those anticipated for support of the footings. Any soft, loose or unacceptable soils should be undercut to suitable materials and backfilled with approved fill materials or lean concrete. Soil backfill should be properly compacted.

Site preparation procedures and foundation excavations should be observed by the geotechnical engineer to assess that adequate bearing conditions exist and that recompaction of native soils and/or placement of engineered fill has been performed satisfactorily. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

6.3 Lateral Design Criteria

For cantilevered walls above any free water surface with level backfill and no surcharge loads, recommended equivalent fluid pressures and coefficients of base friction for unrestrained elements are:

- Active:
  - Undisturbed subsoil ..... 35 psf/ft
  - Compacted granular backfill ..... 30 psf/ft

Compacted site soils (non-clay)..... 35 psf/ft
Clay site soils ..... not recommended for use

- Passive:
  Shallow wall footings ..... 250 psf/ft
  Shallow column footings ..... 400 psf/ft

- Coefficient of base friction 0.40*

  * The coefficient of base friction should be reduced to 0.30 when used in conjunction with passive pressure.

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

- At-rest:
  Undisturbed subsoil ..... 60 psf/ft
  Compacted granular backfill ..... 55 psf/ft

These lateral earth pressures are not applicable for submerged soils. We should be consulted for additional recommendations if such conditions are to be included in the design. Any surcharge from adjacent loadings must also be considered. Walls below grade, should be waterproofed or at least damp proofed.

Fill against footings, stem walls, basement walls and retaining walls should be compacted to densities specified in **Earthwork**. Medium to high plasticity clay soils should not be used as backfill against retaining walls. 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.

6.4 Seismic Considerations

For structural designs based upon the International Residential Building Code 2000, the following criteria will apply. IRC Seismic design Category is E. IRC Site Value is 120.7%g. S_s, the spectral acceleration for short periods, is 1.207. S_1, the spectral acceleration for a 1-second period, is 0.454. Soil Factor for site class D – Fa is 1.50.

6.5 Slab-on-Grade Support

Floor slabs can be supported on properly placed and compacted fill or approved natural soils. The slab subgrade should be prepared by the procedures outlined in this report. A minimum 4

inch layer of clean 3/8 to ¾ inch gravel should be provided beneath all slabs to help prevent capillary rise and a damp slab. If moisture sensitive floor coverings are used, consideration should be given to the use of a suitable moisture barrier. The final selection for the type of moisture barrier to be used should be made by the project architect and/or the slab designer.

All concrete placement and curing operations should follow the American Concrete Institute manual recommendations. Improper curing techniques and/or high slump (water-cement ratio) could cause excessive shrinkage, cracking or curling. The plastic properties of the concrete should be documented at the time of placement and specimens should also be prepared for strength testing to verify compliance with project specifications. Concrete slabs should be allowed to cure adequately before placing vinyl or other moisture sensitive floor covering.

6.6 Drainage

One cause of soil problems in this vicinity is moisture increase in soils below structures. Therefore, it is important that positive drainage be provided during construction and maintained throughout the life of the proposed development. Infiltration of water into utility or foundation excavations must be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the houses should be minimized. Scuppers and drain pipes should be designed to provide drainage away from the homes for a minimum of 10 feet.

In areas where sidewalks or paving do not immediately adjoin the structure, protective slopes should be provided with an outfall of about 6 inches in 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to minimize the possibility of moisture infiltration.

6.6.1 Storm Water Disposal

The near-surface clay soils to depths of 5 to 7 feet exhibit slow infiltration rates. Percolation tests in the proposed storm water detention basin area at depths of 3 to 5 feet were measured at an average rate of 212 minutes per inch. The percolation rate for sand and gravel soils in the same location at depths of 7 to 10 feet were measured at 0.33 minutes per inch. The edges of surface retention areas should not be located within 30 feet of the buildings. Locations of the percolation tests are shown on the **Boring Location Diagram** (Plate 1).

If the faster infiltration rates are needed for the proposed detention basin, the detention basis may be constructed using a French drain or dry wells penetrating the upper clay soils.

6.6.2 Subsurface Drainage

Groundwater was not encountered in any boring to a depth of approximately 31.5 feet below the existing ground surface, at the time of our exploration. Therefore, we do not believe that specialized subsurface drain systems will be required for basements. However, basement walls should be constructed with waterproofing and properly backfilled using on site native soils mechanically compacted according to the **Placement and Compaction** section of this report.

6.6.3 Lot Landscaping and Irrigation

Particular care should be taken during final landscaping of each lot. If the future owner desires to plant next to foundation walls, or next to exterior slabs, it should be understood that there is a risk for potential future damage if the foundation soils become wetted. For this reason, it is advisable to use drip irrigation systems next to the foundation or exterior slabs.

A sprinkler system should not be installed next to foundation walls or next to exterior slabs. If a sprinkler system is installed, the sprinkler heads should be placed so that the spray from the heads, under full pressure, does not fall within five feet of the foundation wall. Lawn irrigation should be controlled to minimize moisture infiltration. Downspout extensions should be constructed so that they discharge minimum of 5 feet beyond foundations walls.

6.7 Corrosivity

We recommend a Type II portland cement be used for all concrete on and below grade.

6.8 Pavements

The on-site soils are considered as poor quality materials for support of pavements. The type of traffic anticipated to use the facility include passenger vehicles and small to medium size trucks. On this basis, a daily traffic value of 50 Equivalent 18-kip Single Axle Loads (ESAL) was estimated for the interior roadways. A resilient modulus (M_r) of 13,500 pounds per square inch was assigned to the on-site soil based on the measured CBR Value of 9. A reliability value of 80 percent was assigned to the roadway which corresponds to occasional interruption of traffic for pavement repairs. Based upon these parameters, the resulting pavement sections according to the AASHTO procedure and anticipated design life are:

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Traffic Area	Asphaltic Concrete Pavement (inches)	Base Course (inches)	Design Life (Years)
Interior Roadways	3	12	20

The "design life" of a pavement is defined as the expected life at the end of which reconstruction of the pavement will need to occur. Normal maintenance, including crack sealing, slurry sealing, and/or chip sealing, should be performed during the life of the pavement.

Bituminous surfacing should be constructed of dense-graded, central plant-mix, asphalt concrete. Base course material should conform with specification requirements for Untreated Base, of the Riverton City specifications. The asphalt concrete should conform to the specification requirements for Asphalt Concrete, Riverton, City.

The soils at proposed subgrade elevations consist mainly of clay soils. These soils are moisture sensitive. The subgrade should be constructed with the same crowns and super elevations as the finished surface to provide drainage. Shallow depressions, trenches and other subsurface features if left in place may collect moisture causing softening of the subgrade and localized pavement failure.

Material and compaction requirements should conform to recommendations presented under **Earthwork**. The gradient of paved surfaces should ensure positive drainage. Water should not pond in areas directly adjoining paved sections.

The pavement section designs presented herein are based upon the normal traffic loading. Some damage may occur in localized areas during periods of abnormally heavy traffic loads, such as from repeated passage of construction equipment, heavily loaded delivery, haul or concrete trucks during subdivision construction. Consideration should be given to a stage construction and maintenance program or alternative access routes during these periods to limit damage to the final pavement section.

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7.0 EARTHWORK

7.1 General

The conclusions contained in this report for the proposed construction are contingent upon compliance with recommendations presented in this section. Any excavating, trenching, or disturbance which occurs after completion of the earthwork must be backfilled, compacted and tested in accordance with the recommendations contained herein. It is not reasonable to rely upon our conclusions and recommendations if any future unobserved and untested trenching, grading or backfilling occurs.

Although fills or underground facilities such as septic tanks, cesspools, basements, utilities, and dry wells were not observed, such features might be encountered during construction. These features should be demolished and removed in accordance with the recommendations of the Geotechnical Engineer. Any loose or disturbed soils resulting from demolition and/or removal of existing facilities should also be removed and/or recompacted as engineered fill, and any excavations should be backfilled in accordance with recommendations presented herein.

7.2 Site Clearing

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

Following any required overexcavation, and prior to placement of fills required to raise the site to construction grade, the upper 8 inches of the existing soils should be brought to the proper water contents and then compacted to a minimum of 95 percent of modified Proctor maximum density as defined by ASTM: D1557. If loose, disturbed, soft or unstable soils are encountered, scarifying, drying and/or overexcavation and replacement with granular materials may be required.

7.3 Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional equipment.

On-site clay and silt soils will pump or become unworkable at high water contents. Workability may be improved by scarifying and drying. Overexcavation of wet zones and replacement with granular materials may be necessary. The use of lightweight excavation and compaction equipment may be required to minimize subgrade pumping.

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7.7 Exterior Slab Preparation

Exterior slabs-on-grade, exterior architectural features, and utilities may experience some movement due to the volume change of the underlying soils. Potential movement could be reduced by:

- placing and compacting a minimum of 6 inches of road base under exterior slabs
- minimizing moisture increases in the backfill
- controlling moisture-density during placement of backfill
- using designs which allow vertical movement between the exterior features and adjoining structural elements
- placing effective control joints on relatively close centers
- allowing vertical movements in utility connections

7.8 Pavement Preparation

Prior to placement of fill and/or pavement materials, the exposed subgrade soils should be proof-rolled to verify that stable subgrade conditions exist. Any loose, soft, disturbed, or otherwise unsuitable materials should be overexcavated and replaced with engineered fill. The subgrade should then be scarified, moistened as required, and recompacted for a minimum depth of 10 inches prior to placement of fill and pavement materials.

7.9 Materials

a. Clean on-site native soils or imported materials may be used as fill material for the following:

- foundation areas
- interior slab areas
- pavement areas
- backfill

b. Frozen soils should not be used as fill or backfill.

c. Imported soils should conform to the following:

- Gradation (ASTM C136): percent finer by weight

6"	100
4"	70-100

No. 4 Sieve.....50-100
No. 200 Sieve.....35 (max)

d. As a minimum, the base course should conform to the following:

- Gradation (ASTM C136): percent finer by weight

1-1/8".....100
No. 4 Sieve.....38-65
No. 200 Sieve.....12 (max)

- Plasticity Index.....5 (max)

And/or should conform to the Utah Department of Transportation Standard Specifications for Road and Bridge Construction, or the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-85(92).

7.10 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. No fill should be placed over frozen ground.

d. Materials should be compacted to the following:

Material	Minimum Percent Compaction (ASTM D1557)
• On-site soils, reworked and fill:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95
• Imported fill:	
Below footings	95
Below slabs-on-grade	90
Below pavement	95

- Aggregate base 95
- Miscellaneous backfill 90

e. On-site and imported soils should be compacted with a moisture content in the range of 3 percent below to 3 percent above optimum.

7.11 Compliance

Recommendations for slabs-on-grade, foundations and pavement elements supported on compacted fills or prepared subgrade depend upon compliance with **Earthwork** recommendations. To assess compliance, observation and testing should be performed under the direction of a geotechnical engineer.

8.0 LIMITATIONS

This report has been prepared based on our understanding of the project criteria as described in Section 2.0. Others may make changes in the project criteria during design or construction, and substantially different subsurface conditions may be encountered or become known. The conclusions and recommendations presented herein shall not continue to be valid unless all variations are brought to our attention in writing, and we have had an opportunity to assess the effect such variations may have on our conclusions and recommendations and respond in writing.

The recommendations presented are based upon data derived from a limited number of samples obtained from widely spaced borings or test pits. The attached logs are indicators of subsurface conditions only at the specific locations and times noted. The geotechnical engineer necessarily makes assumptions as to the uniformity of the geology and soil structure between borings, but variations can exist. Accordingly, whenever any deviation or change is encountered or become known during design or construction, the conclusions and recommendations presented herein shall not continue to be valid unless WT is notified in writing, has actually reviewed the matter, and has issued a written response.

This report does not provide information relative to construction methods or sequences. Any person reviewing this report must draw his own conclusions regarding site conditions as they relate to the employment or development of construction techniques. This report is valid for one year after the date of issuance unless there is a change in circumstances or discovered variations justifying an earlier expiration of validity. After expiration, no person or entity has any right to rely on this report without further review and reporting by WT under a separate contract.

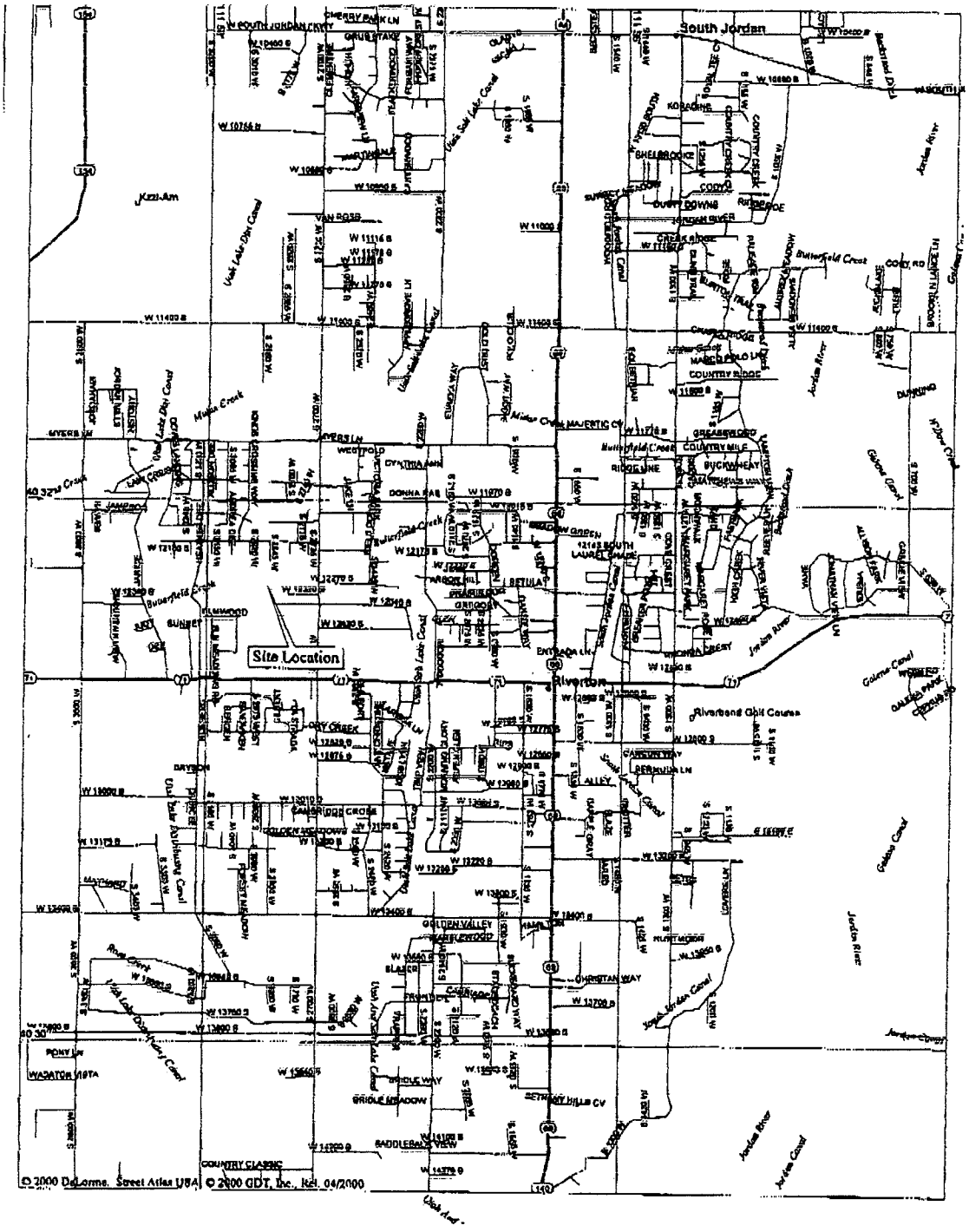
9.0 OTHER SERVICES

It is recommended that the Geotechnical Engineer be provided the opportunity for a general review of final design plans and specifications to assess that the earthwork and foundation recommendations have been interpreted and implemented in accordance with our intent.

The Geotechnical Engineer should be retained to provide services during excavation, earthwork operations, and foundation construction phases of the project. Examination of footing 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.

10.0 CLOSURE

We have prepared this report as an aid to the 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 and observations, and on the 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.



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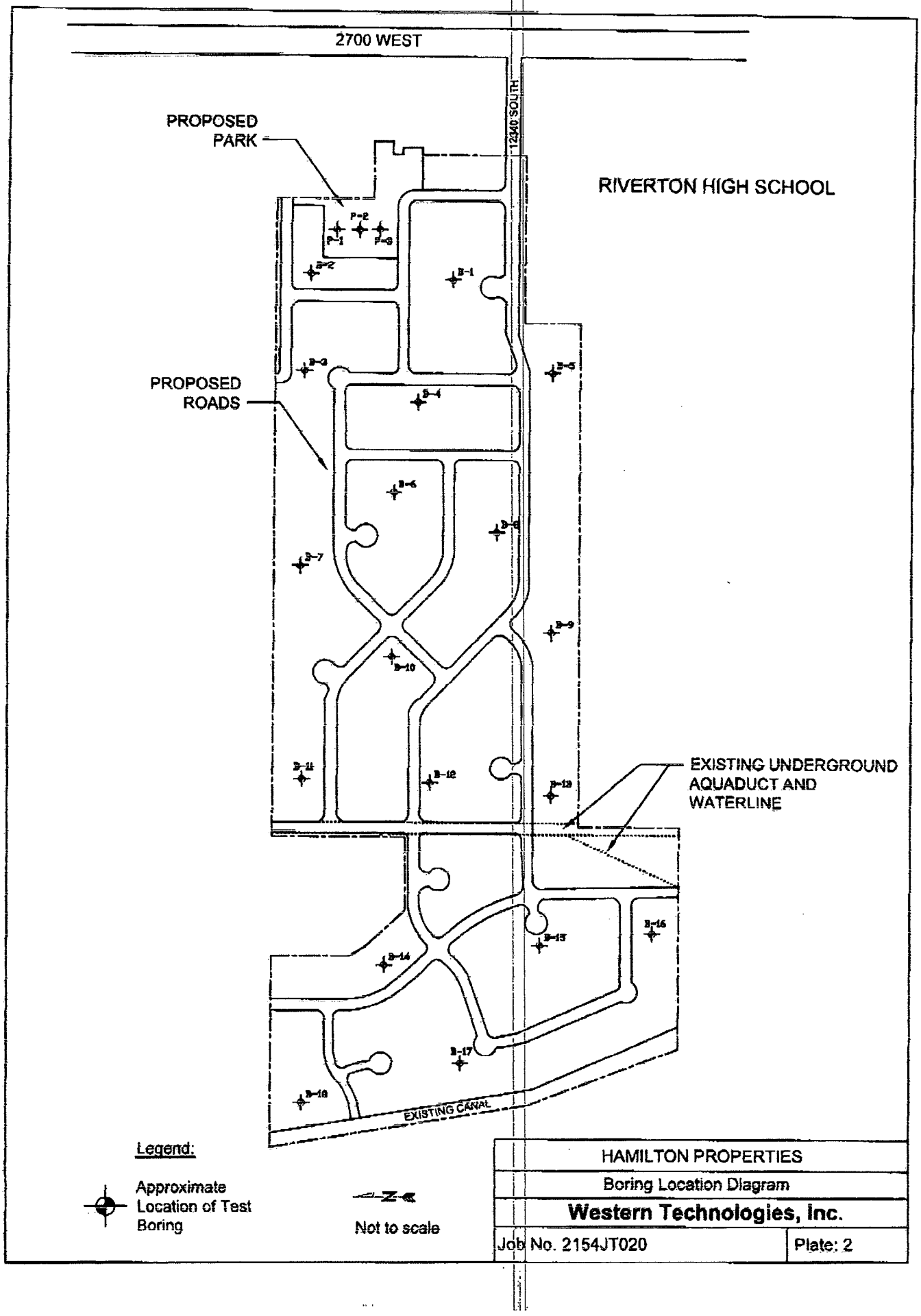
Not to scale

HAMILTON PROPERTIES	
Vicinity Map	
Western Technologies, Inc.	
Job No. 2154JT020	Plate: 1


2700 WEST
1240 SOUTH
PROPOSED PARK
RIVERTON HIGH SCHOOL
PROPOSED ROADS
EXISTING UNDERGROUND AQUADUCT AND WATERLINE
EXISTING CANAL
P-1
P-2
P-3
B-1
B-2
B-3
B-4
B-5
B-6
B-7
B-8
B-9
B-10
B-11
B-12
B-13
B-14
B-15
B-16
B-17
B-18
Legend:
Approximate Location of Test Boring
Not to scale
HAMILTON PROPERTIES
Boring Location Diagram
Western Technologies, Inc.
Job No. 2154JT020
Plate: 2

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 and 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.

HAMILTON PROPERTIES	
Definition of Terminology	
Western Technologies Inc.	
Job No.: 2154JT020	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).

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 LIMIT 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. - 12 in.
GRAVEL	No. 4 - 3 in.
Coarse	3/4 in. - 3 in.
Fine	No. 4 - 3/4 in.
SAND	No. 200 - No. 4
Coarse	No. 10 - No. 4
Medium	No. 40 - No. 10
Fine	No. 200 - 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 PER 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 PER 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 inch 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 WATER CONTENT

DRY
SLIGHTLY DAMP
DAMP
MOIST
WET
SATURATED

HAMILTON PROPERTIES	
Method of Classification	
Western Technologies Inc.	
Job No.: 2154JT020	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.

HAMILTON PROPERTIES	
Boring Log Notes	
Western Technologies Inc.	
Job No.: 2154JT020	Plate: A-3

DATE DRILLED: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-1

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, loose, disturbed by plowing, moist
		R		5			CL		CLAY; sandy, with gravel, brown, very stiff, moist
		N		21		5			
							GM		GRAVEL; silty, interbedded clay layers, brown, orange stains, dense, moist
2.8		N		44		10			
		N		34		15			
							GM		GRAVEL, SILTY, SANDY, BROWN, ORANGE STAINS, VERY DENSE, MOIST
		N		50/6"		20			
		N		50/6"		25			
		N		35		30	SM		SAND; sitly, brown, dense, moist
									31.5 Feet
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ___ DEPTH: ___ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 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: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-2

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, loose, disturbed by plowing, moist
		R		17			SM		SAND; silty, gray-brown, calcareous, stiff, moist
		R		21		5	CL		CLAY; sandy, brown, orange stains, very stiff, moist
		N		12		10	GM		GRAVEL; silty, interbedded clay layers, brown, medium dense to very dense, moist
		N		60		15			Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ___ DEPTH: ___ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-5

DATE DRILLED: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-3

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

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	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, loose, disturbed by plowing, moist
		R		14			CL		CLAY; sandy, calcareous, orange stains, stiff, moist
		R		43		5	GM		GRAVEL; silty, with sand, brown, orange stains, dense, moist
		N		44		10			
		N		15		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-6

DATE DRILLED: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-4

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

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		4		0	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, calcareous, orange stains, firm, moist
37.5	74.1	R		7		5			
		N		22		10	GM		GRAVEL; silty, with sand, brown, orange stains, medium dense to very dense, moist
		N		57		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-7

DATE DRILLED: **02-11-2004** LOCATION: **See Boring Location Diagram**

DRILL RIG TYPE: **MARL M5T**

BORING NO. B-5

ELEVATION: **Not Determined**

BORING TYPE/SIZE: **HSA/8 inch** FIELD ENGR: **REW**

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		7		0	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, brown, orange stains, stiff, moist
		R		18		5			
							SM		SILTY SAND; brown, dense, moist, orange stains
22.0	92.4	R		51		10			
							GM		GRAVEL; silty, with sand, brown, orange stains, dense, moist
		N		59		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES:___ DEPTH:___ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES

Boring Log

Western Technologies Inc.

Job No.: 2154JT020 | Plate: A-8

DATE DRILLED: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-6

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

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	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		R		5			CL		CLAY; sandy, gray-brown, firm, moist
		R		6		5			
							GM		GRAVEL; silty, with sand, brown, orange stains, dense to very dense, moist
		N		34		10			
		N		50/5"		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-9

DATE DRILLED: 02-11-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-7

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		R		14		5	CL		CLAY; sandy, brown, orange stains, stiff, moist
		R		12					
		N		29		10	GM		GRAVEL; silty, with sand, brown, orange stains, medium dense, moist
		N		14		15	CL		CLAY; sandy, brown, orange stains, stiff to very stiff, moist
		R		17		20			
									Terminated At 21.5 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ___ DEPTH: ___ DATE: 02-11-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 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: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-8

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

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	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		R		24			CL		CLAY; sandy, gray to brown, orange stains, stiff to firm, moist
		N		6		5			
		R		50/5"		10	GM		GRAVEL; silty, with sand, brown, orange stains, very dense, moist
		N		18		15	SM		SAND; silty, with gravel, brown, medium dense, moist
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ___ DEPTH: ___ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-11

DATE DRILLED: **02-12-2004**

DRILL RIG TYPE: **MARL M5T**

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

BORING NO. B-9

LOCATION: **See Boring Location Diagram**

ELEVATION: **Not Determined**

FIELD ENGR: **REW**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R O N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		N		12		0	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, gray to brown, orange stains, stiff to firm, moist
		N		5		5			
							GM		GRAVEL; silty, with sand, brown, orange stains, dense to very dense, moist
		N		35		10			
		N		70		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES

Boring Log

Western Technologies Inc.

Job No.: 2154JT020 Plate: A-12

DATE DRILLED: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-10

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		R		16		5	CL		CLAY; sandy, gray to brown, orange stains, stiff , moist
		R		15					
		N		21		10	GM		GRAVEL; silty, with sand, brown, orange stains, medium dense to very dense, moist
		N		50/6"		15			Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 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: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-11

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		N		10		5	CL		CLAY; sandy, gray to brown, stiff , moist
		N		8					
		N		50		10	GM		GRAVEL; silty, with sand, brown, orange stains, dense to very dense, moist
		N		58		15			
		N		49		20			
									Terminated At 21.5 Feet
						25			
						30			
						35			
						40			

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 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: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-12

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		R		4		0	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, gray to brown, orange stains, stiff to firm, moist
		N		7		5			
9.3		N		18		10	SM		SAND; silty, brown, orange stains, medium dense, moist
							GM		GRAVEL; silty, with sand, brown, orange stains, dense, moist
		N		48		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ___ DEPTH: ___ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-15

DATE DRILLED: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-13

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R N g N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		R		9		5	CL		CLAY; sandy, gray to brown, orange stains, stiff to firm, moist
		N		7					
							GM		GRAVEL; silty, with sand, brown, orange stains, dense, moist
		N		44		10			
		N		36		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-16

DATE DRILLED: **02-12-2004** LOCATION: **See Boring Location Diagram**

DRILL RIG TYPE: **MARL M5T**

BORING NO. B-14

ELEVATION: **Not Determined**

BORING TYPE/SIZE: **HSA/8 inch** FIELD ENGR: **REW**

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
		N		6			*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, gray, orange stains, very stiff, moist
		N		19		5			
							GM		GRAVEL; silty, with sand, brown, orange stains, very dense to dense, moist
		N		65		10			
		N		24		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES

Boring Log

Western Technologies Inc.

Job No.: 2154JT020 Plate: A-17

DATE DRILLED: 02-12-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-15

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		N		10		5	CL		CLAY; sandy, brown, orange stains, stiff, moist
		R		13					
		N		50/6"		10	GM		GRAVEL; silty, with sand, brown, orange stains, very dense, moist
		N		50/6"		15			
		N		17		20	CL		CLAY; sandy, brown, orange stains, v.stiff, moist
							GM		GRAVEL; silty, with sand, brown, orange stains, very dense, moist
		N		55		25			
						30			Terminated At 31.5 Feet
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES: ____ DEPTH: ____ DATE: 02-12-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 | Plate: A-18

DATE DRILLED: 02-13-2004 LOCATION: See Boring Location Diagram

DRILL RIG TYPE: MARL MST **BORING NO. B-16** ELEVATION: Not Determined

BORING TYPE/SIZE: HSA/8 inch FIELD ENGR: REW

WATER CONTENT (%)	DRY DENSITY (LBS/CU.FT)	SAMPLE TYPE	SAMPLE	BLOWS/FT. R or N	BLOWS/FT. C	DEPTH (FT.)	USCS	GRAPHIC	SOIL DESCRIPTION
							*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		N		18		5	CL		CLAY; sandy, brown, orange stains, stiff, moist
		N		15					
		N		21		10	SM		SAND; silty, brown, orange stains, medium dense, moist
		N		64/11"		15	GM		GRAVEL; silty, with sand, brown, very dense, moist
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-2004

NOTES

HAMILTON PROPERTIES

Boring Log

Western Technologies Inc.

Job No.: 2154JT020 Plate: A-19

DATE DRILLED: 02-13-2004 LOCATION: See Boring Location Diagram

DRILL RIG TYPE: MARL M5T

BORING NO. B-17

ELEVATION: Not Determined

BORING TYPE/SIZE: HSA/8 inch FIELD ENGR: REW

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		5			*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
							CL		CLAY; sandy, brown, orange stains, stiff, moist
		R		17		5			
							GM		GRAVEL; silty, with sand, brown, medium dense, moist
		N		21		10	CL		CLAY; sandy, with gravel, calcareous cemented, brown, orange stains, stiff, moist
							SM		SAND; silty, brown, dense, moist
		N		27		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE: 02-13-2004

NOTES

HAMILTON PROPERTIES

Boring Log

Western Technologies Inc.

Job No.: 2154JT020 Plate: A-20

DATE DRILLED: 02-13-2004
DRILL RIG TYPE: MARL M5T
BORING TYPE/SIZE: HSA/8 inch

BORING NO. B-18

LOCATION: See Boring Location Diagram
ELEVATION: Not Determined
FIELD ENGR: REW

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	*		* TOP OF BORING: TOPSOIL; clay, sandy, organics, dark brown, soft, disturbed by plowing, moist
		N		24			CL		CLAY; sandy, calcareous, cemented, gray to brown, stiff, dry
		N		43		5	GM		GRAVEL; silty, with sand, brown, orange stains, dense to very dense, moist
2.2		N		66		10			
		N		47		15			
									Terminated At 16.5 Feet
						20			
						25			
						30			
						35			
						40			

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.

GROUNDWATER ENCOUNTERED NO: X YES:____ DEPTH:____ DATE:02-13-2004

NOTES

HAMILTON PROPERTIES
Boring Log
Western Technologies Inc.
Job No.: 2154JT020 Plate: A-21

SOIL PROPERTIES

Boring No.	Depth (ft.)	Soil Class.	Initial Dry Density (pcf)	Initial Water Content (%)	Compression Properties			Expansion Properties		Plasticity		Percent Passing #200	CBR-Value	Remarks
					Surcharge (ksf)	Total Compression (%)		Surcharge (ksf)	Expansion (%)	Liquid Limit	Plasticity Index			
						In-Situ	After Saturation							
1	10-11.5	GM		2.8							NP	9.4		
4	5-6.5	CL	74.1	37.5	0.4	-0.81				45	20	95.5		4
					0.8	-1.59								
					1.6	-2.71								
					1.6		-2.86							2
					3.2		-7.32							
					6.2		-11.97							
					12.5		-18.05							
5	10-11.5	SM	92.4	21.9	0.4	-2.26					NP	49.3		4
					0.8	-2.73								
					1.6	-4.06								
					1.6		-5.23							2
					3.2		-7.94							
					6.2		-11.43							
					12.5		-15.25							
12	10-11.5	SM		9.3							NP	50.8		
18	10-11.5	GM		2.2							NP	10.3		
2,5,7,12 ,18	0-5	CL											9	

Note: Initial Dry Density and Initial Water Content are in-situ values unless otherwise noted.
NP = Non-Plastic

Remarks
1. Compacted density (approx. 95% of ASTM D698 max. density at moisture content slightly below optimum.)
2. Submerged to approximate saturation.
3. Slight rebound after saturation.
4. Sample disturbance observed.

HAMILTON PROPERTIES

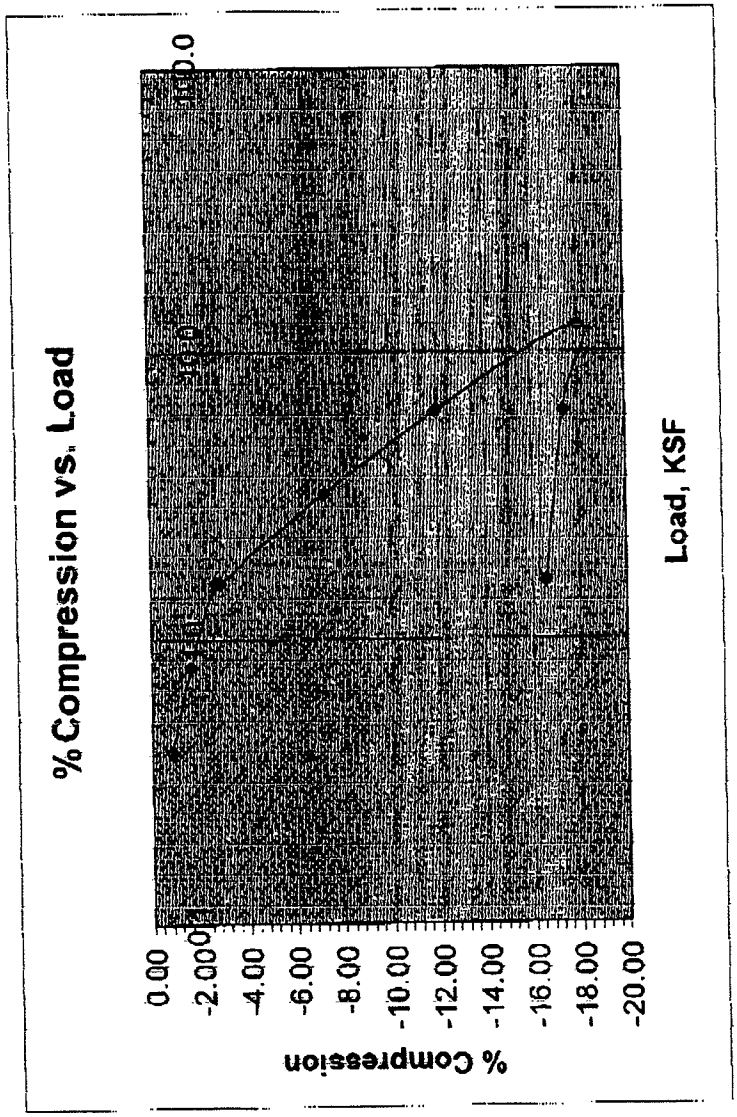
Soil Properties

WESTERN TECHNOLOGIES INC.

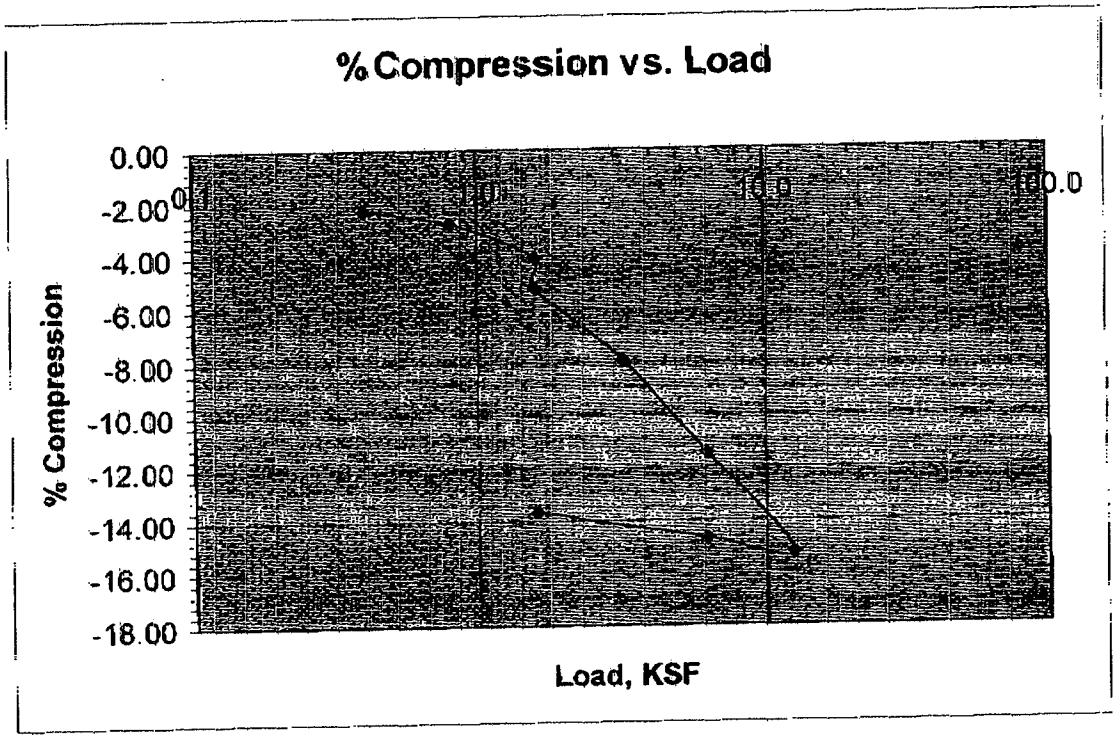
Job No. 215JT020 | Plate: B-1

HAMILTON PROPERTIES
Consolidation Graph
WESTERN TECHNOLOGIES INC.
Job No. 215JT020 Plate: B-2

B-4 at 5 – 6.5 Feet



B-5 at 10 – 11.5 Feet



HAMILTON PROPERTIES	
Consolidation Graph	
WESTERN TECHNOLOGIES INC.	
Job No. 215JT020	Plate: B-3