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SOIL, GEOLOGY, AND GEOLOGIC HAZARD STUDY WATERBURY, PHASE 2 EL PASO COUNTY, COLORADO

Prepared for

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Respectfully Submitted,

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Encl.

Entech Job No. 171292
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1.0 SUMMARY

Project Location:

The project lies in portions of Sections 28 and 29, Township 12 South, Range 64 West of the 6th Principal Meridian. The site is located north of Highway 24 and Stapleton Road, south of Eastonville Road, approximately 3 miles northeast of Falcon, Colorado, in El Paso County.

Project Description:

Total acreage involved in the project is approximately 78 acres. The proposed site development is to consist of primarily single-family residential development with areas of open space and park areas. The development will utilize central water and sewer.

Scope of Report:

The report presents the results of our geologic investigation and treatment of engineering geologic hazards. This report is the result of our geologic reconnaissance, a review of available maps, aerial photographs and our conclusions with respect to the impacts of the geologic conditions on development. Preliminary foundation recommendations are also included.

Land Use and Engineering Geology:

This site was found to be suitable for the proposed development. Geologic conditions will impose some constraints on this phase of the development. These include areas of seasonal shallow groundwater, areas where there is a potential for ponded water, floodplains, artificial fill, the potential for shallow bedrock, loose soils, and expansive soils. Based on the proposed development plan, it appears that these areas will have some impact on the development. Site conditions will be discussed in greater detail in this report.

In general, it is our opinion that the development can be achieved if the observed geologic conditions on site are either avoided or properly mitigated. All recommendations are subject to the limitations discussed in the report.

2.0 GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The site lies in portions of Sections 28 and 29, Township 12 South, Range 64 West of the 6th Principal Meridian, in El Paso County, Colorado. The site is located north of Highway 24 and Stapleton Road, south of Eastonville Road, approximately 3 miles northeast of Falcon, Colorado. The location of the site is shown on the Vicinity Map, Figure 1.

The topography of the site is gently to moderately generally sloping to the southeast. Several drainages exist on the site that flow in southeasterly directions. The area of the site is indicated on the USGS Map, Figure 2. The site contains primarily low field grasses and weeds. Past uses have included grazing and pasture land. Site photographs are included in Appendix A. The locations and directions of the photographs are indicated on Figure 3.

Total acreage involved in the proposed development is approximately 78 acres. The proposed development is to consist of 233 single-family residential lots ranging from 6000 to 14,000 square feet and areas of open space and parks. The Development Plan is shown on Figures 3, 9 and 15.

3.0 SCOPE OF THE REPORT

The scope of this report will include the following:

- A general geologic analysis of the site utilizing published geologic data, and subsurface soils information.
- Detailed site-specific mapping will be conducted to obtain general information in respect to major geographic and geologic features, geologic descriptions, geologic hazards, and their effects on development of the property.
- Recommended mitigation of geologic hazards where they affect development.

4.0 FIELD INVESTIGATION

The site was previously investigated in a *Soil, Geology, Geologic Hazard and Wastewater Study and Preliminary Subsurface Soil Investigation* by Entech Engineering, Inc. January 22, 2004 (Entech Job No. 61992, Reference 1). The previous investigation addressed the entire 558 acre 4-Way Ranch parcel and included a wastewater study for individual water treatment systems. The southwestern portion of 4-Way Ranch has been platted and several single-family residential structures have been constructed. Three addendums were written by Entech Engineering, Inc. May 18, 2004 (Reference 2), June 25, 2004 (Reference 3) and January 26, 2009 (Reference 4). The third addendum (Reference 4) addressed the southern portion of the 558 acre site (south of Stapleton Road) where commercial and multi-family residential development was proposed. At the time of this investigation Stapleton Road had been constructed, paved and curb and gutter installed.

A *Soil, Geology, Geologic Hazard and Preliminary Subsurface Soil Investigation Report* addressing the Waterbury PUD development proposed for the area north of Stapleton Road, north of the proposed commercial and multi-family area and east of the platted single-family residential areas was prepared by Entech Engineering, Inc. May 16, 2012, Entech Job No. 121481, Reference 5. The investigation for the entire 558-acre parcel was used in evaluation of the Waterbury PUD site. Additionally, *A Subsurface Soil Investigation/Bedrock/Groundwater Investigation* was conducted on the site July 18, 2012. (Entech Job No. 120675, Reference 6). The investigation consisted of drilling an additional 19 test borings on the Waterbury PUD site to evaluate soil, bedrock and groundwater conditions where utilities are proposed. A Soil, Geology, Geologic Hazard and Preliminary Subsurface Soil Investigation was performed by Entech Engineering, Inc. March 22, 2013, for Phase 1 of the Waterbury PUD (Reference 7). This report is for Phase 2 of the Waterbury PUD that lies north and east of Phase I. Information from these reports was used in evaluating the site. The Waterbury PUD area was revisited by personnel of Entech Engineering, Inc. May 10, 2012, and for the Waterbury Phase I area on March 15, 2013. The area of Waterbury Phase 2 was revisited and observed on August 24, 2017. No significant changes to the land were observed. Site photographs taken August 24, 2017 are included in Appendix A.

Twenty-five (25) test borings were drilled as a part of a preliminary subsurface soil investigation for the entire site (Reference 1). Seven (7) of these test borings were drilled on or immediately adjacent to Phase 2 of the development. The borings were drilled with a power driven continuous flight auger drill rig to depths ranging from 10 to 20 feet. Samples were obtained during drilling using the Standard Penetration Test, ASTM D-1586, utilizing a 2-inch O.D. Split Barrel Sampler. Results of the penetration tests are shown on the drilling logs to the right of the sampling point. The locations of the test borings are included on the Test Boring Location Plan, Figure 3. The drilling logs are included in Appendix B.

Twenty-eight (28) percolation tests were performed on the site (References 1 through 3) to determine general suitability of the site for the use of individual wastewater treatment systems. Five (5) of these percolation tests were drilled on Phase 2 of the development. The profile holes of the percolation tests were used in evaluating the site. The locations of these profile holes are shown on Figure 3. The profile hole logs are included in Appendix C.

Laboratory testing was performed to classify and determine the soils engineering characteristic. Laboratory tests included moisture content, ASTM D-2216, grain size analysis, ASTM D-422 and Atterberg Limits, ASTM D-4318. Swell tests included both FHA and Denver Swell/Consolidation Testing. Results of the laboratory testing are included in Appendix D. A Summary of Laboratory Test Results is presented in Table 1.

Nineteen test borings were drilled on the Waterbury PUD site as a part of a *Subsurface Soil Investigation/Bedrock/Groundwater Investigation* (Reference 6). Six (6) of these test borings were drilled on Phase 2 of the development. The locations of these test borings are indicated on the Test Boring Location Map, Figure 3. The Test Boring Logs and Laboratory Test Results are included in Appendix E. A Summary of Laboratory Test Results is presented in Table 2.

The geologic analysis was performed using information from the preliminary subsurface soil investigations (References 1, 6, and 7), site-specific mapping and published sources including the *Geologic Map of the Pueblo 1° x 2° Quadrangle, South-Central Colorado* distributed by the U.S. Geological Survey (Reference 8), *The Falcon Quadrangle Geologic Map* distributed by the Colorado Geological Survey (Reference 9), and a study performed by Charles S. Robinson and Associates, Inc. for El Paso County Planning Department (References 10 and 11). The Soil

Conservation Service (SCS) Survey was also reviewed to evaluate the site.

5.0 SOIL, GEOLOGY AND ENGINEERING GEOLOGY

5.1 General Geology

Physiographically, the site lies in the western portion of the Great Plains Physiographic Province. Approximately 17 miles to the west is a major structural feature known as the Rampart Range Fault. This fault marks the boundary between the Great Plains Physiographic Province and the Southern Rocky Mountain Province. The site exists within the southern edge of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a northerly direction (Reference 12). The rocks in the area of the site are sedimentary in nature, and typically Tertiary to Cretaceous in age. The bedrock underlying the site itself is the Dawson Formation. Overlying the Dawson are unconsolidated deposits of alluvial and residual soils. The site's stratigraphy will be discussed in more detail in Section 5.3.

5.2 Soil Conservation Service

The Soil Conservation Service (Reference 13) has mapped two soil types on the site (Figure 4). In general, the soils consist of gravelly sandy loam over a yellowish and pale brown gravelly, loamy sand subsoil. Soils are described as follows:

Type	Description
19	Columbine gravelly sandy loam, 0-3% slopes
83	Stapleton sandy loam, 3-8% slopes

Complete descriptions of the soils are presented in Figures 5 and 6. The soils have been described to have very rapid to rapid permeabilities. Limitations for development on Soil Type 83 include frost action potential and soil blowing as described by the Soil Conservation Service. Special design for roadways may be necessary due to frost heave. Limitations on Soil Type 19 include the hazard of flooding in some areas. Cut banks in excavations are susceptible to caving as described in Table 8 from the Soil Survey (Reference 13). The soil blowing hazard is

severe if vegetation is removed. Possible hazards with soil erosion are present on the site. The erosion potential can be controlled with vegetation. The soils have been described to have moderate erosion hazards.

5.3 Site Stratigraphy

The Colorado Geologic Map distributed by the US Geological Survey showing the location of the site is presented in Figure 7 (Reference 8). The Falcon Quadrangle Geologic Map distributed by the Colorado Geological Survey showing the location of the site is presented in Figure 7A (Reference 9) The Geology Map prepared for the Falcon Quadrangle by Charles S. Robinson and Associates, Inc. for the El Paso County Planning Department (Reference 10) showing the location of the site is presented in Figure 8. The Geology Map prepared for the site is presented in Figure 9. Four mappable units were identified on this site which are discussed as follows:

- **Qaf** **Artificial Fill of Quaternary Age:** These are man-made deposits associated with earthen dams on site.

- **Qal** **Recent Alluvium of Quaternary Age:** These are recent water deposited soils associated with the bed of streams and along valley floors. The soils consist of silt, clay, and sands.

- **Qp** **Piney Creek Alluvium of Quaternary Age:** These are water deposited terraces along the present streams. The material generally consists of silty sand and may be highly stratified, containing lenses of silt, clay or gravel.
- **Tkd** **Dawson Formation of Tertiary to Cretaceous Ages:** This formation consists of coarse grained arkosic sandstone with interbedded claystone and siltstone. Typically overlying the Dawson in many areas is a variable layer of residual soil derived from the in-situ weathering of the bedrock materials on-site.

The soils listed above were mapped from the *Falcon Quadrangle Geologic Map* in 2012 (Figure 7A, Reference 9), The Falcon Quadrangle Geologic from the Robinson Study for El Paso County Planning Department in 1977 (Figure 8, Reference 10), the *Geologic Map of the Pueblo 1° x 2° Quadrangle* in 1978 (Figure 7, Reference 8), previous investigations by

Entech Engineering, Inc. (Reference 1, 6, and 7), and site specific mapping of the site. The test borings and profile holes of the percolation tests were also used in evaluating the site and are included in Appendices A, C and E.

5.4 Soil Conditions

The soils encountered in the test borings and profile holes for the entire site can be grouped into six general soil types. The soils were classified using the Unified Soil Classification System (USCS).

Soil Type 1 consists of slightly silty and silty sands (SW-SM, SP-SM). Areas of clayey sands (SC) were also encountered in the test borings. The sands were encountered in the upper soil profile of most of the test borings and profile holes. These soils were encountered at loose to dense states and dry to wet conditions. Soil Type 1 has 6 to 25 percent passing the No. 200 sieve. The soils tested in the test borings and profile holes are non-expansive and generally non-plastic. A FHA Swell pressure of 290 psf was obtained on a sample of silty sand (Reference 6, Appendix E) indicating the sand has low swell potential.

Soil Type 2 consists of silty to sandy clay (CL). The clays were encountered in the upper soil profile in two of the test borings. The clays were encountered at very stiff consistencies and at moist conditions. The samples tested have 76 and 95 percent passing the No. 200 sieve. An FHA Swell pressure of 1470 psf was measured on the clays. A swell of 1.5% was measured on the clays in the Swell/Consolidation Test. These swells are in the moderate expansion range.

Soil Type 3 consists of clayey silts (ML). The silts were encountered in two of the test borings at stiff consistencies and moist conditions. The silts generally have low plasticity and low swelling properties.

Soil Type 4 consists of clayey, very silty to slightly silty and slightly clayey sandstone bedrock (SC, SM, SM-SW, SW-SC). The sandstone was encountered in most of the test borings and many of the profile holes at depths ranging from the surface to 18 feet below the surface. The sandstones were encountered at very dense states and at moist to wet conditions. The samples tested have 7 and 48 percent passing the No. 200 sieve. FHA Swell pressures of 350

psf and 860 psf were measured on the slightly clayey and clayey sandstones. These swells are in the low expansion range. The silty sandstones are non-plastic and non-expansive. A consolidation of 0.3 % was measured in the Swell/Consolidation Test on the sandstone, indicating low potential for consolidation.

Soil Type 5 consists of silty and sandy claystone (CL). The claystones were encountered in 21 of the test borings at depths ranging from 3 to 14 feet below the surface. The claystones were encountered at hard consistencies and at moist conditions. The samples tested have 56 to 93 percent passing the No. 200 sieve. FHA Swell pressures of 1015 psf to 1470 psf were measured on the claystones. These swells are in the moderate expansion range. Swells of 0.6% and 1.7% were measured in the Swell/Consolidation Test on the claystone (Reference 6, Appendix E). These swells are in the low to moderate expansion range.

Soil Type 6 consists of clayey and sandy siltstone (ML). The siltstones were encountered in 5 of the test borings at depths ranging from 0 to 12 feet below the surface. The siltstones were encountered at hard consistencies and at moist conditions. The samples tested have 62 and 82 percent passing the No. 200 sieve and generally are non-plastic. FHA Swell pressures of 1150 psf and 1818 psf and a Denver swell of 3.8% were measured on the siltstones. These swell pressures are in the moderate to high expansion range.

The laboratory results are summarized in Tables 1 and 2. Laboratory results are included in Appendices D and E. A summary of depth to bedrock for the test borings from Entech Job No. 120675 (Reference 6) is shown in Table 3. The depth to bedrock from Entech Job No. 61992 (Reference 1) are summarized in Tables included in Appendices B and C.

5.5 Groundwater

Groundwater was encountered in the test borings drilled on or immediately adjacent Phase 2 of the development, as a part of the Subsurface Soil Investigation/Bedrock/Groundwater Investigation (Figure 3, Reference 6) at depths ranging from 4.5 to greater than 15 feet. A summary of groundwater depths is presented in Table 3A and included in Appendix E.

Groundwater was encountered in the test borings drilled on or immediately adjacent Phase 2 at depths ranging from the 2 to 13 feet below the surface (Figure 3, Reference 1). A summary of groundwater depths for all of the test borings drilled during the on the entire development is presented in Table 3B and included in Appendix B.

Groundwater was encountered in the profile holes of the percolation tests drilled on or immediately adjacent to Phase 2 of the development, at depths ranging from 7.5 to greater than 10 feet below the surface (Figure 3, References 1-4). A Summary of Groundwater Depths for the profile holes on the entire development is presented in Table 3C and included in Appendix C.

Fluctuation in groundwater conditions may occur due to variations in rainfall and other factors not readily apparent at this time. Isolated sand layers within the variable soil profile, sometimes only a few feet in thickness and width, can carry water in the subsurface. Water may also flow on top of the bedrock. Contractors should be cognizant of the potential for the occurrence of such subsurface water features during construction on-site.

6.0 ENGINEERING GEOLOGY

The Engineering Geology Map of the Falcon Quadrangle as mapped by Charles Robinson and Associates, Inc. for El Paso County Planning Department is presented in Figure 10 (Reference 11). The Robinson Study map and site-specific mapping were utilized to produce an Engineering Geology Map, Figure 9. This map shows the location of various geologic conditions of which the developers and planners should be cognizant during the planning, design and construction stages of the project. The hazards mapped on this site by Entech Engineering, Inc. include floodplains, seasonally shallow groundwater areas, potentially seasonal shallow groundwater areas, potential areas of ponded water, artificial fill, loose soils, and expansive soils. These hazards and the recommended mitigation techniques are as follows:

Expansive Soils

The clays, silts and some of the bedrock encountered in the test borings are expansive. While the majority of the upper sandy soils on the site are non-expansive, expansive clays will likely be encountered in building excavations. These clays, if encountered beneath foundations, can cause differential movement in the structure foundation. Due to the sporadic nature of these occurrences, none have been indicated on the maps. These occurrences should be identified and mitigated on an individual basis.

Mitigation: Should expansive soils be encountered beneath the foundation, mitigation will be necessary. Mitigation of expansive soils will require special foundation design. Overexcavation and replacement with non-expansive soils compacted at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 is a suitable mitigation which is common in the area. The use of drilled pier foundation systems is another option on highly expansive soils. Floor slabs on expansive soils should be expected to experience movement. Overexcavation and replacement has been successful in minimizing slab movements. The use of structural floors should be considered for basement construction on highly expansive clays. Final recommendations should be determined after additional investigation of each building site.

Slope Stability and Landslide Hazard

The majority of the slopes observed on the site are gently to moderately sloping. Small areas of unstable slopes were identified immediately south of the site along a minor drainage that bisects the site. These areas are subject to failure due to erosion by the creeks. These areas lie south of Phase 2. According to the grading and development plan (Figure 9), portions of these areas are to be left as open space with some areas filled and rerouted through drainage easements and storm sewers. No known past landslides have been mapped on the site (References 8, 10, 11). The slopes in Phase 2 are generally gently sloping and in our opinion, are stable in their current state. Based on a review of the grading plans, the proposed grading does not create areas of unstable or potentially unstable slopes provided slopes are constructed no steeper that 3 (horizontal) to 1 (vertical) and properly compacted and benched into native materials.

Groundwater and Floodplain Areas

Groundwater was encountered at depths ranging from the 2 to 13 feet in many of the test borings and profile holes drilled on Phase 2 of the development. Areas were observed on the site that will experience shallow groundwater on a seasonal basis. Additionally, areas where ponded water could accumulate, and physiographic floodplain areas exist on this site. These areas are discussed as follows:

- sw, psw - Seasonal and potentially seasonal shallow groundwater areas: In these areas, we would anticipated the potential for periodically high subsurface moisture conditions, frost heave potential, and highly organic soils. The majority of these areas are to be filled and regraded or designated as open space according to the grading plan: Figure 9. Construction in these areas, should follow these precautions:

  Mitigation: In these locations, foundations are subject to severe frost heave and should penetrate to a sufficient depth so as to discourage the formation of ice lenses beneath foundations. At this location and elevation, a foundation depth for frost protection of 30 inches is recommended. In areas where high subsurface moisture conditions are anticipated periodically, a subsurface perimeter drain will be necessary to help prevent the seepage of water into areas below grade. A typical perimeter drain detail is presented in Figure 12. Any grading in these areas should be done in a manner that directs surface flow around construction to avoid areas of ponded water. Areas of organic material will require removal prior to any fill placement. Unstable soil conditions should be expected in areas of shallow groundwater. Where foundations approach the groundwater level, stabilization of the excavations utilizing shot rock or geo grids may be necessary. Underslab drains or capillary breaks, and interceptor drains may be necessary to prevent the intrusion of water into areas below grade. Typical drain details are presented in Figures 13 and 14.

- w - Areas of potentially ponded water: These are areas where water could potentially pond behind existing earthen dams. According to the grading plan, this area is to be regraded and the dam removed. All soft and organic soils should be removed prior to fill placement. All uncontrolled fill associated with the dams should be removed and recompacted at a minimum of 95% of its maximum Modified Dry Density ASTM D-1557.

- fp - Floodplain: Areas of the site have been mapped as floodplains according to the FEMA Map No. 08041CO575F (Figure 11, Reference 14). The physiographic floodplains on site have been mapped on the Engineering Geology Map (Figure 9). Areas with the potential for flowing water not identified as floodplains on the FEMA map (Figure 11) have been mapped as a physiographic floodplain hazard on Figure 9. It is our understanding a Letter of Map Revision (LOMR) has been submitted for the site and that some drainage improvements and channelization are proposed. A Conditional Letter of Map Revision (CLOMR) is to be submitted for the proposed drainage improvements. The exact floodplain locations should be determined in a drainage study. It should be possible to avoid the floodplain areas with structures on most of the site. The majority of the floodplain areas have been designated as open space. Those areas that currently lie within the FEMA floodplain area will require approval of the Drainage Report. Finished floor levels should be a minimum of one foot above the floodplain level. Structures should not block drainages. Specific floodplain locations and drainage studies are beyond the scope of this report.

Artificial Fill

Areas of artificial fill may be encountered on site associated with the small earthen dams observed on site. These areas are limited and it is anticipated they will be either avoided by development or removed during site grading. Any uncontrolled fill encountered beneath foundation will require removal and recompaction at a minimum of 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Collapsible Soils

Areas of loose soils and possible collapsible soils were encountered in some of the test borings drilled on the entire development. These soils are subject to settlement if encountered beneath foundations.

Mitigation: Should loose or collapsible soils be encountered beneath foundations, removal and recompaction of the upper 2 feet with thorough moisture conditioning at a minimum 95% of its maximum Modified Proctor Dry Density, ASTM D-1557 will be necessary. Specific recommendations should be made after additional investigation of each building site.

7.0 RADIOACTIVITY

Radon levels for the area have been reported by the Colorado Geologic Survey in the Open-File, Report No. 91-4 (Reference 15). Radon levels ranging from 0 to 20 pci/l have been measured in the area. Only one reading had been taken in the area and it is between 4 and 10 pci/l. The minimal information from this report is not sufficient to determine if radon levels are higher for this site. Occurrences of radioactive minerals have been identified 11 miles east and 10 miles west of the site (Reference 16). This occurrence to the west is associated with a limonite deposit in the Dawson Formation. The occurrence to the east is in a carbonaceous clay in the Ogallala Formation. No known occurrences exist on the site.

While it is anticipated that radon levels for the site would not be considered excessive, the potential exists for radon gas to build up in areas of the site. Build-ups of radon gas can be mitigated by providing increased ventilation of basements and crawlspaces and sealing of joints. Specific requirements for mitigation, if any, should be based on site specific testing after the site is constructed.

8.0 EROSION CONTROL

The soil types observed on the site are mildly to moderately susceptible to wind erosion, and moderately to highly susceptible to water erosion. A minor wind erosion and dust problem may be created for a short time during and immediately after construction. Should the problem be considered severe enough during this time, watering of the cut areas or the use of chemical palliative may be required to control dust. However, once construction has been completed, and vegetation reestablished, the potential for wind erosion should be considerably reduced. With regard to water erosion, loosely compacted soils will be the most susceptible to water erosion, residually weathered soils and weathered bedrock materials become increasingly less susceptible to water erosion. For the typical soils observed on site, allowable velocities or

unvegetated and unlined earth channels would be on the order of 3 to 4 feet/second, depending upon the sediment load carried by the water. Permissible velocities may be increased through the use of vegetation to something on the order of 4 to 7 feet/second, depending upon the type of vegetation established. Should the anticipated velocities exceed these values, some form of channel lining material may be required to reduce erosion potential. These might consist of some of the synthetic channel lining materials on the market or conventional riprap.

In cases where ditch-lining materials are still insufficient to control erosion, small check dams or sediment traps may be required. The check dams will serve to reduce flow velocities, as well as provide small traps for containing sediment. The determination of the amount, location and placement of ditch linings, check dams and of the special erosion control features should be performed by or in conjunction with the drainage engineer who is more familiar with the flow quantities and velocities.

Cut and fill slope areas will be subjected primarily to sheetwash and rill erosion. Unchecked rill erosion can eventually lead to concentrated flows of water and gully erosion. The best means to combat this type of erosion is, where possible, the adequate re-vegetation of cut and fill slopes. Cut and fill slopes having gradients more than three (3) horizontal to one (1) vertical become increasingly more difficult to re-vegetate successfully. Therefore, recommendations pertaining to the vegetation of the cut and fill slopes may require input from a qualified landscape architect and/or The Natural Resource Conservation Service (previously the Soil Conservation Service).

9.0 ECONOMIC MINERAL RESOURCES

Some of the sandy materials on-site could be considered a low grade sand resource. According to the *El Paso County Aggregate Resource Evaluation Map* (Reference 17), the area is mapped as upland deposits. According to the Atlas of Sand, Gravel and Quarry Aggregate Resources, Colorado Front Range Counties distributed by the Colorado Geological Survey (Reference 18), areas of the site are mapped as U4 - Upland deposits: probably aggregate resource and A3 – Alluvial fan: sand resource. According to the *Evaluation of Mineral and Mineral Fuel Potential*

(Reference 19), the area of the site has been mapped as "Good" for industrial minerals. Several mines exist in the area of the site for sand and gravel. A gravel quarry is located south of the site. Considering the silty to clayey nature of much of these materials and abundance of similar materials through the region, they would be considered to have little significance as an economic resource.

According to *the Evaluation of Mineral and Mineral Fuel Potential of El Paso County State Mineral Lands* (Reference 19), the site is mapped within the Denver Basin Coal Region. However, the area of the site has been mapped as "Poor" for coal resources. No active or inactive mines have been mapped in the area of the site. The *El Paso County Aggregate Resource Map* (Reference 17) has mapped coal resources in the Falcon area, 1 mile south of the site; however, none are mapped on the site itself. No metallic mineral resources have been mapped on the site (Reference 19).

The site has been mapped as "Fair" for oil and gas resources (Reference 19). No oil or gas fields have been discovered in the area of the site. An exploratory well was drilled northeast of the site to 8,263 feet deep in 1955. The sedimentary rocks in the area lacked the essential elements for oil or gas; therefore, the well was plugged and abandoned.

10.0 RELEVANCE OF GEOLOGIC AND SITE CONDITIONS TO LAND USE PLANNING

It is our opinion that the existing anticipated geologic and engineering geologic conditions will impose some constraints on the proposed development and construction. The most significant problem affecting development will be that of shallow groundwater, potentially shallow bedrock, and floodplains. Which can be mitigated by avoidance, regrading, and/or proper engineering design and construction. Other anticipated constraints such as expansive soils or loose soils can be mitigated through proper engineering design and construction.

The upper soils are typically at loose to very dense states. Expansive layers may be encountered. Expansive soils, if encountered, will require special foundation design and/or

overexcavation and replacement with non-expansive material compacted at a minimum of 95% of its maximum Modified Proctor Dry Density ASTM D-1557. These soils will not prohibit development. Loose or collapsible soils, if encountered, may also require recompaction at 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Small earthen dams observed on site can be avoided by development or regraded. Small erosion berms can be penetrated by foundations or regraded. Should any uncontrolled fill be encountered beneath foundations, it will require recompaction at 95% of its maximum Modified Proctor Dry Density, ASTM D-1557.

Areas of seasonal and potentially seasonal shallow groundwater and floodplains exist on this site. The floodplains are to be either avoided by development, channelized and preserved as open space in drainage easements, or regraded and directed to storm sewers or detention ponds. Some areas will require approval of the Drainage Report that excludes them from the FEMA floodplain prior to construction. Finished floor levels must be a minimum of one foot above the floodplain level. Exact floodplain locations are beyond the scope of this report. The majority of the floodplain areas are in proposed open space areas. According to the grading plan (Figure 9), the minor drainages are to be avoided as open space or filled and directed to storm sewers or detention ponds and will mitigate the hazard. Areas of perched groundwater were encountered on this site. Shallow groundwater was encountered in the area of Test Boring Nos. 306, 308, 313, and 314 (Table 3A), Test Boring Nos. 16, 18, 19, and 22 (Table 3B), and Profile Hole Nos. 17, 19, and 4.5 (Table 3C). According to the grading plan (Figure 9), many of these areas are to be avoided or regraded and surface flows directed to storm sewers and detention ponds. Some areas are to be avoided and preserved as open space. It is anticipated the majority of the areas where shallow groundwater exists on the site will be mitigated with the proposed grading or avoidance. Subsurface drains may be necessary in some areas to prevent the intrusion of water below grade. Dewatering systems may be necessary in some areas where seepage and perched water occurs. Unstable conditions should be expected where excavations approach the groundwater level. Stabilization using geofabric or shot rock may be necessary.

Shallow bedrock may be encountered on portions of this site where the overlying alluvial materials are thinner. Shallow bedrock areas encountered in the test borings and profile

holes are indicated on the Shallow Bedrock Map, Figure 15. Depths of bedrock are indicated on Figure 15. Higher bearing capacities for foundations can be expected in areas of shallow bedrock. Additionally, difficult excavation can be expected in areas of shallow bedrock. The use of track mounted equipment may be necessary in areas of shallow bedrock. Rubber tired equipment can be used where bedrock is not encountered.

In summary, development of the site can be achieved if the items mentioned above are mitigated. These items can be mitigated through avoidance or proper design and construction practices. Investigation of each lot is recommended prior to construction.

11.0 CLOSURE

It is our opinion that the existing geologic engineering and geologic conditions will impose some constraints on development and construction of the site. The proposed development is consistent with the geologic and engineering conditions observed on the site.

It should be pointed out that because of the nature of data obtained by random sampling of such variable and non-homogeneous materials as soil and rock, it is important that we be informed of any differences observed between surface and subsurface conditions encountered in construction and those assumed in the body of this report. Reporting such discrepancies to Entech Engineering, Inc. soon after they are discovered would be greatly appreciated and could possibly help avoid construction and development problems. Individual investigations of building sites is required prior to construction. Planning and design personnel should be made familiar with the contents of this report.

This report has been prepared for Four Way Joint Venture, LLC. for application to the proposed project in accordance with generally accepted geologic soil and engineering practices. No other warranty expressed or implied is made.

We trust this report has provided you with all the information you required. Should you require additional information, please do not hesitate to contact Entech Engineering, Inc.

BIBLIOGRAPHY

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TABLES

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS
from Entech Job No. 61992 (Reference 1)

CLIENT LAND RESOURCE GROUP, INC.
PROJECT 4-WAY RANCH
JOB NO. 61992

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	PH-6	5-10'	15.3%	19	3			SM	SAND, SILTY, GRAVELLY
1	TB1	2-3'	9.7%					SW-SM	SAND, SLIGHTLY SILTY
1	TB11	2-3'	25.0%					SM	SAND, SILTY
1	TB4	2-5'	9.4%	NV	NP			SW-SM	SAND, SLIGHTLY SILTY
2	TB23	2-3'	76.5%			1467		CL	CLAY, SILTY
3	TB4	10'		32	1			ML	SILT, CLAYEY
4	PH-1	10'				861		SC	SANDSTONE, CLAYEY
4	PH-2	5-10'	17.3%	28	13			SC	SANDSTONE, CLAYEY
4	TB11	10'	48.0%	NV	NP			SM	SANDSTONE, VERY SILTY
4	TB11	10'					0.0%	SM	SANDSTONE, VERY SILTY
4	TB16	5'	11.2%			351		SW-SC	SANDSTONE, SLIGHTLY CLAYEY
5	PH-9	10'	56.4%			1014		CL	CLAYSTONE, VERY SANDY
5	PH-8	10'	68.3%	39	23			CL	CLAYSTONE, SANDY
5	TB6	15'	92.9%			1467		CL	CLAYSTONE, SILTY
6	PH-7	10'	62.5%	27	2	1818		ML	SILTSTONE, SANDY
6	TB14	2-3'				1150		ML	SILTSTONE, CLAYEY
6	TB2	10'					3.8%	ML	SILTSTONE, CLAYEY
6	TB2	10'	82.1%	29	0			ML	SILTSTONE, CLAYEY

TABLE 2

SUMMARY OF LABORATORY TEST RESULTS
from Entech Job No. 120675 (Reference 6)

CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH
JOB NO. 120675

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	301	2-3			6.2			0.01			SM-SW	SAND, SLIGHTLY SILTY
1	305	5			7.7						SM-SW	SAND, SLIGHTLY SILTY
1	305	10			18.9	NV	NP		290		SM	SAND, SILTY
1	311	5			10.9						SM-SW	SAND, SLIGHTLY SILTY
1	317	5			5.6						SM-SW	SAND, SLIGHTLY SILTY
2	312	5	16.4	107.5	94.7					1.5	CL	CLAY, SANDY
3	318	10	12.8	119.4	28.9	NV	NP	0.00		-0.3	SM	SANDSTONE, SILTY
3	303	15			6.6	NV	NP				SM-SW	SANDSTONE, SLIGHTLY SILTY
3	307	5			34.4	NV	NP	0.00			SM	SANDSTONE, SILTY
3	308	5			18.7						SM	SANDSTONE, SILTY
3	312	10			19.1						SM	SANDSTONE, SILTY
4	302	15				40	15	0.02			CL	CLAYSTONE, SANDY
4	308	10	16.4	115.5	61.0					0.6	CL	CLAYSTONE, VERY SANDY
4	314	10			56.6	35	17		1360		CL	CLAYSTONE, VERY SANDY
4	315	10	15.8	116.5	77.1					1.7	CL	CLAYSTONE, SANDY
4	316	15			66.0						CL	CLAYSTONE, SANDY

TABLE 3A

Depth to Bedrock and Groundwater
From Entech Job No. 120675 (Reference 6)

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
300	14	6.5
301	9	4
302	13	8
303	14	6
304	12	8.5
305	12	5.5
306*	3	12
307	4	4
308*	3	>15
309	9	11.5
310*	7	4.5
311	8	5.5
312*	7	14.5
313*	3	5.5
314*	4	13
315	7	24.5
316	4	14
317	11	8.5
318	9	4.5

* Test Boring Located on Phase 2 of Waterbury

Table 3B
Summary of Depth to Bedrock and Groundwater in Test Borings (Reference 1)

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	3	>9.5
2	6	3
3	12	0 (surface)
4	11	8
5	12	8
6	11	2.5
7	8	3
8	12	>15
9*	14	11
10	9	>14.5
11	6	5
12	2	>9.5
13	0 (surface)	6
14	0 (surface)	>14
15	0 (surface)	12
16*	4	2
17*	0 (surface)	13
18*	4	>9
19*	4	7
20	1	>8.5
21	3	>9.5
22*	2	>9.5
23	4	>9.5
24	12	12.5
25	>20	12

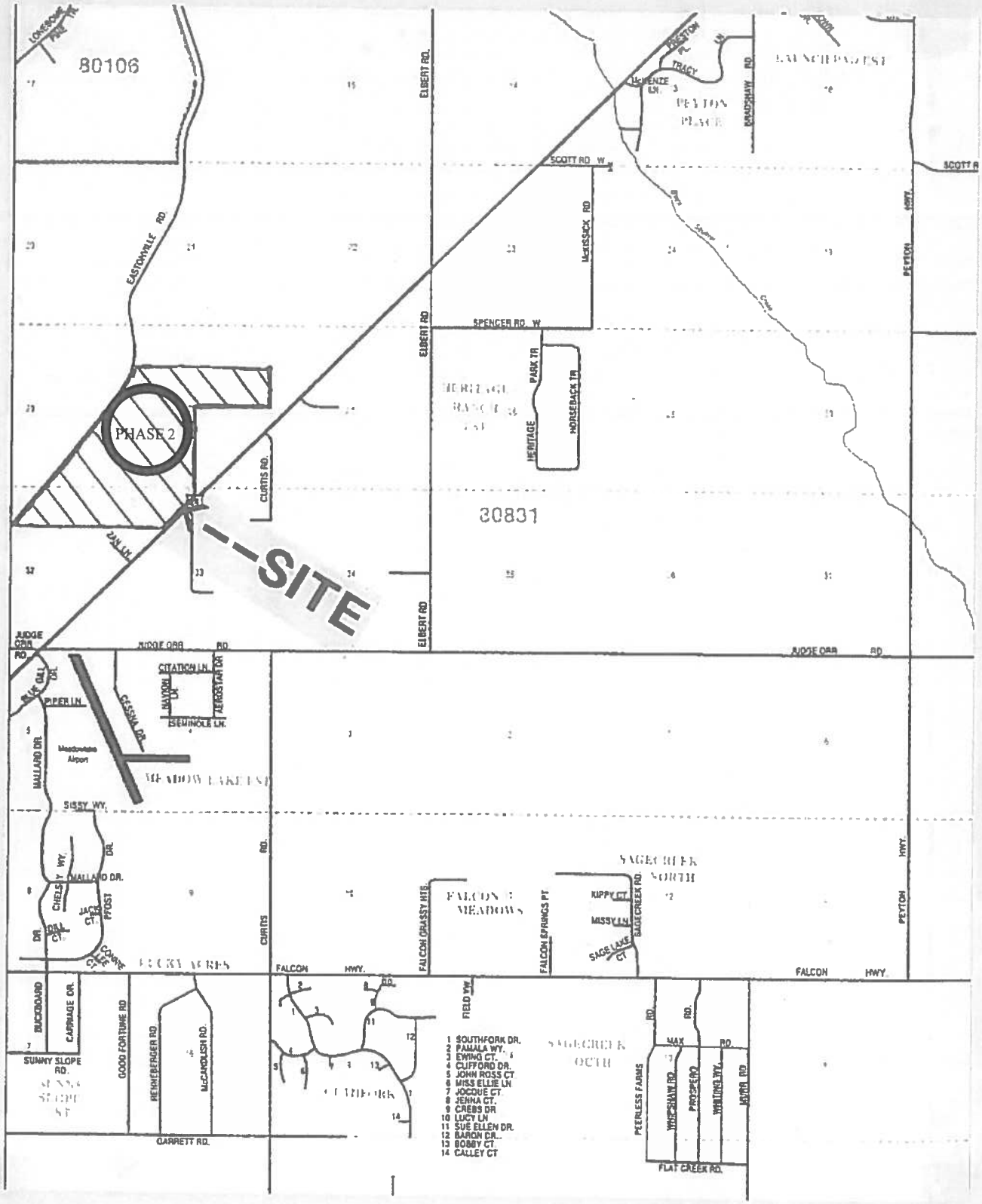
* Test Boring located on or near Phase 2 of Waterbury

Table 3C
Summary of Bedrock/Groundwater Depths in Profile Borings (References 1-4)

Boring Profile No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
1	6.5	4.5
2	4	>10
3	6.5	>10
4	3.5	>10
5	4	>10
6*	>10	7.5
7	7.5	4
8*	7	9.5
9*	7	>10
10	4	>10
11	>10	>10
12	>10	8
13	>10	7
14	4	>10
15	>10	7.5
16	>10	9.5
17*	4	>10
18	>10	4.5
19*	4	>10
20	3	>10
21	>10	7
22	>10	>10
23*	8	9
24*	7	8
25	6	9.5
26	9.5	>10
27*	4.5	>10
28	3	>10

* Profile hole located on or near Phase 2 of Waterbury

FIGURES



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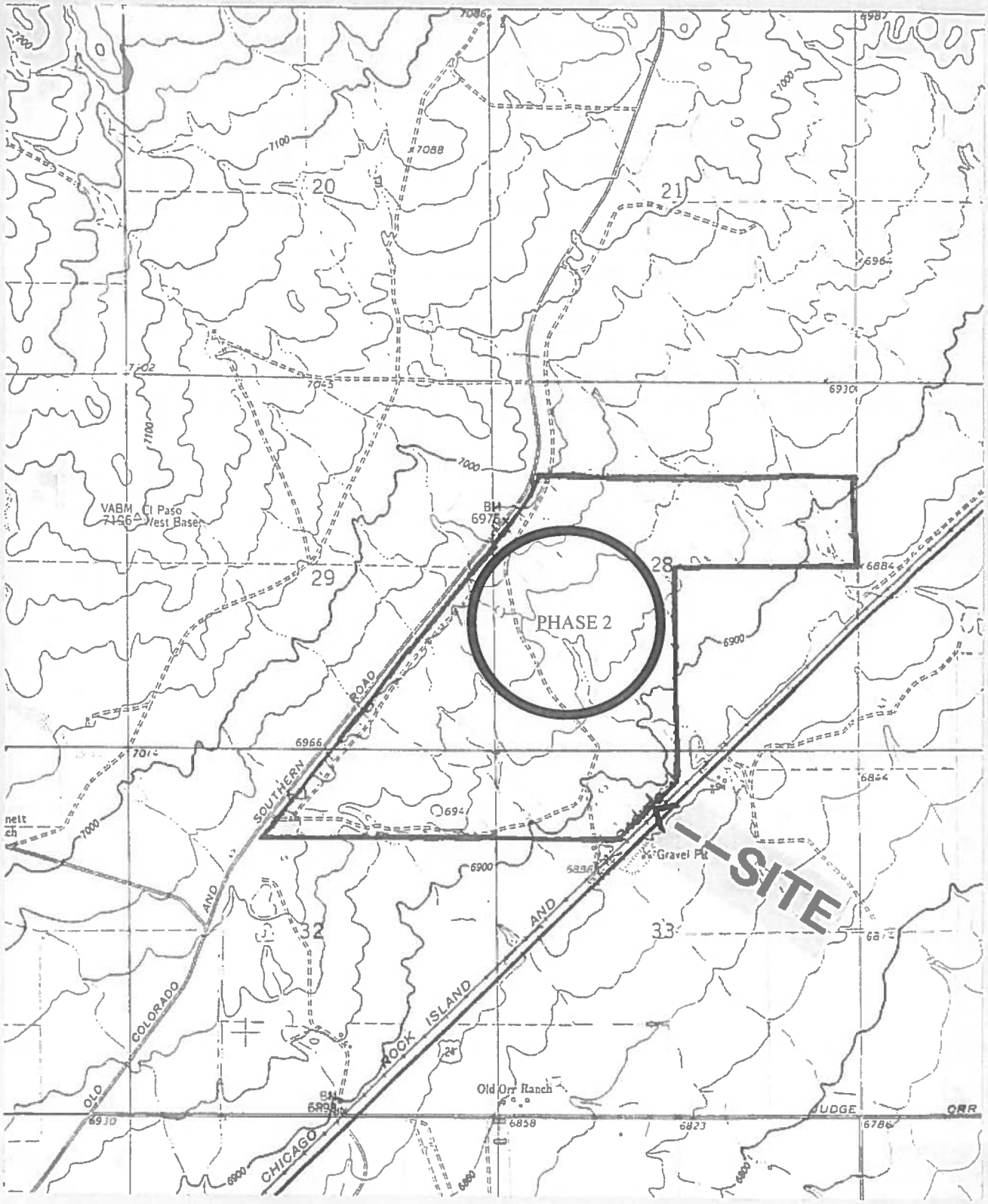
VICINITY MAP
WATERBURY PHASE 2
FOR: LAND RESOURCE CORP.

DRAWN:	DATE:	CHECKED:	DATE:
RJO	10CT02	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 1

D3~C:\MAPS\61992(4 WAY RD)RPT SET.dwg



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USGS MAP

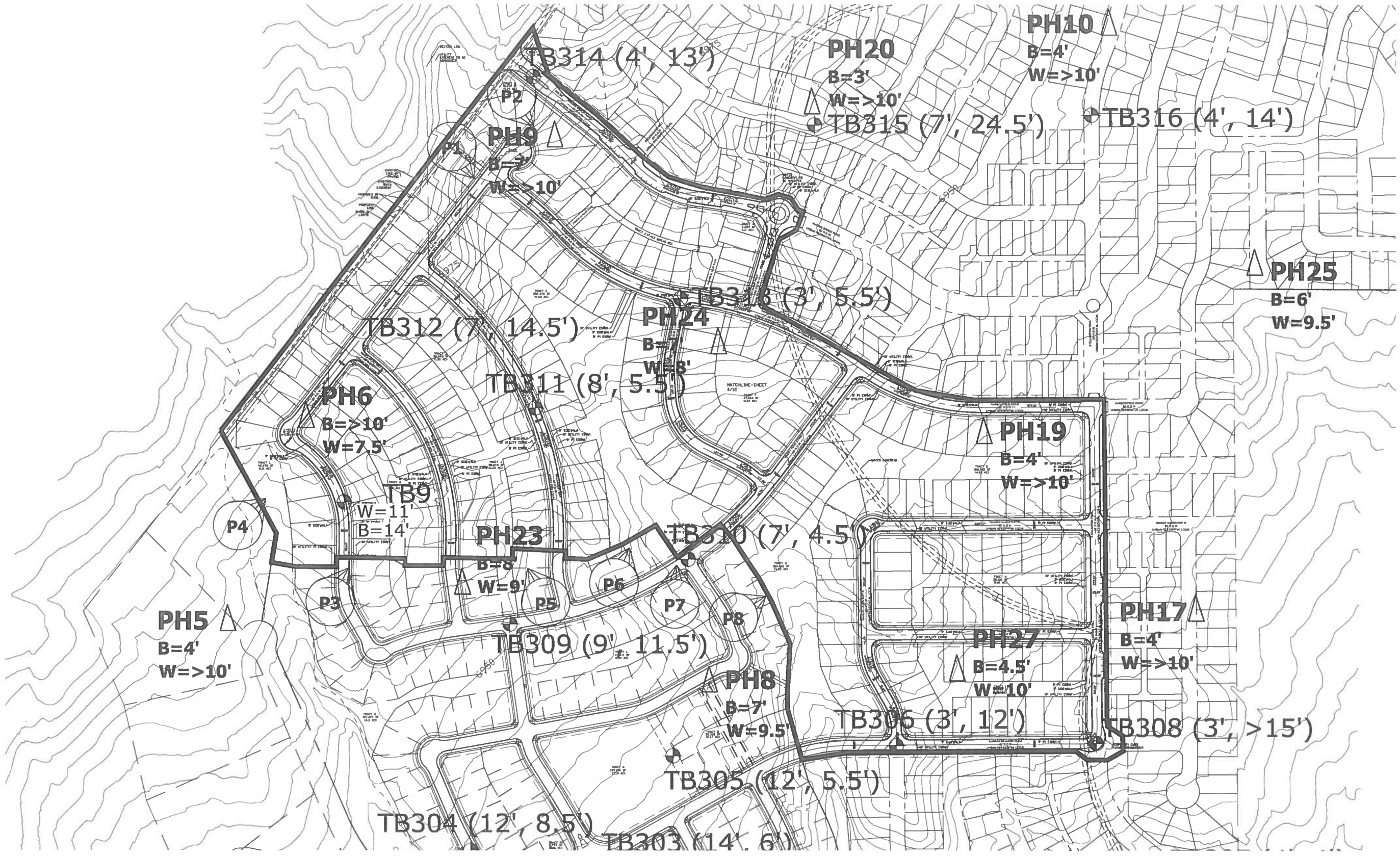
WATERBURY PHASE 2

FOR: LAND RESOURCE CORP.

DRAWN:	DATE:	CHECKED:	DATE:
RJO	10CT02	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 2



TB (14', 6.5') - INDICATES APPROXIMATE TEST BORING LOCATION & NUMBER (DEPTH TO BEDROCK, DEPTH TO GROUNDWATER)

PH (4',>10') - INDICATES APPROXIMATE PERCOLATION TEST LOCATION & NUMBER (DEPTH TO BEDROCK, DEPTH TO GROUNDWATER)

P1B - INDICATES APPROXIMATE PHOTOGRPH LOCATION & DIRECTION TAKEN AUGUST 24, 2017

NORTH

REVISION	BY:

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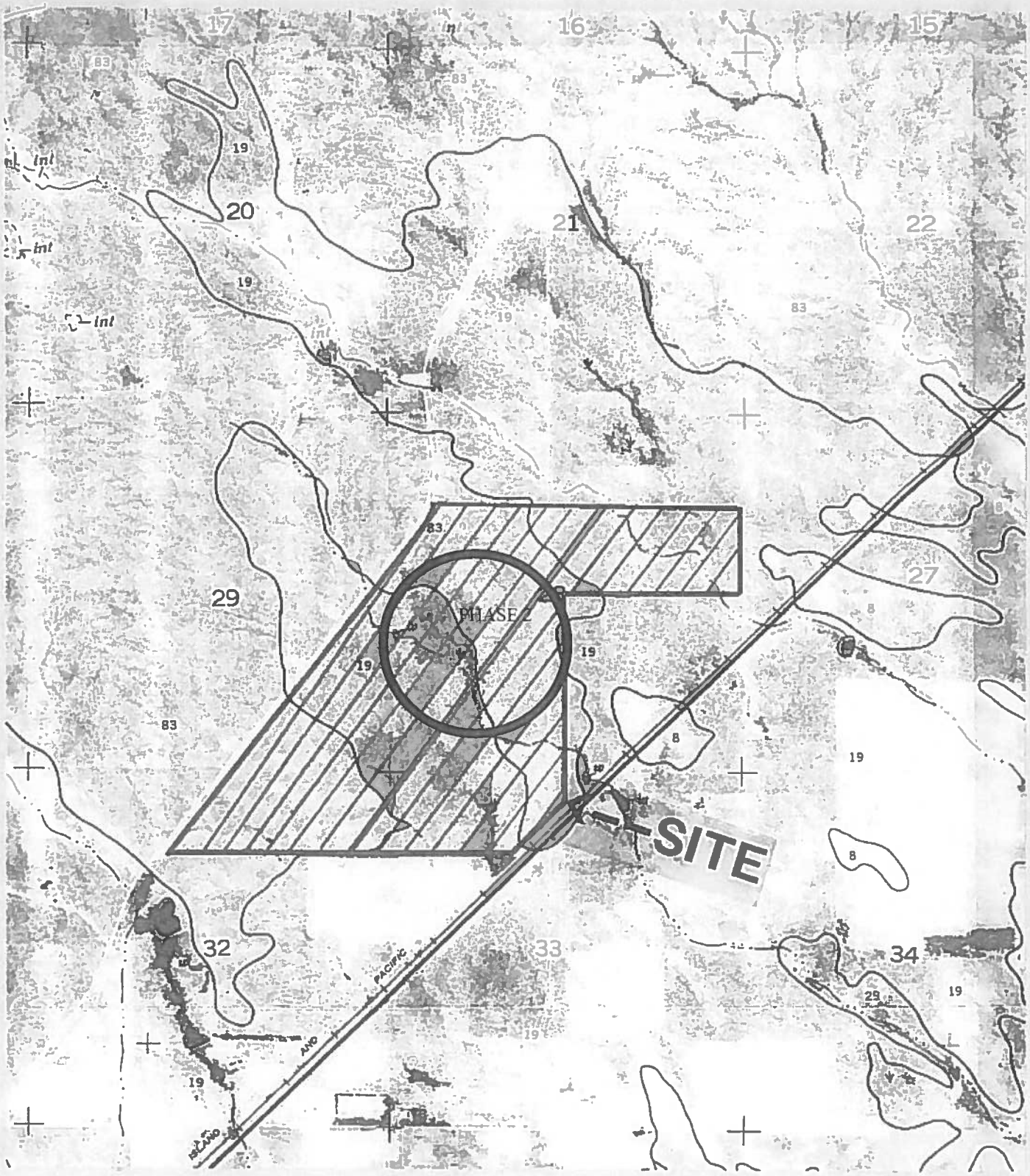
TEST BORING/ PERCOLATION TEST
LOCATION PLAN
4 - WAY JOINT VENTURE
WATERBURY PHASE 2
EL PASO COUNTY, CO
FOR: 4-WAY JOINT VENTURE

DRAWN BY: T.CACAHUATITAN
DESIGNED BY: KAH
CHECKED BY:
DATE: 8/22/17
SCALE: 1" - 150'
JOB NO.: 171292
FIGURE NO.: 3



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SCS MAP
WATERBURY PHASE 2
FOR: LAND RESOURCE CORP.

DRAWN:	DATE:	CHECKED:	DATE:
RJO	10CT02	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 4

19—Columbine gravelly sandy loam, 0 to 3 percent slopes. This deep, well drained to excessively drained soil formed in coarse textured material on alluvial terraces and fans and on flood plains. Elevation ranges from 6,500 to 7,300 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown gravelly sandy loam about 14 inches thick. The underlying material is light yellowish brown very gravelly loamy sand.

Included with this soil in mapping are small areas of Stapleton sandy loam, 3 to 8 percent slopes; Blendon sandy loam, 0 to 3 percent slopes; Louviers silty clay loam, 3 to 18 percent slopes; and Fluvaquentic Haplaquolls, nearly level. In places the parent arkose beds of sandstone or shale are at a depth of 0 to 40 inches.

Permeability of this Columbine soil is very rapid. Effective rooting depth is 60 inches or more. Available water capacity is low to moderate. Surface runoff is slow, and the hazard of erosion is slight to moderate.

This soil is used mainly for grazing livestock and for wildlife habitat. It is also used for homesites.

Native vegetation is mainly western wheatgrass, sideoats grama, needleandthread, and little bluestem. The main shrub is true mountainmahogany.

Proper location of livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are fairly well suited to this soil. Blowing sand and low available water capacity are the principal limitations to the establishment of trees and shrubs. The soil is so loose that trees need to be planted in the rows. Supplemental irrigation may be needed to insure survival. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, and Siberian elm. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

Rangeland wildlife, such as pronghorn antelope, cottontail, coyote, and scaled quail, is best adapted to life on this droughty soil. Forage production is typically loam, and proper livestock grazing management is necessary if wildlife and livestock share the range. Livestock watering developments are also important and are used by various wildlife species.

The main limitation of this soil for urban development is a hazard of flooding in some areas. Care must be taken when locating septic tank absorption fields because of possible pollution as a result of the very rapid permeability of this soil. Capability subclass VIe.

83—Stapleton sandy loam, 3 to 8 percent slopes. This deep, noncalcareous, well drained soil formed in sandy alluvium derived from arkosic bedrock on uplands. Elevation ranges from 6,500 to 7,300 feet. The average annual precipitation is about 15 inches, the average annual air temperature is about 47 degrees F, and the average frost-free period is about 135 days.

Typically, the surface layer is grayish brown sandy loam about 11 inches thick. The subsoil is grayish brown gravelly sandy loam about 6 inches thick. The substratum extends to a depth of 60 inches or more. It is pale brown gravelly sandy loam in the upper part and grades to gravelly loamy sand in the lower part.

Included with this soil in mapping are small areas of Louviers silty clay loam, 3 to 18 percent slopes; Blakeland loamy sand, 1 to 9 percent slopes; Columbine gravelly sandy loam, 0 to 3 percent slopes; and Fluvaquentic Haplaquolls, nearly level. Also included are areas where arkose beds of sandstone and shale are at a depth of 0 to 40 inches. Included areas make up about 20 percent of the mapped acreage.

Permeability of this Stapleton soil is rapid. Effective rooting depth is 60 inches or more. Available water capacity is moderate. Surface runoff is slow, and the hazards of erosion and soil blowing are moderate.

This soil is used as rangeland, for wildlife habitat, and as homesites.

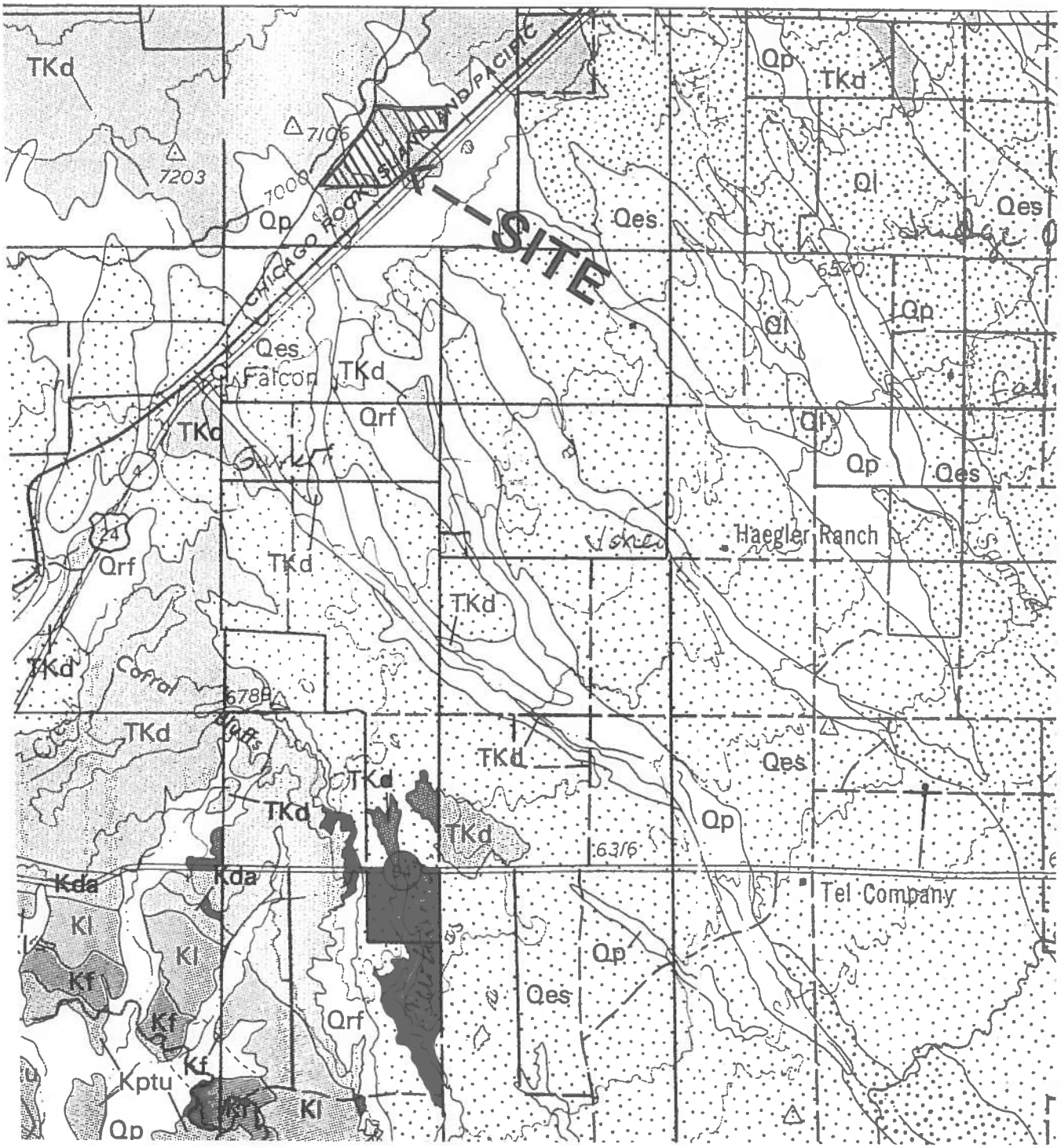
Native vegetation is mainly western wheatgrass, sideoats grama, needleandthread, and little bluestem. The predominant shrub on this soil is true mountainmahogany. Yucca occurs in some areas.

Deferred grazing late in summer and in fall improves the condition of the range. Properly locating livestock watering facilities helps to control grazing.

Windbreaks and environmental plantings are generally suited to this soil. Soil blowing is the principal limitation for the establishment of trees and shrubs. This limitation can be overcome by cultivating only in the tree rows and leaving a strip of vegetation between the rows. Supplemental irrigation may be needed when planting and during dry periods. Trees that are best suited and have good survival are Rocky Mountain juniper, eastern redcedar, ponderosa pine, Siberian elm, Russian-olive, and hackberry. Shrubs that are best suited are skunkbush sumac, lilac, and Siberian peashrub.

This soil is suited to habitat for openland and rangeland wildlife. Rangeland wildlife, such as pronghorn antelope, can be encouraged by developing livestock watering facilities, properly managing livestock grazing, and reseeding range where needed.

The main limitation of this soil for urban use is frost-action potential. Special design of roads and streets is necessary to minimize frost heave damage. Special practices must be provided to minimize water erosion and soil blowing on construction sites where vegetation has been removed. Access roads must have adequate cut-slope grade and be provided with drains to control surface runoff. Capability subclass IVe.



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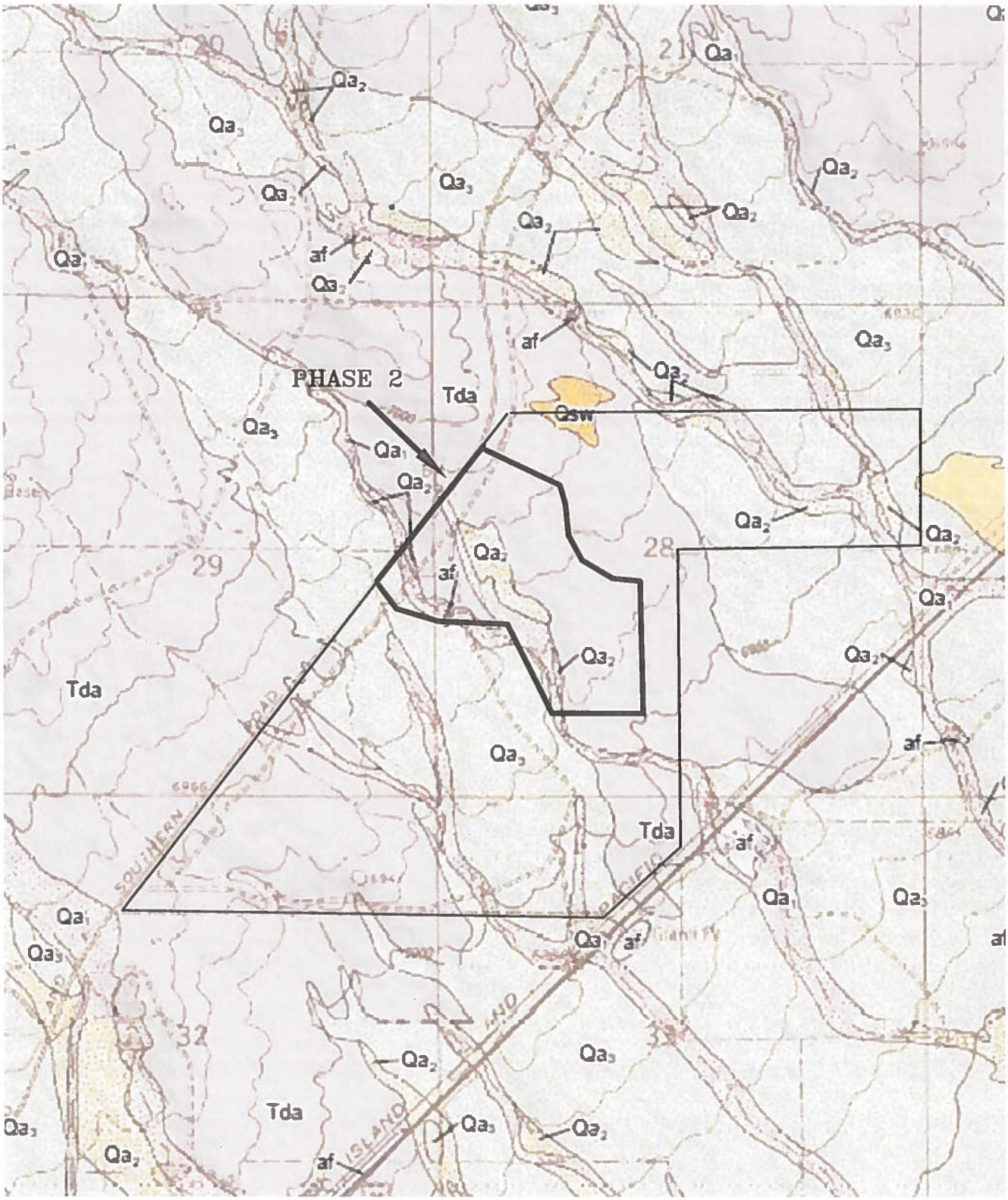
COLORADO GEOLOGY MAP
4 WAY ROAD
FOR: LAND RESOURCE CORP.

DRAWN:	DATE:	CHECKED:	DATE:
RJO	10CT02	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 7



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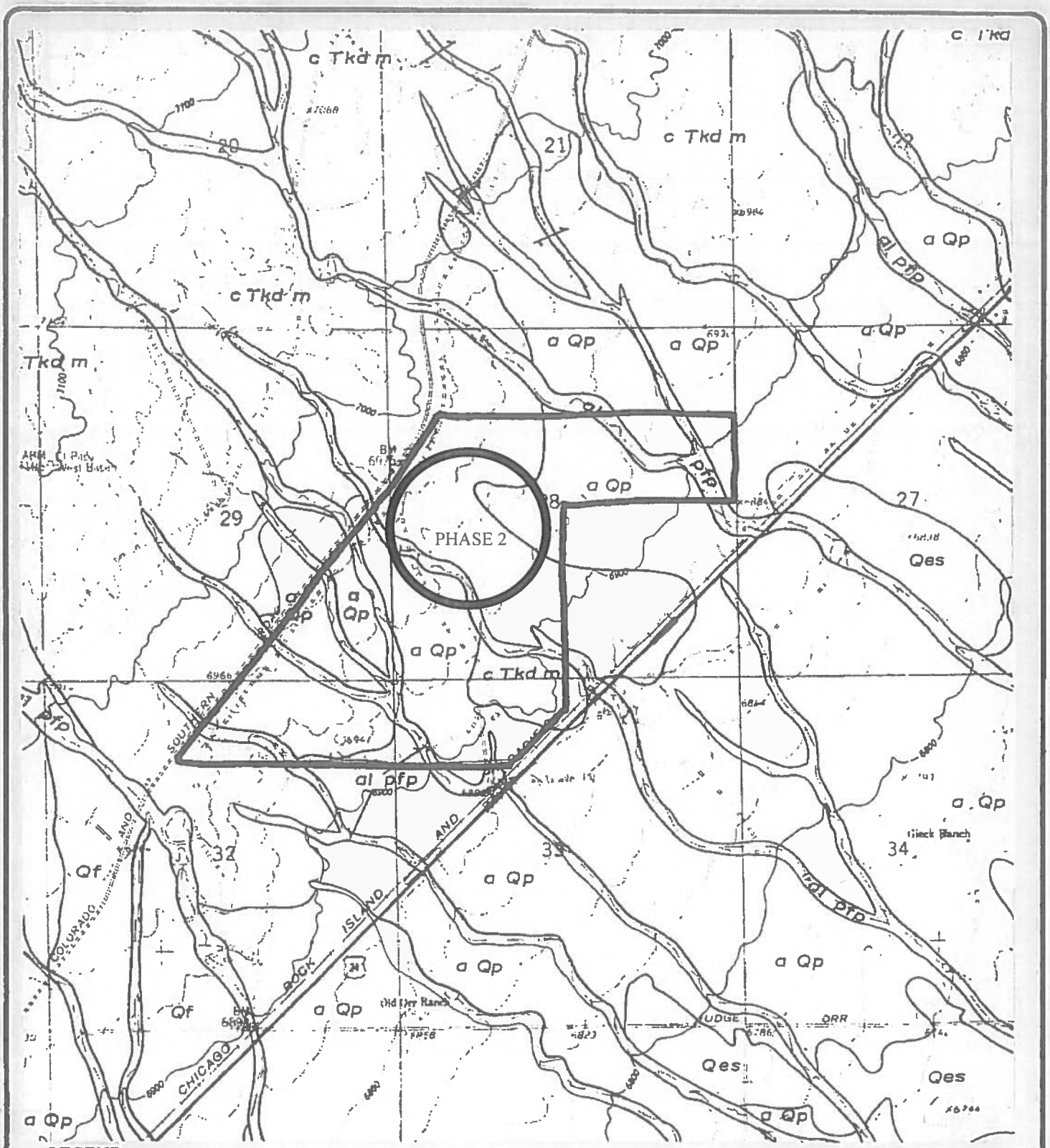
Falcon Quadrangle Geology Map
Waterbury Phase 2
El Paso County, CO.
For: 4-Way Joint Venture, LLC

DRAWN:	DATE:	CHECKED:	DATE:
KAH	8/29/2017		

JOB NO.: 171292

FIG NO.: 7A



LEGEND

al : ALLUVUIM
fp : FLOODPLAIN
Qp : PINEY CREEK ALLUVUIM OF QUATERNARY AGE.
Tkd : DAWSON FORMATION OF TERTIARY TO CRETACEOUS AGE

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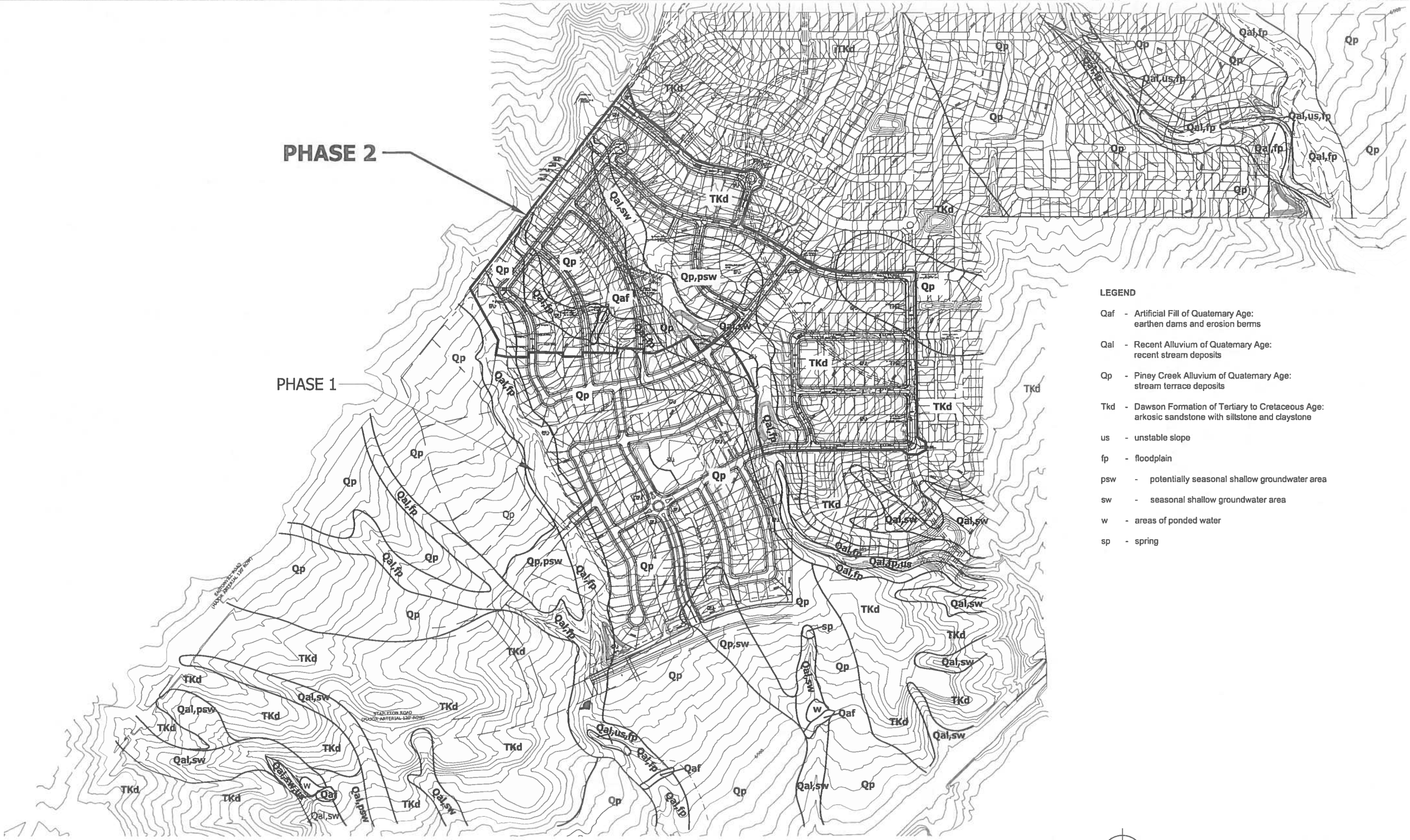
FALCON GEOLOGY MAP
WATERBURY PHASE 2
EL PASO COUNTY, CO.
FOR: LAND RESOURCE GROUP

DRAWN:	DATE:	CHECKED:	DATE:
RJO	27OCT03	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 8



LEGEND

Qaf - Artificial Fill of Quaternary Age: earthen dams and erosion berms

Qal - Recent Alluvium of Quaternary Age: recent stream deposits

Qp - Piney Creek Alluvium of Quaternary Age: stream terrace deposits

Tkd - Dawson Formation of Tertiary to Cretaceous Age: arkosic sandstone with siltstone and claystone

us - unstable slope

fp - floodplain

psw - potentially seasonal shallow groundwater area

sw - seasonal shallow groundwater area

w - areas of ponded water

sp - spring

NORTH

0 150 300 600 900

SCALE 1"=300'

TB - INDICATES APPROXIMATE TEST BORING LOCATION & NUMBER

PH - INDICATES APPROXIMATE PERCOLATION TEST LOCATION & NUMBER

REVISION	BY:

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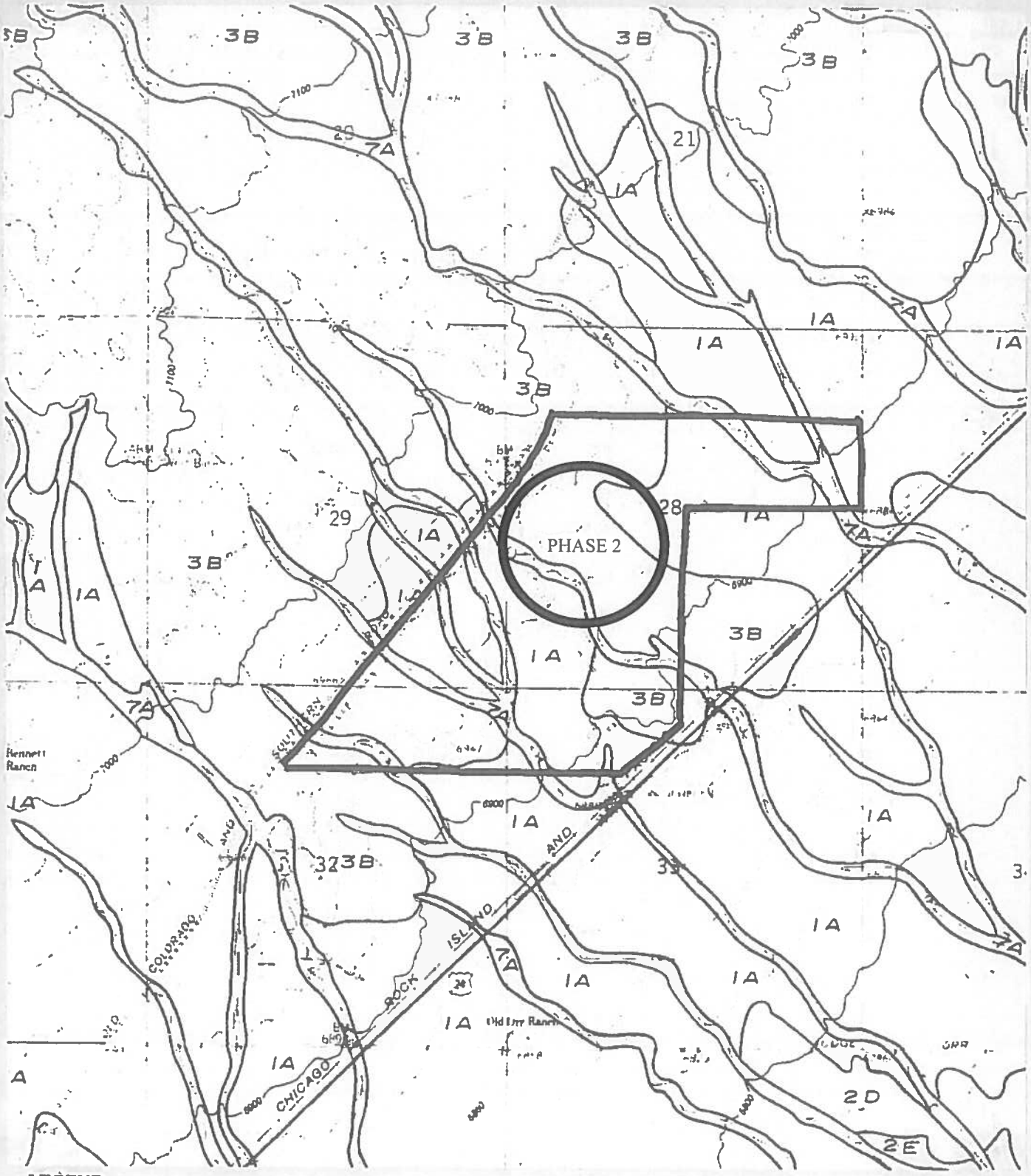
505 ELKTON DRIVE
COLORADO SPRINGS, CO 80907 (719) 531-5599

GEOLOGY/ ENGINEERING GEOLOGY MAP
4 - WAY JOINT VENTURE
WATERBURY PHASE 2
EL PASO COUNTY, CO
FOR: 4-WAY JOINT VENTURE

DRAWN BY: T.CACAHUATITAN
DESIGNED BY: KAH
CHECKED BY: KAH
DATE: 8/24/17
SCALE: 1" = 300'
JOB NO: 171292
FIGURE NO: 9



LEGEND

1A: STABLE ALLUVUIM

3B: EXPANSIVE SOIL AND BEDROCK ON FLAT TO MODERATE SLOPES(0% - 12%)

7A: PHYSIOGRAPHIC FLOODPLAIN. INCLUDES 100 YEAR FLOODPLAIN

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FALCON ENGINEERING GEOLOGY MAP

WATERBURY PHASE 2

EL PASO COUNTY, CO.

FOR: LAND RESOURCE GROUP

DRAWN:	DATE:	CHECKED:	DATE:
RJO	27OCT03	KAH	12/1/03

JOB NO.: 171292

FIG NO.: 10

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

- **ZONE A** — No base flood elevations determined.
- **ZONE AE** — Base flood elevations determined.
- **ZONE AH** — Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.
- **ZONE AO** — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE A99** — To be protected from 100-year flood by Federal flood protection system under construction; no base elevations determined.
- **ZONE V** — Coastal flood with velocity hazard (wave action); no base flood elevations determined.
- **ZONE VE** — Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

- **ZONE X** — Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

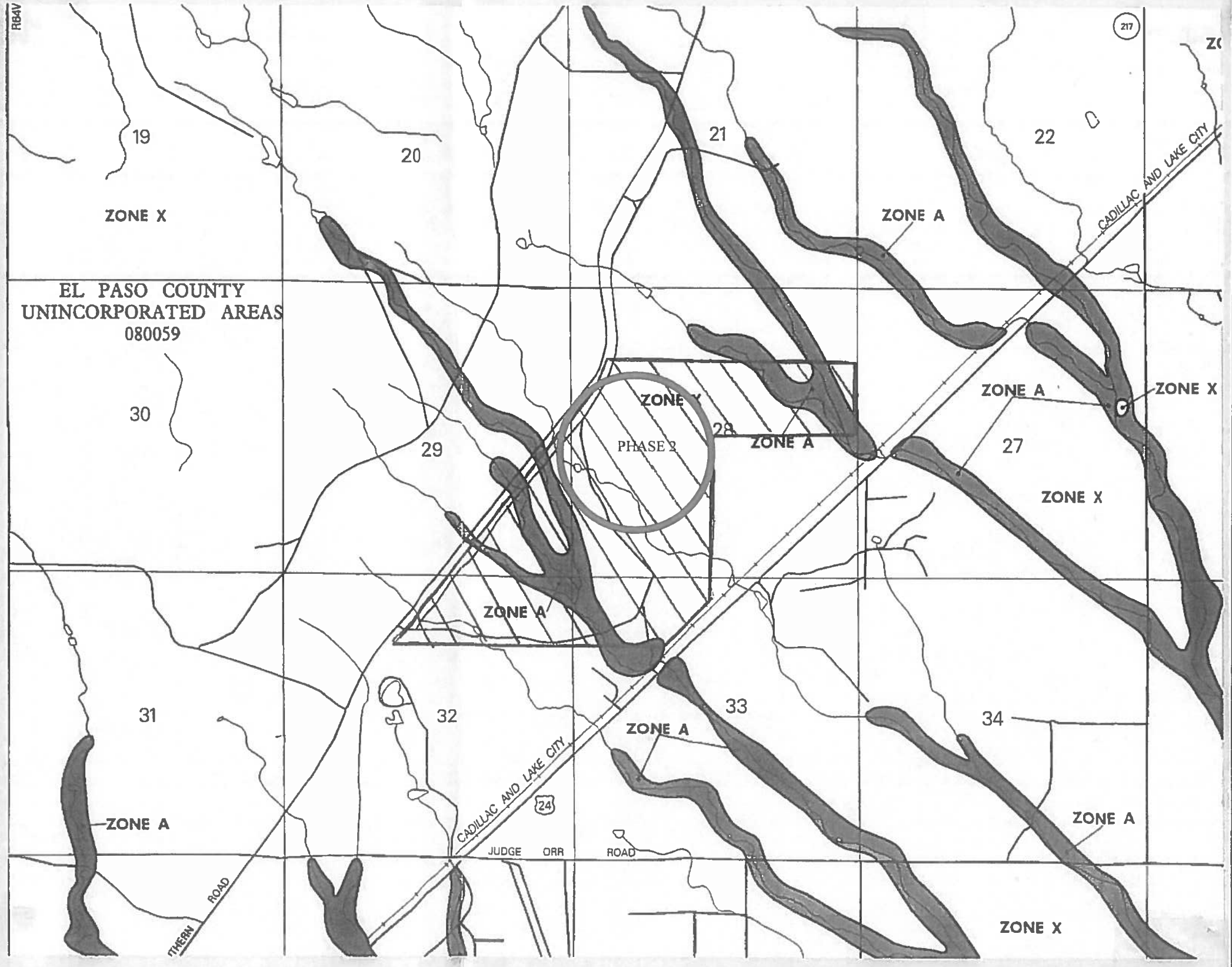
- **ZONE X** — Areas determined to be outside 500-year floodplain.
- **ZONE D** — Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 | Identified 1990 | Otherwise Protected Areas

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

- Flood Boundary
- Floodway Boundary
- Zone D Boundary
- Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.
- 513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.
- D — D — Cross Section Line
- (EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.
- RM7 × — Elevation Reference Mark
- ● M2 — River Mile
- 97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.



REVISION	BY

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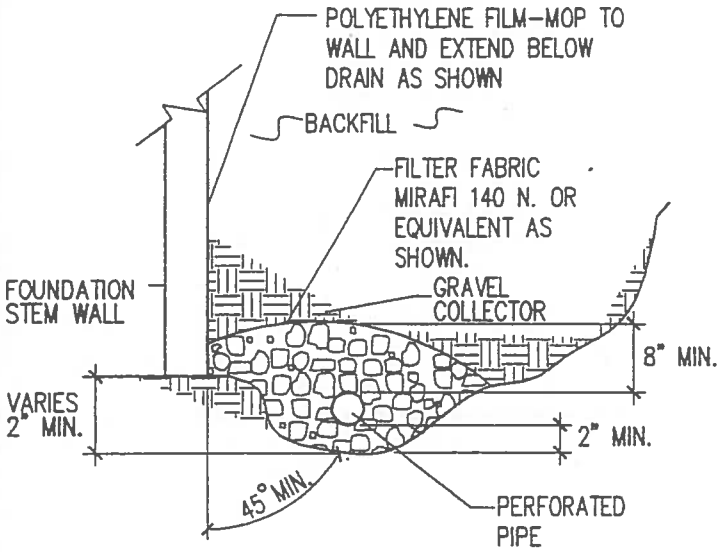
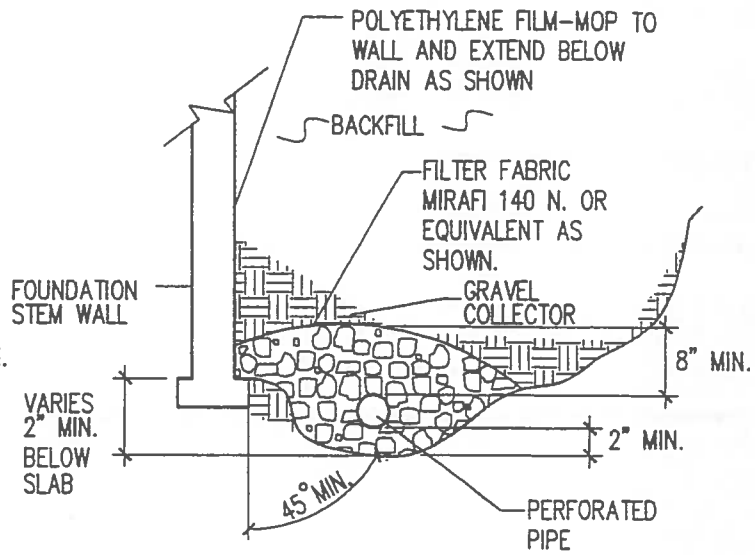
505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907
(719) 531-5599

FLOODPLAIN MAP
WATERBURY PHASE 2
FOR: LAND RESOURCE CORP.

DRAWN	R.J.OLSON
CHECKED	KAH
DATE	10CT02
SCALE	AS SHOWN
JOB NO.	171292
FIGURE No.	11





NOTES:

–GRAVEL SIZE IS RELATED TO DIAMETER OF PIPE PERFORATIONS–85% GRAVEL GREATER THAN 2x PERFORATION DIAMETER.

–PIPE DIAMETER DEPENDS UPON EXPECTED SEEPAGE. 4–INCH DIAMETER IS MOST OFTEN USED.

–ALL PIPE SHALL BE PERFORATED PLASTIC. THE DISCHARGE PORTION OF THE PIPE SHOULD BE NON–PERFORATED PIPE.

–FLEXIBLE PIPE MAY BE USED UP TO 8 FEET IN DEPTH, IF SUCH PIPE IS DESIGNED TO WITHSTAND THE PRESSURES. RIGID PLASTIC PIPE WOULD OTHERWISE BE REQUIRED.

–MINIMUM GRADE FOR DRAIN PIPE TO BE 1% OR 3 INCHES OF FALL IN 25 FEET.

–DRAIN TO BE PROVIDED WITH A FREE GRAVITY OUTFALL, IF POSSIBLE. A SUMP AND PUMP MAY BE USED IF GRAVITY OUT FALL IS NOT AVAILABLE.

DRAWN:	M. VAN KAMPEN
CHECKED:	KAW
DATE:	12/1/03
SCALE:	NTS
JOB NO.:	101942
FIG. NO.:	12

PERIMETER DRAIN DETAILS

ENTECH ENGINEERING, INC.
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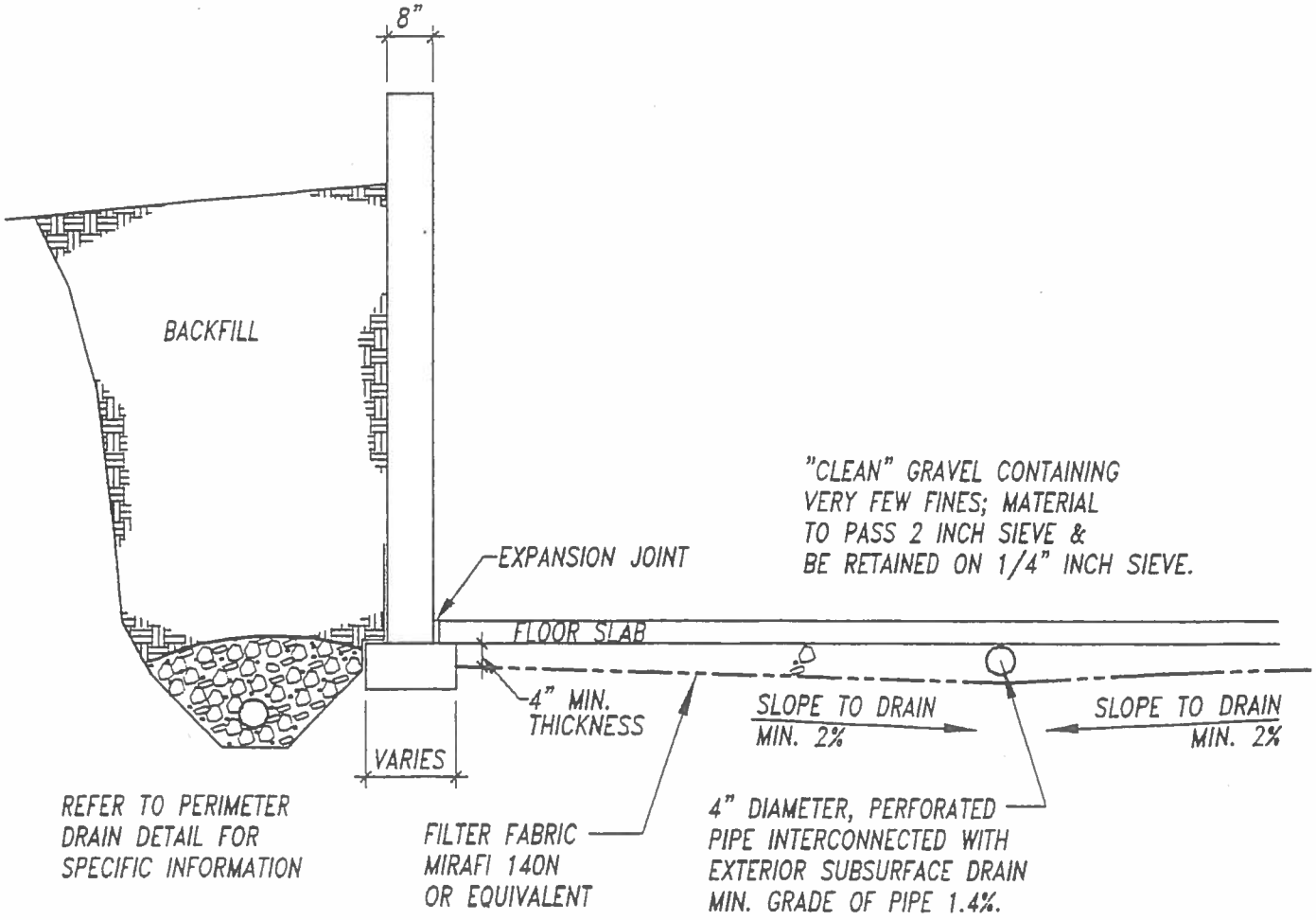
REVISION	BY

FIG. 12



D1-C:\DETAILS\DETAIL 11

DRAWN	C. WALTON
CHECKED	ICAK
DATE	12/1/03
SCALE	NTS
JOB NO.	61992
SHEET	13

TYP. UNDERSLAB DRAINAGE
LAYER (CAPILLARY BREAK)

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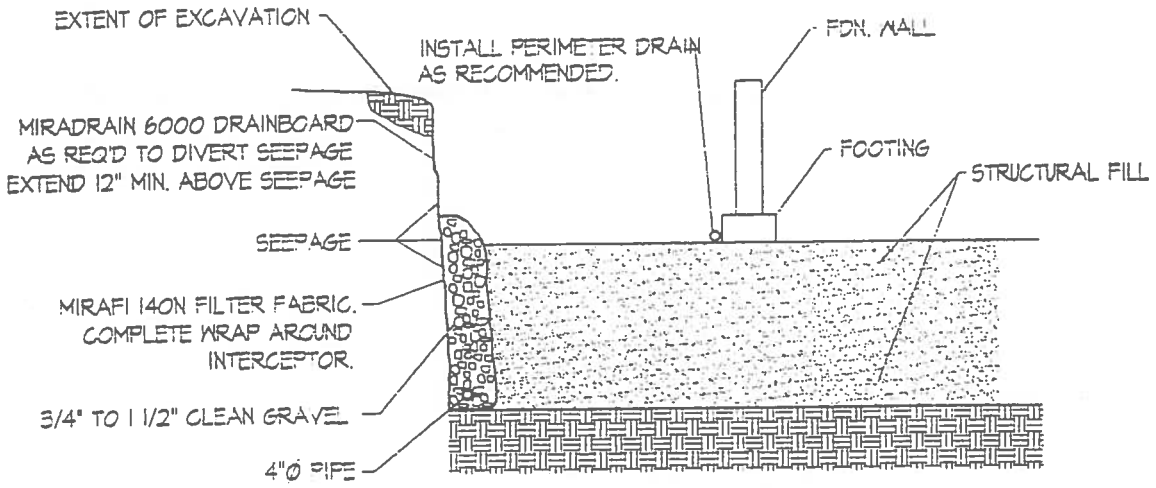
REVISION	BY

FIG. 13



NOTE:
EXTEND INTERCEPTOR DRAIN TO DAYLIGHT

INTERCEPTOR DRAIN DETAIL

N.T.S.

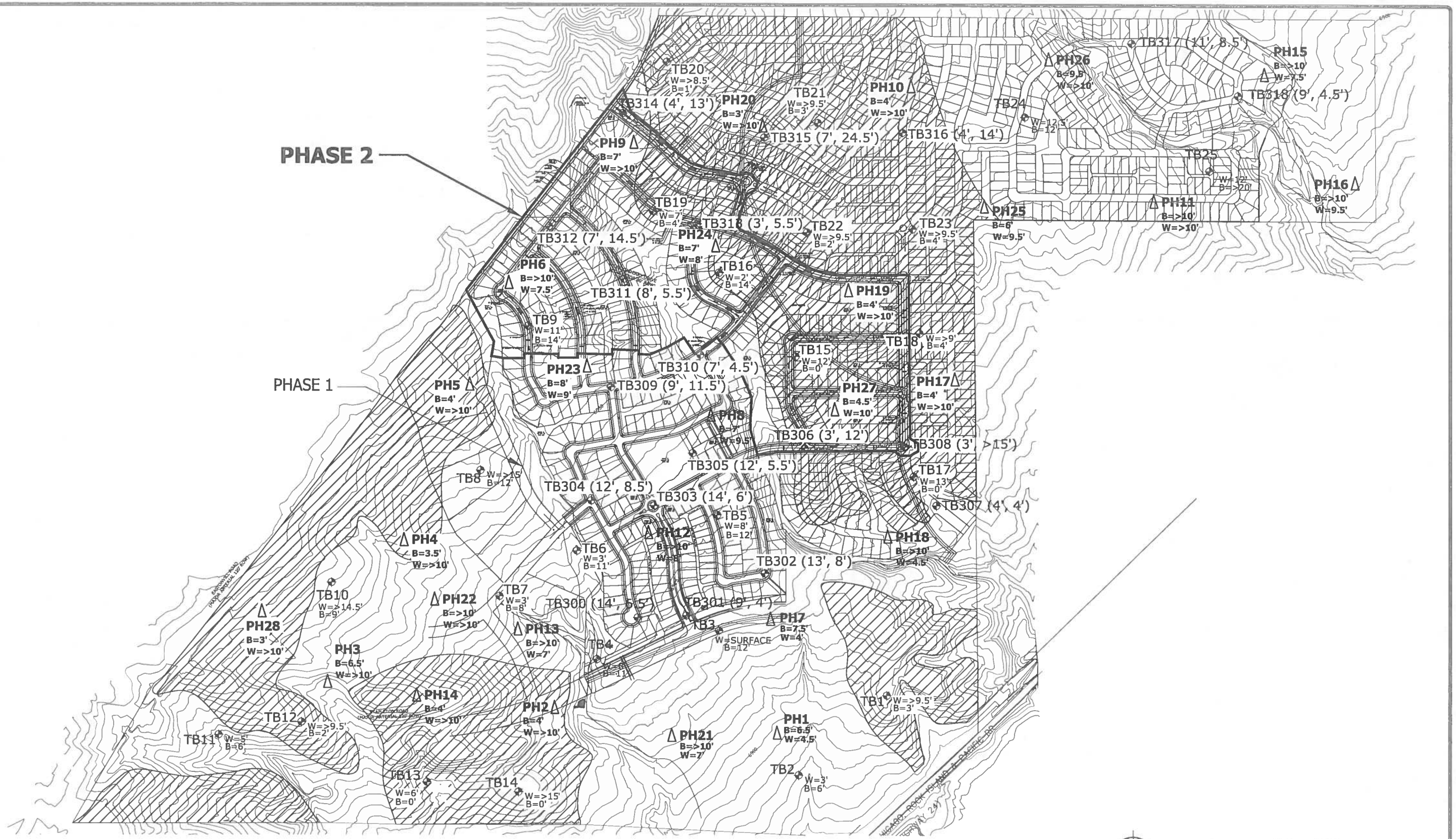
DRAWN	R.TETI
CHECKED	KAW
DATE	12/1/03
SCALE	NTS
JOB NO.	61992
SHEET	14 OF SHEETS

INTERCEPTOR DRAIN DETAIL

ENTECH ENGINEERING, INC.
303 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

REVISION	BY

FIG. 14



- CROSSHATCHED AREAS INDICATE AREAS OF POTENTIAL SHALLOW BEDROCK (<6 FT.)

TB (14', 6.5') - INDICATES APPROXIMATE TEST BORING LOCATION & NUMBER (DEPTH TO BEDROCK, DEPTH TO GROUNDWATER)

PH (4', >10') - INDICATES APPROXIMATE PERCOLATION TEST LOCATION & NUMBER (DEPTH TO BEDROCK, DEPTH TO GROUNDWATER)

REVISION	BY:

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COLORADO SPRINGS, CO. 80907
(719) 531-5599

POTENTIAL SHALLOW BEDROCK MAP
4 - WAY JOINT VENTURE
WATERBURY PHASE 2
EL PASO COUNTY, CO
FOR: 4-WAY JOINT VENTURE

DRAWN BY:	T.CACAHUATITAN
DESIGNED BY:	KAH
CHECKED BY:	KAH
DATE:	8/24/17
SCALE:	1" - 300'
JOB NO.:	171292
FIGURE NO.:	15

APPENDIX A: Site Photographs

1

Looking south from northern portion of the site.

August 24, 2017

2

Looking southeast from northern portion of the site.

August 24, 2017

Job No. 171292

3

Looking northeast from the southwestern portion of the site.

August 24, 2017

4

Looking north-northeast from the southwestern portion of the site.

August 24, 2017

5

Looking northwest from the southwest-central portion of the site.

August 24, 2017

6

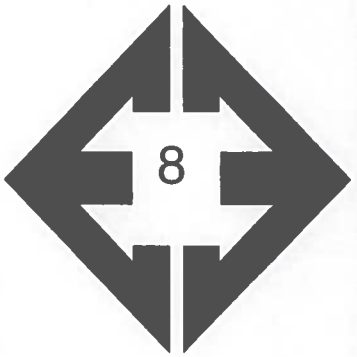
Looking northeast from southwest-central portion of the site.

August 24, 2017

Job No. 171292

Looking north from the southern portion of the site.

August 24, 2017



Looking northeast from the southern portion of the site.

August 24, 2017

Job No. 171292

APPENDIX B: Test Boring Logs

TEST BORING NO. 1
DATE DRILLED 9/11/02
Job # 61992

REMARKS

DRY TO 9.5', 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			39	3.8	1
5			50 / 7"	8.7	4
10			50 / 5"	9.2	4
15					
20					

SAND, SLIGHTLY SILTY, MEDIUM GRAINED, TAN, DENSE, MOIST

SANDSTONE, CLAYEY, COARSE GRAINED, OLIVE TAN, VERY DENSE, MOIST

TEST BORING NO. 2
DATE DRILLED 9/11/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

WATER AT 3', 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			18	13.9	1
5			14	15.3	1
10			50 / 9"	16.8	6
15			50 / 5"	15.1	4
20					

SAND, CLAYEY, COARSE TO FINE GRAINED, BROWN TO GRAY, MEDIUM DENSE, MOIST TO WET

SILTSTONE, CLAYEY, LIGHT BLUE, HARD, MOIST

SANDSTONE, CLAYEY, MEDIUM GRAINED, OLIVE, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-1

TEST BORING NO. 3
DATE DRILLED 9/11/02
Job # 61992

REMARKS

WATER AT SURFACE, 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, CLAYEY, GRAYISH BROWN, COARSE GRAINED, MEDIUM DENSE TO DENSE, WET				
			22	19.2	1
5			12	19.2	1
10			43	14.9	1
	SANDSTONE, CLAYEY, LIGHT BLUE-GRAY, VERY DENSE, MOIST				
15			50/5"	13.1	4
20					

TEST BORING NO. 4
DATE DRILLED 9/11/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

WATER AT 8', 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SLIGHTLY SILTY, TAN TO BROWN, DENSE TO MEDIUM DENSE, MOIST TO VERY MOIST				
			42	2.6	1
5			22	13.2	1
10	SILT, CLAYEY, DARK BROWN, STIFF, MOIST		25	21.3	3
	CLAYSTONE, SILTY, GRAY, HARD, MOIST				
15			50/6"	20.4	5
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAbt	10/1/02

JOB NO.: 61992
FIG NO.: B-2

TEST BORING NO. 5
DATE DRILLED 9/11/02
Job # 61992

REMARKS

WATER AT 8', 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, DENSE TO MEDIUM DENSE, MOIST				
			34	1.6	1
5			20	2.7	1
	SAND, CLAYEY, COARSE TO FINE GRAINED, GRAY, MEDIUM DENSE, WET				
10			14	15.3	1
	CLAYSTONE, LIGHT BLUISH GRAY, HARD, MOIST				
15			50/5"	23.1	5
20					

TEST BORING NO. 6
DATE DRILLED 9/11/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

WATER AT 2.5', 09/13/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SLIGHTLY CLAYEY, COARSE TO MEDIUM GRAINED, LIGHT BLUE TO LIGHT BROWN, MEDIUM DENSE TO DENSE, WET				
			12	17.1	1
5			24	15.3	1
10			32	12.5	1
	CLAYSTONE, SILTY, LIGHT BLUE, HARD, MOIST				
15			50/6"	14.0	5
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KHH	10/1/02

JOB NO.: 61992
FIG NO.: B-3

TEST BORING NO. 7
DATE DRILLED 9/11/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER AT 3', 09/13/02						
SAND, CLAYEY, BLUE-GRAY, MEDIUM DENSE, VERY MOIST TO WET				16	12.5	1
	5			12	15.6	1
CLAYSTONE, SANDY, BLUE, HARD, MOIST	10			50/3"	20.2	5
	15					
	20					

TEST BORING NO. 8
DATE DRILLED 9/11/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 15', 09/13/02						
SAND, SLIGHTLY SILTY, CLAYEY, FINE GRAINED, TAN, MEDIUM DENSE, MOIST				19	1.7	1
SAND, VERY SILTY, FINE GRAINED, TAN, MEDIUM DENSE, MOIST	5			14	5.3	1
SAND, CLAYEY, MEDIUM GRAINED, GRAY, MEDIUM DENSE, VERY MOIST	10			24	11.2	1
SANDSTONE, CLAYEY, COARSE GRAINED, BROWN, VERY DENSE, MOIST	15			50/6"	10.1	4
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		HAH	10/1/02

JOB NO.: 61992
FIG NO.: B-4

TEST BORING NO. 9
DATE DRILLED 9/12/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER AT 11', 09/13/02						
SAND, SLIGHTLY SILTY, COARSE GRAINED, BROWN, DENSE, DRY				39	2.4	1
SAND, SLIGHTLY CLAYEY, COARSE GRAINED, BROWN TO GRAY, MEDIUM DENSE, MOIST TO VERY MOIST	5			24	5.8	1
	10			21	11.2	1
CLAYSTONE, SILTY, GRAY, HARD, MOIST	15			50/7"	14.9	5
	20					

TEST BORING NO. 10
DATE DRILLED 9/13/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 14.5', 09/16/02						
SAND, VERY SILTY, FINE GRAINED, BROWN, MEDIUM DENSE TO DRY				15	2.2	1
SAND, SILTY, MEDIUM GRAINED, GRAY, DENSE, MOIST	5			46	5.3	1
SANDSTONE, CLAYEY, GRAY TO TAN, VERY DENSE, MOIST	10			50/8"	10.2	4
	15			50/7"	9.4	4
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAW	10/1/02

JOB NO.: 61992
FIG NO.: B-5

TEST BORING NO. 11
DATE DRILLED 9/13/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER AT 5', 09/16/02						
SAND, SILTY, FINE GRAINED, DARK BROWN TO BLUE, MEDIUM DENSE, MOIST TO VERY MOIST				18	3.3	1
	5			17	26.5	1
SANDSTONE, VERY SILTY, FINE GRAINED, BLUE TO TAN, VERY DENSE, WET	10			50/9"	20.7	4
	15			50/9"	21.7	4
SANDSTONE, CLAYEY, COARSE GRAINED, BLUE, VERY DENSE, WET	20			50/11"	15.1	4

TEST BORING NO. 12
DATE DRILLED 9/13/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 9.5', 09/16/02						
SAND, SILTY, BROWN						1
SANDSTONE, SILTY, MEDIUM TO COARSE GRAINED, TAN TO BLUE VERY DENSE, DRY TO MOIST				50/11"	1.7	4
	5			50/8"	11.9	4
	10			50/6"	5.7	4
	15					
	20					

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COLORADO SPRINGS, CO. 80907 (719) 531-5599

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-6

TEST BORING NO. 13
DATE DRILLED 9/16/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER AT 6', 09/27/02						
SANDSTONE, SILTY, COARSE GRAINED, GRAY, VERY DENSE, MOIST				50 / 8"	8.4	4
SANDSTONE, VERY SILTY, VERY FINE GRAINED, OLIVE, VERY DENSE, MOIST	5			50 / 8"	11.8	4
SANDSTONE, CLAYEY, FINE GRAINED, BLUE-GRAY, VERY DENSE, MOIST	10			50 / 7"	12.1	4
	15					
	20					

TEST BORING NO. 14
DATE DRILLED 9/16/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 14', 09/27/02						
SILTSTONE, CLAYEY, OLIVE BROWN, HARD, MOIST				50 / 8"	12.4	6
	5			50 / 8"	14.3	6
SANDSTONE, SILTY, BROWN, VERY DENSE, MOIST	10			50 / 8"	9.7	4
CLAYSTONE, SILTY, BROWN, HARD, MOIST	15			50 / 5"	17.4	5
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KrH	10/1/02

JOB NO.: 61992
FIG NO.: B-7

TEST BORING NO. 15
DATE DRILLED 9/16/02
Job # 61992

REMARKS

WATER AT 12', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST		50 / 5"	3.9	4
5			50 / 5"	10.0	4
	SANDSTONE, CLAYEY, MEDIUM GRAINED, BROWN TO OLIVE BROWN, VERY DENSE, MOIST				
10			50 / 9"	13.4	4
15			50 / 5"	10.2	4
20					

TEST BORING NO. 16
DATE DRILLED 9/16/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

WATER AT 2', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, CLAYEY, FINE TO COARSE GRAINED, OLIVE BROWN, LOOSE, WET		8	16.4	1
5	SANDSTONE, SLIGHTLY CLAYEY TO CLAYEY, MEDIUM GRAINED, BLUE-GRAY, VERY DENSE, VERY MOIST TO WET		50 / 9"	12.1	4
10			50 / 4"	23.3	4
15					
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-8

TEST BORING NO. 17
DATE DRILLED 9/16/02
Job # 61992

REMARKS

WATER AT 13', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			50 / 9"	2.5	4
5			50 / 10"	11.8	4
10			50 / 8"	16.6	4
15			50 / 4"	20.7	4
20					

SANDSTONE, SILTY, FINE TO COARSE GRAINED, VERY DENSE, DRY

SANDSTOEN, SLIGHTLY CLAYEY TO CLAYEY, FINE TO COARSE GRAINED, VERY DENSE, MOIST TO WET

TEST BORING NO. 18
DATE DRILLED 9/16/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

DRY TO 9', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			41	2.0	1
5			50	13.0	5
10			50 / 2"	8.0	4
15					
20					

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, LIGHT BROWN, DENSE, DRY

CLAYSTONE, SILTY, OLIVE BROWN, HARD, MOIST

SANDSTONE, VERY SILTY, FINE GRAINED, LIGHT BROWN, VERY DENSE, MOIST

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COLORADO SPRINGS, CO. 80907 (719) 531-5599

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-9

TEST BORING NO. 19
DATE DRILLED 9/16/02
Job # 61992

REMARKS

WATER AT 7', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			38	8.8	1
5			50 / 9"	9.9	4
10			50 / 6"	15.8	4
15					
20					

SAND, CLAYEY, FINE TO COARSE GRAINED, OLIVE BROWN, DENSE, MOIST

SANDSTONE, CLAYEY TO SILTY, OLIVE BROWN TO TAN, VERY DENSE, MOIST

TEST BORING NO. 20
DATE DRILLED 9/20/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

DRY TO 8.5', 09/27/02

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
					1
			50 / 6"	3.5	4
5			50 / 8"	9.9	4
10			50 / 3"	11.8	4
15					
20					

SAND, SILTY, BROWN

SANDSTONE, SILTY TO CLAYEY, MEDIUM TO COARSE GRAINED, TAN TO OLIVE, VERY DENSE, MOIST

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAA	10/1/02

JOB NO.: 61992
FIG NO.: B-10

TEST BORING NO. 21
DATE DRILLED 9/20/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 9.5', 09/27/02						
SAND, SLIGHTLY SILTY, TAN, MEDIUM DENSE, DRY				26	2.0	1
CLAYSTONE, SILTY, OLIVE, HARD, MOIST	5			50 / 9"	15.5	5
SANDSTONE, CLAYEY, COARSE GRAINED, TAN, VERY DENSE, MOIST	10			50 / 4"	10.3	4
	15					
	20					

TEST BORING NO. 22
DATE DRILLED 9/20/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 9.5', 09/27/02						
SILT, CLAYEY, LIGHT BROWN						3
SILTSTONE, CLAYEY, LIGHT OLIVE, HARD, MOIST				50 / 10"	9.8	6
SANDSTONE, VERY SILTY, FINE GRAINED, LIGHT GRAY, VERY DENSE, MOIST	5			50 / 7"	8.1	4
SANDSTONE, CLAYEY, COARSE GRAINED, OLIVE, VERY DENSE, MOIST	10			50 / 5"	12.4	4
	15					
	20					

ENTECH
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505 ELKTON DRIVE
COLORADO SPRINGS, CO. 80907 (719) 531-5599

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-11

TEST BORING NO. 23
DATE DRILLED 9/20/02
Job # 61992

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
DRY TO 9.5', 09/27/02						
CLAY, SILTY, OLIVE, VERY STIFF, MOIST				38	12.1	2
CLAYSTONE, SILTY, OLIVE, HARD, MOIST	5			50 / 9"	12.5	5
SILTSTONE, SANDY, CLAYEY, RUST, HARD, MOIST	10			50 / 5"	12.4	6
	15					
	20					

TEST BORING NO. 24
DATE DRILLED 9/20/02
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER AT 12.5', 09/27/02						
SAND, SILTY TO SLIGHTLY CLAYEY, MEDIUM TO COARSE GRAINED, TAN, LOOSE TO MEDIUM DENSE, MOIST				9	2.1	1
	5			20	3.8	1
	10			14	6.1	1
SILTSTONE, SANDY, OLIVE, HARD, MOIST	15			50 / 6"	12.3	6
	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-12

TEST BORING NO. 25
DATE DRILLED 9/20/02
Job # 61992

TEST BORING NO.
DATE DRILLED
CLIENT LAND RESOURCES
LOCATION FOUR WAY RD., 558 AC. PARCEL

REMARKS

WATER AT 12', 09/27/02

SAND, SLIGHTLY SILTY TO SLIGHTLY CLAYEY, MEDIUM TO COARSE GRAINED, TAN TO GRAY, MEDIUM DENSE TO DENSE, MOIST TO WET

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			19	1.7	1
5			13	2.3	1
10			25	11.6	1
15			21	16.9	1
20			41	14.0	1

REMARKS

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	10/1/02

JOB NO.: 61992
FIG NO.: B-13

APPENDIX C: Profile Hole Logs

PROFILE HOLE NO 1
DATE DRILLED 11/6/2003
Job # 120481

REMARKS

WATER @ 4.5', 11/8/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, DARK BROWN				
5	SAND, GRAVELLY, SILTY, TAN		18		
	SANDSTONE, CLAYEY, GRAY BROWN				
10			50 / 10"		
15					
20					

PROFILE HOLE NO 2
DATE DRILLED 11/6/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/7/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, TAN				
5	SANDSTONE, CLAYEY, GRAY BROWN		50 / 9"		
10			50 / 7"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-1

PROFILE HOLE NO 3
DATE DRILLED 11/6/2003
Job # 120481

REMARKS

DRY TO 10', 11/7/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, GRAVELLY, SILTY, TAN				
5			17		
	SANDSTONE, SILTY, TAN				
10			50 / 8"		
15					
20					

PROFILE HOLE NO 4
DATE DRILLED 11/6/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/7/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, SILTY, TAN				
5	SANDSTONE, SILTY, TAN TO LIGHT GREEN		50 / 8"		
10			50 / 7"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-2

PROFILE HOLE NO 5
DATE DRILLED 11/6/2003
Job # 120481

REMARKS

DRY TO 10', 11/7/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, TAN				
5	SANDSTONE, SILTY, TAN	■	50 / 11"		
10		■	50 / 9"		
15					
20					

PROFILE HOLE NO 6
DATE DRILLED 11/6/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

WATER @ 7.5', 11/8/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN TO LIGHT BROWN				
	SAND, SILTY, GRAVELLY, TAN				
5		■	35		
10		■	41		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-3

PROFILE HOLE NO 7
DATE DRILLED 11/6/2003
Job # 120481

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 4', 11/8/03						
SAND, SILTY, BROWN TO LIGHT BROWN						
SAND, GRAVELLY, TAN	5			25		
WEATHERED SILTSTONE, SANDY	10			46		
	15					
	20					

PROFILE HOLE NO 8
DATE DRILLED 11/11/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 9.5', 11/12/03						
SAND, SILTY, LIGHT BROWN						
SAND, GRAVELLY, SILTY, TAN	5			25		
CLAYSTONE, SILTY, GREENISH BROWN	10			50/10"		
	15					
	20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
		KL	5/11/12

JOB NO.: 61992
FIG NO.: C-4

PROFILE HOLE NO 9
DATE DRILLED 11/11/2003
Job # 120481

REMARKS

DRY TO 10', 11/12/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	CLAY, SANDY, DARK GREEN BROWN				
5		■	21		
	CLAYSTONE, VERY SANDY, GREENISH BROWN				
10		■	50 / 11"		
15					
20					

PROFILE HOLE NO 10
DATE DRILLED 11/11/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/12/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, SILTY TO GRAVELLY, LIGHT BROWN				
5	SANDSTONE, LIGHT BROWN TO TAN	■	50 / 11"		
10		■	50 / 6"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-5

PROFILE HOLE NO 11
DATE DRILLED 11/11/2003
Job # 120481

REMARKS

DRY TO 10', 11/12/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, SILTY TO GRAVELLY, LIGHT BROWN				
5		■	8		
	SAND, LIGHT BROWN, COARSE GRAINED				
10		■	28		
15					
20					

PROFILE HOLE NO 12
DATE DRILLED 11/11/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

WATER @ 8', 11/12/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, GRAVELLY, TAN				
5		■	23		
10		■	21		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-6

PROFILE HOLE NO 13
DATE DRILLED 11/13/2003
Job # 120481

REMARKS

WATER @ 7', 11/14/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, GRAVELLY, TAN				
5	SAND, GRAVELLY, CLAYEY, GREENISH BROWN TO TAN	■	20		
	CLAY, SILTY, GRAY				
10		■	21		
15					
20					

PROFILE HOLE NO 14
DATE DRILLED 11/13/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/14/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, GRAVELLY, TAN				
5	SANDSTONE, TAN	■	50/10"		
10		■	50/10"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
		a	5/11/12

JOB NO.: 61992
FIG NO.: C-7

PROFILE HOLE NO 15
DATE DRILLED 11/19/2003
Job # 120481

REMARKS

WATER @ 7.5', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, GRAVELLY, TAN				
5		■	21		
	SAND, SILTY TO GRAVELLY, LIGHT GRAYISH TAN				
10		■	20		
15					
20					

PROFILE HOLE NO 16
DATE DRILLED 11/19/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

WATER @ 9.5', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
5	SAND, SILTY, TAN	■	5		
	SAND, GRAVELLY, TAN				
10		■	20		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-8

PROFILE HOLE NO 17
DATE DRILLED 11/19/2012
Job # 120481

REMARKS

DRY TO 10', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, LIGHT BROWN				
5	SANDSTONE, SILTY TO GRAVELLY, TAN		50 / 10"		
10			50 / 10"		
15					
20					

PROFILE HOLE NO 18
DATE DRILLED 11/19/2012
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

WATER @ 4.5', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, GRAVELLY, TAN				
5			50 / 11"		
10			50 / 6"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-9

PROFILE HOLE NO 19
DATE DRILLED 11/19/2012
Job # 120481

REMARKS

DRY TO 10', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, GRAVELLY, LIGHT BROWN-TAN				
5	SANDSTONE, LIGHT BROWN TAN	■	50 / 11"		
10		■	50 / 4"		
15					
20					

PROFILE HOLE NO 20
DATE DRILLED 11/19/2012
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/20/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, GRAVELLY, BROWN				
	SANDSTONE, LIGHT GREENISH TAN				
5		■	50 / 5"		
	CLAYSTONE, TAN-BROWN				
	SANDSTONE, TAN				
10		■	50 / 3"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-10

PROFILE HOLE NO 21
DATE DRILLED 11/24/2003
Job # 120481

REMARKS

WATER @ 7', 11/25/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, LIGHT BROWN				
	SAND, GRAVELLY, SILTY WITH CLAYEY LENSES, TAN				
5			21		
10			13		
15					
20					

PROFILE HOLE NO 22
DATE DRILLED 11/24/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/14/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, GRAVELLY, LIGHT BROWN, TAN				
5			26		
10			26		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-11

PROFILE HOLE NO 23
DATE DRILLED 11/24/2003
Job # 120481

REMARKS

WATER @ 9', 11/25/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
5	SAND, GRAVELLY, TAN		21		
	SAND, CLAYEY, TAN				
10	SANDSTONE, GRAVELLY, TAN		20		
15					
20					

PROFILE HOLE NO 24
DATE DRILLED 11/24/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

WATER @ 8', 11/25/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, CLAYEY, GRAVELLY, LIGHT GREENISH BROWN				
5			32		
10	SILTSTONE/CLAYSTONE, GRAY		50 / 11"		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-12

PROFILE HOLE NO 25
DATE DRILLED 11/24/2012
Job # 120481

REMARKS

WATER @ 9.5', 11/25/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, SILTY, LIGHT BROWN				
5	SAND, GRAVELLY, TAN	■	35		
	SANDSTONE, TAN				
10		■	50/10"		
15					
20					

PROFILE HOLE NO 26
DATE DRILLED 11/25/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/26/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
5	SAND, GRAVELLY, TAN	■	19		
	SAND, CLAYEY, BROWN				
10	WEATHERED SANDSTONE, TAN	■	36		
15					
20					

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PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED: a	DATE: 5/11/12

JOB NO.: 61992
FIG NO.: C-13

PROFILE HOLE NO 27
DATE DRILLED 11/25/2003
Job # 120481

REMARKS

DRY TO 10', 11/26/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
5	SANDSTONE, SILTY, TAN		50		
10			50 / 8"		
15					
20					

PROFILE HOLE NO 28
DATE DRILLED 11/25/2003
CLIENT 4-WAY JOINT VENTURES
LOCATION 4-WAY RANCH

REMARKS

DRY TO 10', 11/26/03

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	SAND, SILTY, BROWN				
	SAND, SILTY, LIGHT BROWN				
	SANDSTONE, LIGHT BROWN				
5			50 / 9"		
10			50 / 8"		
15					
20					

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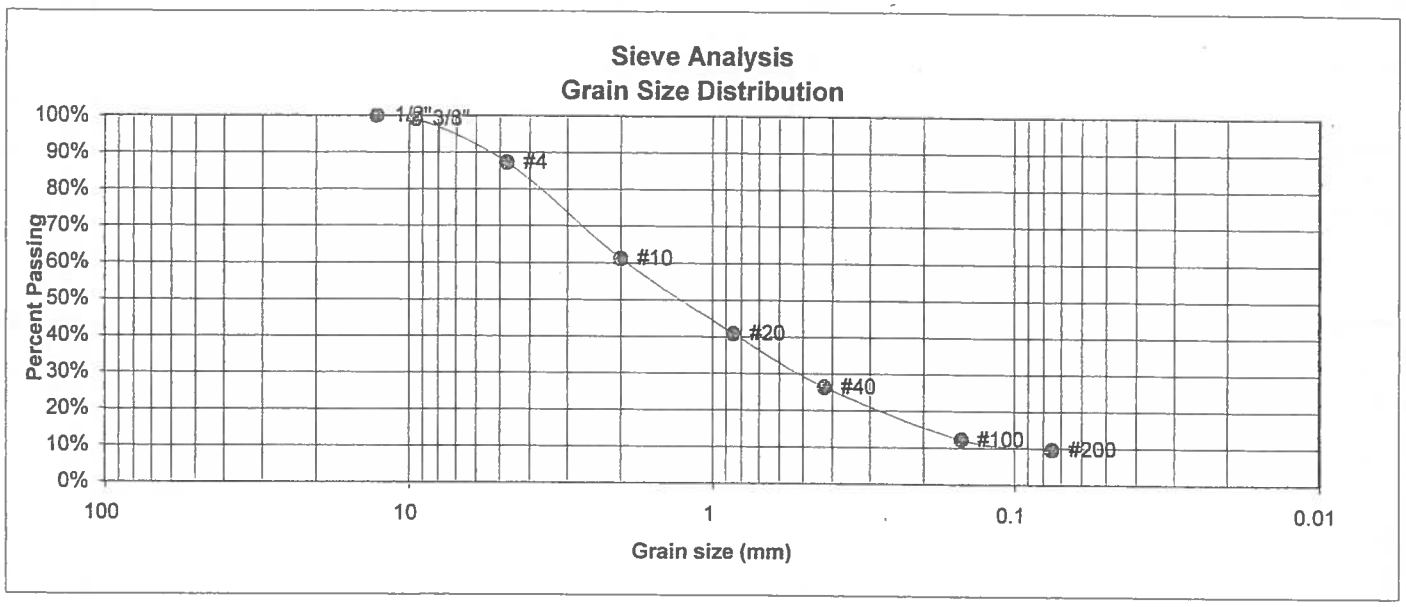
PROFILE HOLE LOG

DRAWN:	DATE:	CHECKED:	DATE:
			5/11/12

JOB NO.: 61992
FIG NO.: C-14

APPENDIX D: Laboratory Test Results

UNIFIED CLASSIFICATION	SW-SM	CLIENT	LAND RESOURCES
SOIL TYPE #	1	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB1	JOB NO.	61992
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.1%
4	87.2%
10	61.2%
20	40.8%
40	26.4%
100	12.3%
200	9.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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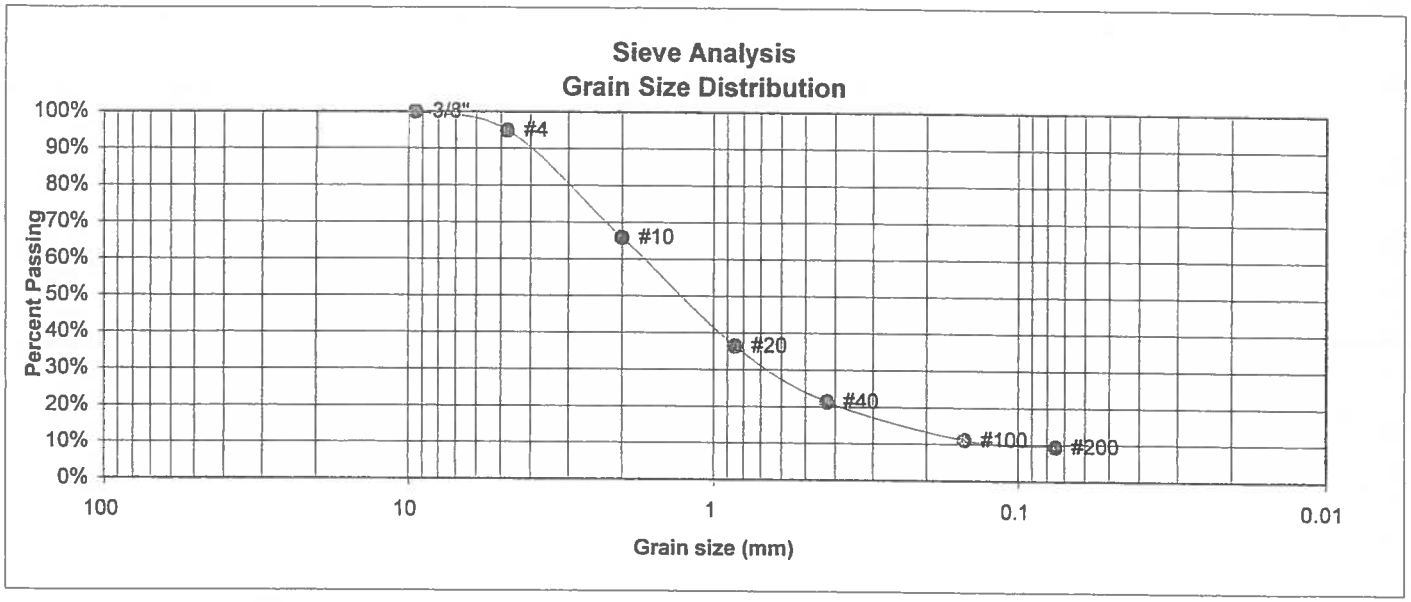
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-1

UNIFIED CLASSIFICATION	SW-SM	CLIENT	LAND RESOURCES
SOIL TYPE #	1	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB4	JOB NO.	61992
DEPTH	2-5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	95.0%
10	65.9%
20	36.4%
40	21.4%
100	11.2%
200	9.4%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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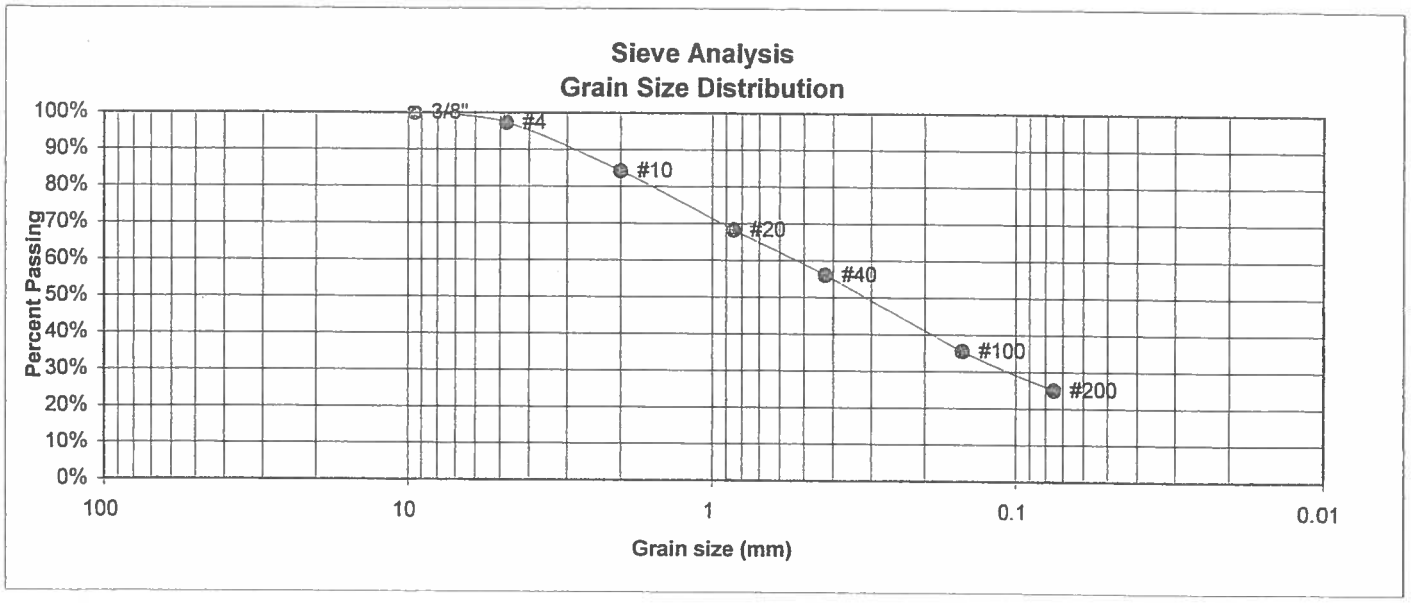
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-2

UNIFIED CLASSIFICATION	SM	CLIENT	LAND RESOURCES
SOIL TYPE #	1	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB11	JOB NO.	61992
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.3%
10	84.2%
20	68.2%
40	56.1%
100	35.5%
200	25.0%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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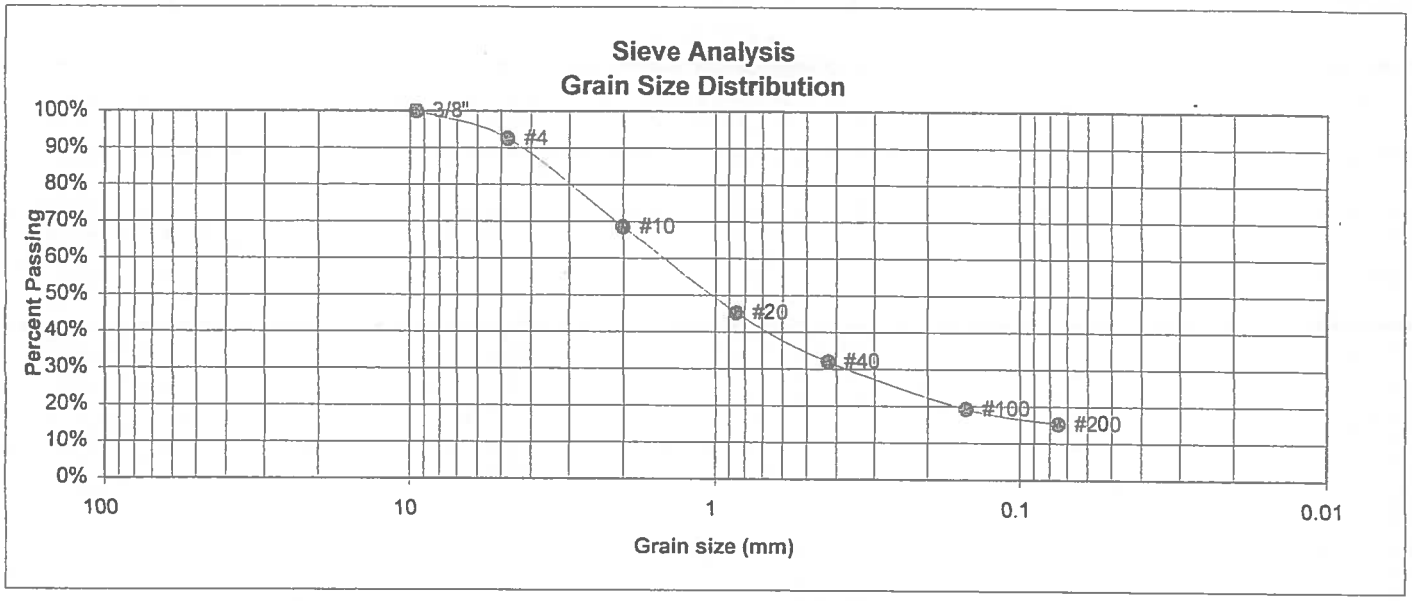
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-3

UNIFIED CLASSIFICATION	SM	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	1	PROJECT	FOUR WAY RD.
TEST BORING #	PH-6	JOB NO.	61992
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	92.5%
10	68.6%
20	45.3%
40	32.0%
100	19.3%
200	15.3%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	19
Plastic Index	3

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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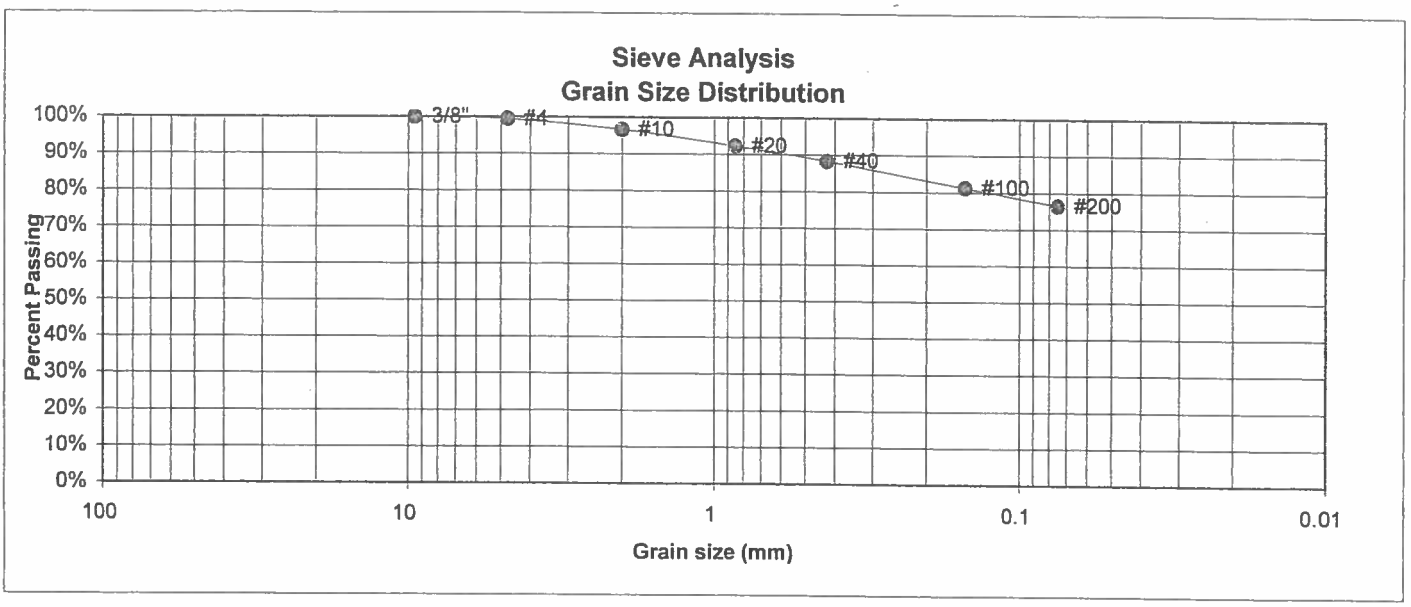
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	12/1/03

JOB NO.: 61992

FIG NO.: D-4

UNIFIED CLASSIFICATION	CL	CLIENT	LAND RESOURCES
SOIL TYPE #	2	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB23	JOB NO.	61992
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.5%
10	96.6%
20	92.3%
40	88.4%
100	81.2%
200	76.5%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	11.8%
Moisture at finish	25.0%
Moisture increase	13.1%
Initial dry density (pcf)	99
Swell (psf)	1467

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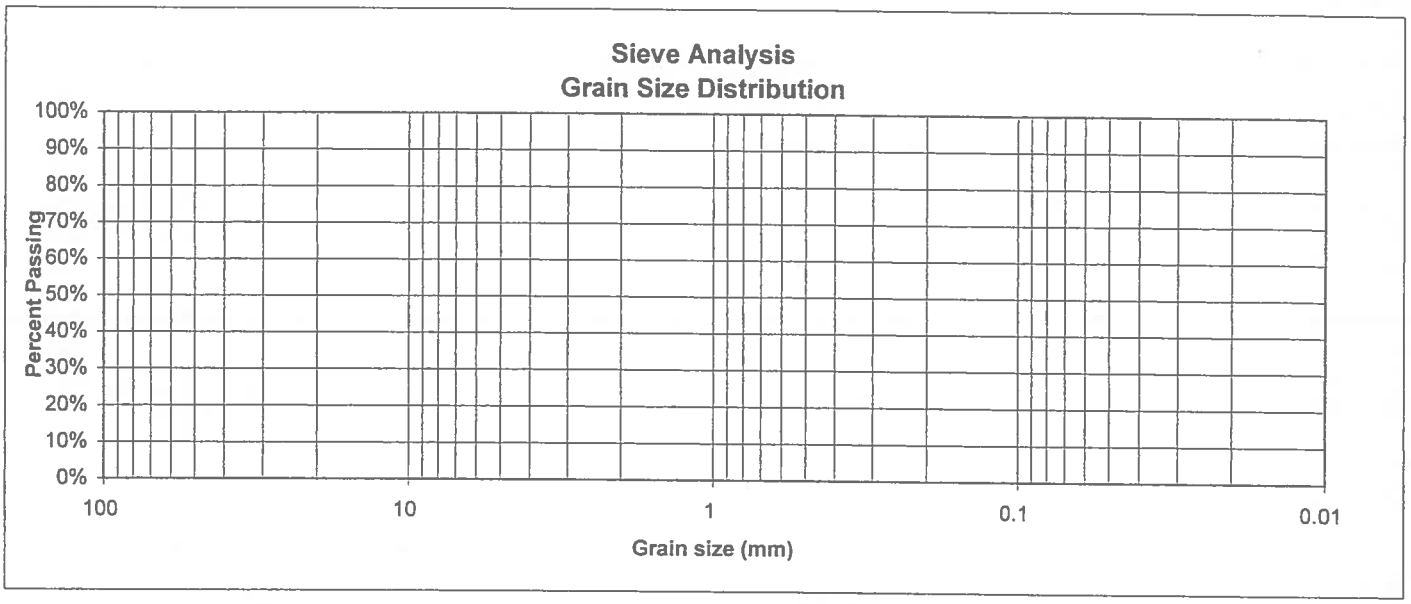
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-5

UNIFIED CLASSIFICATION	ML	CLIENT	LAND RESOURCES
SOIL TYPE #	3	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB4	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	31
Liquid Limit	32
Plastic Index	1

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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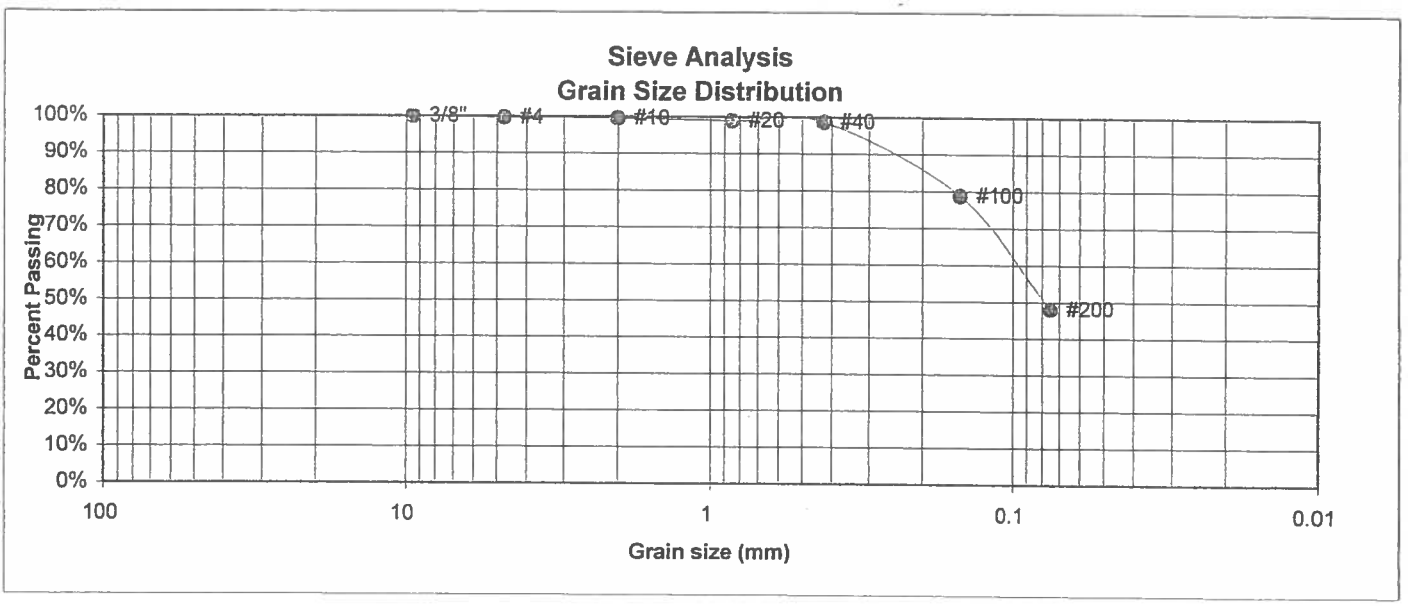
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-6

UNIFIED CLASSIFICATION	SM	CLIENT	LAND RESOURCES
SOIL TYPE #	4	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB11	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	99.6%
10	99.6%
20	99.0%
40	98.7%
100	78.8%
200	48.0%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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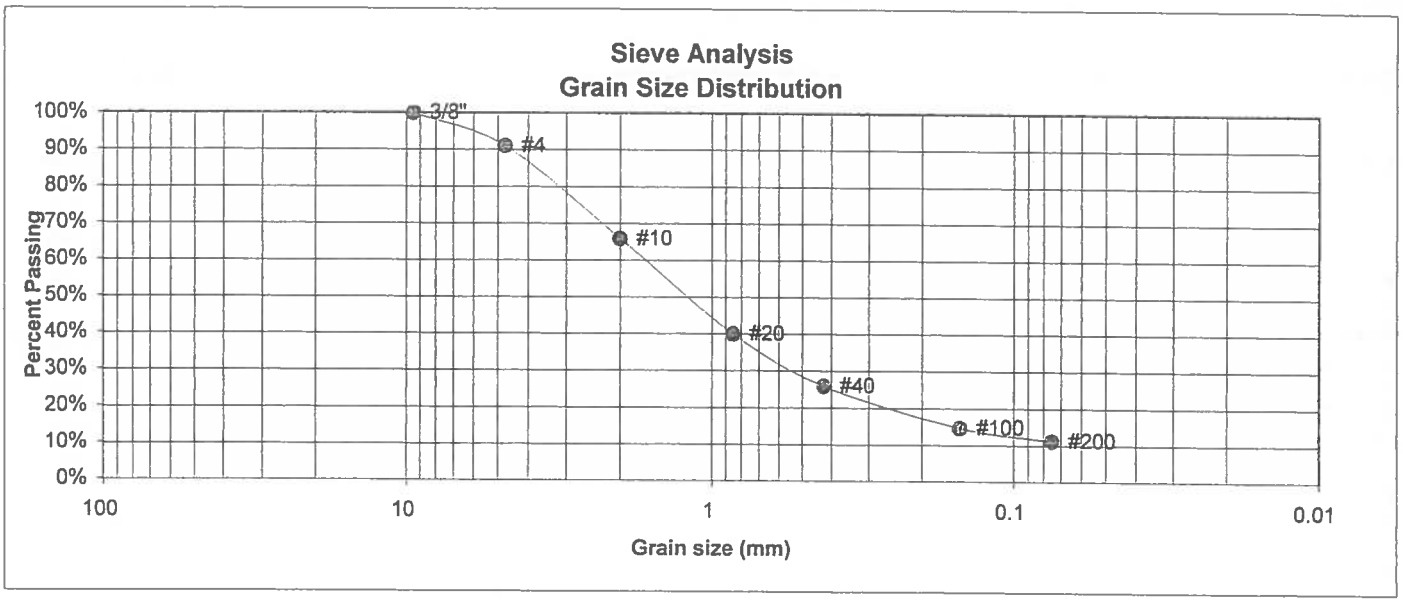
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/22/00

JOB NO.: 61992

FIG NO.: D-7

UNIFIED CLASSIFICATION	SW-SC	CLIENT	LAND RESOURCES
SOIL TYPE #	4	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB16	JOB NO.	61992
DEPTH	5'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	91.1%
10	65.9%
20	40.0%
40	25.9%
100	14.7%
200	11.2%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	6.2%
Moisture at finish	21.6%
Moisture increase	15.5%
Initial dry density (pcf)	100
Swell (psf)	351

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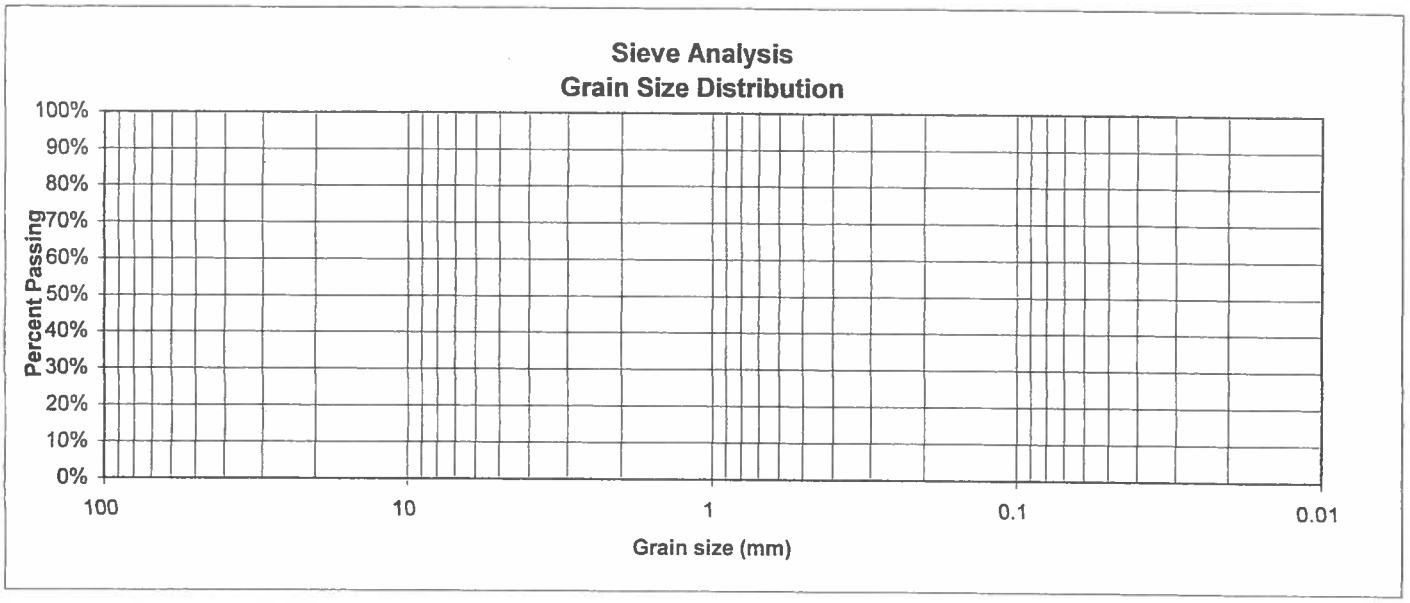
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAG	9/30/02

JOB NO.: 61992

FIG NO.: D-8

UNIFIED CLASSIFICATION	SC	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	4	PROJECT	FOUR WAY RD.
TEST BORING #	PH-1	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	9.5%
Moisture at finish	18.5%
Moisture increase	9.0%
Initial dry density (pcf)	106
Swell (psf)	861

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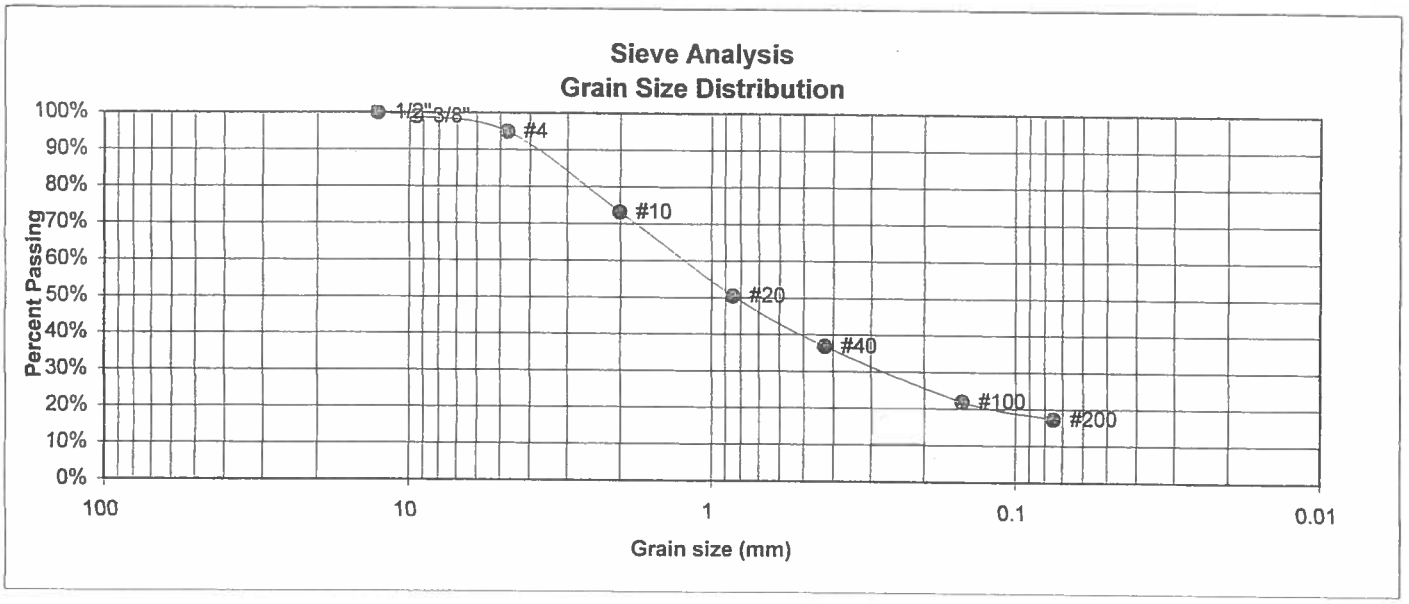
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	12/1/03

JOB NO.: 61992
FIG NO.: D-9

UNIFIED CLASSIFICATION	SC	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	4	PROJECT	FOUR WAY RD.
TEST BORING #	PH-2	JOB NO.	61992
DEPTH	5-10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	98.9%
4	94.9%
10	73.2%
20	50.5%
40	36.9%
100	21.9%
200	17.3%

Atterberg Limits	
Plastic Limit	15
Liquid Limit	28
Plastic Index	13

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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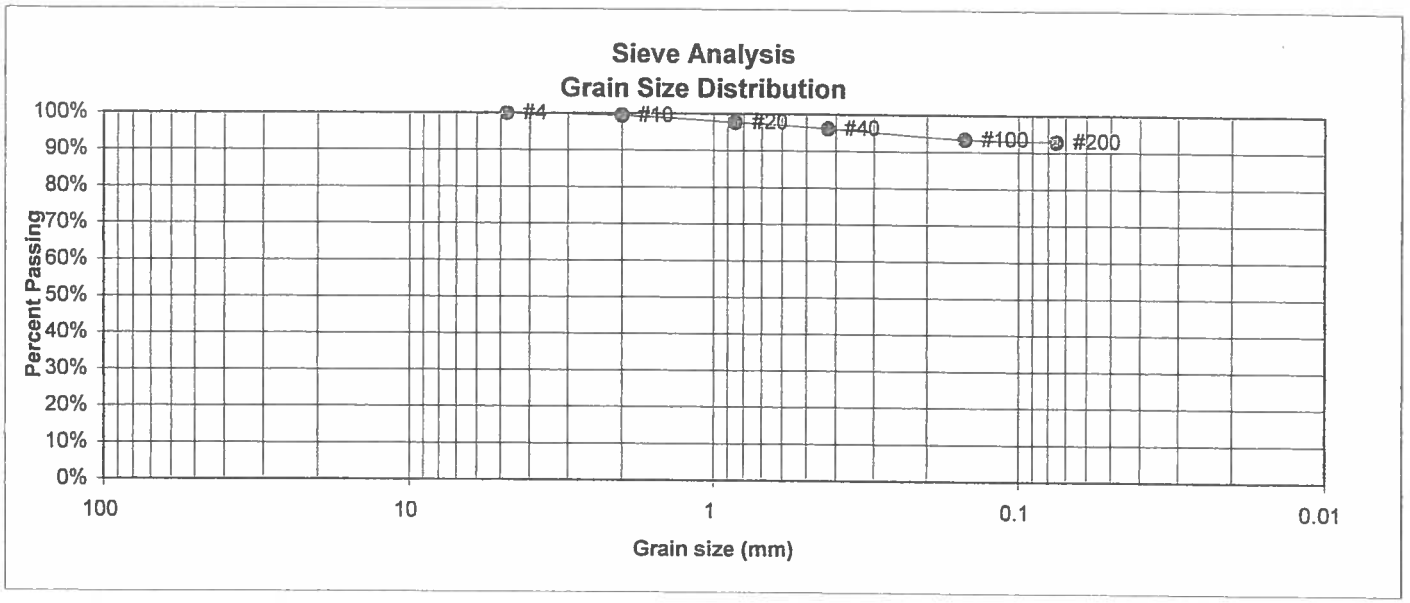
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	12/1/03

JOB NO.: 61992
FIG NO.: D-10

UNIFIED CLASSIFICATION	CL	CLIENT	LAND RESOURCES
SOIL TYPE #	5	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB6	JOB NO.	61992
DEPTH	15'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.4%
20	97.7%
40	96.1%
100	93.4%
200	92.9%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	12.1%
Moisture at finish	23.3%
Moisture increase	11.2%
Initial dry density (pcf)	99
Swell (psf)	1467

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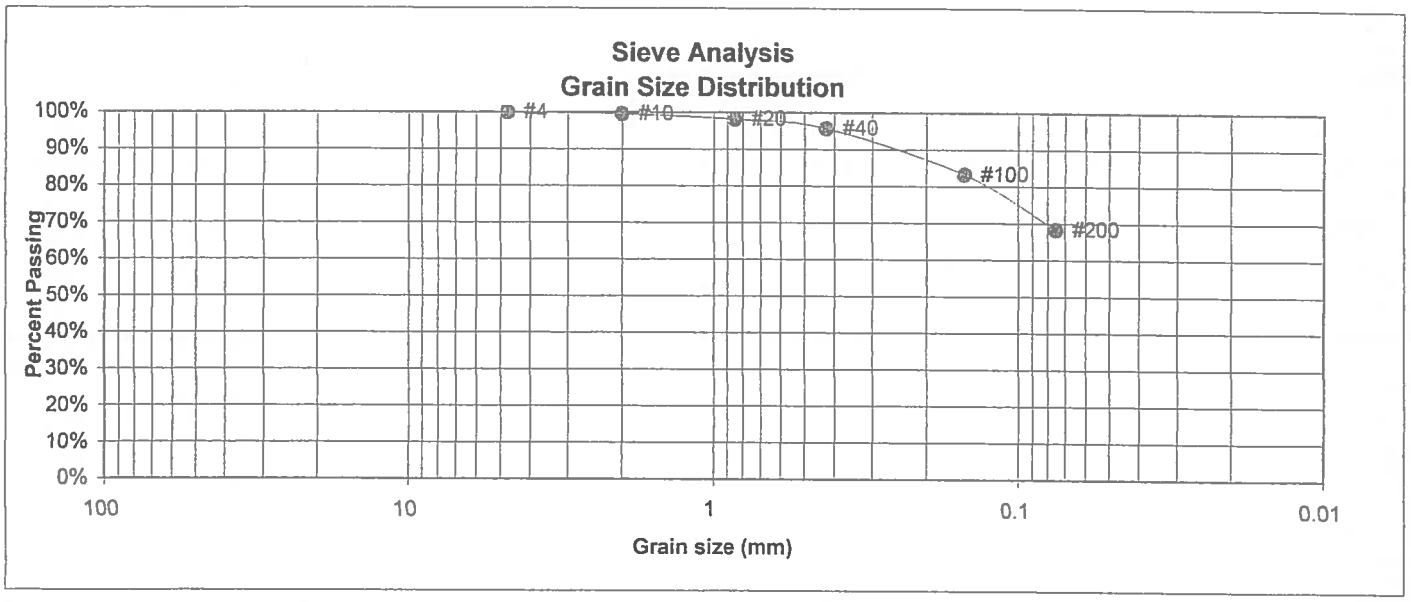
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/22/02

JOB NO.: 61992

FIG NO.: D-11

UNIFIED CLASSIFICATION	CL	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	5	PROJECT	FOUR WAY RD.
TEST BORING #	PH-8	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.6%
20	98.1%
40	95.7%
100	83.3%
200	68.3%

Atterberg Limits	
Plastic Limit	16
Liquid Limit	39
Plastic Index	23

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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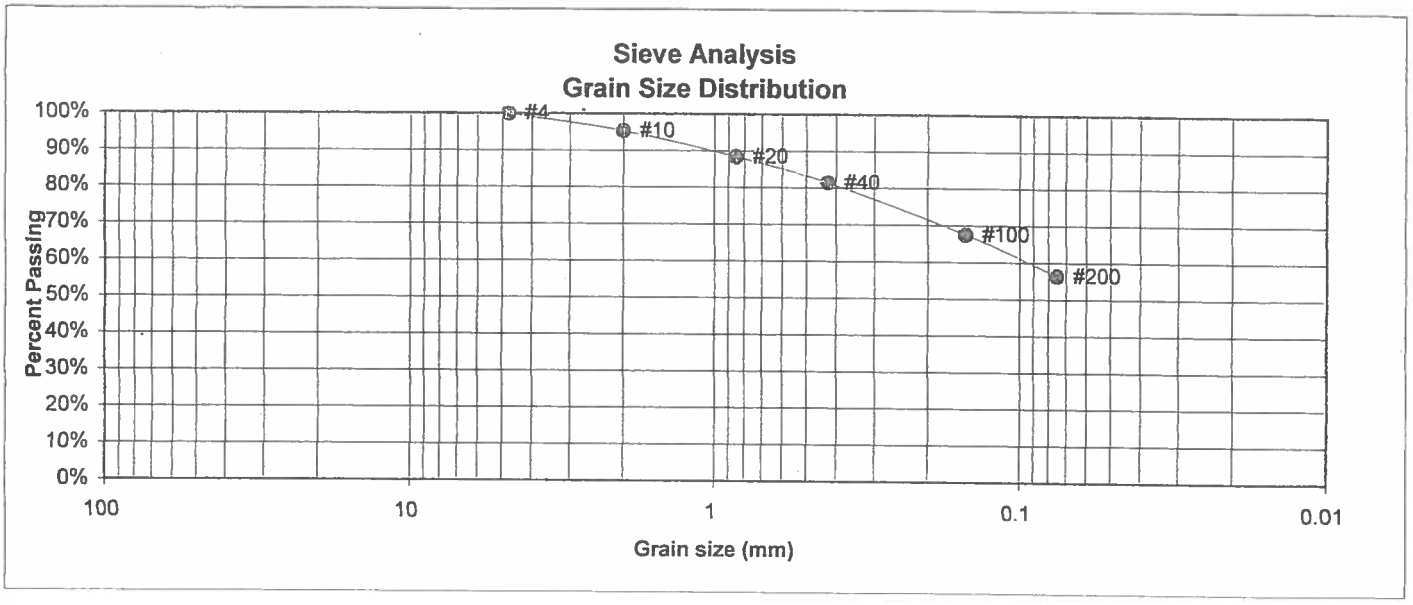
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	12/1/03

JOB NO.: 61992
FIG NO.: D-12

UNIFIED CLASSIFICATION	CL	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	5	PROJECT	FOUR WAY RD.
TEST BORING #	PH-9	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	95.3%
20	88.4%
40	81.4%
100	67.5%
200	56.4%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	14.9%
Moisture at finish	19.0%
Moisture increase	4.2%
Initial dry density (pcf)	109
Swell (psf)	1014

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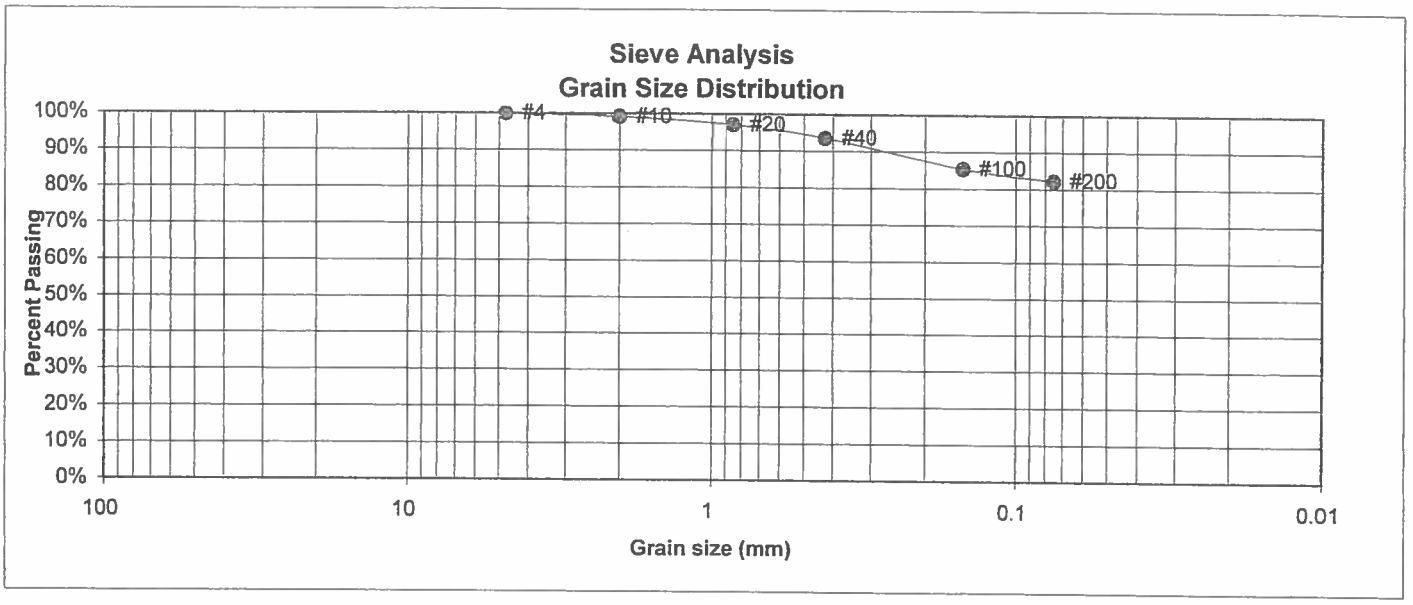
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	12/1/03

JOB NO.: 61992

FIG NO.: D-13

UNIFIED CLASSIFICATION	ML	CLIENT	LAND RESOURCES
SOIL TYPE #	6	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB2	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.2%
20	97.1%
40	93.6%
100	85.5%
200	82.1%

Atterberg Limits	
Plastic Limit	29
Liquid Limit	29
Plastic Index	0

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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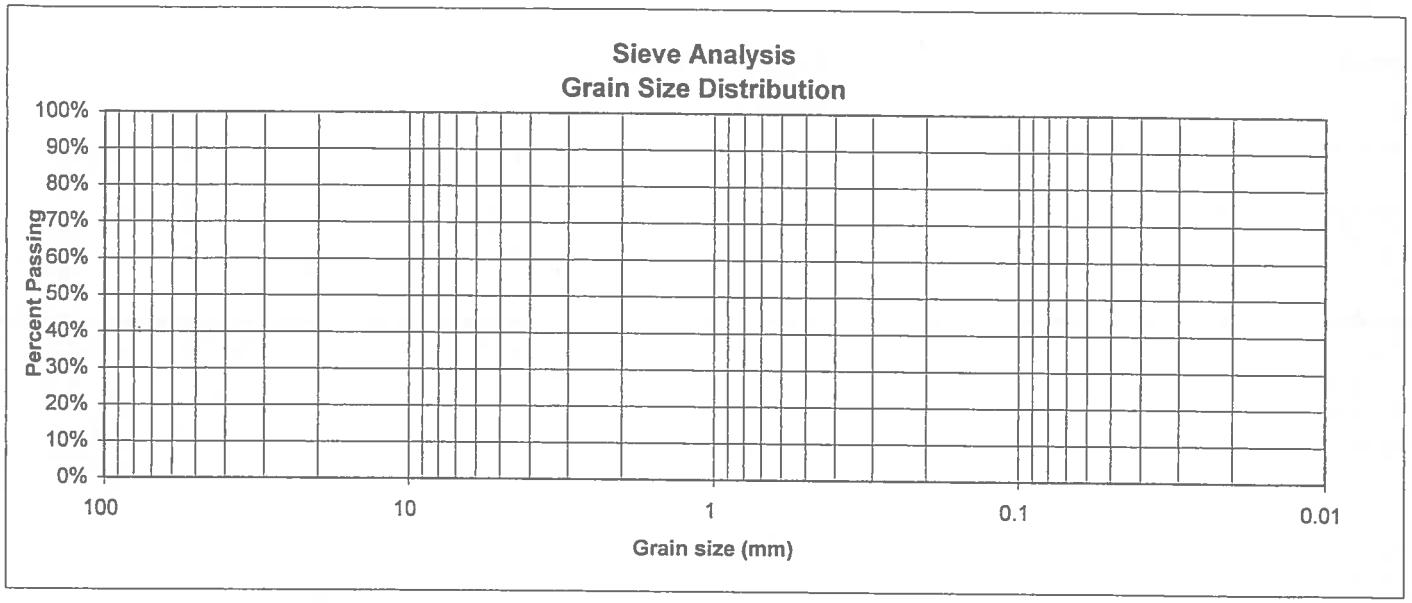
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/02

JOB NO.: 61992

FIG NO.: D-14

UNIFIED CLASSIFICATION	ML	CLIENT	LAND RESOURCES
SOIL TYPE #	6	PROJECT	FOUR WAY RD., 558 AC. PARCEL
TEST BORING #	TB14	JOB NO.	61992
DEPTH	2-3'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	

Swell	
Moisture at start	9.5%
Moisture at finish	22.6%
Moisture increase	13.1%
Initial dry density (pcf)	103
Swell (psf)	1150

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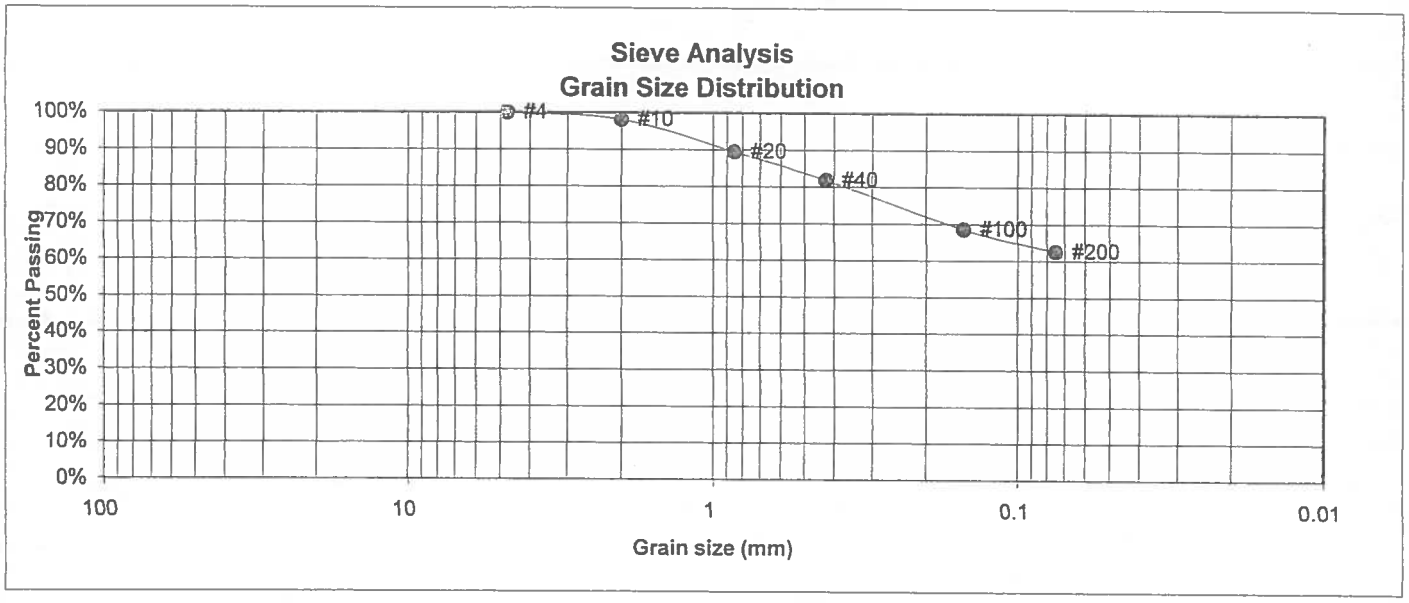
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/30/02

JOB NO.: 61992

FIG NO.: D-15

UNIFIED CLASSIFICATION	ML	CLIENT	LAND RESOURCE GROUP, INC.
SOIL TYPE #	6	PROJECT	FOUR WAY RD.
TEST BORING #	PH-7	JOB NO.	61992
DEPTH	10'	TEST BY	DG



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.2%
20	89.4%
40	81.8%
100	68.6%
200	62.5%

Atterberg Limits	
Plastic Limit	25
Liquid Limit	27
Plastic Index	2

Swell	
Moisture at start	11.0%
Moisture at finish	20.5%
Moisture increase	9.6%
Initial dry density (pcf)	105
Swell (psf)	1818

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KEW	12/1/03

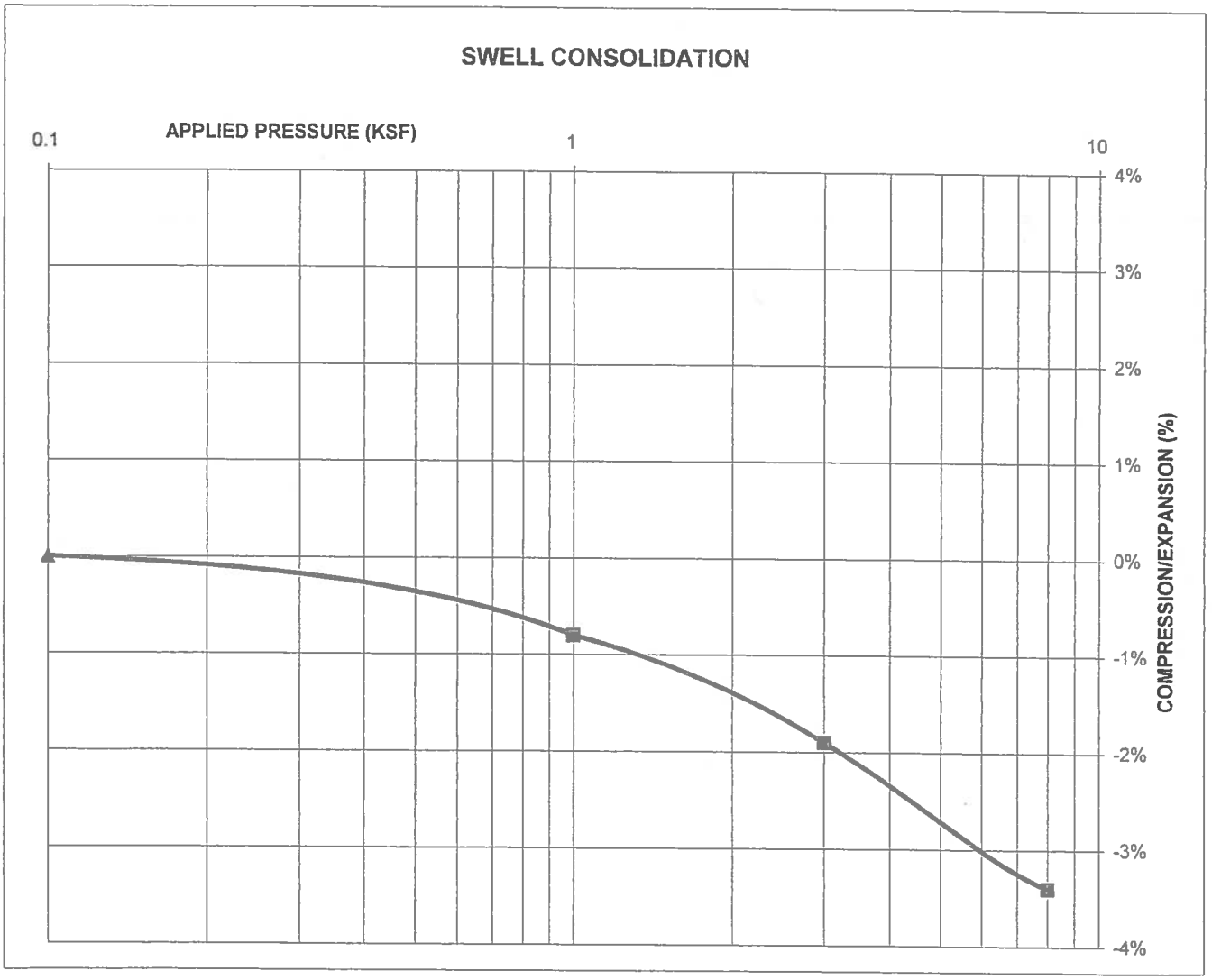
JOB NO.: 61992

FIG NO.: D-16

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB11	AT DEPTH	10'
DESCRIPTION	SM	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			107
NATURAL MOISTURE CONTENT			20.7%
SWELL/CONSOLIDATION (%)			0.0%

JOB NO. 61992
CLIENT LAND RESOURCES
PROJECT FOUR WAY RD., 558 AC. PARCEL



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SWELL CONSOLIDATION TEST RESULTS

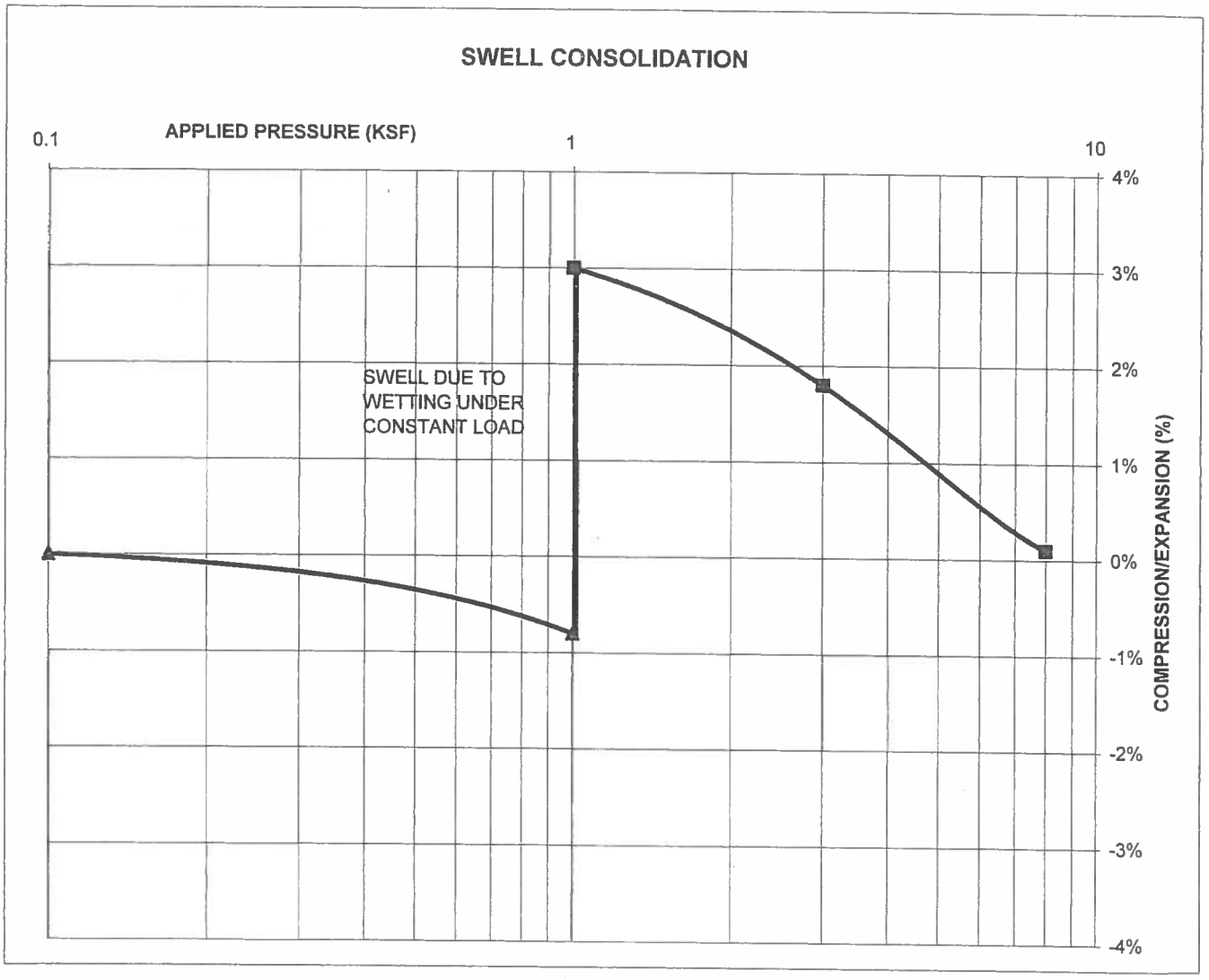
DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/27/00

JOB NO.: 61992
FIG NO.: D-17

CONSOLIDATION TEST RESULTS

SAMPLE FROM:	TB2	AT DEPTH	10'
DESCRIPTION	ML	SOIL TYPE	6
NATURAL UNIT DRY WEIGHT (PCF)			111
NATURAL MOISTURE CONTENT			19.3%
SWELL/CONSOLIDATION (%)			3.8%

JOB NO. 61992
CLIENT LAND RESOURCES
PROJECT FOUR WAY RD., 558 AC. PARCEL



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		KAH	9/30/02

JOB NO.: 61992
FIG NO.: D-18

APPENDIX E: Test Boring Logs and Laboratory Test Results from Entech Job No. 120675

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH
JOB NO. 120675

SOIL TYPE	TEST BORING NO.	DEPTH (FT)	WATER (%)	DRY DENSITY (PCF)	PASSING NO. 200 SIEVE (%)	LIQUID LIMIT (%)	PLASTIC INDEX (%)	SULFATE (WT %)	FHA SWELL (PSF)	SWELL/ CONSOL (%)	UNIFIED CLASSIFICATION	SOIL DESCRIPTION
1	301	2-3			6.2			0.01			SM-SW	SAND, SLIGHTLY SILTY
1	305	5			7.7						SM-SW	SAND, SLIGHTLY SILTY
1	305	10			18.9	NV	NP		290		SM	SAND, SILTY
1	311	5			10.9						SM-SW	SAND, SLIGHTLY SILTY
1	317	5			5.6						SM-SW	SAND, SLIGHTLY SILTY
2	312	5	16.4	107.5	94.7					1.5	CL	CLAY, SANDY
3	318	10	12.8	119.4	28.9	NV	NP	0.00		-0.3	SM	SANDSTONE, SILTY
3	303	15			6.6	NV	NP				SM-SW	SANDSTONE, SLIGHTLY SILTY
3	307	5			34.4	NV	NP	0.00			SM	SANDSTONE, SILTY
3	308	5			18.7						SM	SANDSTONE, SILTY
3	312	10			19.1						SM	SANDSTONE, SILTY
4	302	15				40	15	0.02			CL	CLAYSTONE, SANDY
4	308	10	16.4	115.5	61.0					0.6	CL	CLAYSTONE, VERY SANDY
4	314	10			56.6	35	17		1360		CL	CLAYSTONE, VERY SANDY
4	315	10	15.8	116.5	77.1					1.7	CL	CLAYSTONE, SANDY
4	316	15			66.0						CL	CLAYSTONE, SANDY

FIG NO. E-1

TABLE 2

Depth to Bedrock and Groundwater
4- WAY RANCH
120675

Test Boring No.	Depth to Bedrock (ft.)	Depth to Groundwater (ft.)
300	14	6.5
301	9	4
302	13	8
303	14	6
304	12	8.5
305	12	5.5
306	3	12
307	4	4
308	3	>15
309	9	11.5
310	7	4.5
311	8	5.5
312	7	14.5
313	3	5.5
314	4	13
315	7	24.5
316	4	14
317	11	8.5
318	9	4.5

Entech Job No. 120675
2MSW/rep/2012/120675 table 2

FIG NO. E-2

TEST BORING NO. 300
DATE DRILLED 6/21/2012
Job # 120675

REMARKS

WATER @ 6.5', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			*	1.2	1	SAND, SILTY TO SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO DENSE, DRY TO WET
5			21	6.1	1	
10			30	11.0	1	
15			50 / 6"	13.7	3	SANDSTONE, CLAYEY, FINE TO MEDIUM GRAINED, GRAY BROWN, VERY DENSE, MOIST
20						

* - BULK SAMPLE TAKEN

TEST BORING NO. 301
DATE DRILLED 6/21/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 4', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type	
			10	7.4	1	SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, MOIST TO WET
5			14	11.2	1	
10			50 / 11"	9.2	4	CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST
15			50 / 5"	12.8	3	SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, WET
20						

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.:

TEST BORING NO. 302
DATE DRILLED 6/21/2012
Job # 120675

REMARKS

WATER @ 8', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO COARSE GRAINED, TAN TO BROWN, MEDIUM DENSE, DRY TO WET			19	2.1	1
5			21	6.6	1
10			15	16.0	1
CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST 15			50 / 7"	12.4	4
20					

TEST BORING NO. 303
DATE DRILLED 6/21/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 6', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
SAND, SILTY, FINE TO COARSE GRAINED, LIGHT BROWN, MEDIUM DENSE TO DENSE, DRY TO WET			*	2.3	1
5			22	5.0	1
10			39	13.9	1
SANDSTONE, SLIGHTLY SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, VERY MOIST 15			50 / 8"	15.1	3
* - BULK SAMPLE TAKEN 20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 7/20/12

JOB NO.: 120675
FIG NO.: E-3

TEST BORING NO. 304
DATE DRILLED 6/21/2012
Job # 120675

REMARKS

WATER @ 8.5', 7/6/12

SAND, SILTY, FINE TO COARSE GRAINED, BROWN TO TAN, MEDIUM DENSE TO DENSE, DRY TO WET

SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, WET

* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.8	1
5			23	6.3	1
10			33	13.5	1
15			50 / 6"	10.5	3
20					

TEST BORING NO. 305
DATE DRILLED 6/21/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 5.5', 7/6/12

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, LIGHT BROWN TO BROWN, MEDIUM DENSE TO DENSE, DRY

SAND, SILTY, FINE GRAINED, GRAY, DENSE, WET

SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, VERY MOIST

* - BULK SAMPLE TAKEN

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.1	1
5			26	2.1	1
10			34	23.5	1
15			50 / 6"	11.4	3
20					

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505 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907

TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-4

TEST BORING NO. 306
DATE DRILLED 6/26/2012
Job # 120675

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 12', 7/6/12						
SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN, MOIST				*	3.9	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN TO TAN, VERY DENSE, MOIST	5			50 / 7"	8.8	3
	10			50 / 6"	8.7	3
	15			50 / 6"	14.1	3
* - BULK SAMPLE TAKEN	20					

TEST BORING NO. 307
DATE DRILLED 6/26/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 4', 7/6/12						
SAND, CLAYEY, FINE GRAINED, DARK BROWN, MOIST				*	13.0	1
SANDSTONE, SILTY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST	5			50	16.8	3
	10			50 / 6"	15.1	3
	15			50 / 8"	15.8	3
* - BULK SAMPLE TAKEN	20					

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
		R	7/18/12

JOB NO.: 120675
FIG NO.: E-5

TEST BORING NO. 308
DATE DRILLED 6/26/2012
Job # 120675

REMARKS

DRY TO 15', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	5.6	1
5			50 / 6"	8.5	3
10			50 / 8"	15.3	4
15			50 / 5"	9.1	3
20					

SAND, SILTY, FINE TO COARSE GRAINED, BROWN, MOIST

SANDSTONE, SILTY, FINE GRAINED, BROWN, VERY DENSE, MOIST

CLAYSTONE, VERY SANDY, BROWN, HARD, MOIST

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

TEST BORING NO. 309
DATE DRILLED 6/21/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 11.5', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.3	1
5			24	3.8	1
10			50 / 9"	8.8	3
15			50 / 8"	12.6	3
20					

SAND, SILTY, FINE TO COARSE GRAINED, TAN, MEDIUM DENSE, DRY TO MOIST

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, OLIVE BROWN, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-6

TEST BORING NO. 310
DATE DRILLED 6/21/2012
Job # 120675

REMARKS

WATER @ 4.5', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	14.9	1
5			15	15.7	1
10			50 / 7"	8.0	3
15			50 / 2"	10.5	4
20					

SAND, CLAYEY, FINE GRAINED, DARK BROWN TO GRAY, MEDIUM DENSE, MOIST TO WET

SANDSTONE, CLAYEY, FINE GRAINED, GRAY BROWN, VERY DENSE, MOIST

CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST

* - BULK SAMPLE TAKEN

TEST BORING NO. 311
DATE DRILLED 6/21/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 5.5', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.9	1
5			38	12.4	1
10			50 / 7"	11.7	3
15			50 / 10"	10.5	3
20					

SAND, SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, DENSE, DRY TO WET

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST TO VERY MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-7

TEST BORING NO. 312
DATE DRILLED 6/21/2012
Job # 120675

REMARKS

WATER @ 14.5', 7/6/12

Depth (ft)	Samples	Blows per foot	Watercontent %	Soil Type
		*	2.6	1
5		37	8.3	2
10		50 / 4"	8.5	3
15		50 / 7"	9.3	3
20				

SAND, SILTY, FINE GRAINED, TAN

CLAY, SANDY, TAN, VERY STIFF, MOIST

SANDSTONE, SILTY, FINE TO MEDIUM GRAINED, BUFF TO OLIVE BROWN, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

TEST BORING NO. 313
DATE DRILLED 6/26/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 5.5', 7/6/12

Depth (ft)	Samples	Blows per foot	Watercontent %	Soil Type
		*	3.1	1
5		50 / 8"	10.5	3
10		50 / 9"	17.0	4
15		50 / 8"	13.1	4
20				

SAND, SILTY, FINE TO MEDIUM GRAINED, BROWN, MOIST

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST TO WET

CLAYSTONE, SANDY, BLUE GRAY, HARD, MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE: 7/18/12

JOB NO.: 120675
FIG NO.: E-8

TEST BORING NO. 314
DATE DRILLED 6/26/2012
Job # 120675

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 13', 7/6/12						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, DRY				*	1.5	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST	5			50 / 11"	8.0	3
CLAYSTONE, VERY SANDY, BROWN, HARD, MOIST	10			50 / 8"	12.8	4
SANDSTONE, CLAYEY, FINE GRAINED, BROWN, VERY DENSE, MOIST	15			50 / 7"	11.1	3
* - BULK SAMPLE TAKEN	20					

TEST BORING NO. 315
DATE DRILLED 6/26/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 24.5', 7/6/12						
SAND, SILTY, FINE TO COARSE GRAINED, BROWN, DENSE, DRY TO MOIST				*	2.3	1
	5			41	7.7	1
CLAYSTONE, SANDY, BROWN, HARD, MOIST	10			50 / 9"	15.3	4
	15			50 / 8"	11.3	4
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, BLUE GRAY, VERY DENSE, MOIST	20			50 / 7"	9.5	3
* - BULK SAMPLE TAKEN	25			50 / 6"	8.7	3

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-9

TEST BORING NO. 316
DATE DRILLED 6/26/2012
Job # 120675

REMARKS

WATER @ 14', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.7	1
5			50 / 11"	14.3	3
10			50 / 8"	9.2	3
15			50 / 6"	12.9	4
20					

SAND, SILTY, FINE TO COARSE GRAINED, TAN, DRY

SANDSTONE, SILTY, FINE GRAINED, TAN, VERY DENSE, MOIST

SANDSTONE, SILTY, FINE TO COARSE GRAINED, BROWN, VERY DENSE, MOIST

CLAYSTONE, SANDY, GRAY BROWN, HARD, MOIST

* - BULK SAMPLE TAKEN

TEST BORING NO. 317
DATE DRILLED 6/26/2012
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS

WATER @ 8.5', 7/6/12

Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
			*	1.8	1
5			20	5.9	1
10			33	14.6	1
15			50 / 6"	8.0	3
20					

SAND, SILTY TO SLIGHTLY SILTY, FINE TO COARSE GRAINED, BROWN, MEDIUM DENSE TO DENSE, DRY TO WET

SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, BLUE GRAY, VERY DENSE, MOIST

* - BULK SAMPLE TAKEN

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TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-10

TEST BORING NO. 318
DATE DRILLED 6/26/2012
Job # 120675

TEST BORING NO.
DATE DRILLED
CLIENT 4 WAY JOINT VENTURE
LOCATION FOUR WAY RANCH

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
WATER @ 4.5', 7/6/12						
SAND, SILTY TO CLAYEY, FINE TO MEDIUM GRAINED, BROWN, MOIST TO WET				*	4.7	1
	5			10	12.8	1
SANDSTONE, SILTY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST	10			50 / 9"	11.7	3
SANDSTONE, CLAYEY, FINE TO COARSE GRAINED, GRAY BROWN, VERY DENSE, MOIST	15			50 / 6"	11.3	3
* - BULK SAMPLE TAKEN	20					

REMARKS	Depth (ft)	Symbol	Samples	Blows per foot	Watercontent %	Soil Type
	5					
	10					
	15					
	20					

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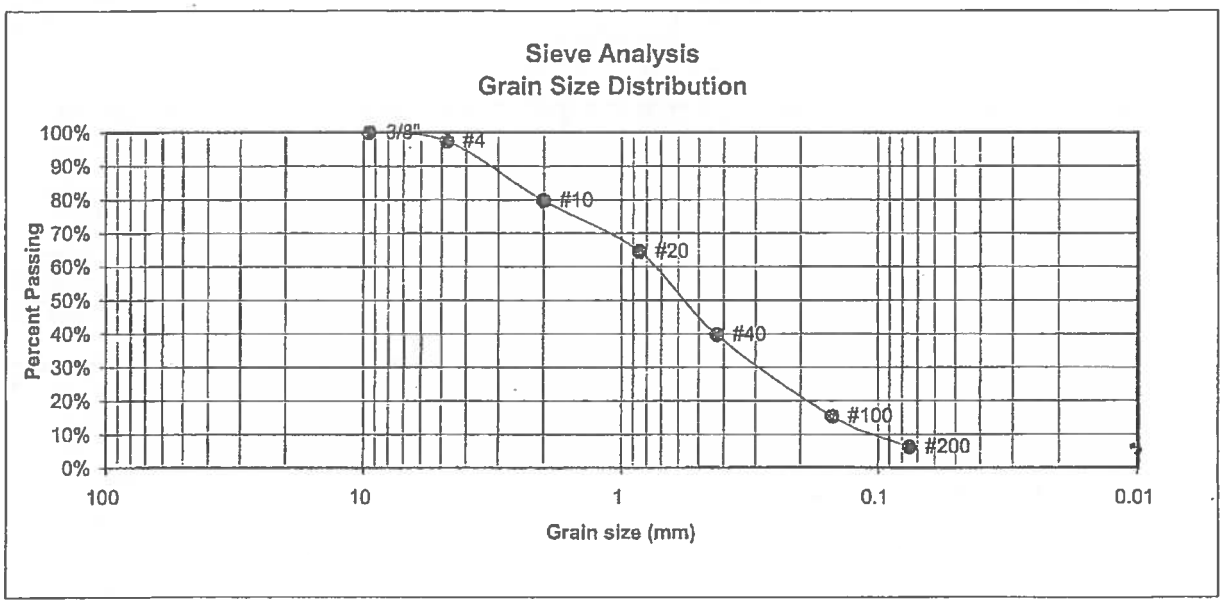
TEST BORING LOG

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-11

UNIFIED CLASSIFICATION	SM-SW	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	1	PROJECT	FOUR WAY RANCH
TEST BORING #	301	JOB NO.	120675
DEPTH (FT)	2-3	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.5%
10	79.7%
20	64.5%
40	39.7%
100	15.4%
200	6.2%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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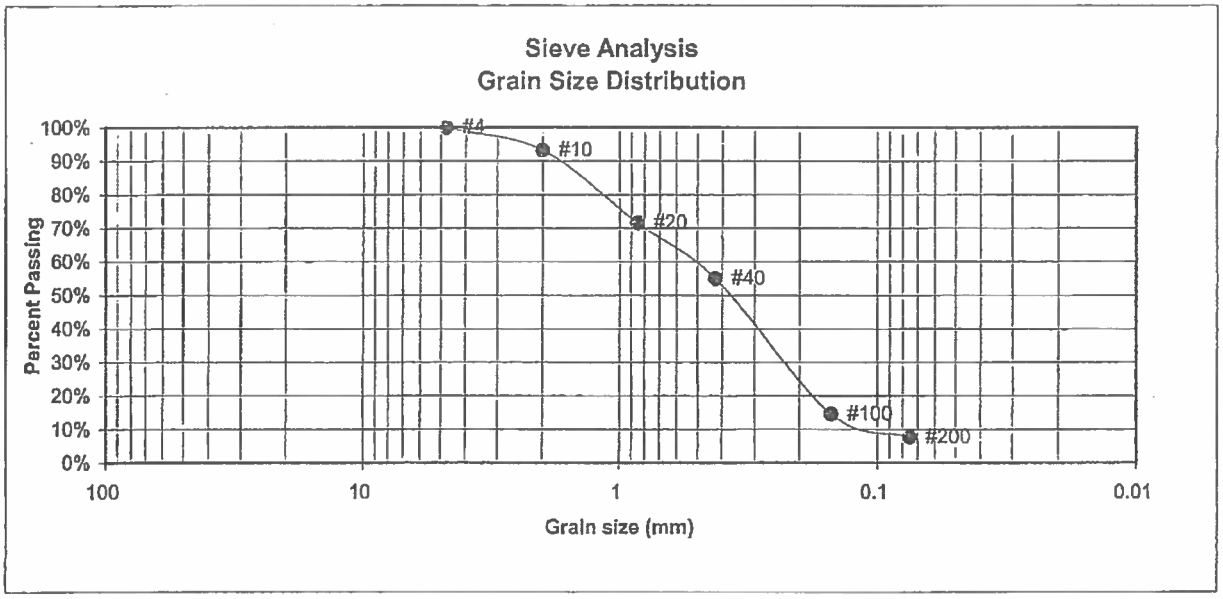
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-12

UNIFIED CLASSIFICATION	SM-SW	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	1	PROJECT	FOUR WAY RANCH
TEST BORING #	305	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	93.2%
20	71.5%
40	55.0%
100	14.6%
200	7.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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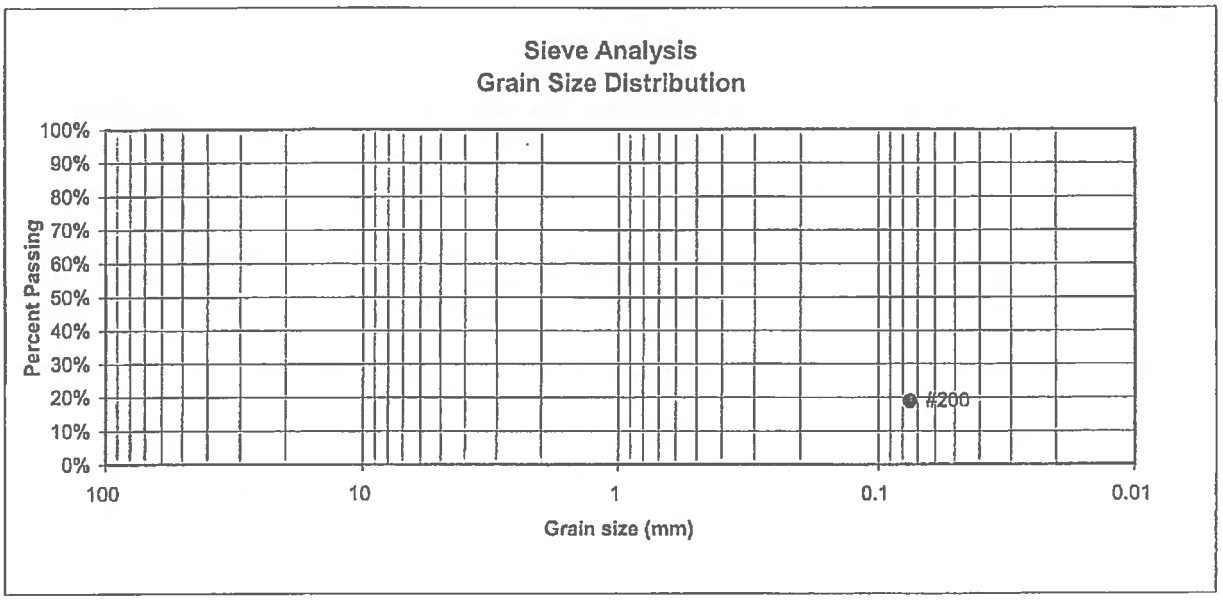
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		dc	7/18/12

JOB NO.: 120675

FIG NO.: E-13

UNIFIED CLASSIFICATION	SM	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	1	PROJECT	FOUR WAY RANCH
TEST BORING #	305	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	18.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	11.1%
Moisture at finish	20.8%
Moisture increase	9.7%
Initial dry density (pcf)	102
Swell (psf)	290

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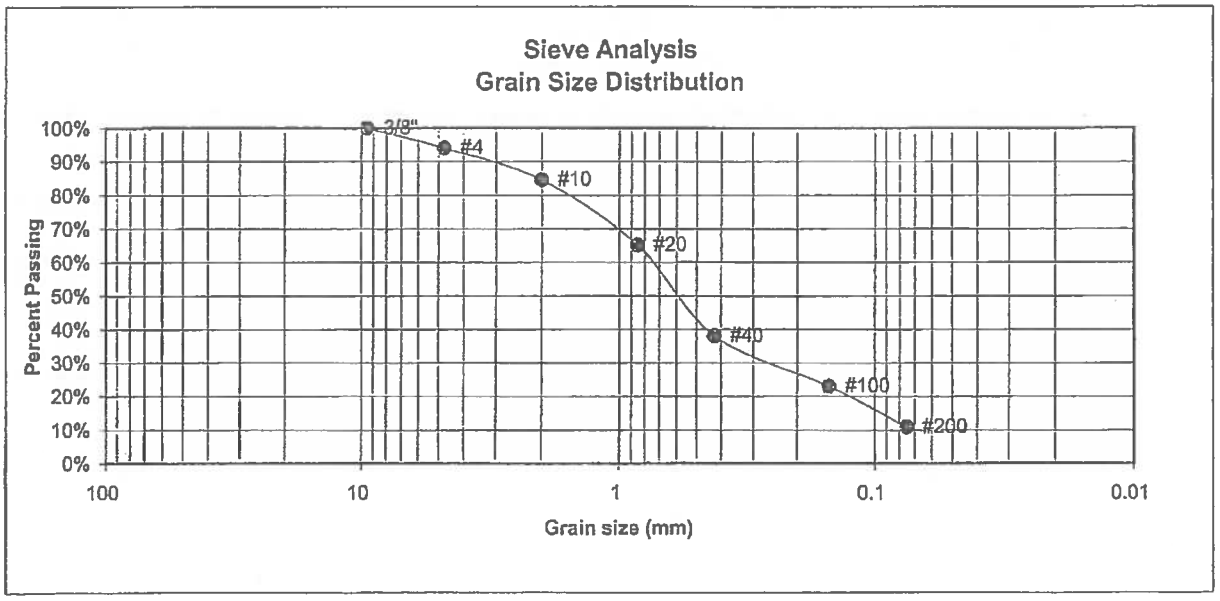
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-14

UNIFIED CLASSIFICATION	SM-SW	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	1	PROJECT	FOUR WAY RANCH
TEST BORING #	311	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	94.0%
10	84.6%
20	65.1%
40	38.0%
100	23.1%
200	10.9%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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COLORADO SPRINGS, COLORADO 80907

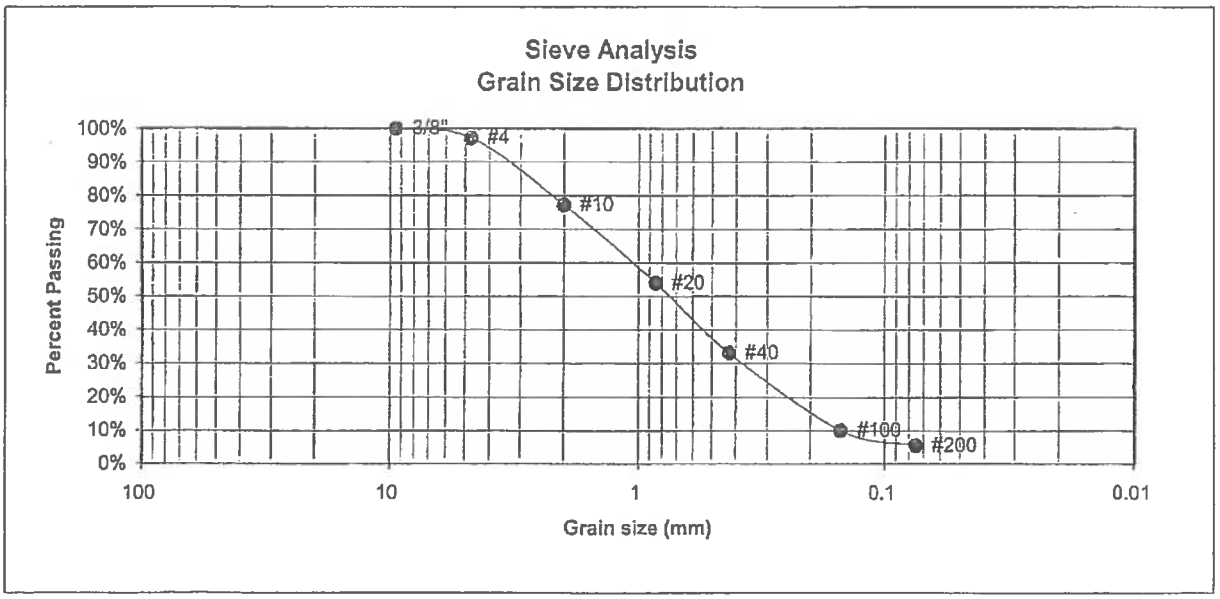
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-15

UNIFIED CLASSIFICATION	SM-SW	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	1	PROJECT	FOUR WAY RANCH
TEST BORING #	317	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.2%
10	77.2%
20	53.9%
40	33.1%
100	10.0%
200	5.6%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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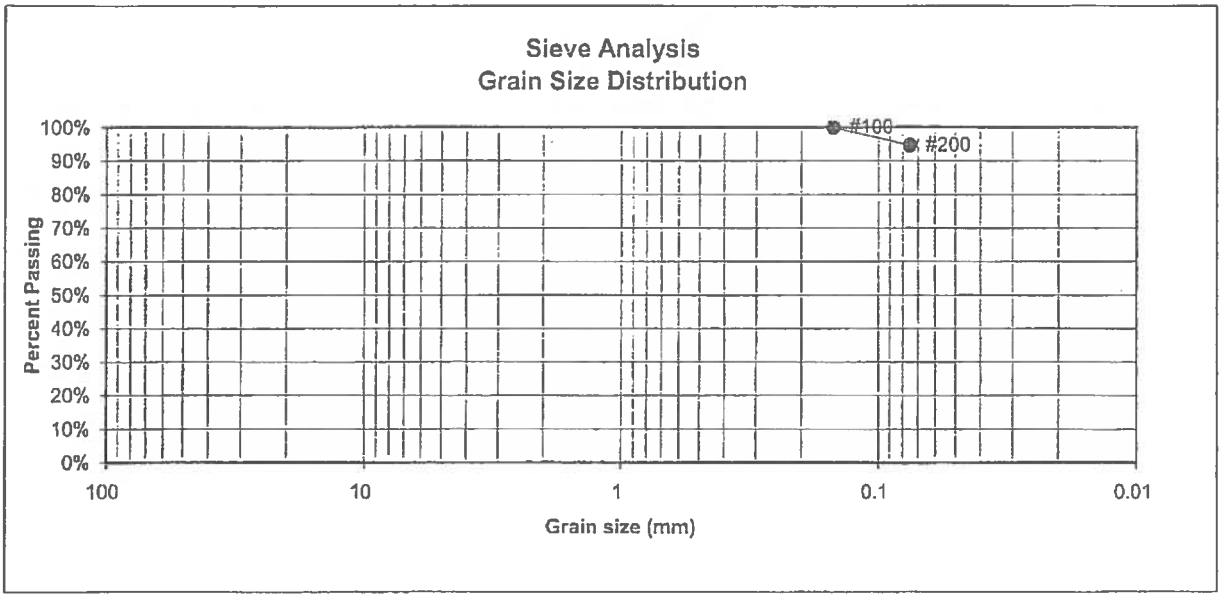
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		h	7/18/12

JOB NO.: 120675
FIG NO.: E-16

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	2	PROJECT	FOUR WAY RANCH
TEST BORING #	312	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	100.0%
200	94.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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COLORADO SPRINGS, COLORADO 80907

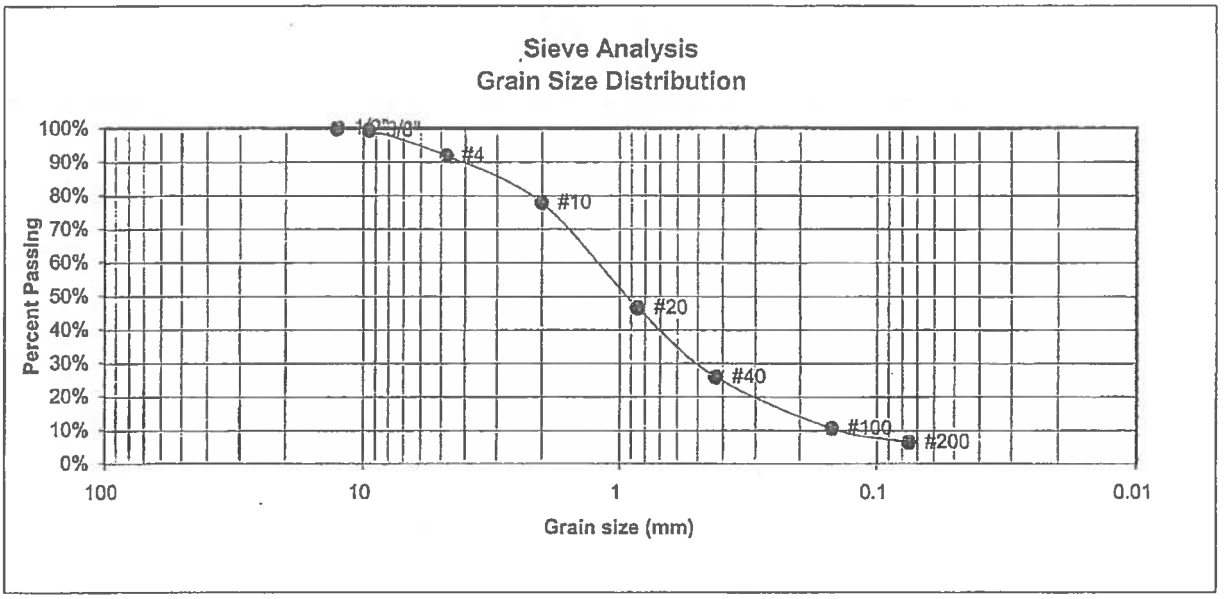
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-17

UNIFIED CLASSIFICATION	SM-SW	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	3	PROJECT	FOUR WAY RANCH
TEST BORING #	303	JOB NO.	120675
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	100.0%
3/8"	99.5%
4	92.0%
10	77.9%
20	46.5%
40	26.0%
100	10.7%
200	6.6%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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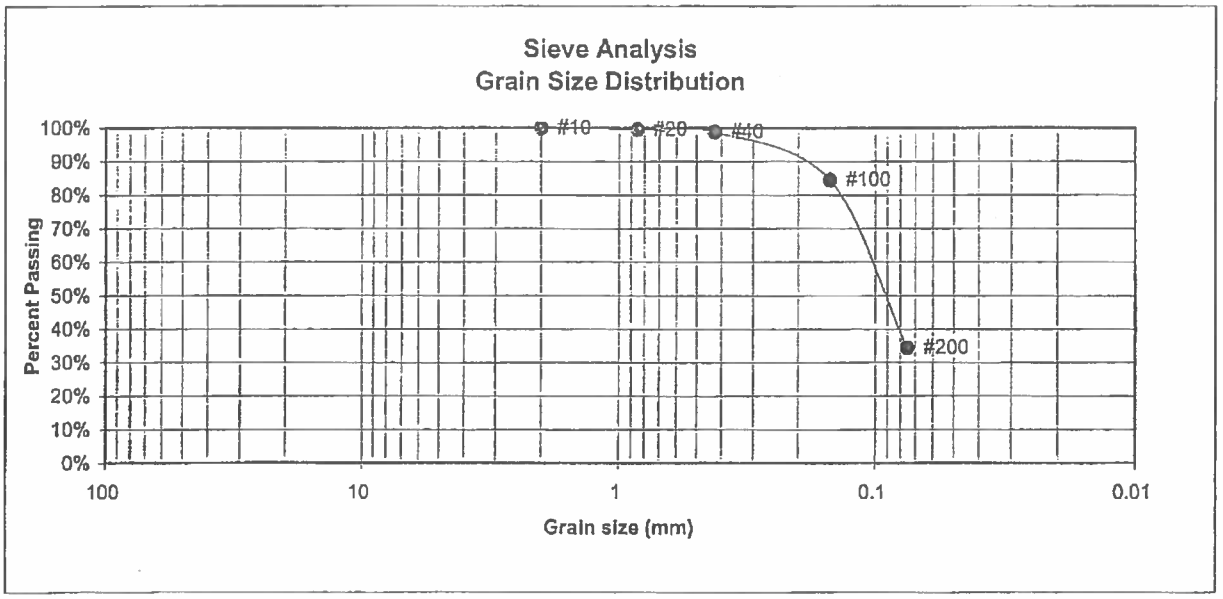
COLORADO SPRINGS, COLORADO 80907

LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-18

UNIFIED CLASSIFICATION	SM	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	3	PROJECT	FOUR WAY RANCH
TEST BORING #	307	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	100.0%
20	99.5%
40	98.8%
100	84.4%
200	34.4%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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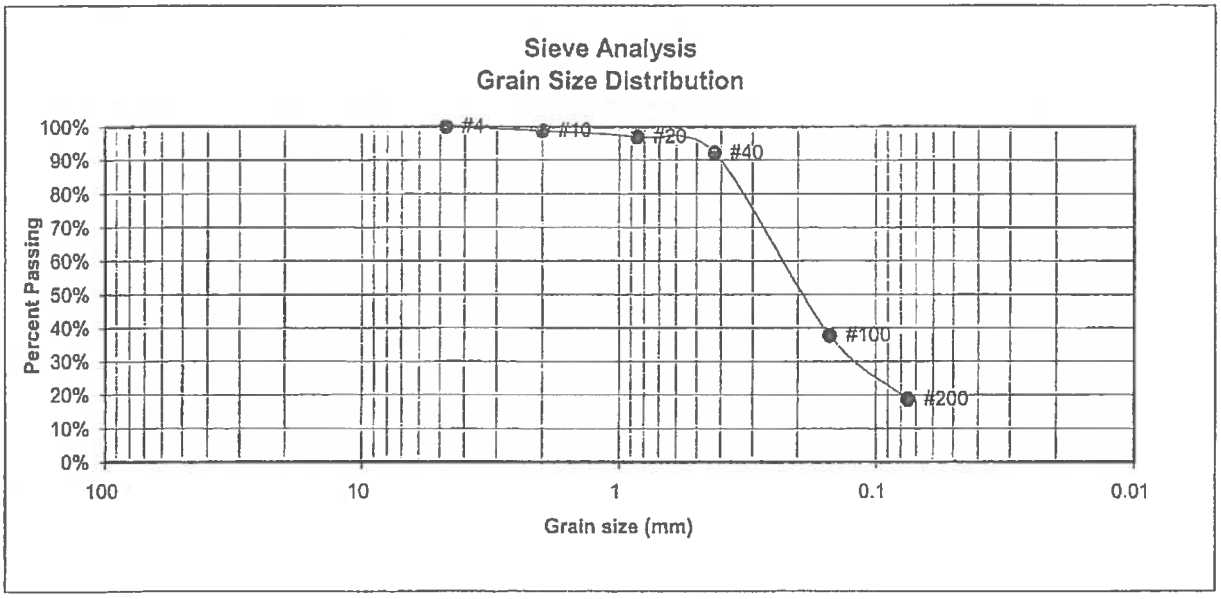
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
		LL	7/18/12

JOB NO.: 120675
FIG NO.: E-19

UNIFIED CLASSIFICATION	SM	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	3	PROJECT	FOUR WAY RANCH
TEST BORING #	308	JOB NO.	120675
DEPTH (FT)	5	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.8%
20	97.0%
40	92.1%
100	37.8%
200	18.7%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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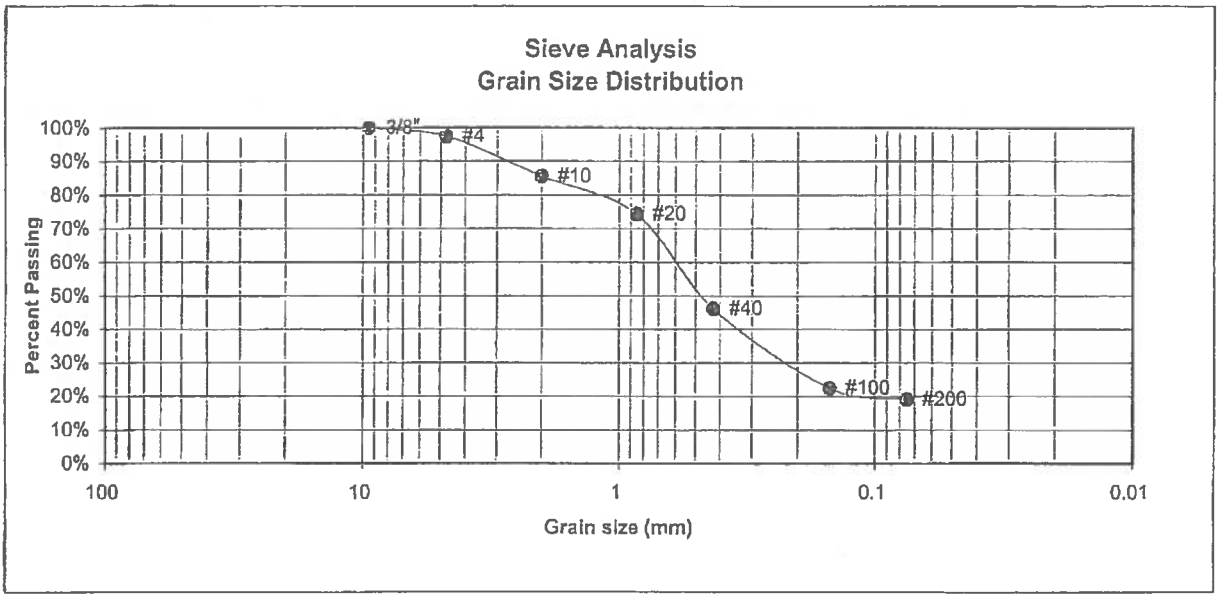
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-20

UNIFIED CLASSIFICATION	SM	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	3	PROJECT	FOUR WAY RANCH
TEST BORING #	312	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	97.4%
10	85.6%
20	74.3%
40	46.1%
100	22.5%
200	19.1%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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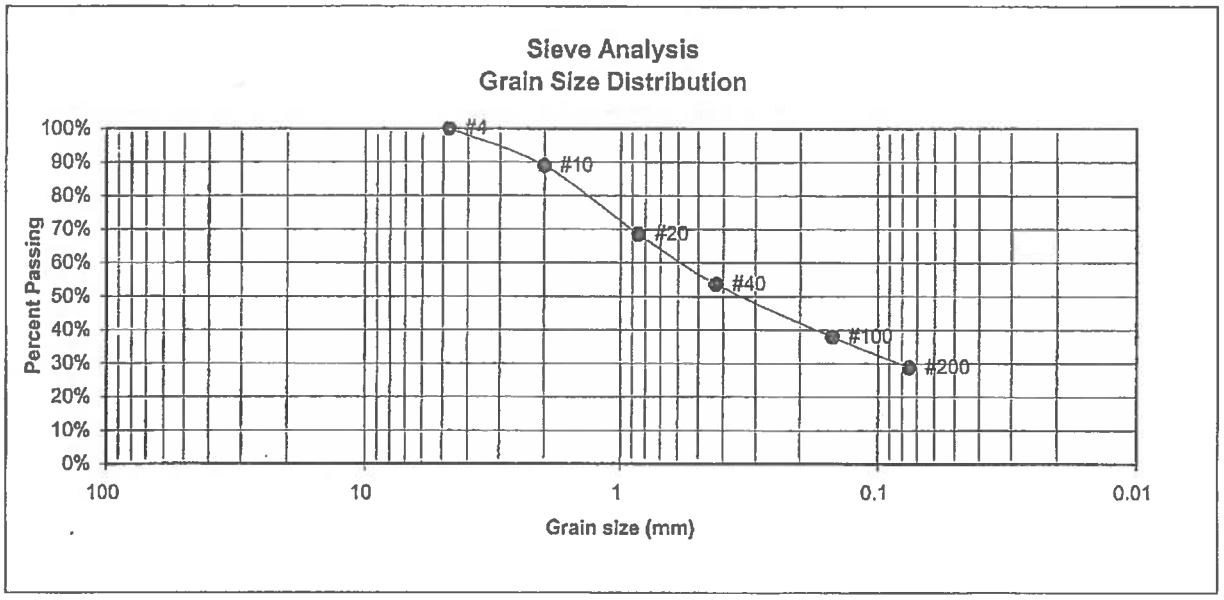
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-21

UNIFIED CLASSIFICATION	SM	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	3	PROJECT	FOUR WAY RANCH
TEST BORING #	318	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	89.0%
20	68.6%
40	53.6%
100	38.0%
200	28.9%

Atterberg Limits	
Plastic Limit	NP
Liquid Limit	NV
Plastic Index	NP

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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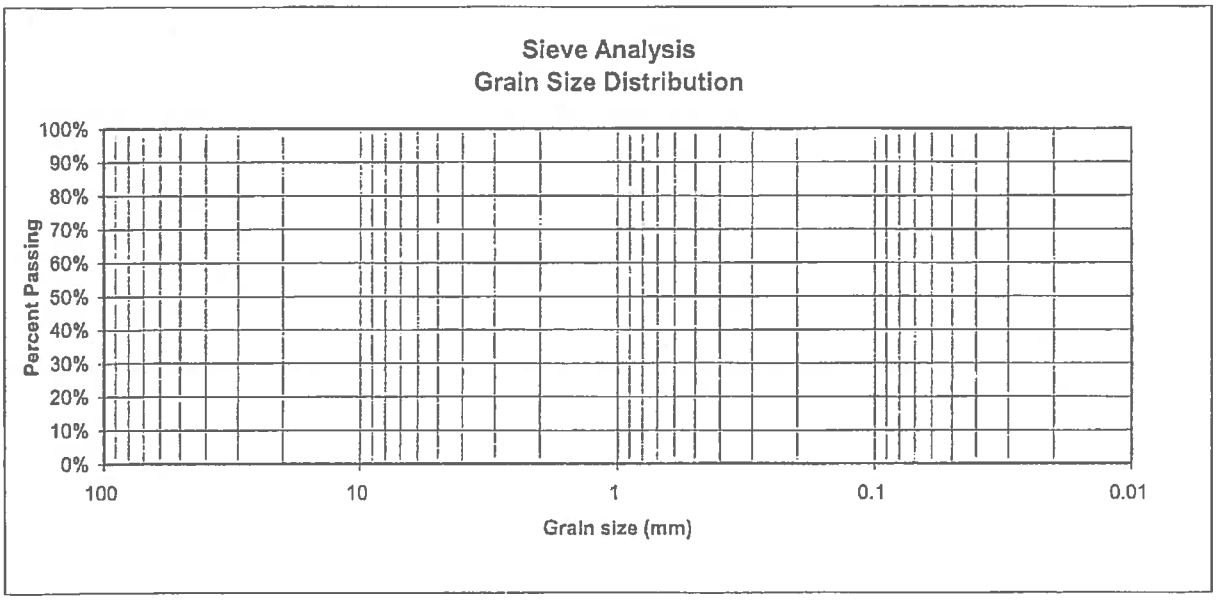
JOB NO.: 120675
FIG NO.: E-22

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	4	PROJECT	FOUR WAY RANCH
TEST BORING #	302	JOB NO.	120675
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	
10	
20	
40	
100	
200	

Atterberg Limits	
Plastic Limit	25
Liquid Limit	40
Plastic Index	15

Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

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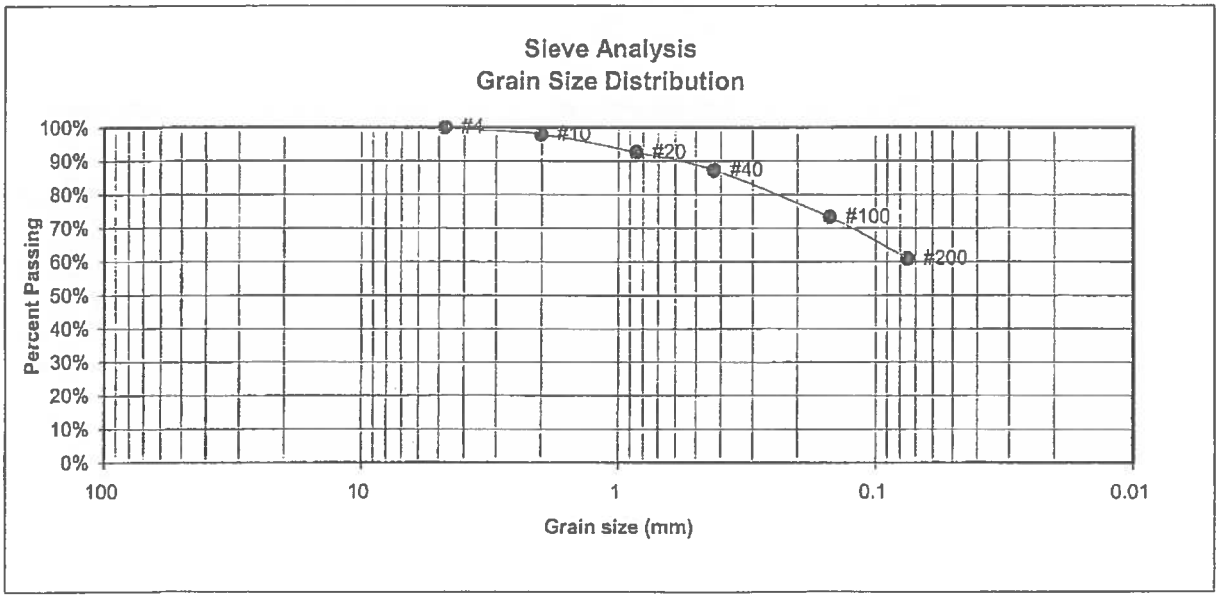
JOB NO.: 120675
FIG NO.: E-23

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	4	PROJECT	FOUR WAY RANCH
TEST BORING #	308	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	98.0%
20	92.6%
40	87.3%
100	73.3%
200	61.0%

Atterberg Limits
Plastic Limit
Liquid Limit
Plastic Index
Swell
Moisture at start
Moisture at finish
Moisture increase
Initial dry density (pcf)
Swell (psf)

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LABORATORY TEST RESULTS

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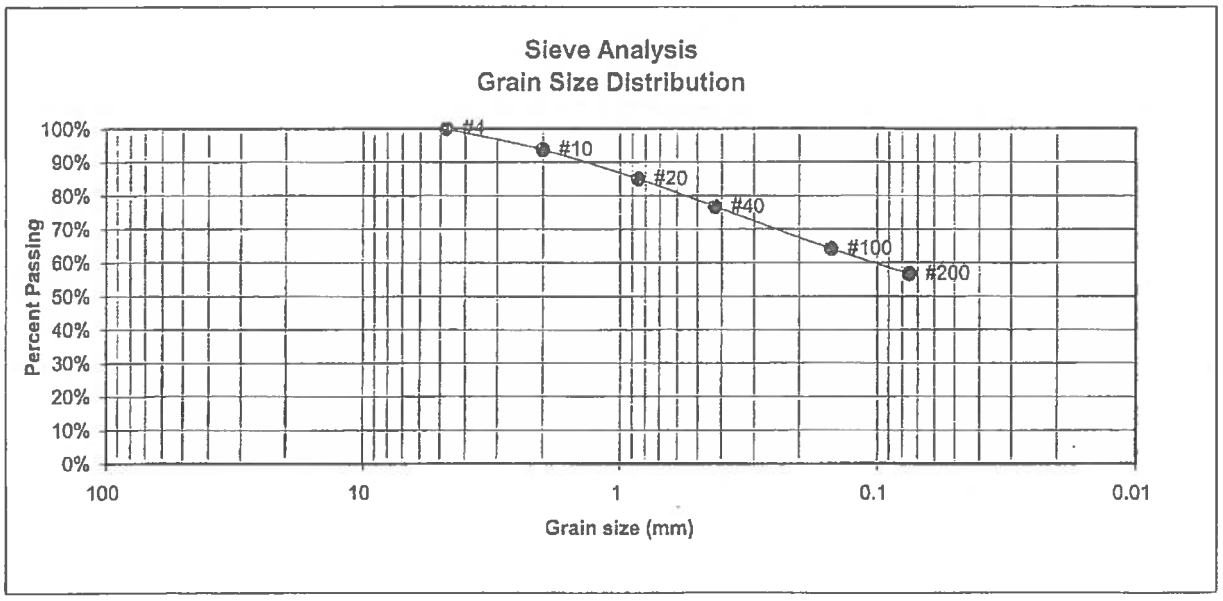
JOB NO.: 120675
FIG NO.: E-24

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	4	PROJECT	FOUR WAY RANCH
TEST BORING #	314	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	93.6%
20	85.0%
40	76.6%
100	64.2%
200	56.6%

Atterberg Limits	
Plastic Limit	18
Liquid Limit	35
Plastic Index	17

Swell	
Moisture at start	12.5%
Moisture at finish	20.1%
Moisture increase	7.6%
Initial dry density (pcf)	105
Swell (psf)	1360

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LABORATORY TEST RESULTS

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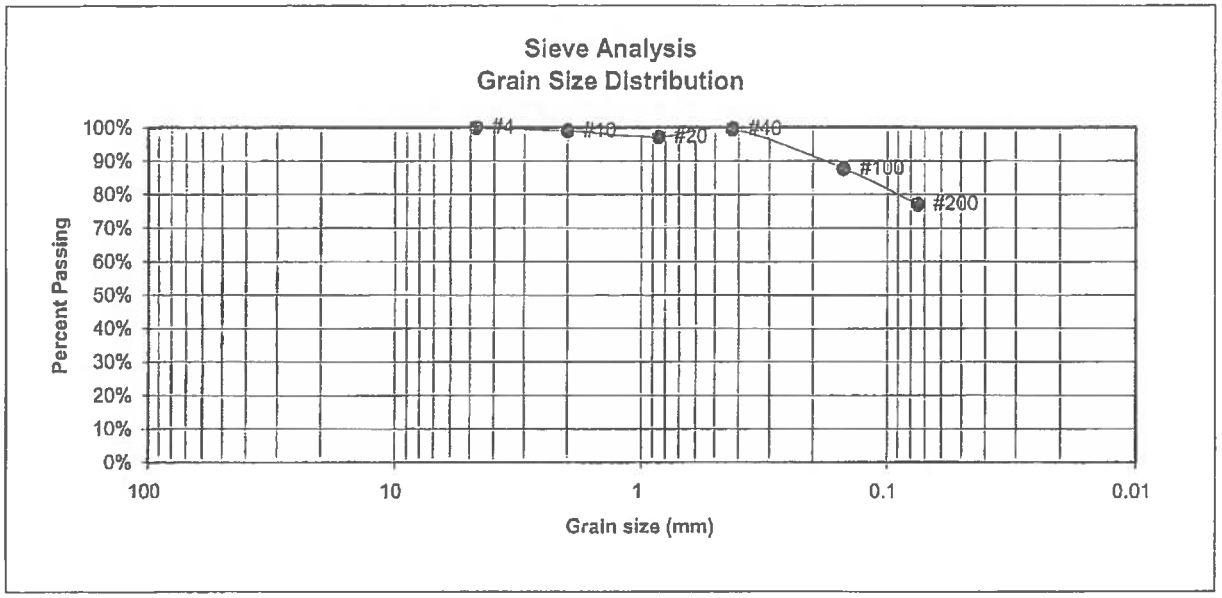
JOB NO.: 120675
FIG NO.: 6-25

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	4	PROJECT	FOUR WAY RANCH
TEST BORING #	315	JOB NO.	120675
DEPTH (FT)	10	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	
4	100.0%
10	99.0%
20	97.3%
40	99.5%
100	87.7%
200	77.1%

Atterberg Limits

Plastic Limit

Liquid Limit

Plastic Index

Swell

Moisture at start

Moisture at finish

Moisture increase

Initial dry density (pcf)

Swell (psf)

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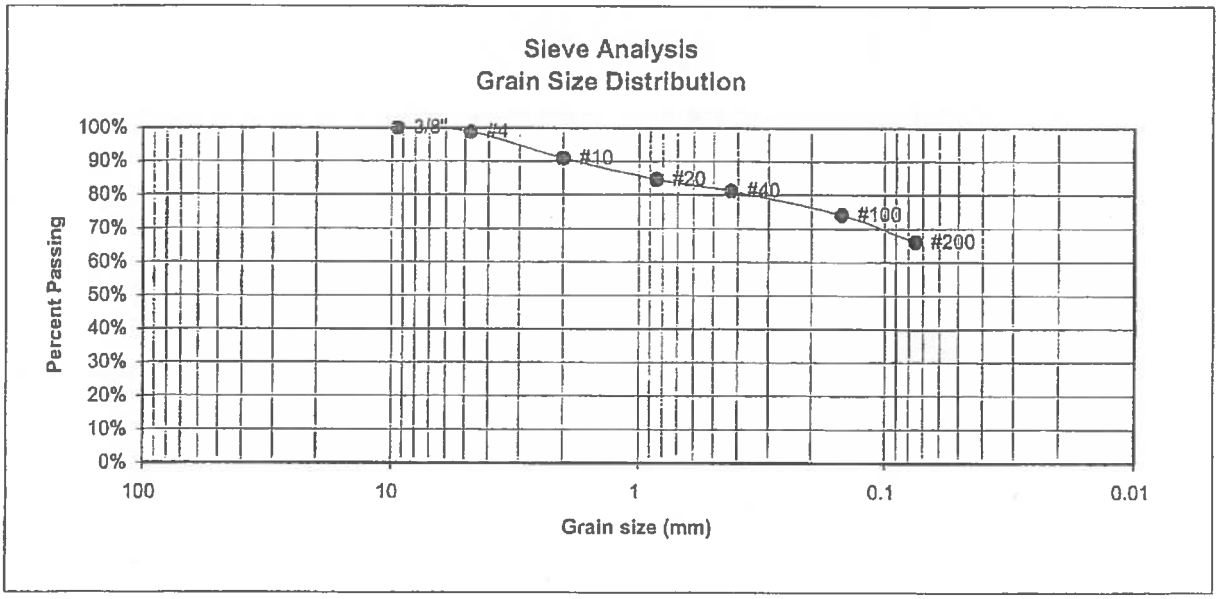
LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675

FIG NO.: E-26

UNIFIED CLASSIFICATION	CL	CLIENT	4 WAY JOINT VENTURE
SOIL TYPE #	4	PROJECT	FOUR WAY RANCH
TEST BORING #	316	JOB NO.	120675
DEPTH (FT)	15	TEST BY	BL



U.S. Sieve #	Percent Finer
3"	
1 1/2"	
3/4"	
1/2"	
3/8"	100.0%
4	98.8%
10	90.9%
20	84.6%
40	81.2%
100	74.1%
200	66.0%

Atterberg Limits	
Plastic Limit	
Liquid Limit	
Plastic Index	
Swell	
Moisture at start	
Moisture at finish	
Moisture increase	
Initial dry density (pcf)	
Swell (psf)	

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LABORATORY TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
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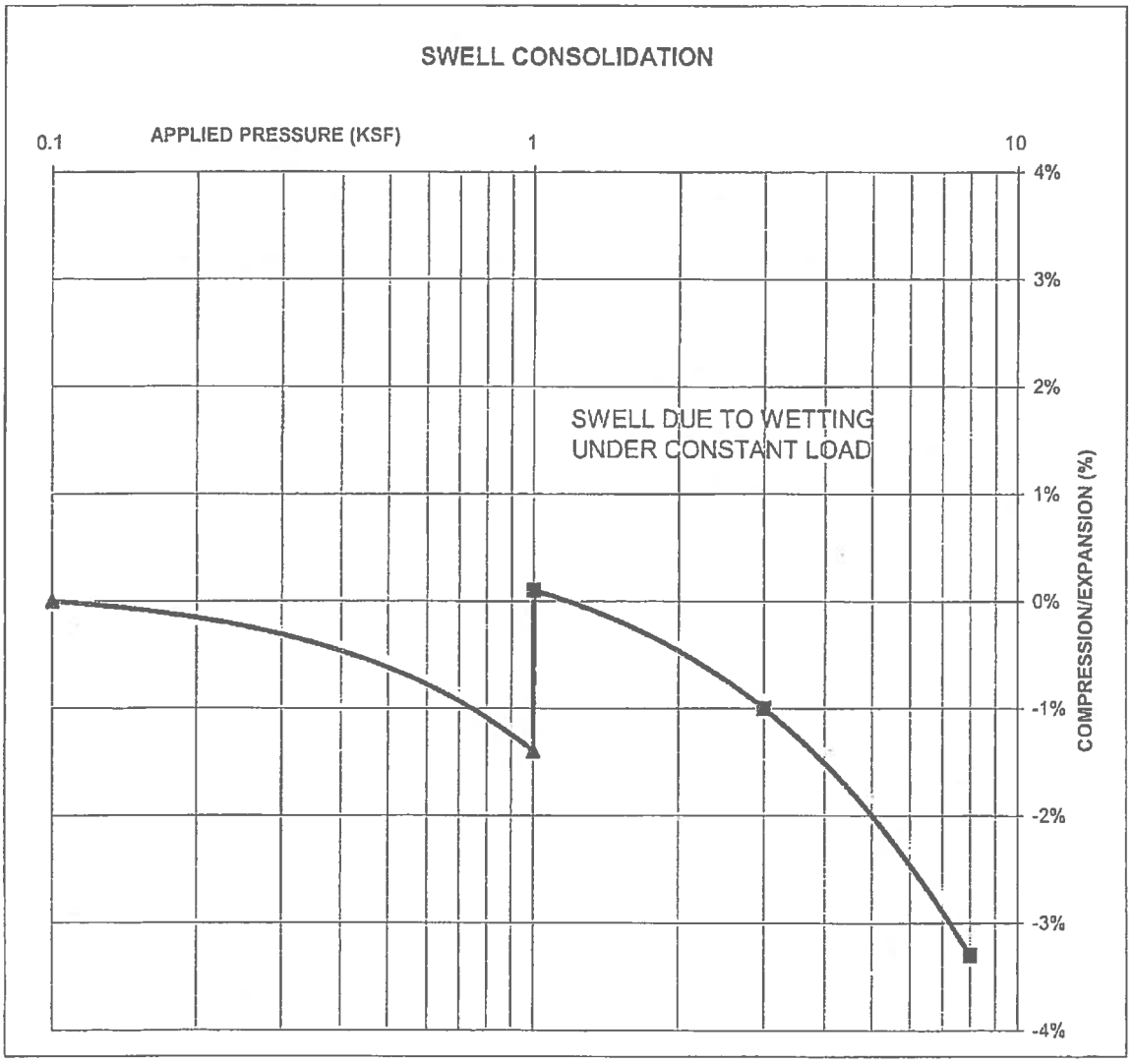
JOB NO.: 120675
FIG NO.: E-27

CONSOLIDATION TEST RESULTS

TEST BORING #	312	DEPTH(ft)	5
DESCRIPTION	CL	SOIL TYPE	2
NATURAL UNIT DRY WEIGHT (PCF)			108
NATURAL MOISTURE CONTENT			16.4%
SWELL/CONSOLIDATION (%)			1.5%

JOB NO. 120675
CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH



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SWELL CONSOLIDATION
TEST RESULTS

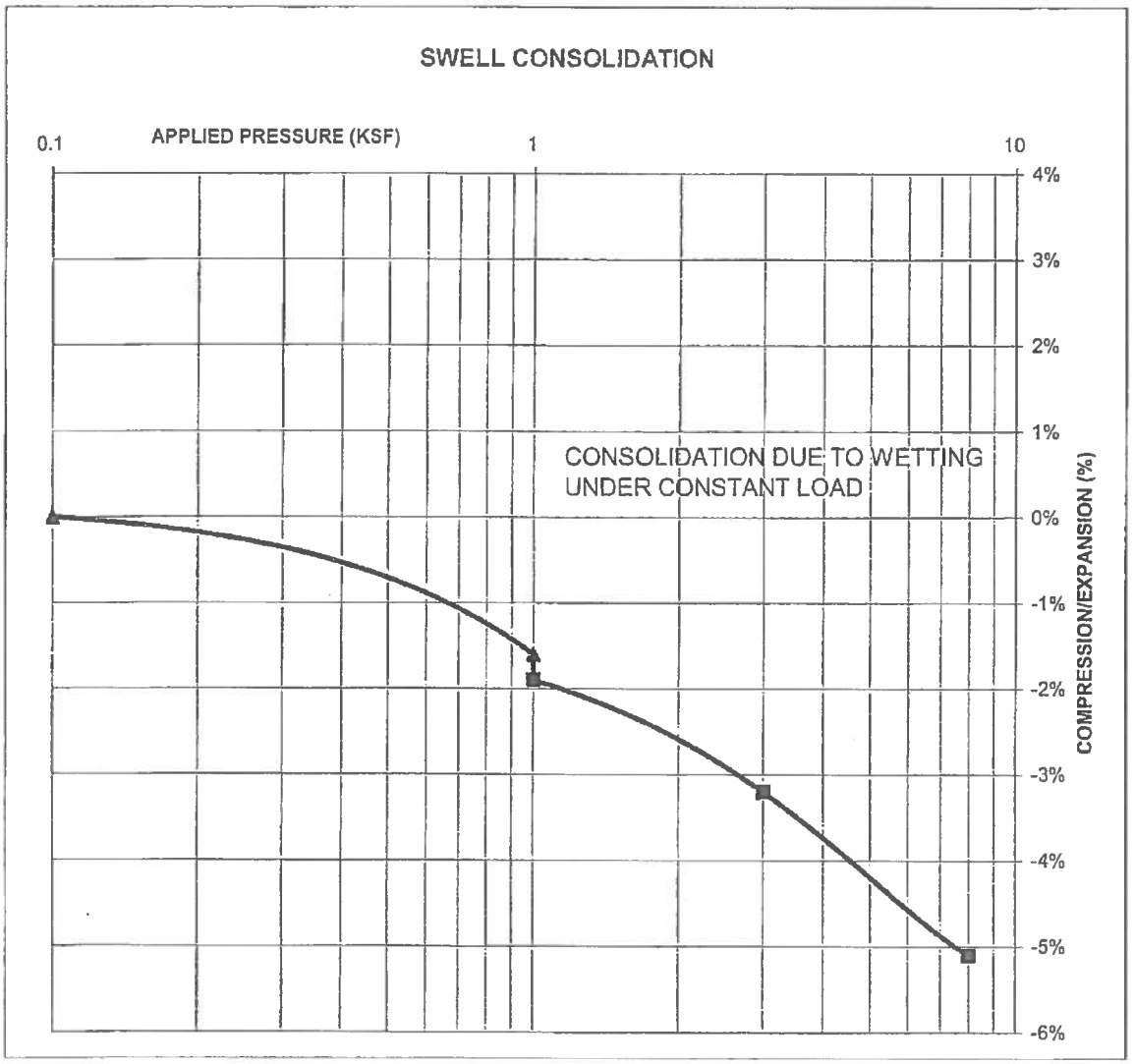
DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-28

CONSOLIDATION TEST RESULTS

TEST BORING #	318	DEPTH(ft)	10
DESCRIPTION	SM	SOIL TYPE	3
NATURAL UNIT DRY WEIGHT (PCF)			119
NATURAL MOISTURE CONTENT			12.8%
SWELL/CONSOLIDATION (%)			-0.3%

JOB NO. 120675
CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH



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SWELL CONSOLIDATION
TEST RESULTS

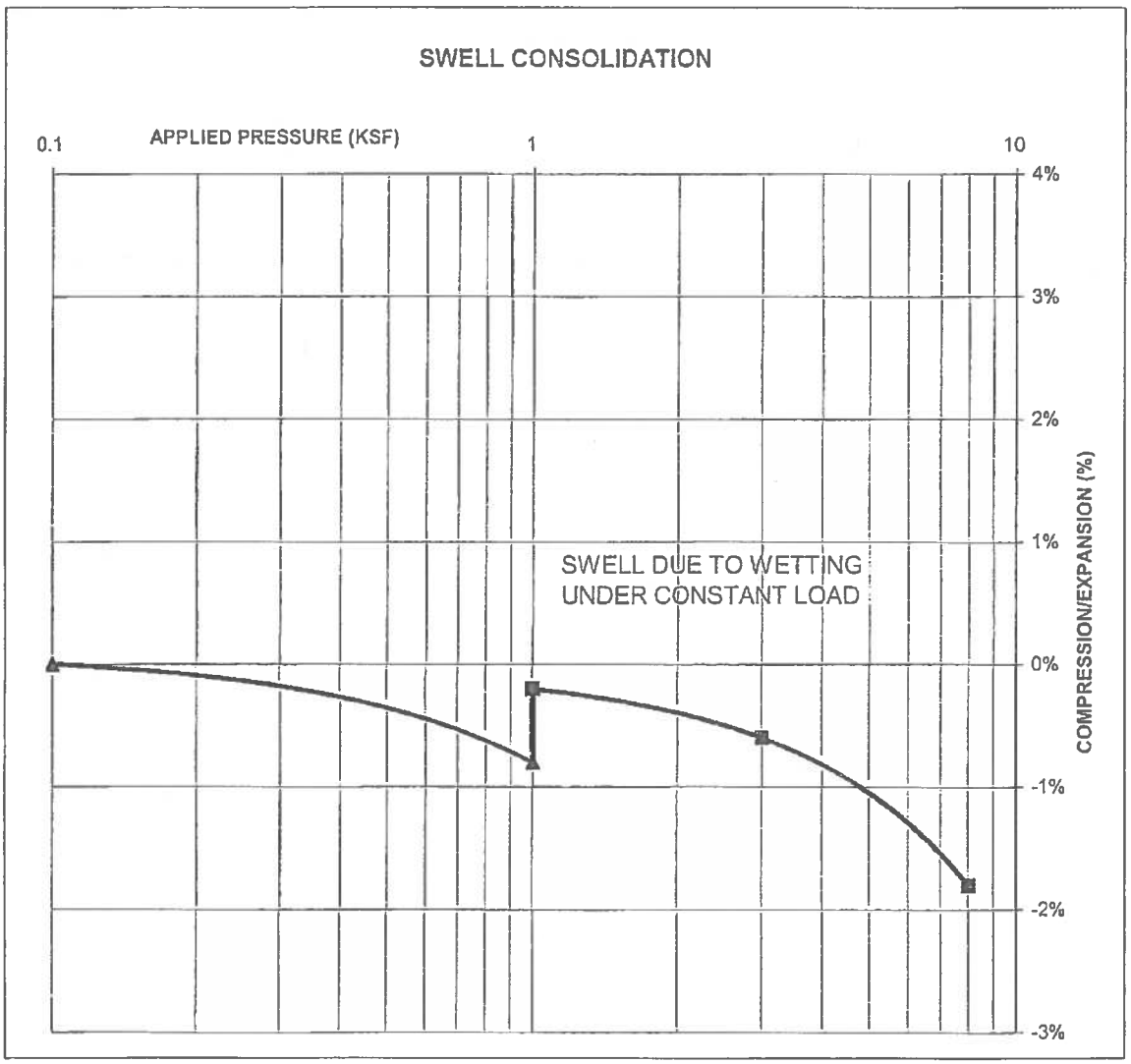
DRAWN:	DATE:	CHECKED:	DATE:
		DL	7/18/12

JOB NO.: 120675
FIG NO.: E-29

CONSOLIDATION TEST RESULTS

TEST BORING #	308	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			116
NATURAL MOISTURE CONTENT			16.4%
SWELL/CONSOLIDATION (%)			0.6%

JOB NO. 120675
CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH



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SWELL CONSOLIDATION
TEST RESULTS

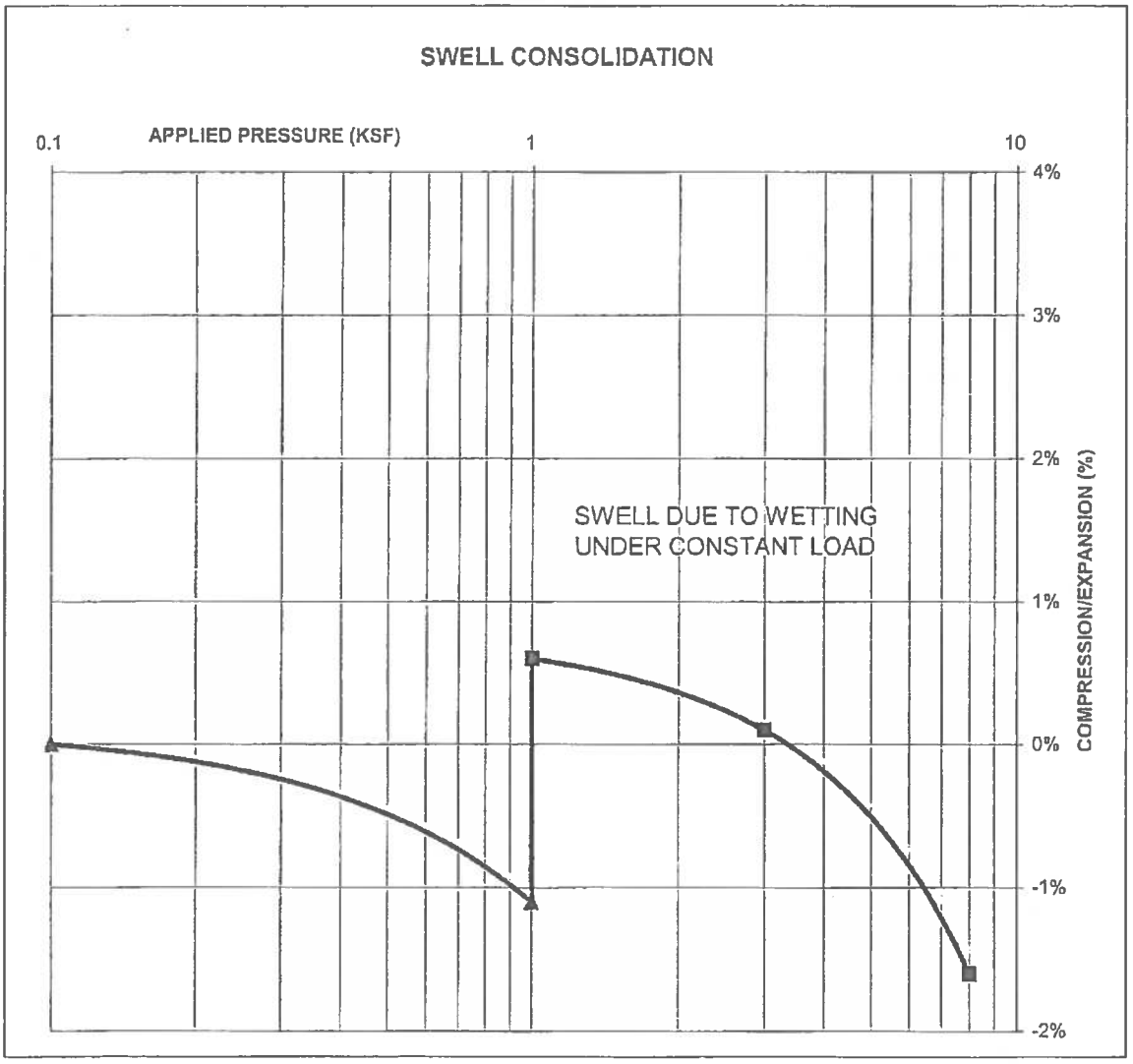
DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-30

CONSOLIDATION TEST RESULTS

TEST BORING #	315	DEPTH(ft)	10
DESCRIPTION	CL	SOIL TYPE	4
NATURAL UNIT DRY WEIGHT (PCF)			117
NATURAL MOISTURE CONTENT			15.8%
SWELL/CONSOLIDATION (%)			1.7%

JOB NO. 120675
CLIENT 4 WAY JOINT VENTURE
PROJECT FOUR WAY RANCH



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SWELL CONSOLIDATION
TEST RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-31

CLIENT	4 WAY JOINT VENTURE	JOB NO.	120675
PROJECT	FOUR WAY RANCH	DATE	7/10/2012
LOCATION	FOUR WAY RANCH	TEST BY	BL

BORING NUMBER	DEPTH, (ft)	SOIL TYPE NUMBER	UNIFIED CLASSIFICATION	WATER SOLUBLE SULFATE, (wt%)
TB-301	2-3	1	SM-SW	0.01
TB-302	15	4	CL	0.02
TB-307	5	2	CL	0.00
TB-318	10	3	SM	0.00

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LABORATORY TEST
SULFATE RESULTS

DRAWN:	DATE:	CHECKED:	DATE:
			7/18/12

JOB NO.: 120675
FIG NO.: E-32