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July 29, 2016

Northwest Plateau Development, Inc.
667 24 1/2 Road
Grand Junction, CO 81505

Re: Subsurface Soils Exploration (Report Updated by Review)
Adobe View North Subdivision
Fruita, CO

Gentlemen:

Transmitted herein are the results of a Subsurface Soils Exploration for the proposed 34 lot residential subdivision, to be known as Adobe View North, in Fruita, CO. This report also contains specifications and recommendations for backfilling the Raley Drain.

This report was originally prepared and published in 2007. An intensive review was accomplished in July, 2016 and determined that no technical changes were required. The only changes in this report are in the final format.

It is believed that all pertinent points have been addressed. If you have any questions after reviewing this report, please feel free to contact this office at any time. This opportunity to provide geotechnical engineering services is sincerely appreciated.

Respectfully submitted,

GRAND JUNCTION
LINCOLN DeVORE, INC.

Reviewed By:
Edward M. Morris, P.E.
Principal Engineer

GJLD Job No. 92793-GJ

EMM/em

SUBSURFACE SOILS EXPLORATION

ADOBE VIEW NORTH SUBDIVISION

FRUITA, CO

(Report Updated by Review)

Prepared For:

NORTHWEST PLATEAU DEVELOPMENT, INC.
667 24 1/2 ROAD
GRAND JUNCTION, CO 81505

Prepared By:

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1441 Motor Street
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July 29, 2016 (Report Updated by Review)

TABLE OF CONTENTS

INTRODUCTION

PROJECT DESCRIPTION

This report presents the results of our geotechnical evaluation performed to determine the general subsurface conditions of the site applicable to construction of a 34 lot residential subdivision (information current 2007), to be known as Adobe View North, in Fruita, CO. A vicinity map is included in the Appendix of this report.

To assist in our exploration, we were provided with a Sketch Plan prepared by Rolland Engineering, Grand Junction, CO, Project #5068, dated December 29, 2006. The Boring Location Plan attached to this report is based on that plan provided to us.

We understand that the proposed residential structures will probably consist of one and possibly two story, normally wood-framed structures with either slab on grade or crawlspace type construction. There is a possibility that half basement type construction may be constructed, assuming that adequate protection from the high water table is accomplished. Grand Junction Lincoln DeVore has not seen a full set of building plans, but structures of this type in the Fruita area typically develop wall loads on the order of 600 to 2,500 plf and column loads on the order of 5 to 20 kips.

The characteristics of the subsurface materials encountered were evaluated with regard to the type of construction described above. Recommendations are included herein to match the described construction to the soil characteristics found. The information contained herein may or may not be valid for other purposes. If the proposed site use or type of construction proposed is changed to other than what is noted herein, Grand Junction Lincoln DeVore should be contacted to determine if the information in this report can be used for the new construction without further field evaluations.

PROJECT SCOPE

The purpose of our exploration was to evaluate the surface and subsurface soil and geologic conditions of the site, and based on the conditions encountered, to provide recommendations pertaining to the geotechnical aspects of the site development as previously described. The conclusions and recommendations included herein are based on an analysis of the data obtained from our field explorations, laboratory testing program, and on our experience with similar soil and geologic conditions in the area.

This report provides site-specific information for the construction of a 34 lot single family residential subdivision. Included in this report are recommendations regarding general site development and foundation design criteria.

Specifically, the intent of this study is to:

1. Explore the subsurface conditions to the depth expected to be influenced by the proposed construction.
2. Evaluate by laboratory and field tests the general engineering properties of the various strata which could influence the development.

3. Define the general geology of the site including likely geologic hazards which could have an effect on site development.

4. Develop geotechnical criteria for site grading and earthwork.

5. Identify potential construction difficulties and provide recommendations concerning these prob-lems.

6. Recommend an appropriate foundation system for the anticipated structure and develop criteria for foundation design.

FIELD EXPLORATION AND LABORATORY TESTING

A field evaluation was performed on January 4, 2007 and consisted of a site reconnaissance by our geotechnical personnel and the drilling of three shallow exploration borings. These three exploration borings were drilled within the proposed building areas near the locations indicated on the Boring Location Plan. The exploration borings were located to obtain a reasonably good profile of the subsurface soil conditions. All exploration borings were drilled using a CME 45-B truck-mounted drill rig with continuous flight auger to depths of approximately 14 to 15 feet. Samples were taken with a standard split-spoon sampler, thin-walled shelby tubes, and by bulk methods. Logs describing the subsurface conditions are presented in the attached figures.

The following field sampling and testing were performed:

ASTM D-1586 Standard Penetration Testing (SPT) 1-5/8" id, unlined Split-Spoon
ASTM D-1587 Thin-Walled Shelby Tube 2-1/2" id, Shelby Tube

The following laboratory tests were performed on representative soil samples to determine their relative engineering properties:

ASTM D-2487 Soil Classification
ASTM D-2435 One Dimensional Consolidation
ASTM D-2937 In-Place Soil Density
ASTM D-2216 Moisture Content of Soil
ASTM D-2844 R-Value of Soils (Hveem-Carmany)

Tests were performed in accordance with test methods of the American Society for Testing and Materials or other accepted standards. The results of our laboratory tests are included in this report. The in-place soil density, moisture content, and the standard penetration test values are presented on the attached drilling logs.

FINDINGS

SITE DESCRIPTION

The project site is located in the Southeast Quarter of the Northeast Quarter of Section 20, Township 1N, Range 2W of the Ute Principal Meridian, in Mesa County, Colorado. More specifically, the site is located immediately north of the existing Adobe View Subdivision and is bordered on the east by Pine Street (18 Road) and on the west by the Murray Drain. The Raley Drain is in the southern portion of the tract and will be piped and backfilled with a controlled earth fill. The site contains approximately 12.05 acres.

The topography of the site is relatively flat, being located on the margins of the alluvial plain of the Colorado River and at the southern margin of ancient debris fan deposits, probably a combination of the Little Salt Wash and the Adobe Creek Drainage Features. The ground surface in the vicinity of the site has an overall gradient to the southwest. The exact direction of surface runoff on this site will be controlled to an extent by the proposed new construction and will be variable. Surface and subsurface drainage on this site can be described as poor.

GENERAL GEOLOGY AND SUBSURFACE DESCRIPTION

The geologic materials encountered under the site consist of about 25 to 26 feet of fine-grained alluvial soils, which have been deposited on the coarse-grained sandy gravel and cobble alluvium of the Ancient Colorado River Terrace Deposit. To aid in interpretation of the subsurface profile, previous Boring No's. 1 and 3 from our report of Subsurface Soils Exploration, Adobe View Subdivision, Job #90003-GJ, dated March 6, 2003 have been included in the figures of this report. The geologic and engineering properties of the materials found in our three recent exploration borings will be discussed in the following sections.

The surface soils on this site consist of a series of silty sand, sandy silt, and sandy clay soils, which are a product of mud flow/debris flow features originating on the south-facing slopes of the Bookcliffs. These mud flow/debris flow features are a small part of a very extensive mud flow/debris flow complex located along the base of the Bookcliffs and extending to the Colorado River. Utilizing recent events and standard evaluation techniques, this tract is not considered to be within an active debris flow hazard area.

The surface soils are an erosional product of the upper Mancos Shale and the Mount Garfield Formations, which are exposed on the slopes of the Bookcliffs. The soils contained within these mud flow/debris flow features normally exhibit a metastable condition that can range from very slight to severe. Metastable soil is subject to internal collapse and is very sensitive to changes in the soil moisture content. Based on the field and laboratory testing of the soils on this site, the severity of the metastable soils can be described as slight.

The fine-grained soils encountered on this site consist of silty sands and sandy silts, which are very similar to deposits of the Little Salt Wash, and lean clays and silty clays, which are typical of the Adobe Creek Alluvial Feature.

Soil Type No. I was classified as a Poorly Graded Silty Sand (SP-SM) under the Unified Classification System. Standard penetration tests ranged from 4 blows per foot to 5 blows per foot. Penetration tests of this magnitude indicate that the soil is fairly soft and of low density. The moisture content above the water table ranged from

17.2% to 23.4%, indicating a wet to essentially saturated soil. This material is non-plastic, with occasional low plastic, clayey strata of moderate to moderately high permeability, and was encountered in a low density condition. This material will consolidate upon saturation or excessive loading. One dimensional consolidation tests using the consolidation apparatus ASTM D-2435 were performed on relatively undisturbed samples of the soil. Upon test saturation, no collapse was measured, with 1.53% consolidation occurring at an applied load of 2,050 psf. Upon further test loading, 2.41% consolidation occurred at an applied load of 4,100 psf. If these soils are overexcavated, water-conditioned, and reworked according to recommendations contained in this report, this consolidation potential should be partially mitigated. The maximum allowable bearing capacity for this reworked soil in the upper 4 feet of the soil profile was found to be up to 1,200 psf, with 150 psf minimum dead load pressure recommended. These soils are very sensitive to equipment rolling and vibrations and usually exhibit a "pumping" or "quick" condition.

Soil Type No. II was classified as a Lean Clay with Sand (CL) under the Unified Classification System. Standard penetration tests ranged from 4 blows per foot to 5 blows per foot, indicating that the soil is soft and of low density. The moisture content above the water table ranged from 19.4% to 22.7%, indicating a wet soil. This material is of low to medium plasticity, of low to moderate permeability, and was encountered in a low density condition. If this soil is found in a relatively dry condition, it may undergo slight expansion with the entry of small amounts of moisture, but it will undergo collapse/long-term consolidation upon the addition of larger amounts of moisture. This material will consolidate upon saturation or excessive loading. One dimensional consolidation tests using the consolidation apparatus ASTM D-2435 were performed on relatively undisturbed samples of the soil. Upon test saturation, no collapse was measured, with 1.21% consolidation occurring at an applied load of 1,025 psf. Upon further test loading, 2.13% consolidation occurred at an applied load of 2,050 psf. If these soils in the upper 5 feet of the soil profile are overexcavated, water-conditioned, and reworked according to recommendations contained in this report, this consolidation potential should be partially mitigated. The maximum allowable bearing capacity for this reworked soil in the upper 5 feet of the soil profile was found to be 1,200 psf, with 200 psf minimum dead load pressure recommended. Due to the very wet conditions, these soils will exhibit rutting and pumping under traffic from construction equipment.

Soil Type No. III was classified as a Silty Clay (CL-ML) under the Unified Classification System. Standard penetration tests are on the order of 4 blows per foot. Penetration tests of this magnitude indicate that the soil is soft and of low density. The moisture content above the water table was found to be on the order of 30.4%, indicating a wet soil. This material is of low plasticity and of low permeability. If this soil is found in a relatively dry condition, it may undergo slight expansion with the entry of small amounts of moisture, but it will undergo collapse/long-term consolidation upon the addition of larger amounts of moisture. This material will consolidate upon saturation or excessive loading. If these soils within the upper 5 feet of the soil profile are overexcavated, water-conditioned, and reworked according to recommendations contained in this report, this consolidation potential should be partially mitigated. The maximum allowable bearing capacity for this reworked soil was found to be 1,000 psf, with 200 psf minimum dead load pressure recommended. Due to the very wet conditions, these soils will exhibit rutting and pumping under traffic from construction equipment.

GROUNDWATER

A free water table came to equilibrium during drilling at 6 to 8 feet below the present ground surface. This is

probably very close to the true phreatic surface rather than a perched water table. In our opinion, the subsurface water conditions shown are a permanent feature on this site. The depth to free water would be subject to fluctuation on this site, depending upon external environmental effects.

Because of capillary rise, the soil zone within a few feet above the free water level identified in the borings will be quite wet. Pumping and rutting may occur during the excavation process, particularly if the bottoms of the foundations are near the capillary fringe. Pumping is a temporary, quick condition caused by vibration of excavating equipment on the site. If pumping occurs, it can often be stopped by removal of the equipment and by exercising greater care in the excavation process. In other cases, geotextile fabric layers can be designed and/or cobble-sized material can be introduced into the bottom of the excavation and worked into the soft soils. Such a geotextile and/or cobble raft is designed to stabilize the bottom of the excavation and to provide a firm base for equipment.

Our experience in this area of Fruita indicates that the free water surface, after development of a residential subdivision on this tract and surrounding sites is completed, will possibly rise to a seasonally high level of 5 to 6 feet below the present ground surface. Due to the relatively high rise of groundwater, it is common in this area (and recommended) to minimize the depth of excavation for utilities, street improvements, and foundations. ***The use of basements is not recommended within this subdivision; however, half basement type construction may be feasible in portions of this subdivision.***

It must be noted that if the foundation subgrade soils are properly prepared, moist to very wet conditions at the foundation level should not adversely affect properly designed and constructed foundations. The possibility of very moist to even wet conditions in crawlspaces should be anticipated, and measures should be taken to prevent damage to residential structures. Such measures would include coverings of the soil in the crawlspace area (plastic membrane), additional venting of the crawlspace area to minimize moisture build-up in the wood framing and the living areas, and proper compaction of foundation subgrade soils and all backfills adjacent to building foundations, including utility trenches leading to the foundations. We strongly recommend that foundation insulation placed on concrete stemwalls **NOT** be extended to the crawlspace ground surface. The insulation should be placed 6 to 10 inches above the ground surface to minimize moisture "wicking" up the foundation concrete surface

Data presented in this report concerning groundwater levels are representative of those levels at the time of our field exploration. Groundwater levels are subject to change seasonally or by changed environmental conditions. Quantitative information concerning rates of flow into excavations or pumping capacities necessary to dewater excavations is not included and is beyond the scope of this report. If this information is desired, permeability and field pumping tests will be required.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL DISCUSSION

No geologic or geotechnical conditions were apparent during our reconnaissance that would preclude the site development as planned, provided that the recommendations contained herein are fully complied with. Based on

our investigation to date and the knowledge of the proposed construction, the site condition that would have the greatest effect on the planned development is the very soft soils associated with the high groundwater elevation.

Since the exact magnitude and nature of the foundation loads are not precisely known at the present time, the following recommendations must be somewhat general in nature. Any special loads or unusual design conditions should be reported to Grand Junction Lincoln DeVore so that changes in these recommendations may be made, if necessary. However, based upon our analysis of the soil conditions and project characteristics previously outlined, the following recommendations are made.

OPEN FOUNDATION OBSERVATION

Since the recommendations in this report are based on information obtained through random borings, it is possible that the subsurface materials between the boring points could vary. Therefore, prior to placing forms or pouring concrete, an open excavation observation should be performed by representatives of Grand Junction Lincoln DeVore. The purpose of this observation is to determine if the subsurface soils directly below the proposed foundations are similar to those encountered in our exploration borings. If the materials below the proposed foundations differ from those encountered, are unstable, or in our opinion, are not capable of supporting the applied loads, additional recommendations could be provided at that time.

EXCAVATION AND STRUCTURAL FILL

General: All earthwork and grading for this site development should be accomplished in accordance with the Project Earthwork and Grading Specifications and Chapter 18 of the IBC. The backfill of the Raley Drain is to be completed using these specifications.

Preconstruction Meeting: Prior to the start of any site grading or stripping, we recommend that a pre-grading meeting be arranged between Grand Junction Lincoln DeVore, the grading contractor, and the owner's representative. The purpose of this meeting is to discuss site preparation recommendations, grading specifications, equipment to be used, scheduling, and any unusual soil conditions or special requirements for this development. In addition, we recommend that Grand Junction Lincoln DeVore be provided with a final grading plan and a set of specifications at least 48 hours prior to our attending the pre-grade meeting.

Since no site grading plan was made available at the time of writing this report, the extent of site grading and the proposed footing elevations is not known. Therefore, these grading recommendations must be considered preliminary until Grand Junction Lincoln DeVore has had the opportunity to review the site grading plans.

Preparation of Areas to Receive Fill: Areas where excavation or fill is required shall be cleared of trees, stumps, roots, brush, sod, topsoil, vegetation and other objectionable materials to minimum depth of 6 inches, or sufficient to remove all detrimentally organic material. The cleared materials shall be legally disposed of or, if appropriate, stockpiled for later use in non-structural areas or landscaping.

It is recommended that the exposed native soil be scarified to a depth of 12 inches, brought to near optimum

moisture conditions, and recompacted to a minimum of 90% of maximum dry density as determined by ASTM D-1557.

Prior to placing fill, the exposed ground should be observed by representatives of Grand Junction Lincoln DeVore to determine that all deleterious material, man-made fill, and soft areas have been adequately removed. The removed material may then be replaced with uniformly compacted lifts of structural fill until the desired slab or footing elevation is achieved. We recommend that the structural fill be placed within 2% of the optimum moisture content of the material and compacted to a minimum of 90% of its maximum dry density (ASTM D-1557).

Any abandoned, buried structures encountered during grading operations shall be totally removed or otherwise rendered harmless for the proposed purposes of the fill unless other specific recommendations have been provided. All underground utilities to be abandoned beneath any proposed structure shall be removed from within 10 feet of any structures and properly capped. The resulting depressions from the above-described procedures shall be backfilled with soil uniformly compacted in accordance with the recommendations in the body of this report. This includes, but is not limited to, septic tanks, fuel tanks, sewer lines or leach lines, storm drains, and water lines. Any buried structures or utilities not to be abandoned shall be investigated by the geotechnical engineer to determine if any special recommendation will be necessary.

All water wells that will be abandoned shall be backfilled and capped in accordance with the requirements of the Health Department. The top of the cap should be at least 4 feet below finished grade, or 3 feet below the bottom of footing, whichever is greater. The type of cap will depend on the diameter of the well and shall be determined by the geotechnical engineer and/or a qualified structural engineer

Fill Material: Materials placed in the fill shall be approved by the geotechnical engineer and shall be free of vegetable matter, frozen material, and other deleterious substances. No material over 6 inches in maximum dimension shall be placed in fill unless special recommendations are provided by the geotechnical engineer. Granular soil shall contain sufficient fine material to fill enough voids to provide a stable fill. The definition and disposition of oversized rocks, and expansive and/or detrimental soils are given in the site soils report. Expansive soils, soils of poor gradation, or soils with low strength characteristics may be thoroughly mixed with other soils only if specific recommendations have been provided by the geotechnical engineer. Any import material shall be approved by the geotechnical engineer before being brought to the site.

Placing and Compacting Fill: After clearing or benching, the natural ground in areas to be filled shall be observed by the geotechnical engineer to determine the presence of any adverse unanticipated conditions. The area shall then be scarified to a depth of 12 inches, cleared of oversized material, brought to the proper moisture content, compacted, and tested.

The distribution of the material in the fill shall be such as to avoid the formation of lenses, or layers of material differing substantially in characteristics from the surrounding material. The materials shall be delivered to the fill surface at a uniform rate and in such quantity as to permit a satisfactory construction procedure.

Unnecessary concentration of travel, tending to cause ruts and uneven compaction, shall be avoided. Before placing each successive layer, all ruts and other hollows more than 6 inches in depth shall be regraded and compacted. Fill material shall be spread by approved methods in approximately horizontal lifts. These lifts shall not be greater than 8 inches in thickness after compaction. Thicker lifts may be used only if it can be demonstrated adequately in the field by a test section that uniform compaction can be achieved. The material in each layer, while being compacted, shall be at approximately optimum moisture content, as determined by the geotechnical engineer's field representative.

As moisture is added to the material in each layer, it shall be thoroughly mixed into the layer by suitable equipment prior to compaction. Water shall be delivered to the soil by means of a spreader bar, which distributes the water approximately uniformly over the fill area. If, in the opinion of the geotechnical engineer, the moisture content cannot be uniformly obtained by adding water on the fill surface, the moisture shall be added in the borrow excavation. Water used during earthwork shall be obtained in accordance with the provisions of the regulations of the agency governing the use of water and water meters.

When the moisture content and condition of each spread layer is satisfactory, it shall be compacted by an approved method to the recommended relative compaction based on the appropriate laboratory test.

Slope Compaction: When the slope of the natural ground receiving fill exceeds 20% (5 horizontal units to 1 vertical unit), the original ground shall be stepped or benched. Benches shall be cut to firm, competent soil. The lower bench shall be at least 10 feet wide or 1-1/2 times the equipment width, whichever is greater, and shall be sloped back into the hillside at a gradient of not less than 2 percent. All other benches shall be at least 6 feet wide. The horizontal portion of each bench shall be compacted prior to receiving fill as previously recommended for compacted natural ground. Ground slopes flatter than 20% shall be benched when considered necessary by the geotechnical engineer.

Fill slopes shall be compacted by approved equipment to the relative compaction specified in the geotechnical report. Compacting the slope surface may be done progressively in increments of 3 to 5 feet in fill height or after the fill is brought to its total height. The interior shall be compacted by the "horizontal" methods previously outlined. Slopes having a horizontal to vertical ratio steeper than 2:1 shall be overfilled by at least 5 feet and then cut back to the desired slope ratio.

Structural Fill Placement and Compaction: We recommend that structural fill placed beneath floor slabs, foundations, roadways and parking lots be compacted to a minimum of 90% of its maximum modified proctor dry density (ASTM D-1557). The structural fill shall be placed and compacted at a moisture content within $\pm$2% of optimum moisture. Structural fill should be a granular, non-expansive soil. These lifts should not be greater than 6 inches in thickness after compaction.

Non-Structural Fill Placement and Compaction: We recommend that all backfill placed around the exterior of the buildings, and in utility trenches which are outside the perimeter of buildings and not located beneath roadways or parking lots, be compacted to a minimum of 90% of its maximum proctor dry density

(ASTM D-698). The non-structural fill shall be placed and compacted at a moisture content within ± 2% of optimum moisture. These lifts should not be greater than 6 inches in thickness after compaction.

OSHA Excavation: No major difficulties are anticipated in the course of excavating into the surficial soils on the site. It is probable that safety provisions such as sloping or bracing the sides of excavations over 4 feet deep will be necessary. Any such safety provisions shall conform to reasonable industry safety practices and to applicable OSHA regulations. The OSHA Classification for excavation purposes for Soil Types I, II, and III on this site is Soil Class C.

Cut Slopes: The geotechnical engineer will observe all cut slopes during the grading operations at intervals determined at his discretion. If any conditions not anticipated in the geotechnical report, including but not limited to, perched water, seepage, lenticular or confined strata of a potentially adverse nature, unfavorably inclined bedding, joints, or fault planes are encountered during grading, these conditions shall be analyzed by the geotechnical engineer to determine if mitigating measures are necessary.

Density Tests: Field density tests shall be made by the representative of the geotechnical engineer. The location and frequency of the tests shall be at the geotechnical engineer's discretion. In general, the density tests shall be made at an interval not exceeding 2 feet in vertical rise and/or 500 cubic yards of embankment. If any density test indicates any part of the layer does not meet the required density, that portion of the layer shall be reworked until the required density is obtained. The geotechnical engineer will provide a final completion report on the fill work.

Seasonal Limits: No fill shall be placed, spread, or rolled while it is frozen or thawing, or during other unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until the geotechnical engineer indicates that the moisture content and density of the previously placed fill are as specified. Fill surfaces shall be scarified and recompacted after rainfall, if necessary, to obtain the proper moisture content and density within the cover layer at the time of the rain.

DRAINAGE AND GRADIENT

Adequate site drainage should be provided in the foundation area, both during and after construction, to prevent the ponding of water and the wetting or saturation of the subsurface soils. We recommend that the ground surface around the structure be graded so that surface water will be carried quickly away from the building. The minimum gradient within 10 feet of the building will depend on surface landscaping. We recommend that paved areas maintain a minimum gradient of 2% and that landscaped areas maintain a minimum gradient of 8%. It is further recommended that roof drain downspouts be carried at least 5 feet beyond all backfilled areas and discharge a minimum 10 feet away from the structure. **Proper discharge of roof drain downspouts may require the use of subsurface piping in some areas.** Under no circumstances should a "dry well discharge" be used on this site unless specifically sited by a geotechnical engineer. Planters, if any, should be so constructed that moisture is not allowed to seep into foundation areas or beneath slabs or pavements.

The existing drainage on the site must either be maintained carefully or improved. We recommend that water be drained away from structures as rapidly as possible and not be allowed to stand or pond near the building. We recommend that water removed from one building not be directed onto the backfill areas of adjacent buildings. We recommend that a hydrologist or drainage engineer experienced in this area be retained to complete a drainage plan for this site.

Should an automatic lawn irrigation system be used on this site, we recommend that the sprinkler heads, irrigation piping, and valves be installed no less than 5 feet from the buildings. In addition, these heads should be adjusted so that spray from the system does not fall onto the walls of the buildings and that such water does not excessively wet the backfill soils.

It is recommended that lawn and landscaping irrigation be reasonably limited so as to prevent undesirable saturation of subsurface soils or backfilled areas. Several methods of irrigation water control are possible, to include, but not be limited to:

- Metering the irrigation water.
- Sizing the irrigation distribution service piping to limit onsite water usage.
- Encourage efficient landscaping practices.
- Enforcing reasonable limits on the size of high water usage landscaping for each lot and any park areas.
- Incorporating "xeriscaping" landscaping and irrigation techniques.

A plastic membrane placed on any crawlspace ground surfaces may retain/trap excessive amounts of water beneath the membrane. If future moisture problems develop or are anticipated, the foundation design engineer or the geotechnical engineer may require that the membrane be partially or completely removed from the crawlspace area.

Provided that all recommendations found herein pertaining to site surface drainage, grading, and soil compaction are closely followed, a perimeter foundation drain would not be required. For fully finished basements, however, the use of a perimeter foundation drain would significantly reduce potential moisture related problems that can arise from subsequent area development.

FOUNDATIONS

Due to the water table's anticipated depth as high as 5 to 6 feet below the ground surface, we strongly recommend that no foundations or finished liveable areas be constructed deeper than 4 feet below the present ground surface. It is recommended that excavations be limited to the upper 1 to 2 feet of the existing soil profile. The recommendations contained in the following sections of this report will all assume that the foundation concrete is placed within the upper 4 feet of the existing soil profile. Due to the softer conditions with depth, it is strongly recommended that the excavation on this site be minimized in so far as is possible.

SHALLOW FOUNDATIONS

Assuming that some amount of differential movement can be tolerated, and the foundation system is placed within

the upper 4 feet of the soil profile (upper 2 feet is recommended), then a conventional shallow foundation system, underlain by at least 1 foot and up to 2 feet of structural fill (possibly utilizing a geotextile fabric), placed in accordance with the recommendations contained in this report, may be utilized. The foundation would consist of continuous spread footings beneath all bearing walls and isolated spread footings beneath all columns and other points of concentrated load. Such a shallow foundation system, resting on the properly constructed structural fill, may be designed on the basis of an allowable bearing capacity of 1,300 to 1,600 psf maximum and 150 psf minimum.

Recommendations pertaining to balancing, reinforcing, drainage, and inspection are considered extremely important and must be followed. Contact stresses beneath all continuous walls should be balanced to within $\pm$ 200 psf at all points. Isolated interior column footings should be designed for contact stresses of about 150 psf less than the average used to balance the continuous walls. The criteria for balancing will depend somewhat on the nature of the structure. Single story, slab on grade structures may be balanced on the basis of dead load only. Multi-story structures may be balanced on the basis of dead load plus one-half live load for up to three stories.

If the design of the upper structure is such that loads can be balanced reasonably well, or if minor amounts of differential settlement can be tolerated, a floating structural slab or raft-type of foundation could be used on this site. If the slab is to be a floating structural slab, similar in appearance to the "monolithic" slab used in the Grand Junction area, the slab should be underlain by a minimum of 2 feet of structural fill, placed in accordance with recommendations contained in this report. Such a slab would require heavy reinforcing to resist differential bending. This structural slab, using a granular structural fill as part of the foundation system, could be designed, assuming that the top of the structural fill has a modulus of subgrade reaction of k = 170 pci. If large concentrated loads are located in the interior of this fill, or if minor construction problems are encountered in the placement of the fill, the use of geosynthetic fabric or geogrid as part of the fill construction would significantly improve the performance of the fill and foundation system.

It is possible to design either the floating structural slab or the raft-type of slab either as a solid or ribbed slab, but in either case, a rimwall must be used for confinement. Any such slab must be specifically designed for the anticipated loading. Such a foundation system will settle to some degree as the softer underlying soils consolidate, but differential movement is held to a minimum. Because the soils may settle in varying amounts, some minor cracking and heave are possible unless the slabs are specifically designed with the movement in mind.

STRUCTURAL FILL/SOIL IMPROVEMENT

For use in conjunction with a shallow foundation system, a structural fill is recommended to replace the upper low density, compressible soils. This structural fill may be placed in conjunction with structural fill beneath concrete slabs on grade. The existing low density, compressible soils should be removed to a minimum depth of 1 foot and up to 2 feet below the proposed bottom footing elevation. *The excavation/fill width is to extend at least 20 inches from the interior and exterior of the proposed foundation wall or bearing pad in contact with the fill.* Once it is felt that adequate soil removal has been achieved, it is recommended that the excavation be closely examined by a representative of Grand Junction Lincoln DeVore to ensure that an adequate overexcavation depth has indeed

occurred and that the exposed soils are suitable to support the proposed structural man-made fill.

After any required water conditioning has been accomplished, the subgrade soils are to be mechanically compacted to a minimum of 86% of the soil's maximum modified proctor dry density (ASTM D-1557) for a depth of at least 6 inches. Due to the soft, low density, and wet soil conditions encountered on this site, the placement of a geotextile fabric for separation and minor reinforcement beneath the structural fill may be required for some or all of the residential excavations.

Geotextile fabric for separation and minor reinforcement should be a woven-type, with a minimum grab strength of 180 lbs. in the weakest direction, such as Amoco 2002, Contech C-180 or Mirafi 500-X. If free water is encountered, equivalent reinforcement strength (minimum grab strength of 180 lbs. in the weakest direction) can be obtained by using Amoco 4552, Contech C-70NW, or Mirafi 180N and may be used for better constructability. In instances requiring only separation properties, a non-woven/needle-punched geotextile, with a minimum grab strength of 120 lbs. in the weakest direction, such as Amoco 4506, Contech C-50NW, or Mirafi 140N, may be utilized even though it is a weaker fabric.

Once this examination has been completed, it is recommended that a coarse-grained, non-expansive, non free-draining, man-made structural fill be imported to the site and placed on the properly prepared subgrade soils. Non-expansive native soils may be utilized as structural fill if specifically approved by the geotechnical engineer. The upper 6 to 12 inches (minimum) of the fill is to be a sandy gravel (-3/4 inch and GM/GW) or a gravelly sand (-3/4 inch and SM/SW). The structural fill should be placed in the overexcavated portion of this site in lifts not to exceed 6 inches after compaction. A minimum of 90% of the soil's maximum modified proctor dry density (ASTM D-1557) must be maintained during the soil placement. These soils should be placed at a moisture content conducive to the required compaction (usually proctor optimum moisture content $\pm$ 2%).

The granular material must be brought to the required density by mechanical means. No soaking, jetting, or puddling techniques of any type should be used in placement of fill on this site. To confirm the quality of the compacted fill product, it is recommended that surface density tests be taken at maximum 2-foot vertical intervals.

It is recommended that any required perimeter drain be placed in the exterior portion of the structural fill, at the base of the fill, in order to prevent or at least minimize the collection of water in the soils and fill beneath the structure.

SETTLEMENT

In general, we expect total settlements for the proposed structures to be 1 to 2 inches, and differential settlements to be less than 1 inch.

FROST PROTECTION

We recommend that the bottoms of all foundation components rest a minimum of 1-1/2 feet below finished grade

or as required by the local building codes.

Structural slab on grade (monolithic) foundation systems typically have an effective soil cover of less than 12 inches. Under normal use, the building and foundation system radiates sufficient heat so that frost heave from the underlying soils is normally not a problem. However, additional protection can be provided by applying an insulation board to the exterior of the foundation and extending this board to approximately 18 inches below the final ground surface grade. This board may be applied either prior to or after the concrete is cast. It is very important that all areas of soil backfill are compacted. Local building officials should be consulted for regulatory frost protection depths.

SEISMIC DATA

Utilizing the criteria of the 2000 International Building Code, Section 1615, and our interpretation of figures 1615(1) and 1615(2), structures in Fruita, Colorado should be designed with special response acceleration factors, $S_s = 0.35$ and $S_1 = 0.08$. Based upon our analysis of the soils expected to be present beneath the building foundations, the Site Classification is E. These values can be used to determine the values of site coefficient F_a and F_v from tables 1615.1.2(1) and 1615.1.1(2), to calculate Sms, Sm_1, Sps and SP1, and to determine the seismic design categories from tables 1616.3(1) and 1616.3(2).

CONCRETE SLABS ON GRADE

On-grade slabs may bear directly on the native soils or on new man-made fill. Because the native soils were oftentimes found to be relatively loose, some settlement should be expected. If these settlements are deemed to be intolerable, then the existing soils should be removed to a minimum depth of 1 foot below slab elevation and replaced with uniformly compacted lifts of structural fill, compacted to at least 90% of maximum proctor dry density as determined by ASTM D-1557. The purpose of this recommendation is to decrease the likelihood of adverse slab movement. We recommend that the subgrade soil surface be slightly moistened and "proof rolled" immediately prior to concrete placement.

In the case of relatively heavy residential structures, all the non-bearing partitions that will be located on the slabs should be constructed with a minimum 1-1/2 inches of void space at the bottom of the wall. This space would allow for the future upward movement of floor slabs and minimize the damage to walls and roof sections above the slabs. The space may require rebuilding after a period of time since heaving produced by the soils may exceed 1-1/2 inches.

We recommend that all on-grade slabs be isolated from other structural portions of the building. This is generally accomplished by an expansion joint at the slab/foundation wall interface and between the slab and interior posts, columns, and bearing walls. If a vapor barrier is desired beneath slabs, we recommend that it be overlain by approximately 6 inches of a -3/4 inch sandy gravel or a compactable gravelly sand fill. This method must be very carefully accomplished to minimize excessive puncturing and tearing of the vapor barrier.

A recommended design/construction alternative is to dispense with slab on grade construction and use a structural floor system. A structural floor system may be either a structural reinforced concrete slab or a structural wood floor system suspended with floor joists. Each system would utilize a crawlspace. This alternative would substantially reduce a potential for post construction slab difficulties due to the compressible properties of the underlying soils.

It is recommended that slabs on grade be constructed over a capillary break of approximately 6 inches in thickness. We recommend that the material used to form the capillary break be free-draining granular material and not contain significant fines. A free-draining outlet is also recommended for this break so that it will not trap water beneath the slab. A vapor barrier is recommended beneath the floor slab and above the capillary break. To decrease difficulties in finishing concrete, we recommend that the vapor barrier be placed beneath approximately 6 inches of a -3/4 inch sandy gravel or a compactable gravelly sand fill. This method must be very carefully accomplished to minimize excessive puncturing and tearing of the vapor barrier.

Another alternative is to install a minimum 1-foot and up to a 2-foot "buffer zone" of non-expansive, granular soil beneath the slab. This would mitigate the potential for slab movement; however, some potential for movement still exists. Should this alternative be selected, we would recommend that the following be performed.

1. Non-expansive, non free-draining, granular soils should be selected for the "buffer zone." The granular soils should contain less than 20% of the material by dry weight, passing the U.S. No. 200 Sieve. We recommend that the geotechnical engineer be contacted to examine the soils when they are selected, to substantiate that they comply with the recommendations.

2. The perimeter drain for the structures should be located at the elevation equal to or deeper than the "buffer zone." This is to reduce the potential for a "bathtub" effect," which will concentrate water benath the slab. The "bathtub effect" is created when water is allowed to seep into the "buffer zone" and then becomes trapped, since the underlying clay soils have a much lower permeability rate than the "buffer zone" material.

3. In the case of relatively heavy residential structures, all the non-bearing partitions that will be located on the slabs should be constructed with a minimum 1-1/2 inches of void space at the bottom of the wall. This space will allow for the future upward (relative) movement of the floor slabs and minimize damage to walls and roof sections above the slabs. The space may require rebuilding after a period of time since total settlement produced by underlying soil consolidation beneath heavily loaded residential structures may exceed 1-1/2 inches.

It is recommended that floor slabs on grade be constructed with control joints placed to divide the floor into sections. Slab sections of up to 256 square feet are successfully placed using appropriate concrete mixes and placement techniques common to good workmanship in this area. Unless specifically designed, control joints should be placed no more than 16 feet on center in each direction. In the case of expansive subgrade soils, additional joints should be placed at columns and at inside corners. In the case of expansive subgrade soils, we further

recommend additional joints placed 2 to 3-1/2 feet off and parallel to foundation wall. Also, additional control joints are recommended at all inside corners and at all columns to control cracking in those areas.

Problems associated with slab "curling" are usually minimized by a "low shrinkage" concrete mix design, placing distributed reinforcing steel in the slab, and proper curing of the placed concrete slab. This period of curing usually is most critical within the first 5 days after placement. Proper curing can be accomplished by minimizing moisture loss at the top slab surface. This may be accomplished by utilizing continuous water application to the concrete surface, or in some instances, by the placement of a "heavy" curing compound formulated to minimize water evaporation from the concrete. Curing by continuous water application must be carefully undertaken to prevent the wetting or saturation of the subgrade soils.

EARTH-RETAINING STRUCTURES

The active soil pressure for Soil Types I, II, and III, for the design of earth-retaining structures, may be based on an equivalent fluid pressure of 50 pounds per cubic foot. The active pressure should be used for retaining structures which are free to move at the top (unrestrained walls). For earth-retaining structures which are fixed at the top, such as basement walls, an equivalent fluid pressure of 60 pounds per cubic foot may be used. It should be noted that the above values should be modified to take into account any surcharge loads, sloping backfill, or other externally applied forces. The above equivalent fluid pressures should also be modified for the effects of free water, if any.

The passive pressure for resistance to lateral movement may be considered to be 230 pcf per foot of depth. The coefficient of friction for concrete to soil may be assumed to be 0.3 for resistance to lateral movement. When combining frictional and passive resistance, the latter must be reduced by approximately one-third.

Drainage behind retaining walls is considered critical. If the backfill behind the wall is not well drained, hydrostatic pressures are allowed to build up, and lateral earth pressures will be considerably increased. Therefore, we recommend that a vertical drain be installed behind any impermeable retaining walls. Because of the difficulty in placing a gravel drain, we recommend the use of a composite drainage mat (similar to Contech C-Drain or Mirafi D Series). An outfall must be provided for this drain.

REACTIVE SOILS

Since groundwater in the Fruita area typically contains sulfates in quantities detrimental to a Type I cement, a Type II, Type I-II, or Type II-V cement is recommended for all concrete which is in contact with the subsurface soils and bedrock. Calcium chloride should not be added to a Type II, Type I-II, or Type II-V cement under any circumstances.

PAVEMENTS

Samples of the surficial native soils that may be required to support pavements in the interior portions of this subdivision have been evaluated using the Hveem-Carmany method (ASTM D-2844) to determine their support characteristics. The results of the laboratory testing are as follows:

AASHTO Classification - A-4(8)	Unified Classification - CL-ML	[Soil Type No's. I, II, & III]
R	= 9	
Expansion @ 300 psi	= 95 psf	
Displacement @ 300 psi	= 4.55	

Displacement values higher than 4.00 generally indicate the soil is unstable and may require confinement for proper performance.

Traffic counts or anticipated volumes have not been provided to Grand Junction Lincoln DeVore. We have assumed an EAL = 5 for the interior low volume, residential streets.

The 1986/94 AASHTO design procedure, recognized by the Colorado Department of Transportation as having a design life of 30 years was used, and incorporates an annual growth rate of 3%. Based upon the existing topography, the anticipated final road grades, and subsurface soil conditions encountered during the drilling program, a drainage factor of 0.8 (1986/94 AASHTO procedure) has been utilized for the section analysis. **Please note the Pavement Sections provided in this report assume proper subgrade preparation has been completed, with the subgrade soils compacted to 90% of its maximum modified proctor dry density (ASTM-D-1557) at a moisture content within ± 2% of optimum moisture.**

CALCULATED PAVEMENT SECTIONS

Flexible Pavement

18K EAL = 5	Low Volume Residential				
AC	3"	or	3"	or	4"
ABC	9"	or	6"	or	6"
Subbase (R>50)	0"	or	4"	or	0"
Compacted Subgrade			12"		

PAVEMENT SECTIONS, POSSIBLE UNSTABLE SUBGRADE SOILS, SUBGRADE IMPROVEMENT, AND MECHANICALLY STABILIZED FILL

Based on the soil support characteristics outlined above, we recommend the following structural fill sections for several levels of unstable subgrade (pumping) due to permanent or seasonally soil moisture.

Very Minor Instability, Less than 2 Inches of Rutting During Proof Rolling

3" asphaltic concrete AC
on 9" of aggregate base course ABC
on Geotextile for separation and minor reinforcement (minimum grab strength of 120 lbs.)
on Reworked, compacted subgrade soil

Minor Instability, 2 to 4 Inches of Rutting During Proof Rolling

3" asphaltic concrete AC
on 6" (minimum) of aggregate base course ABC
on Geotextile or biaxial geogrid for reinforcement (req'd if subbase/structural fill is rutting)
on 12" of subbase/structural fill (R>50)
on Geotextile for separation and reinforcement (minimum Grab Strength of 180 lbs.)
on Reworked, compacted subgrade soil

Moderately Severe Instability, Over 4 Inches of Rutting During Proof Rolling

3" asphaltic concrete
on 6" (minimum) of aggregate base course ABC
on Geotextile or biaxial geogrid for reinforcement
(product use will depend on degree of instability)
on 18" (minimum) of subbase/structural fill (R>50)
on Geotextile for separation and reinforcement (minimum grab strength of 180 lbs.)
on Slightly reworked, leveled subgrade soil

Due to the probability of very high soil moisture in the subgrade soils, the use of a geotextile fabric for separation and minor reinforcement placed beneath the structural section may be required along these road alignments. It is recommended that a woven fabric such as Amoco 2002, Contech C-180, or Mirafi 500-X be utilized unless free water is present in the excavation. If free water is present, a non-woven fabric such as Amoco 4547, Contech C-50NW or Mirafi 140N, while possessing lower strength, generally provides better constructability. If required, equivalent reinforcement strength can be obtained by using Amoco 4552, Contech C-70NW or Mirafi 180N. The upper layer of biaxial geogrid or geotextile for reinforcement, placed beneath the aggregate base course and the subbase/structural fill, may not be required depending upon actual field conditions.

The additional materials and effort expended in subgrade stabilization is to provide a construction platform so that the actual road section can be placed and compacted. The specific areas requiring placement of the geotextile fabric will depend upon the actual conditions encountered during construction. Subgrade and road section construction should be monitored by representatives of the geotechnical engineer.

Geotextile fabric for separation and minor reinforcement should be a woven-type, with a minimum grab strength of 180 lbs. in the weakest direction, such as Amoco 2002, Contech C-180 or Mirafi 500-X. If free water is encountered, equivalent reinforcement strength (minimum grab strength of 180 lbs. in the weakest direction) can be obtained by using Amoco 4552, Contech C-70NW, or Mirafi 180N and may be used for better constructability.

In instances requiring only separation properties, a non-woven/needle-punched geotextile, with a minimum grab strength of 120 lbs. in the weakest direction, such as Amoco 4506, Contech C-50NW, or Mirafi 140N, may be utilized even though it is a weaker fabric.

Biaxial geogrid for reinforcement shall have a minimum tensile strength @ 5% strain of 550 lbs./ft. in the weakest direction (e.g., Tensar BX 1100).

The imported structural fill (Hveem-Carmany R>50 , swell not critical) is to be granular, medium- to coarse-grained, very low plastic (PI<4), non free-draining, compactable, and within the following gradation.

Maximum size, by screening	8"
Passing the #4 screen	20% - 85%
Passing the #40 screen	10% - 60%
Passing the #200 screen	3% - 15%

The maximum aggregates size may be exceeded if the contractor can provide evidence of proper compaction of the matrix material while avoiding excessive particle size segregation of the fill material and excessive overworking of the subgrade soils.

Imported structural fill and aggregate base course (ABC) should be compacted to 90% of its maximum modified proctor dry density (ASTM-D-1557) at a moisture content within $\pm$ 2% of optimum moisture. The use of lightweight tracked equipment will minimize subgrade degradation. Vibratory compaction equipment is not recommended.

During the placement of any structural fill, it is recommended that a sufficient amount of field tests and observation be performed under the direction of the geotechnical engineer. The geotechnical engineer should determine the amount of observation time and number of field density tests required to determine substantial conformance with these recommendations.

Any areas of fill or subgrade instability encountered during construction are to be immediately brought to the attention of the geotechnical engineer so that recommendations for stabilization can be given.

The subgrade stabilization is normally considered effective if the imported structural fill materials are confined, if specified imported fill and specified asphalt densities are obtained, and when the final traffic surface is stable according to local practices. Some "pumping and rolling" of the finish base course (ABC) surface is anticipated, but rutting should not occur.

PAVEMENT SECTION CONSTRUCTION

All pavement should be protected from moisture migrating beneath the pavement structure. If surface drainage is allowed to pond behind curbs, islands, or other areas of the site, and allowed to seep beneath pavement, premature deterioration or possibly pavement failure could result.

If landscape irrigation or storm water collection is allowed (or designed) to infiltrate into soils adjacent to the Road Prism (or behind curb/gutter/sidewalk), measures **MUST** be undertaken to protect the pavement section structure. Such measures may include:

— The use of Geotextile Fabric to separate the pavement section from subgrade or perimeter soils which exhibit excessive Displacement, as measured by the Hveem-Carmany test method. Preventing subgrade or perimeter soil intrusion into the Base & Sub Base Gravel Section is extremely important.

— The use of Geotextile Fabric to laterally restrain the Base & Sub Base Gravel Section due to softened (wetted) subgrade or perimeter soils can be beneficial. Geotextile fabric can be 'wrapped' up the sides of the Base & Sub Base Gravel Section

— The use of excessively thick sections of Base & Sub Base Gravel beneath Curb, Gutter & Sidewalk Concrete should be discouraged as excessive lateral water flow may occur into the pavement section.

FLEXIBLE PAVEMENT

The asphalt concrete specifications will depend upon the requirements of the jurisdiction. In general, we recommend that the asphaltic concrete pavement meet State of Colorado requirements for either a Grading C or SX mix. In addition, the asphaltic concrete pavement should be compacted to a minimum of 95% of its maximum Hveem density, or 92% to 96% of its maximum theoretical density, depending upon the jurisdiction.

The aggregate base course should meet the requirements of State of Colorado Class 5 or Class 6 material and have a minimum R value of 78. We recommend that the base course be compacted to a minimum of 95% of its maximum modified proctor dry density (ASTM D-1557) at a moisture content within $\pm$2% of optimum moisture. The native subgrade shall be scarified and recompacted to a minimum of 90% of its maximum modified proctor dry density (ASTM D-1557) at a moisture content within $\pm$ 2% of optimum moisture.

LIMITATIONS

This report is issued with the understanding that it is the responsibility of the owner or his representative to ensure that the information and recommendations contained herein are brought to the attention of the individual lot purchasers for the subdivision. In addition, it is the responsibility of the individual lot owners to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the individual projects, and that the necessary steps are taken to ensure that the contractor and his subcontractors carry out the appropriate recommendations during construction.

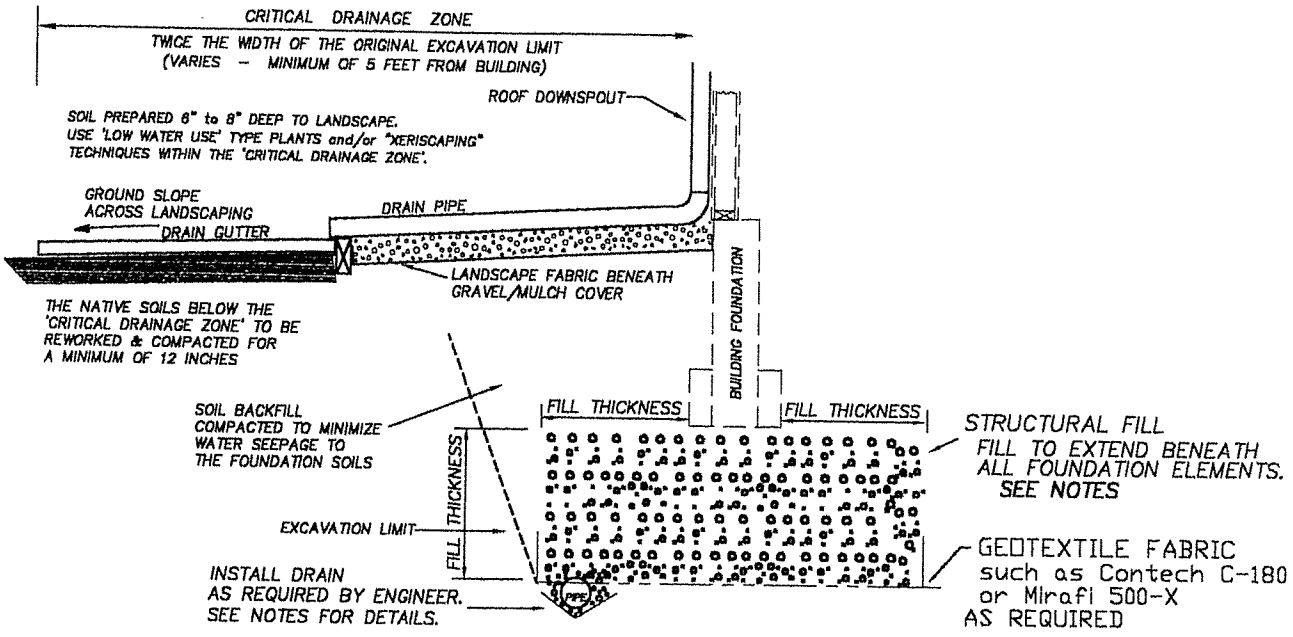
The findings of this report are valid as of the present date. However, changes in the conditions of a property can occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. In addition, changes in acceptable or appropriate standards may occur or may result from legislation or the broadening of engineering knowledge. Accordingly, the findings of this report may be invalid, wholly or partially, by changes outside our control. Therefore, this report is subject to review and should not be relied upon

after a period of three years.

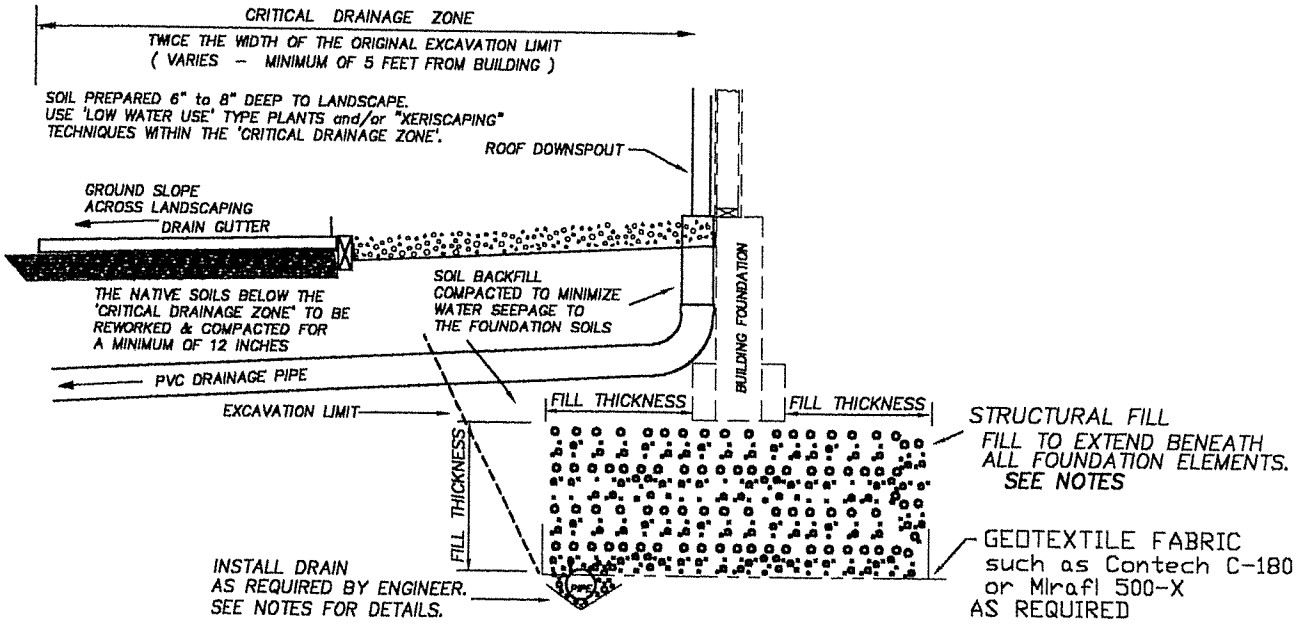
The recommendations of this report pertain only to the site investigated and are based on the assumption that the soil conditions do not deviate from those described in this report. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned on the day of this report, Grand Junction Lincoln DeVore should be notified so that supplemental recom-mendations can be provided, if appropriate.

Grand Junction Lincoln DeVore makes no warranty, either expressed or implied, as to the findings, recommendations, specifications, or professional advice, except that they were prepared in accordance with generally accepted professional engineering practices in the field of geotechnical engineering.

APPENDIX



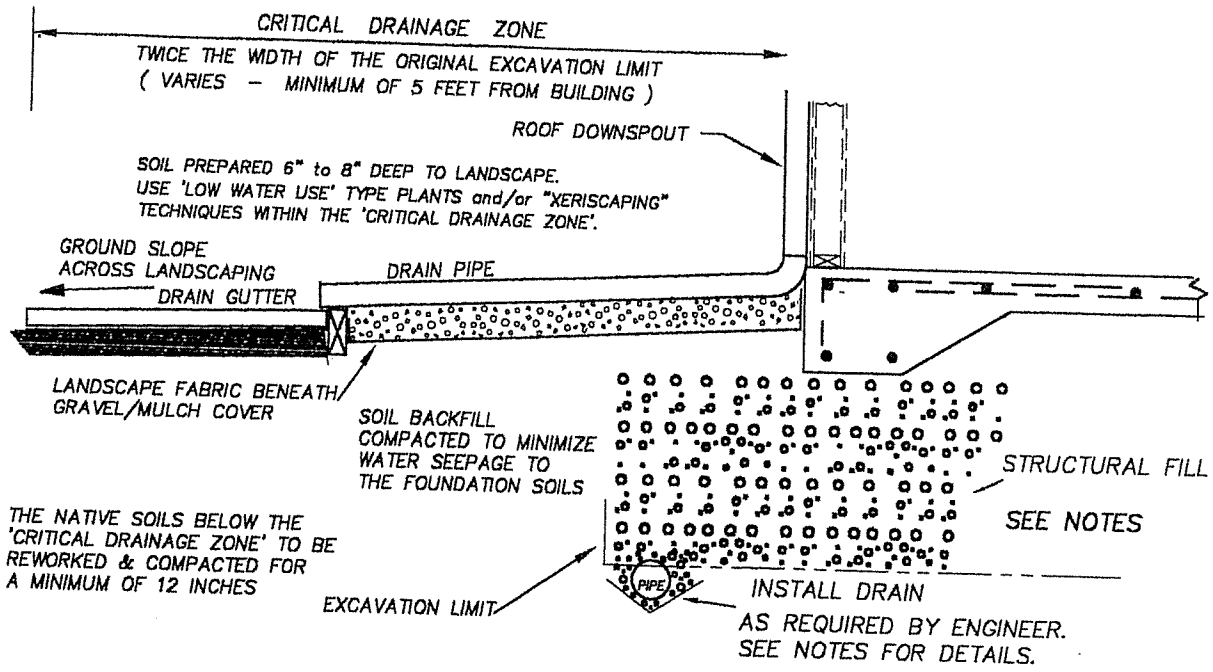
DRAINAGE / LANDSCAPING CONCEPT
'NO WATER ZONE' BY FOUNDATION



DRAINAGE / LANDSCAPING CONCEPT
'NO WATER ZONE' BY FOUNDATION

GRAND JUNCTION
LINCOLN–DeVORE, Inc.
GEOTECHNICAL ENGINEERS–GEOLOGISTS

EXTERIOR DRAINAGE / LANDSCAPING CONCEPT		
		DATE: 9-16-2005
SCALE: NONE	LD #	File # D-DRAIN2



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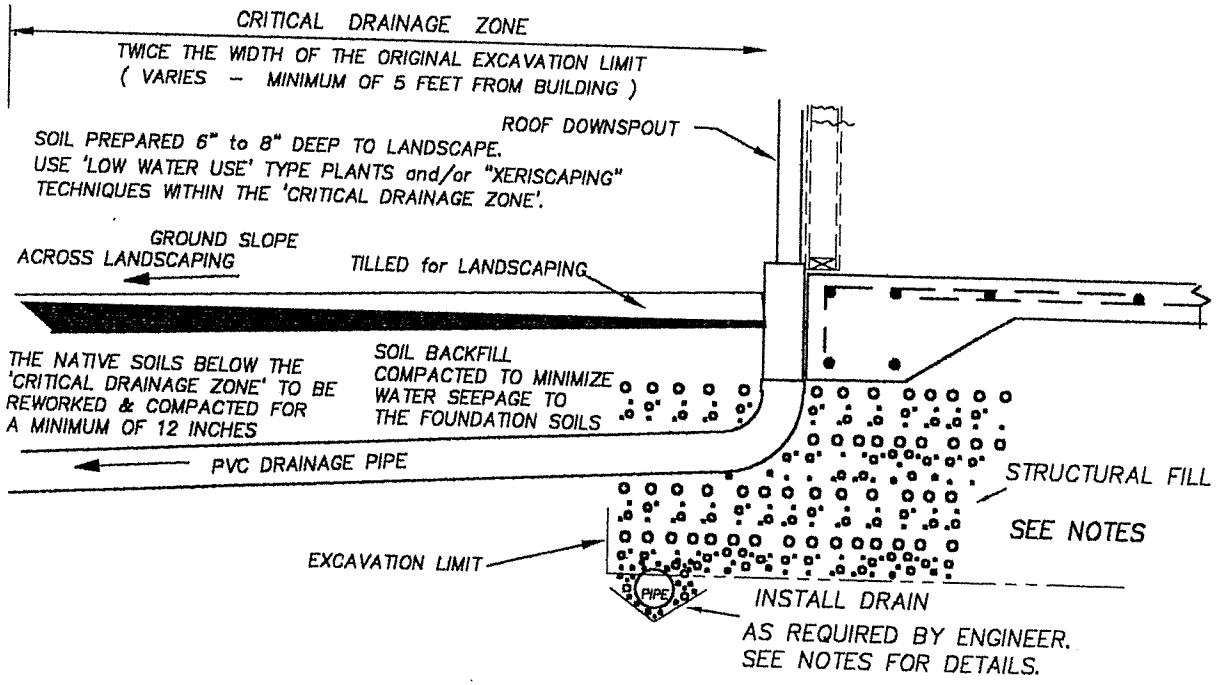
'NO WATER ZONE' BY FOUNDATION



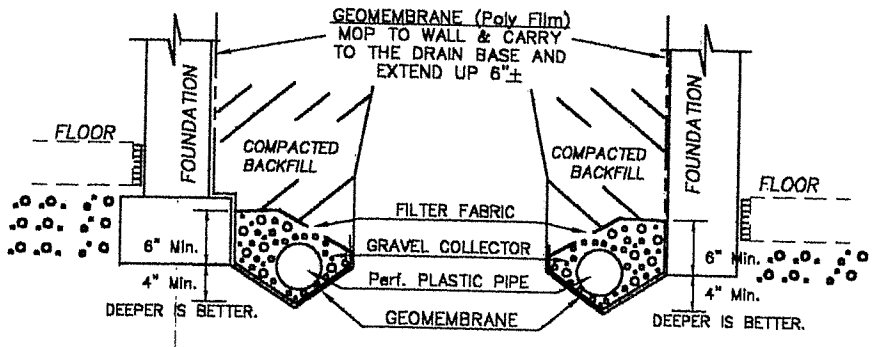
DRAINAGE / LANDSCAPING CONCEPT
'LOW WATER ZONE'

GRAND JUNCTION
LINCOLN–DeVORE, Inc.
GEOTECHNICAL ENGINEERS–GEOLOGISTS

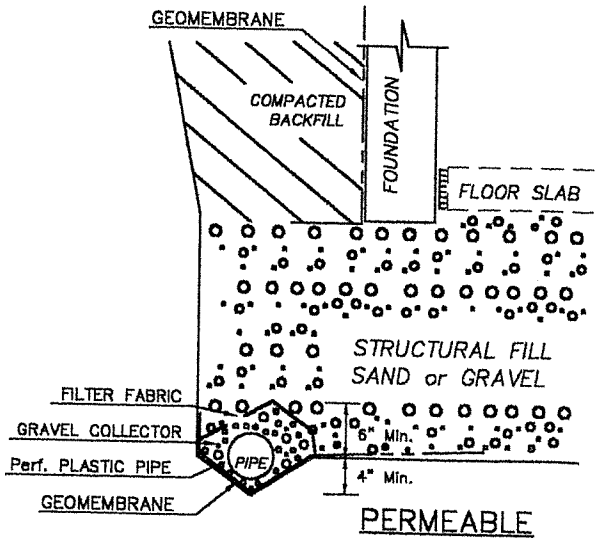
EXTERIOR DRAINAGE / LANDSCAPING CONCEPT		
		DATE: 9–17–2005
SCALE: NONE	LD #	File # D–DRAIN5

NOTES FOR UNDERGROUND FOUNDATION DRAIN, Protect Dry Subgrade Soils

- The drain trench to be located at the base and exterior limit of any structural fill or below the base of the exterior foundations elements. Excavate any trenching as narrow as practical. Observe sloping or bracing, as required by the appropriate OSHA req.
- The sides and bottom of the trench is to be smooth and must be graded to drain to 'Daylight' Discharge or Sump.
- The Minimum trench and pipe gradient is to be 1%. If Daylight Discharge is not possible, a Sump & Pump must be used.
- A Geomembrane Barrier is to be placed on the foundation side, extended away from the Foundation and toward the Drain. The Geomembrane Barrier is to be placed beneath the drain, as a water channel and extend up 3" to 6" above Drain Pipe.
- All cut and graded earth surfaces in contact with the Geomembrane to be smooth, free of pockets, no loose rocks and have no sharp projections OR a protective Geotextile or sand cushion layer must be installed between the soil and the Geomembrane.
- In Non-Traffic Areas, The Geomembrane to be a Polyethylene or equal and to have the following characteristics:
  Minimum Thickness, ASTM D-5199 0.5mm (6 mils)
  In Traffic Areas, The Geomembrane to be a 10 mil Polyethylene or equal.
- All joints in the Geomembrane shall be overlapped and glued with products and in such a manner that conforms to the manufacturer's recommendation. If glued joints are not used, the membrane edges shall be overlapped a minimum of 32 inches (0.6m). The overlaps shall be 'shingled' so the exposed edges face in the same direction as the flow of water drainage.
- A Geosynthetic/Composite Clay Liner may be substituted for the Geomembrane. Confirm with the Design Engineer.
- A Perforated Plastic Pipe (PVC) is to be enclosed within the Geomembrane, at the base of the trench. 'Flexible' Piping may be used if backfill is less than 5' deep or Specifically approved by the Design Engineer. For 'Critical' Applications, the use of 'flexible' piping is NOT RECOMMENDED.
- The Perforated Plastic Pipe to be a minimum 3" Diameter But, Must be sized for the anticipated conditions. If the length of 'Perforated Pipe Run Along Gradient' exceeds 200 feet, An Additional Perforated Pipe is to added in the trench OR the pipe size increased to either 4" or 6" diameter. Confirm with Engineer.
- The Plastic Pipe must be graded to drain to the 'Daylight" Discharge or a Sump Discharge. Minimum 1% Grade.
- The Perforated Plastic Pipe to be protected from clogging. Such protection can be achieved by wrapping the pipe with a non-woven Geotextile 'Filter Fabric' (Such as Amoco 4547, Contech C-50W, Mirafi 140N).
- A permeable Sand or Gravel Water Drainage/Collection medium is to be placed around and above the Perforated Pipe. This Drainage/Collection Medium to be compacted to at least 80% of Maximum Dry Density, ASTM D-1557.
- Place Geotextile fabric at the Top Surface of permeable Sand Or Gravel medium to prevent clogging.
- The permeable Water Drainage/Collection medium must be protected from clogging. Protection may be wrapping the medium with a non-woven Geotextile 'Filter Fabric', Such as Amoco 4547, Contech C-50W, Mirafi 140N ('Burrito Drain').
- All Backfill Cover over the Sand or Gravelly Sand Drain must be carefully placed and compacted. Th Bacfill Cover is to be placed in lifts and compacted to at least 85% of Maximum Dry Density, ASTM D-1557. Additional Compaction (min. 90% ASTM D-1557) is recommended for backfill over 18" above the Drain Pipe.
- With the approval of the Design Engineer, either Geocomposite Drains, Board Drains and Edge Drains may be substituted for portions of the drain shown on this drawing.
- Required Observations by the Design Engineer or approved representative:
  Completion of Trench and Surface Excavation / Preparation, prior to Membrane Installation. (Compaction Testing)
  Perforated Drain Pipe or other Products in place, to include protection from clogging.
  Top of Water Drainage/Collection Medium. (May require soil compaction testing)
  Top and Intermediate Backfill (Soil compaction testing)
  Final Soil Cover, surface graded and prior to final landscaping.



SPREAD FOOTING WALL-on-GRADE
NO STRUCTURAL FILL or Non-PERMEABLE FILL



PERMEABLE STRUCTURAL FILL

GRAND JUNCTION
LINCOLN-DeVORE, Inc.
GEOTECHNICAL ENGINEERS-GEOLOGISTS

FOUNDATION DRAIN (Protect Dry Subgrade Soils)

SCALE:	LD #	DATE:
NONE	.	9-16-2005
		File # D-DRAIN6

SOILS DESCRIPTIONS

SYMBOL	USCS	DESCRIPTION
		Topsoil
		Man-Made Fill
	GW	Gravel Well-Graded
	GP	Gravel Poorly-Graded
	GM	Silty Gravel
	GC	Clayey Gravel
	SW	Sand Well-Graded
	SP	Sand Poorly-Graded
	SM	Silty Sand
	SC	Clayey Sand
	ML	Silt Low-Plastic
	CL	Clayey Sand Low-Plastic
	OL	Organic Silt & Clay Low-Plastic
	MH	Elastic Silt High-Plastic
	CH	Clay High-Plastic
	OH	Organic Clay High-Plastic
	Pt	Peat
	GW/GM	Silty Gravel Well-Graded
	GW/GC	Clayey Gravel Well-Graded
	GP/GM	Silty Gravel Poorly-Graded
	GP/GC	Clayey Gravel Poorly-Graded
	GM/GC	Silty Clayey Gravel
	SW/SM	Silty Sand Well-Graded
	SW/SC	Clayey Sand Well-Graded
	SP/SM	Silty Sand Poorly-Graded
	SP/SC	Clayey Sand Poorly-Graded
	SM/SC	Silty Clayey Sand
	CL-ML	Silty Clay

ROCK DESCRIPTIONS

SYMBOL	DESCRIPTION
	Sedimentary Rocks
	CONGLOMERATE
	SANDSTONE
	SILTSTONE
	SHALE
	CLAYSTONE
	MUDSTONE
	COAL
	LIMESTONE
	DOLOMITE
	MARLSTONE
	GYPSUM
	Other Sedimentary Rocks
	Igneous Rocks
	GRANITIC ROCKS
	DIORITIC ROCKS
	GABBRO
	BASALT
	RHYOLITE
	TUFF & ASH FLOWS
	BRECCIA & Other Volcanics
	Other Igneous Rocks
	Metamorphic Rocks
	GNEISS
	SCHIST
	PHYLLITE
	HORNFELS
	METAQUARTZITE
	MARBLE
	Other Metamorphic Rocks

SYMBOLS & NOTES

SYMBOL	DESCRIPTION
SPT 9/6	Standard Penetration Drive ASTM D-1586 Disturbed Sample 1.625" I.D. - 2" O.D. Numbers indicate 9 Blows To drive the Sampler 'Spoon' 6" into ground.
CS 9/6	'California Lined Sampler' Modified Penetration Drive ASTM D-3550 Disturbed Sample 1.875" I.D. - 2.5" O.D. Numbers indicate 9 Blows To drive the Sampler 'Spoon' 6" into ground.
D&M 9/6	'Dames & Moore Lined Sampler' Modified Penetration Drive ASTM D-3550 Disturbed Sample 2.44" I.D. - 3" O.D. Numbers indicate 9 Blows To drive the Sampler 'Spoon' 6" into ground.
ST	Thin-Walled 'Shelby' Tube ASTM D-1587 2.5" I.D. Intact Sample old - 'Relatively Undisturbed Sample'
BULK	Disturbed, Bulk Sample Disturbed Sample
	Free Water Table
Wx	Weathered Rock Formation
	Test Boring Location
	Test Pit Location
	Seismic or Resistivity Station

Standard Penetration Drives are made by driving a standard 2" od, 1.625" id Split Spoon Sampler into the ground by dropping a 140 lb. weight 30", ASTM D-1586.
CME Automatic Hammer Used, unless noted.
The Drive Shoe is Blunt and the sample is Disturbed.

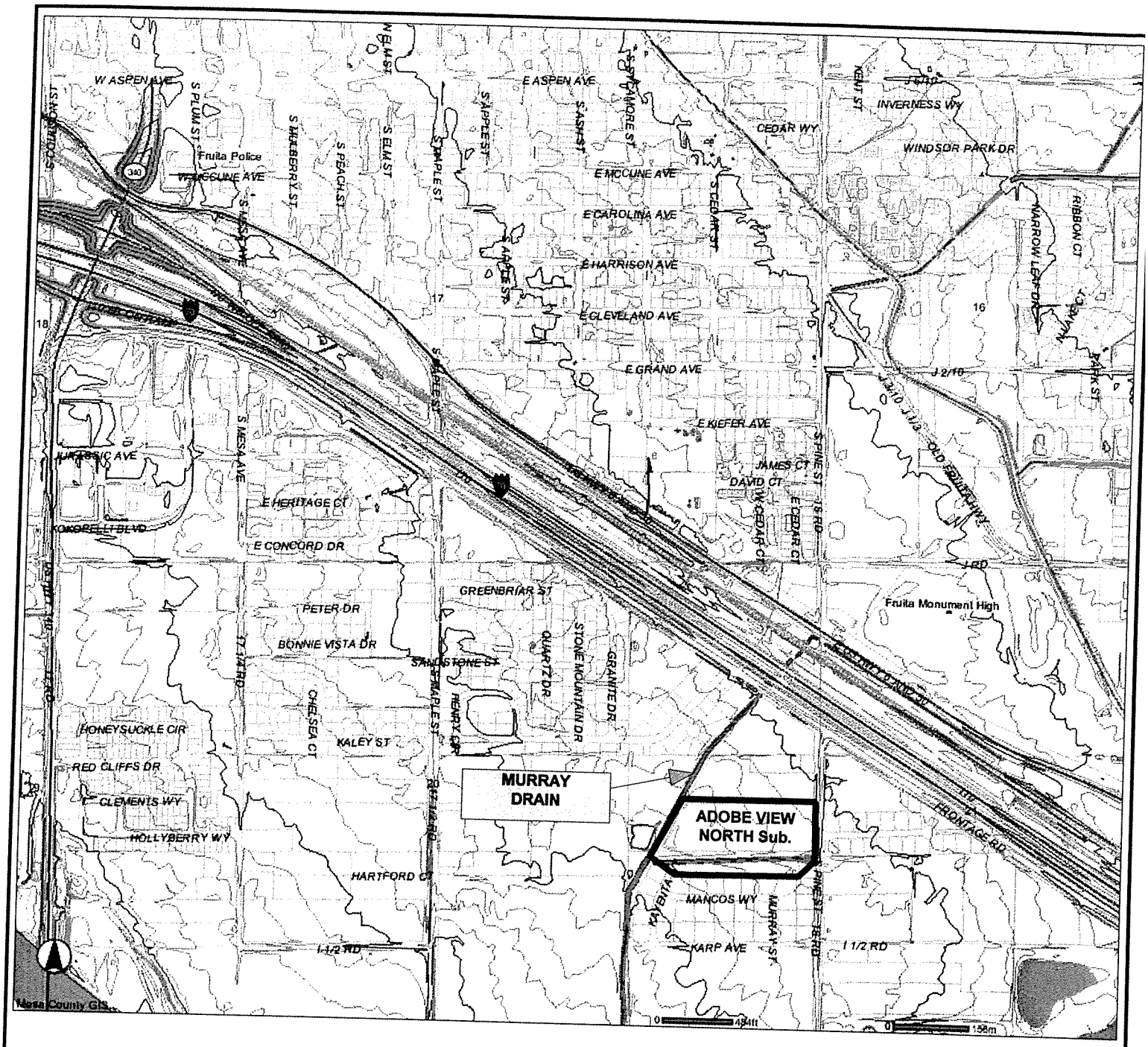
Modified Penetration Drives are made by driving a 2-1/2" od, 1.875" id California Spoon Sampler or a 3" od, 2-3/8" id Dames & Moore Spoon Sampler into the ground by dropping a 140 lb. weight 30", ASTM D-3550.
CME Automatic Hammer Used, unless noted.
The Drive Shoe is Blunt and the sample is Disturbed.

The Boring Logs show subsurface conditions at the dates and locations shown. It is not warrented that these Boring logs are representative of subsurface conditions at other times, or at other locations near these Borings.

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

EXPLANATION OF BOREHOLE LOGS AND LOCATION DIAGRAMS

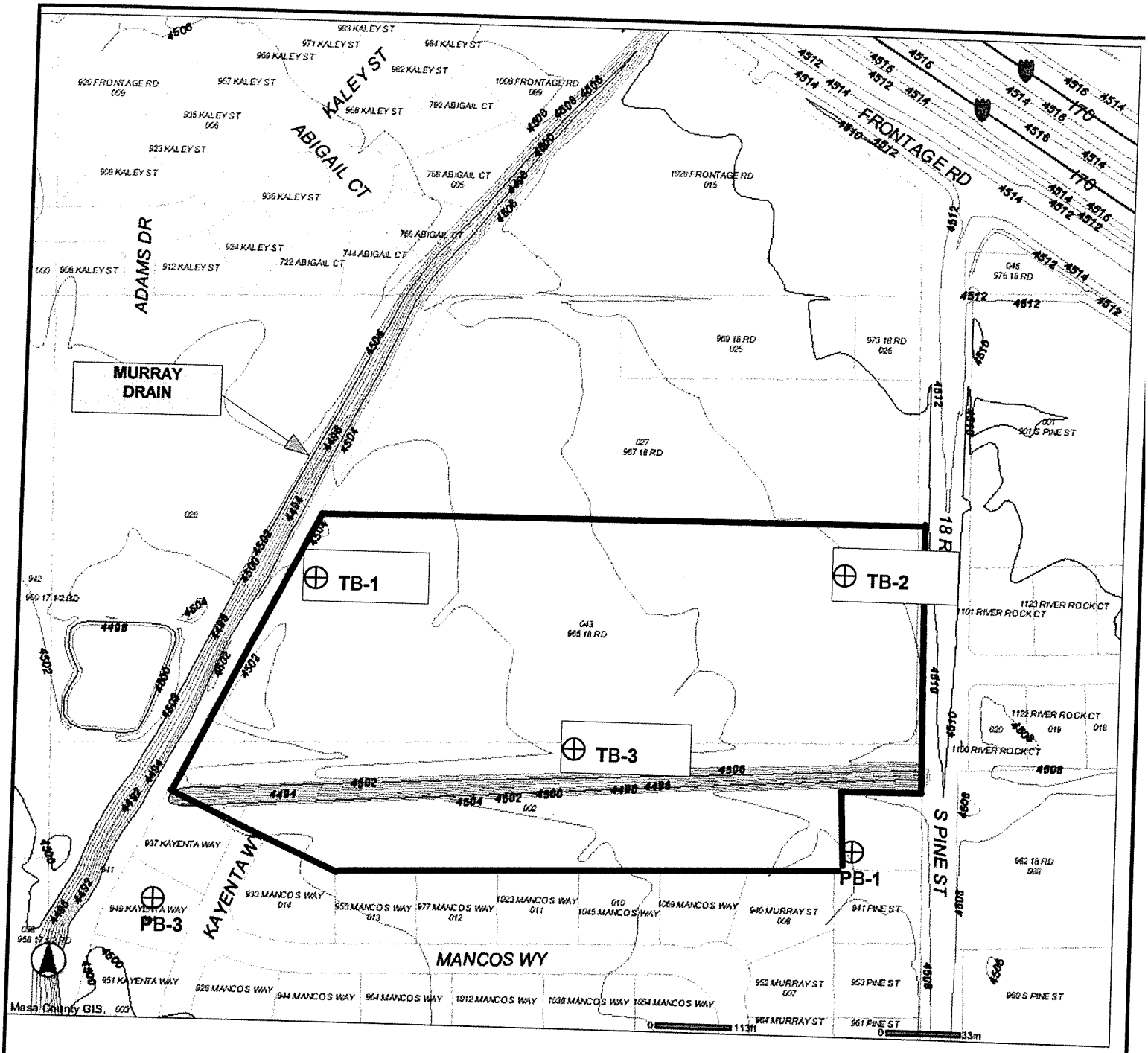
Form No.	Drawn	Date
GJLDFORM-EXPL	EMM	2-12-2009



NO SCALE

SITE LOCATION DIAGRAM

GRAND JUNCTION LINCOLN - DeVORE, Inc. Geotechnical Consultants Grand Junction, Colorado	**ADOBE VIEW NORTH Subdivision** 18 Road & I-70 Frontage, Fruita, Colorado
	North West Plateau Development Grand Junction, Colorado — Date 1-15-2007
	Job No. 92793-GJ — Drawn EMM



TB-1 **TB-1 TEST BORING**

PB-1 **PB-1 TEST BORING, GJLD #90003-GJ, March 6, 2003**

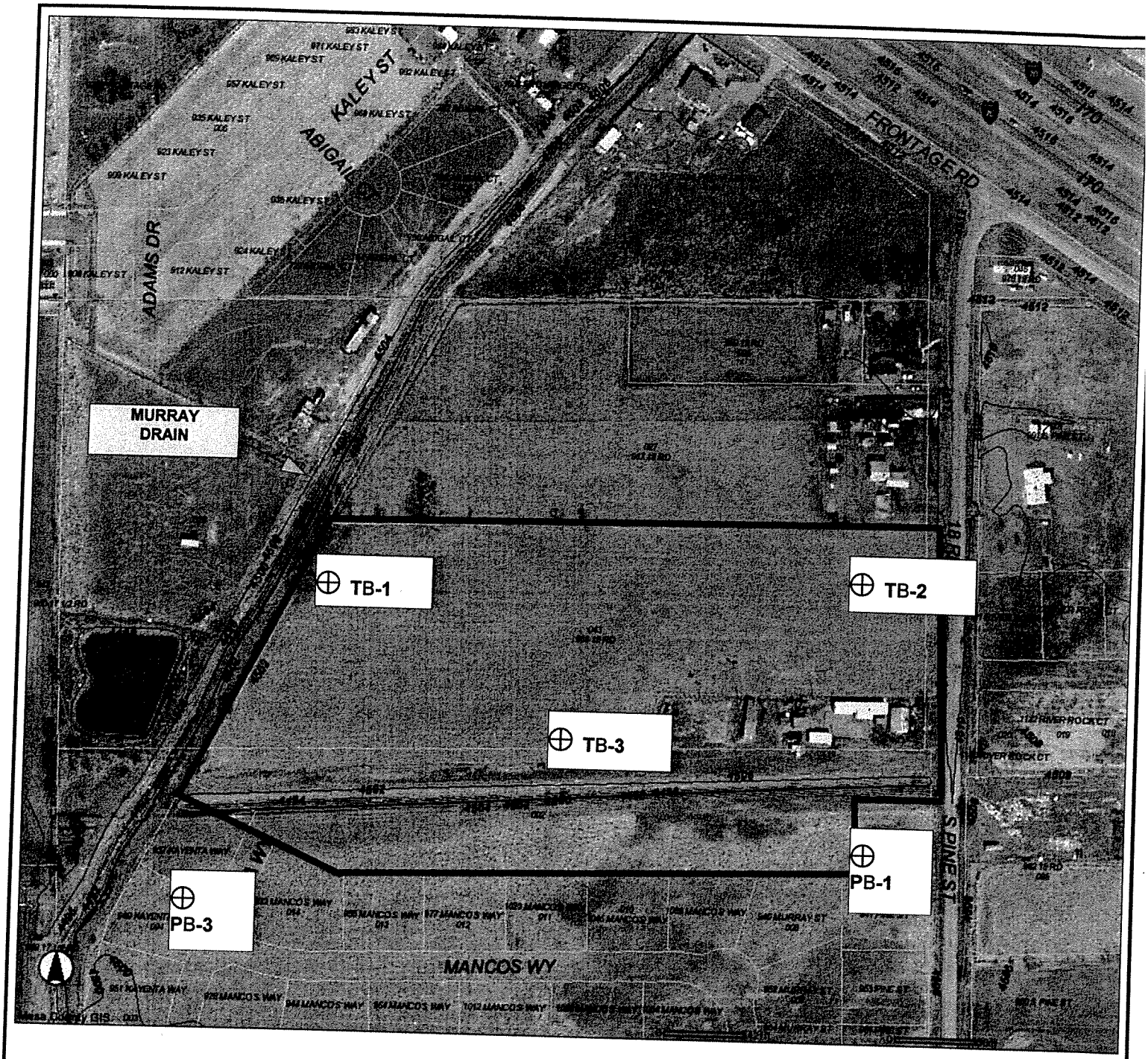
TOPOGRAPHY from MESA COUNTY GIS Web Site

BORING LOCATION DIAGRAM

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado

North West Plateau Development **Grand Junction, Colorado**		Date **1-15-2007**
Job No. **92793-GJ**	Drawn **EMM**	



TB-1 TEST BORING

PB-1 TEST BORING, GJLD #90003-GJ, March 6, 2003

2001-02 PHOTO from MESA COUNTY GIS Web Site

BORING LOCATION DIAGRAM

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision 18 Road & I-70 Frontage, Fruita, Colorado		
North West Plateau Development Grand Junction, Colorado		Date 1-15-2007
Job No. 92793-GJ	Drawn EMM	

BORING NO. 1 DRILL: GJLD CME-45B

NORTHWEST CORNER of TRACT

BORING ELEVATION: AUGER/TOOLS: 4" od, SOLID

DEPTH (FT.)	SOIL LOG	DESCRIPTION		BLOW COUNT /inch	SOIL DENSITY pcf	WATER %
		SURFACE SOILS REWORKED by AGRICULTURAL ACTIVITIES				
		ROOTS & ORGANIC MATTER	ST		93.8	17.2%
		SP-SM SILTY SAND, Poorly Graded LOW DENSITY WET			92.4	29.6%
		I COMPRESSIBLE SOFT to DRILL	ST			
5		**ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf**	5		92.8	19.6%
		CL LEAN CLAY MOTTLED SOIL SULFATES	SPT	2/6	98.5	24.2%
		II V. COMPRESSIBLE LOW DENSITY		3/6		31.3%
		FREE WATER STRATIFIED		2/6		
		SHALE FRAGMENTS	ST			
10		CL LEAN CLAY LOW DENSITY	10		89.2	31.8%
		II V. COMPRESSIBLE			95.3	28.2%
		V. SOFT to DRILL				
		CL-ML SILTY CLAY LOW DENSITY	Bulk			28.3%
15		III V. COMPRESSIBLE STRATIFIED	15			
		ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf				
		HOLE IS SQUEEZING SHUT				
20			20			
		T.D. @ 14'				
25			25			
30			30			
35			35			
		Blow Counts are counted for each 6 inches of sampler penetration.				
40		**Free Water @ 7'**	40			
		During Drilling 1-4-2007				

LOG OF SUBSURFACE EXPLORATION

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado

North West Plateau Development
Grand Junction, Colorado

Date **1-15-2007**

Job No. **92793-GJ**

Drawn **EMM**

BORING NO. 2 DRILL: GJLD CME-45B

NORTHEAST CORNER of TRACT

BORING ELEVATION: AUGER/TOOLS: 4" od, SOLID

DEPTH (FT.)	SOIL LOG	DESCRIPTION		BLOW COUNT /inch	SOIL DENSITY pcf	WATER %
		SURFACE SOILS REWORKED by AGRICULTURAL ACTIVITIES				
	CL	LEAN CLAY ROOTS & ORGANIC MATTER	ST		97.9	22.7%
	II	COMPRESSIBLE LOW DENSITY WET				
	CL-ML	SILTY CLAY **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf**	ST			
5	III	COMPRESSIBLE MOTTLED SOIL	5		89.0	30.4%
		V. SOFT to DRILL WET	SPT	2/6		
		STRATIFIED		2/6		33.0%
		FREE WATER ▽		2/6		
	SP-SM	SILTY SAND, Poorly Graded LOW DENSITY	ST			
10	I	COMPRESSIBLE	10			22.9%
	CL	LEAN CLAY				
	II	V. COMPRESSIBLE STRATIFIED				
		V. SOFT to DRILL				
	CL-ML	SILTY CLAY LOW DENSITY	Bulk			32.0%
15	III	V. COMPRESSIBLE	15			
		ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf				
20		HOLE IS SQUEEZING SHUT	20			
		T.D. @ 14'				
25			25			
30			30			
35			35			
40			40			

Blow Counts are counted for each 6 inches of sampler penetration.

Free Water @ 8'

During Drilling 1-4-2007

LOG OF SUBSURFACE EXPLORATION

GRAND JUNCTION LINCOLN - DeVORE, Inc.

Geotechnical Consultants

Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision

18 Road & I-70 Frontage, Fruita, Colorado

North West Plateau Development

Grand Junction, Colorado

Date **1-15-2007**

Job No. **92793-GJ**

Drawn **EMM**

BORING NO. 3 DRILL: GJLD CME-45B

SOUTH CENTRAL PORTION of TRACT, NORTH of DRAIN DITCH

BORING ELEVATION: AUGER/TOOLS: 4" od, SOLID

DEPTH (FT.)	SOIL LOG	DESCRIPTION			BLOW COUNT /inch	SOIL DENSITY pcf	WATER %
		SURFACE SOILS REWORKED by AGRICULTURAL ACTIVITIES					
		ROOTS & ORGANIC MATTER					
		SP-SM SILTY SAND, Poorly Graded	LOW DENSITY	WET	ST	89.9	23.0%
		I COMPRESSIBLE	STRATIFIED				
5		**ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf**			5		23.4%
		THIN CLAY & SILTY CLAY STRATA			ST		
		FREE WATER V. SOFT to DRILL					
		SP-SM SILTY SAND, Poorly Graded					
		I COMPRESSIBLE	LOW DENSITY		SPT		
10					10	2/6	19.4%
		SP-SM SILTY SAND, Poorly Graded				3/6	
		STRATIFIED				1/6	
		THIN CLAY & SILTY CLAY STRATA					
		SP-SM SILTY SAND, Poorly Graded			ST		
15		I COMPRESSIBLE	LOW DENSITY		15		22.3%
		CL LEAN CLAY **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf**					
		II V. COMPRESSIBLE					
		V. SOFT to DRILL					
20					20		
		HOLE IS SQUEEZING SHUT					
		T.D. @ 15'					
25					25		
30					30		
35					35		
		Blow Counts are counted for each 6 inches of sampler penetration.					
40		**Free Water @** 6' **During Drilling** 1-4-2007			40		

LOG OF SUBSURFACE EXPLORATION

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado
North West Plateau Development
Grand Junction, Colorado

Date **1-15-2007**

Job No. **92793-GJ**

Drawn **EMM**

Previous BORING NO. 1 PB-1 DRILL: GJLD CME-45B

North East CORNER of TRACT

BORING ELEVATION: AUGER/TOOLS: 4" od, SOLID

DEPTH (FT.)	SOIL LOG	DESCRIPTION		BLOW COUNT /inch	SOIL DENSITY pcf	WATER %
		LEAN CLAY ORGANIC THICK GRASS				
	CL	LEAN CLAY	MEDIUM DENSITY STRATA WET			
	I	Sl. EXPANSIVE STRATA	SULFATES	ST	93.0	23.6%
		ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf			94.5	28.1%
5			LOW DENSITY WET	5	2/6	
	ML	SANDY SILT	SOFT to DRILL	SPT	2/6	23.8%
	II	COMPRESSIBLE	SULFATES		2/6	
	CL	LEAN CLAY STRATIFIED				
	I	COMPRESSIBLE	WET	SPT	1/12	28.5%
10			LOW DENSITY	10	1/6	
		FREE WATER ▽				
	ML	SANDY SILT THIN LEAN CLAY STRATA				
	II					
	CL	LEAN CLAY				
15	I	COMPRESSIBLE	V. SOFT to DRILL	SPT	1/18	26.7%
	SM	SILTY SAND w/GRAVELS	LOW DENSITY	15		
	III	COMPRESSIBLE				
		GRAVEL SIZED FRAGMENTS of SILTSTONE & MUDSTONE				
20		HOLE COLLAPSED BACK TO 10' WHEN AUGER WAS REMOVED		20		
25		T.D. @ 15'		25		
30				30		
35				35		
40				40		

Blow Counts are counted for each 6 inches of sampler penetration.

Free Water @ During Drilling 10' 2-21-03

LOG OF SUBSURFACE EXPLORATION

GRAND JUNCTION LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW SUBDIVISION
18 & I.5 Roads, Fruita, CO

Northwest Plateau Development
Grand Junction, Colorado

Date: 3-3-2003

Job No.: 90003-GJ

Drawn: EMM

PREVIOUS BORING NO. 3 pb-3 DRILL: GJLD CME-45B

North west PORTION of TRACT

BORING ELEVATION: AUGER/TOOLS: 4" od, SOLID

DEPTH (FT.)	SOIL LOG	DESCRIPTION		BLOW COUNT /inch	SOIL DENSITY pcf	WATER %
		ML SANDY SILT ORGANIC THICK GRASS				
		II COMPRESSIBLE Sl. FIRM to DRILL Sl. DAMP				
		SM SILTY SAND w/GRAVELS LOW DENSITY SULFATES	ST		95.0	3.2
		III COMPRESSIBLE MOIST				
5		CL LEAN CLAY ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf	5	3/6		
		I COMPRESSIBLE	SPT	4/6		16.6
		V. THIN SILT STRATA SULFATES		5/6		
		LOW DENSITY WET				
		CL LEAN CLAY V. SOFT to DRILL				
10		I COMPRESSIBLE	SPT	1/18		31.0
		FREE WATER	10			
		STRATIFIED				
		ML SANDY SILT				
		II COLORADO RIVER ALLUVIAL DEPOSITS, Qa				
15		CL LEAN CLAY V. SOFT to DRILL	15			
		I COMPRESSIBLE				
		STRATIFIED				
		LOW DENSITY				
20		ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf	20			
		CL LEAN CLAY				
		I COMPRESSIBLE V. SOFT to DRILL				
25		V. THIN SILT STRATA	25			
		GM SANDY GRAVEL & COBBLE Sl. FIRM to DRILL NO SAMPLE				
		IV COLORADO RIVER ALLUVIAL DEPOSITS, Qa				
30			30			
		T.D. @ 28'				
		THE MURRY DRAIN, WEST of THIS TRACT, HAS FLOWING WATER.				
35		LARGE GRAVELS & SOME COBBLE IN THE DRAIN BOTTOM.	35			
		THIS GRAVEL & COBBLE MAY NOT BE NATIVE.				
		Blow Counts are counted for each				
		6 inches of sampler penetration.				
40		Free Water @ 10'	40			
		During Drilling 2-21-03				

LOG OF SUBSURFACE EXPLORATION

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW SUBDIVISION
18 & I.5 Roads, Fruita, CO

Northwest Plateau Development
Grand Junction, Colorado

Date 3-3-2003

Job No. 90003-GJ

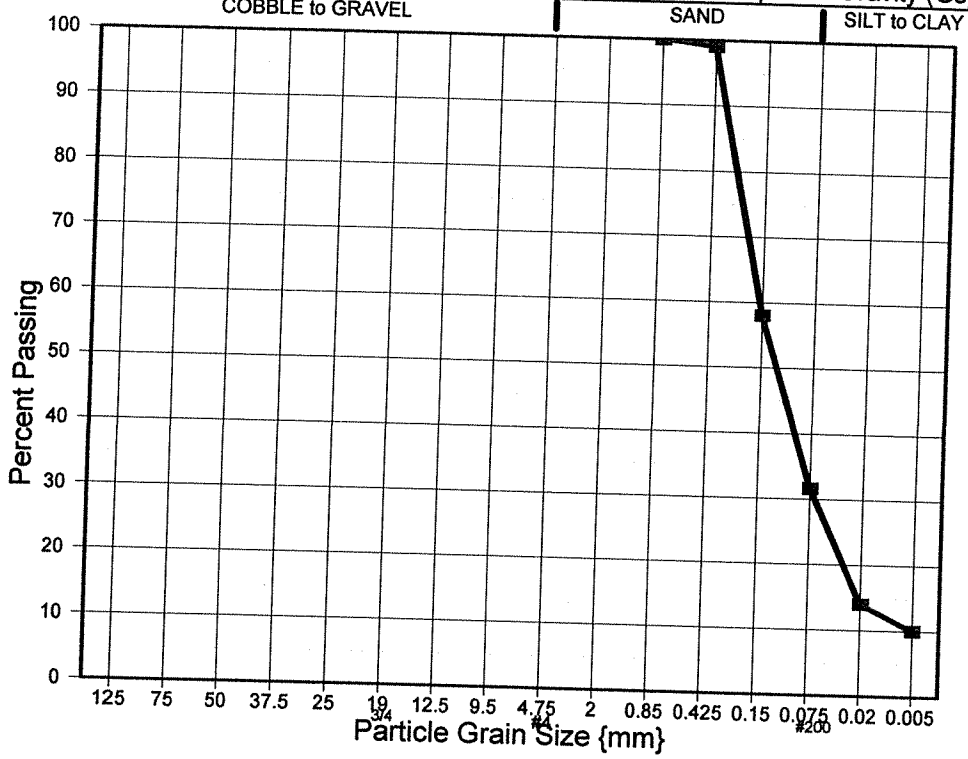
Drawn EMM

Soil Sample: **SILTY SAND, Poorly Graded (SP-SM)** Sample No.: **I** **(Typical)**

Geologic Origin: **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf** Test by: **LRS**

Natural Water Content (w): **29.6%** Boring No.: **1** Depth: **2'**

In-Place Density (pcf): **92.4** Soil Specific Gravity (Gs): **2.67** Estimated



Effective size **0.005** mm

Cu **36.0**

Cc **5.4**

Plastic Limit (PL) **N.P.**

Liquid Limit (LL) **N.V.**

Plasticity Index (PI) **N.P.**

Skempton's Activity **0.0**

Shrinkage Limit (SL)

Shrinkage Ratio

DIRECT SHEAR: **CD**

	Peak	Res.
Shear Angle:	deg.	
Tan Shear:		
Cohesion:	psf	

Sieve	(mm)	% Passing
5"	125	
3"	75	
2"	50	
1-1/2"	37.5	
1"	25	
3/4"	19	
1/2"	12.5	
3/8"	9.5	
# 4	4.75	
#10	2	
#20	0.85	100
#40	0.425	99
#100	0.15	58
#200	0.075	31.7
	0.02	14
	0.005	10

Maximum Size Allowed By Sampler 2-1/2"

MOISTURE / DENSITY RELATIONSHIP:

ASTM Method: **D-698 A** **D 4718 - 0% Rock Correction**

Max. Dry Density : pcf pcf

Optimum Moisture :

HVEEM-CARMANY:

'R' Value @ 300 psi:

Displacement 300 psi:

Expansion @ 300 psi: psf

FHA Soil Swell:

Swell

psf

Remolded Sample

ALLOWABLE BEARING (net): **2500** psf by Consolidometer

Standard Penetration (SPT): **800** psf by Penetrometer

Unconfined Compression (qu): psf

NO SAMPLE COLLAPSE @ **110** psf

CONSOLIDATION: **1.53%** @ **2050** psf

CONSOLIDATION: **2.41%** @ **4100** psf

SULFATE SALTS: **<50** ppm

PERMEABILITY:

K (20 C): Remolded cm/sec @ pcf

SOIL ANALYSIS and SUMMARY

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado

North West Plateau Development
Grand Junction, Colorado

Date **1-15-2007**

Job No. **92793-GJ**

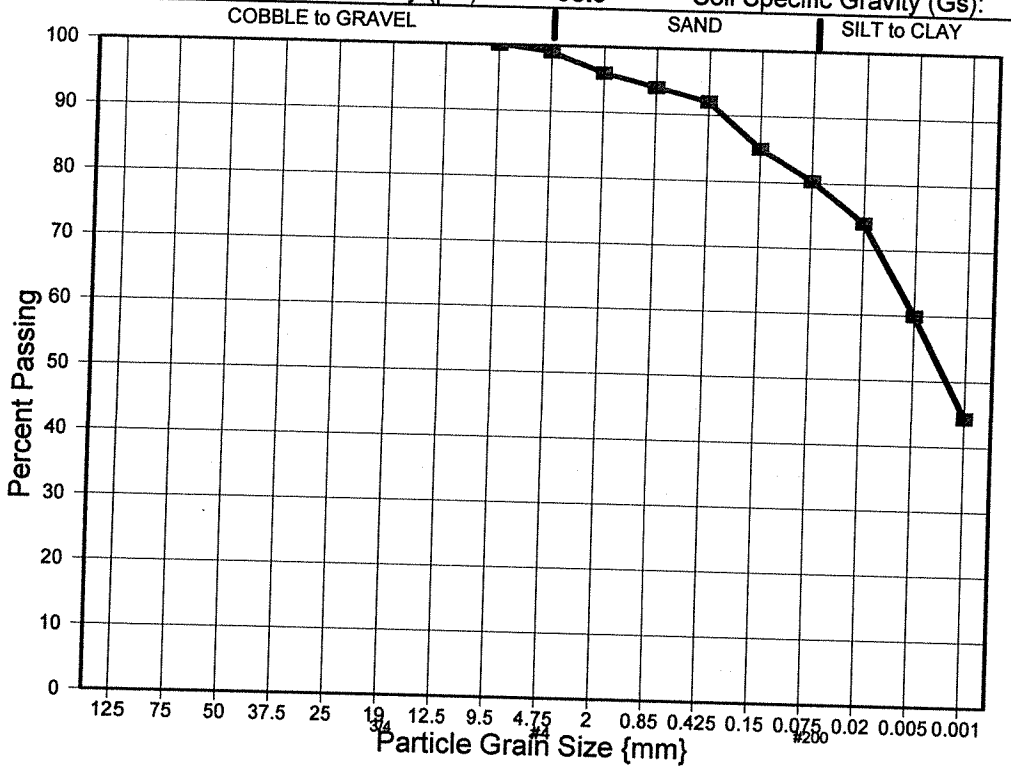
Drawn **EMM**

Soil Sample: **LEAN CLAY, w/SAND Medium Plastic (CL)** Sample No.: **II** **(Typical)**

Geologic Origin: **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf** Test by: **LRS**

Natural Water Content (w): **28.2%** Boring No.: **1** Depth: **9'**

In-Place Density (pcf): **95.3** Soil Specific Gravity (Gs): **2.68** Estimated



Effective size mm

Cu

Cc

Plastic Limit (PL)	**27**
Liquid Limit (LL)	**46**
Plasticity Index (PI)	**19**
Skempton's Activity	**0.3**
Shrinkage Limit (SL)	
Shrinkage Ratio	

DIRECT SHEAR: **CD**

	Peak	Res.
Shear Angle:	deg.	
Tan Shear:		
Cohesion:	psf	

Sieve	(mm)	% Passing
5"	125	
3"	75	
2"	50	
1-1/2"	37.5	
1"	25	
3/4"	19	
1/2"	12.5	
3/8"	9.5	100
# 4	4.75	99
#10	2	96
#20	0.85	94
#40	0.425	92
#100	0.15	85
#200	0.075	80.3
	0.02	74
	0.005	60
	0.001	44

Maximum Size Allowed By Sampler 2-1/2"

MOISTURE / DENSITY RELATIONSHIP:

ASTM Method: **D-698 A** **D 4718 - 0% Rock Correction**

Max. Dry Density : pcf pcf

Optimum Moisture :

HVEEM-CARMANY: **FHA Soil Swell:**

'R' Value @ 300 psi: Swell

Displacement 300 psi: psf

Expansion @ 300 psi: psf Remolded Sample

ALLOWABLE BEARING (net): **1500** psf by Consolidometer

Standard Penetration (SPT): **700** psf by Penetrometer

Unconfined Compression (qu): psf

NO SAMPLE COLLAPSE @ **110** psf

CONSOLIDATION: **1.21%** @ **1025** psf

CONSOLIDATION: **2.13%** @ **2050** psf

SULFATE SALTS: **10,000+** ppm

PERMEABILITY:

K (20 C): Remolded cm/sec @ pcf

SOIL ANALYSIS and SUMMARY

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado

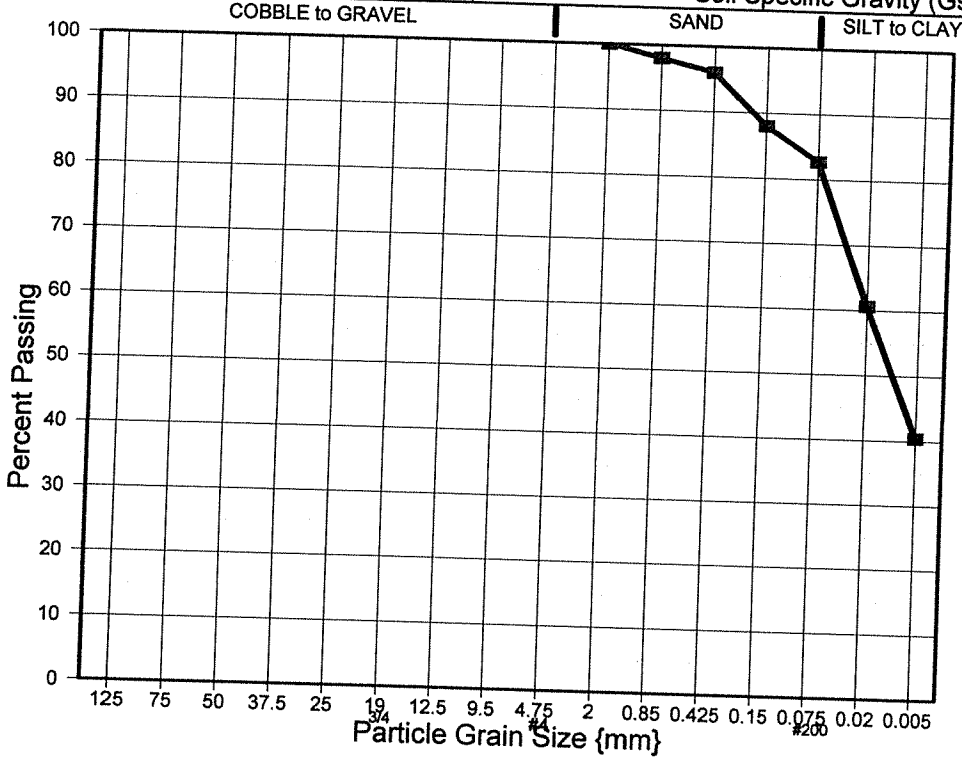
North West Plateau Development Grand Junction, Colorado	Date 1-15-2007
Job No. 92793-GJ	Drawn EMM

Soil Sample: **SILTY CLAY (CL-ML)** Sample No.: **III** **(Typical)**

Geologic Origin: **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf** Test by: **LRS**

Natural Water Content (w): **30.4%** Boring No.: **2** Depth: **5'**

In-Place Density (pcf): **89.0** Soil Specific Gravity (Gs): Estimated



Effective size mm

Cu

Cc

Plastic Limit (PL)	21
Liquid Limit (LL)	27
Plasticity Index (PI)	6
Skempton's Activity	0.1
Shrinkage Limit (SL)	
Shrinkage Ratio	

DIRECT SHEAR: **CD**

	Peak	Res.
Shear Angle:	deg.	
Tan Shear:		
Cohesion:	psf	

Sieve	(mm)	% Passing
5"	125	
3"	75	
2"	50	
1-1/2"	37.5	
1"	25	
3/4"	19	
1/2"	12.5	
3/8"	9.5	
# 4	4.75	
#10	2	100
#20	0.85	98
#40	0.425	96
#100	0.15	88
#200	0.075	82.7
	0.02	61
	0.005	40

Maximum Size Allowed By Sampler 2-1/2"

MOISTURE / DENSITY RELATIONSHIP:

ASTM Method: **D-698 A** **D 4718 - 0% Rock Correction**

Max. Dry Density : pcf pcf

Optimum Moisture :

HVEEM-CARMANY:

'R' Value @ 300 psi: 9

Displacement 300 psi: 4.55

Expansion @ 300 psi: 95 psf

FHA Soil Swell:

Swell psf

Remolded Sample

ALLOWABLE BEARING (net): psf by Consolidometer

Standard Penetration (SPT): 700 psf by Penetrometer

Unconfined Compression (qu): psf

NO SAMPLE COLLAPSE @ psf

CONSOLIDATION: @ psf

CONSOLIDATION: @ psf

SULFATE SALTS: <50 ppm

PERMEABILITY:

K (20 C): Remolded cm/sec @ pcf

SOIL ANALYSIS and SUMMARY

GRAND JUNCTION LINCOLN - DeVORE, Inc.

Geotechnical Consultants

Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision

18 Road & I-70 Frontage, Fruita, Colorado

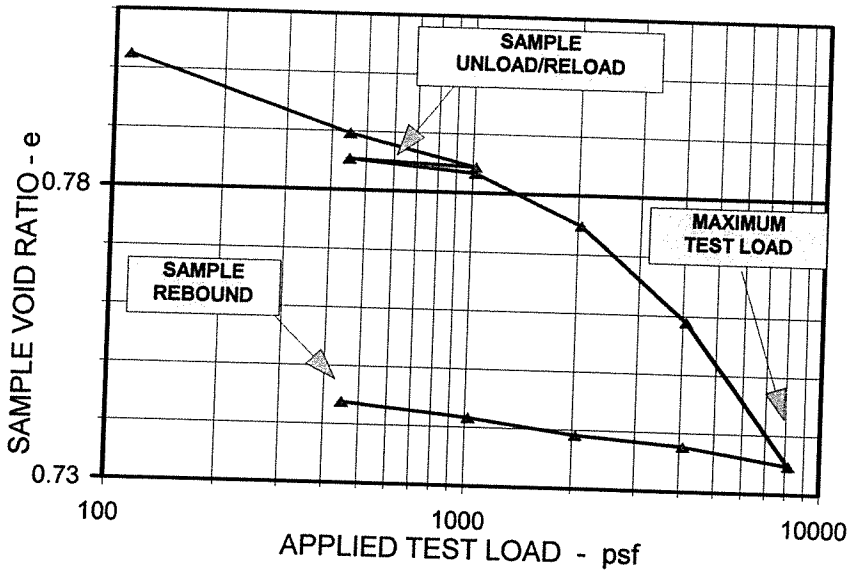
North West Plateau Development

Grand Junction, Colorado

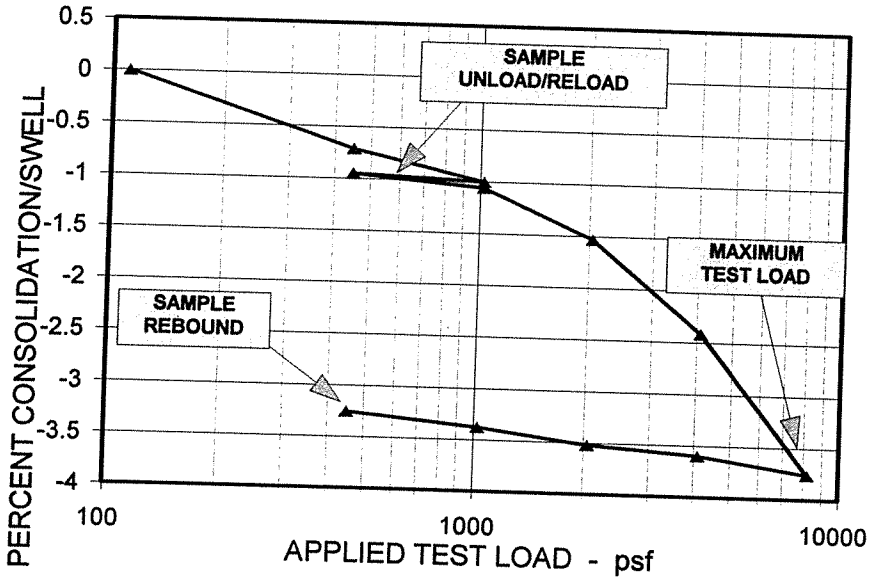
Date **1-15-2007**

Job No. **92793-GJ**

Drawn **EMM**



The Consolidation Test (ASTM D-2435, History) Was Run By Subjecting The Soil Specimen To A 'Seating' Load To Remove Slack From The Apparatus And To Provide An Accurate Point Of Beginning. The Test Begins With The Stones Being Very Moist The Sample Is Inundated With Water. The Sample Is Then Loaded To 1025 psf, Unloaded And Reloaded. The Sample Is Then Loaded To The Maximum Test Load. After The Maximum Test Load, The Soil Specimen Is Unloaded To Measure Rebound And Any Swelling Potential After Consolidation.



LOAD SUMMARY

110	*psf SEATING LOAD*
110	*psf SAMPLE SATURATED*
0	*% SOIL COLLAPSE*
0.00	*% SOIL EXPANSION / SWELL D-4546 B*
0.50	*% SAMPLE REBOUND @ UNLOAD*
3.75	*% MAXIMUM CONSOLIDATION*
8200	*psf MAXIMUM TEST LOAD*

	INITIAL	MAXIMUM LOAD	FINAL LOAD
SOIL DENSITY (pcf)	92.4	96.0	95.5
SOIL MOISTURE (%)	29.6%	27.4%	27.7%
CONSOLIDATION (%)	-0-	3.75%	3.25%
VOID RATIO (e)	0.802	0.735	0.744
SATURATION (%)	99%	99%	99%

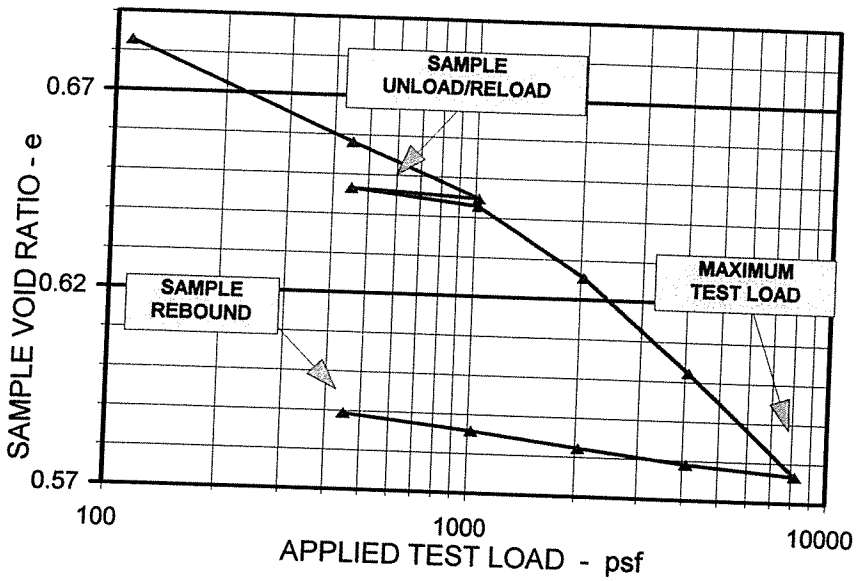
SOIL #: I
SOIL TYPE : SP-SM, Qdf
TEST HOLE #: 1 @ 2'
SAMPLE Gs: 2.67
DIAMETER (in.): 2.5
AREA (inches): 4.9087

SAMPLE Gs WAS ESTIMATED

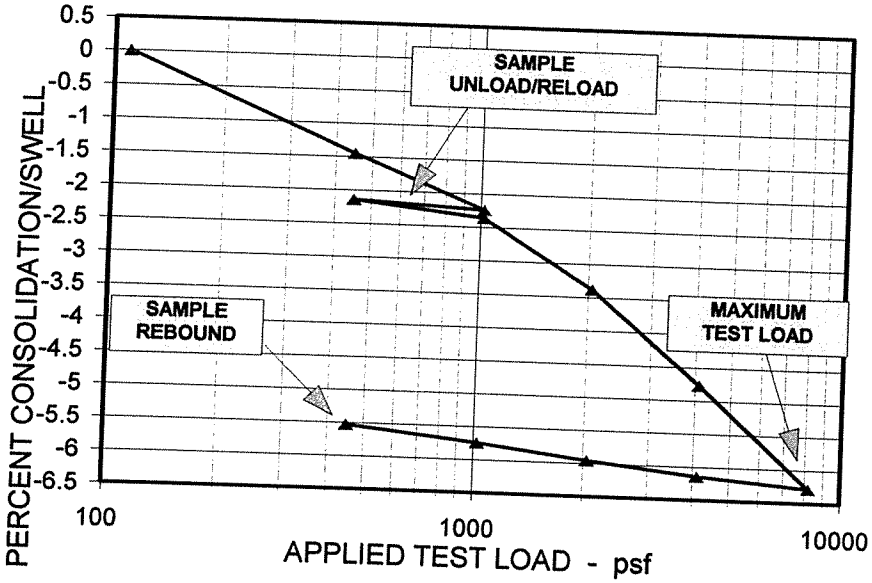
SOIL CONSOLIDATION ASTM D-2435

GRAND JUNCTION
LINCOLN - DeVORE, Inc.
Geotechnical Consultants
Grand Junction, Colorado

ADOBE VIEW NORTH Subdivision
18 Road & I-70 Frontage, Fruita, Colorado
North West Plateau Development
Grand Junction, Colorado
Date **1-15-2007**
Job No. **92793-GJ**
Drawn **EMM**



The Consolidation Test (ASTM D-2435, History) Was Run By Subjecting The Soil Specimen To A 'Seating' Load To Remove Slack From The Apparatus And To Provide An Accurate Point Of Beginning. The Test Begins With The Stones Being Very Moist The Sample Is Inundated With Water. The Sample Is Then Loaded To 1025 psf, Unloaded And Reloaded. The Sample Is Then Loaded To The Maximum Test Load. After The Maximum Test Load, The Soil Specimen Is Unloaded To Measure Rebound And Any Swelling Potential After Consolidation.



LOAD SUMMARY

110	*psf SEATING LOAD*
110	*psf SAMPLE SATURATED*
0	*% SOIL COLLAPSE*
0.00	*% SOIL EXPANSION / SWELL D-4546 B*
0.75	*% SAMPLE REBOUND @ UNLOAD*
6.27	*% MAXIMUM CONSOLIDATION*
8200	*psf MAXIMUM TEST LOAD*

	INITIAL	MAXIMUM LOAD	FINAL LOAD
SOIL DENSITY (pcf)	98.5	105.7	104.8
SOIL MOISTURE (%)	24.2%	21.3%	21.8%
CONSOLIDATION (%)	-0-	6.27%	5.52%
VOID RATIO (e)	0.683	0.577	0.589
SATURATION (%)	95%	99%	99%

SOIL #: I
SOIL TYPE : SP-SM, Qdf
TEST HOLE #: 1 @ 4'
SAMPLE Gs: 2.67
DIAMETER (in.): 2.5
AREA (inches): 4.9087

SAMPLE Gs WAS ESTIMATED

SOIL CONSOLIDATION ASTM D-2435

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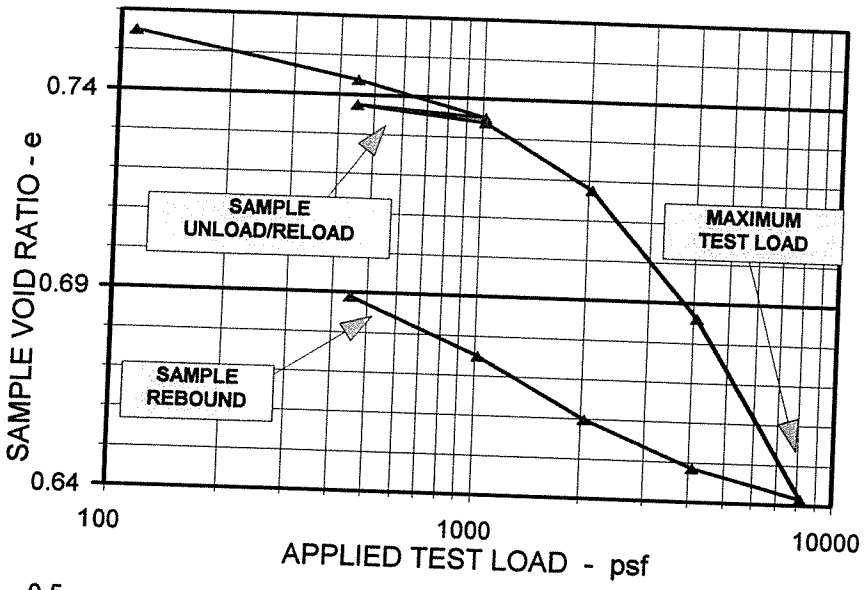

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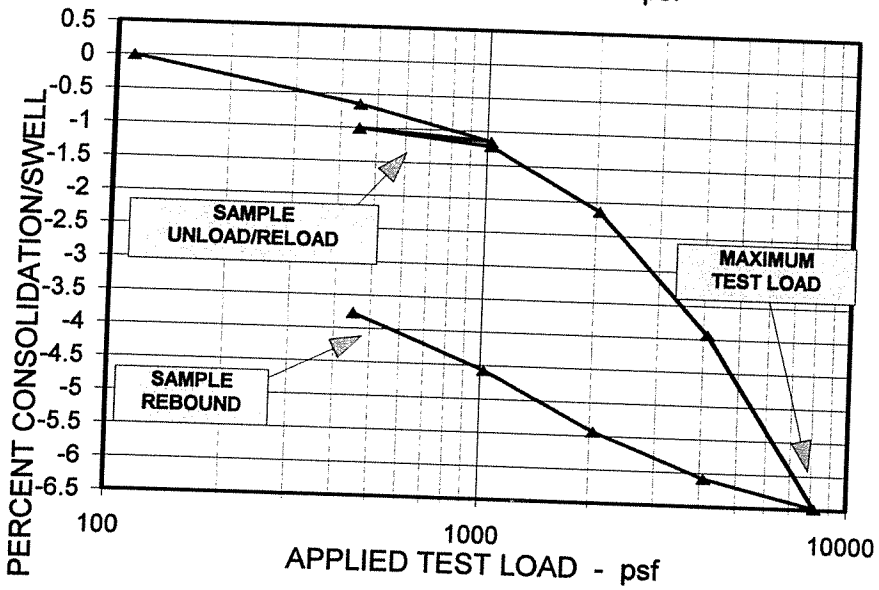

LOAD SUMMARY

110	*psf SEATING LOAD*
110	*psf SAMPLE SATURATED*
0	*% SOIL COLLAPSE*
0.00	*% SOIL EXPANSION / SWELL D-4546 B*
2.71	*% SAMPLE REBOUND @ UNLOAD*
6.47	*% MAXIMUM CONSOLIDATION*
8200	*psf MAXIMUM TEST LOAD*

	INITIAL	MAXIMUM LOAD	FINAL LOAD
SOIL DENSITY (pcf)	95.3	101.9	99.0
SOIL MOISTURE (%)	28.2%	23.9%	25.7%
CONSOLIDATION (%)	-0-	6.47%	3.76%
VOID RATIO (e)	0.755	0.642	0.689
SATURATION (%)	100%	100%	100%

SOIL #: II
SOIL TYPE : CL, Qdf
TEST HOLE #: 1 @ 9'
SAMPLE Gs: 2.68
DIAMETER (in.): 2.5
AREA (inches): 4.9087

SAMPLE Gs WAS ESTIMATED

SOIL CONSOLIDATION ASTM D-2435

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Soil Sample: **LEAN CLAY (CL) w/ SILTY CLAY STRATA** Sample No.: **III** **(Typical)**

Geologic Origin: **ALLUVIAL/DEBRIS FAN DEPOSITS, Qa/Qdf** Test by: **DC**

Natural Water Content (w): **22.7%** Boring No.: **2** Depth: **1'-3'**

In-Place Density (pcf): **97.9** Soil Specific Gravity (Gs): Estimated

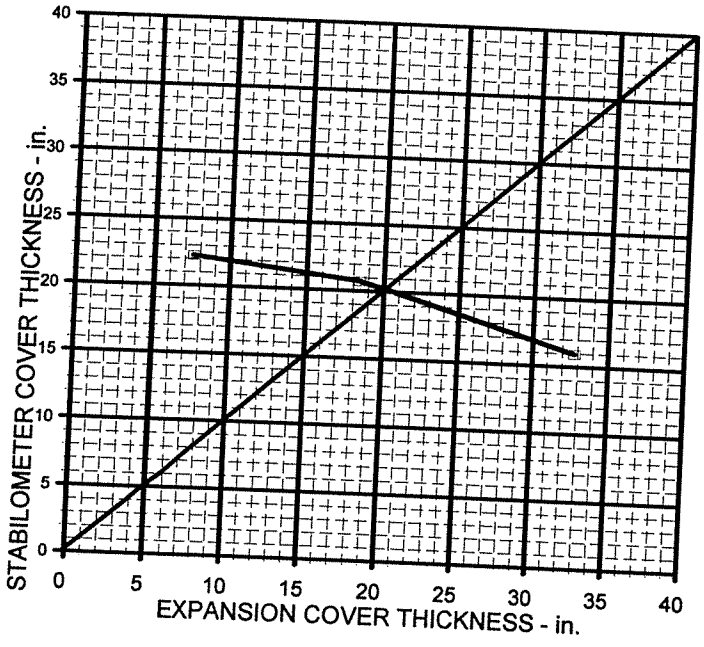
TEST SPECIMEN	1	2	3	4	5
DATE TESTED	1-11-07	1-11-07	1-11-07		
INITIAL MOISTURE %	8	8	8		
WATER ADDED ml.	84	108	114		
WATER ADDED %	7	9	9.5		
MOISTURE at COMPACTION %	15	17	17.5		
WET WEIGHT of BRIQUETTE gm	1091.6	1087.8	1084.9		
HEIGHT of BRIQUETTE in.	2.5	2.5	2.55		
COMPACTED DRY DENSITY pcf	115.1	112.7	109.7		
STABILOMETER @ 1000 lb	71	75	76		
STABILOMETER @ 2000 lb	118	134	137		
DISPLACEMENT	3.44	4.45	4.65		
R VALUE (test)	21	10	8		
EXUDATION PRESSURE psi	427	308	299		
STABILITY THICKNESS in.	16	20.8	22.3		
EXPANSION PRESSURE psi	355	199	82		
EXPANSION THICKNESS in.	32.8	18.4	7.6		

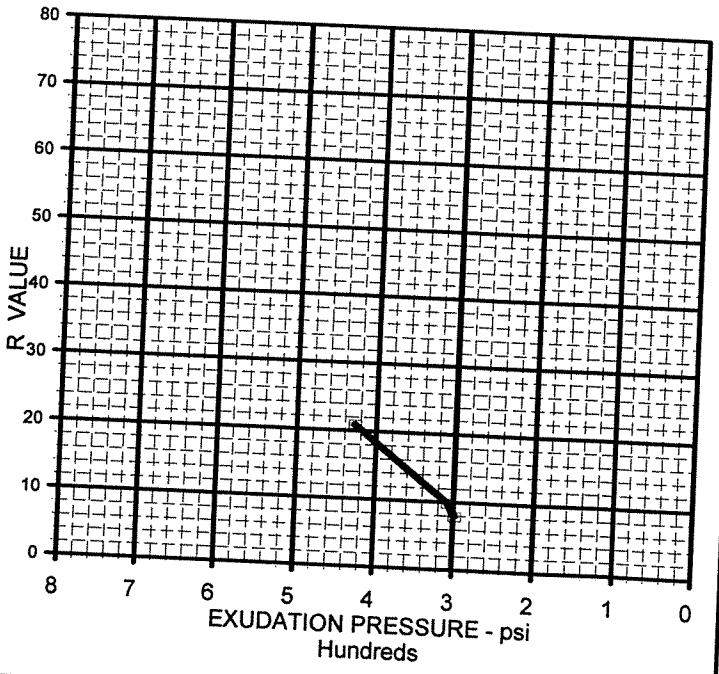
REPORT VALUES

R = **9**

Disp.= **4.55**

Swell= **95**





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