Dancing Wolf Estates

RMG
ENGINEERS

GEOLOGIC HAZARD INVESTIGATION

40 ACRE SUBDIVISION
N.E. CORNER OF HWY 83 AND HODGEN ROAD
PART OF THE SOUTH 1/2 OF THE SOUTHEAST 1/4 OF SECTION 22, TOWNSHIP 11 SOUTH, RANGE 66 WEST
EL PASO COUNTY, COLORADO

Prepared for:

David & Alice McElhoes
8115 D Sommerset Drive
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Respectfully Submitted,

COLORADO REGISTERED MICHAEL J. GACKLE 27015 PROFESSIONAL ENGINEER

Michael J. Gackle, P.E. 27015
Professional Engineer

Reviewed by:

Michael Kunz
Professional Geologist

Job No. 26710GEO

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SUMMARY

Project Location

The project is approximately 40 acres which lies at the northeast corner of Highway 83 and Hodgen Road in part of the south 1/2 of the southeast 1/4 of Section 22, Township 11 South, Range 66 West with boundaries approximately as shown on the maps accompanying this report.

Project Description

It is our understanding that the project is to consist of a residential development of approximately 7 lots of approximately 5 acres which will utilize individual wells for water supply and have individual waste water disposal systems.

Purpose of Report

This report is intended to present a geologic investigation and treatment of engineering geologic hazards. The characteristics of the site with regard to the use of individual septic systems are also addressed. Water resource use is beyond the scope of this report.

Land Use and Engineering Geology

In general, this site was found to be suitable for the proposed residential development; however, areas were encountered where the geologic conditions will impose certain constraints on development and land use in those areas. Such areas include bog areas. This condition is discussed in much greater detail in the body of this report and is shown on the attached geologic map. Figure No. 2.

Individual Wastewater Disposal

A total of 5 percolation tests have been performed on this site. The percolation tests conducted on this site indicated average percolation rates ranging from 11 minutes/inch to 23 minutes/inch. These average perc rates are in the range which would be considered acceptable for the use of conventional septic systems utilizing absorption trenches. Some limitations on the use of conventional septic systems on this site may exist in areas due to shallow bedrock. This will be discussed in much greater detail in the body of this report.

More complete discussion and additional recommendations can be found in the body of this report. All recommendations are subject to the limitations set forth herein.

GENERAL SITE CONDITIONS AND PROJECT DESCRIPTION

The project is approximately 40 acres which lies at the northeast corner of Highway 83 and Hodgen Road in part of the south 1/2 of the southeast 1/4 of Section 22, Township 11 South, Range 66 West with boundaries approximately as shown on the maps accompanying this report. The topography of the site tends to range from moderately sloping to gently rolling topography. The major drainage in this area flows in a southerly direction through the central portion of the site. A spring is located at the north end of the drainage area.

Previous land uses have been agricultural in nature, as the area has been primarily used as grazing and pasture land. It is our understanding that the proposed development will be largely residential in nature having average lot sizes on the order of 5 acres in size. We also understand that the area will be serviced by individual wells as well as individual waste water treatment systems.

Vegetation in the area consists principally of low grasses with tree coverage in the northeast corner of the site.

FIELD INVESTIGATION

The field investigation on this site consisted of test borings, and detailed field mapping, resulting in the production of a detailed geologic map of the bedrock features and significant surficial deposits. This mapping also produced an engineering geologic map identifying pertinent geologic hazards affecting development.

In addition, 5 percolation tests were performed by RMG Engineers, Inc. The tests were performed at different locations on this site to provide general information on the suitability of the site for the use of individual waste water treatment systems. Results of the testing will be discussed later in this report.

GENERAL GEOLOGY

Physiographically, the site lies in the western portion of the Great Plains Province. Some 10 miles or so to the west is the South Rocky Mountain Province. Marking this boundary is a major structure feature known as the Rampart Range fault. The site exists along the southern margin of a large structural feature known as the Denver Basin. Bedrock in the area tends to be very gently dipping in a north to northeasterly direction. Rock formations in the area of this site are sedimentary in nature and typically Tertiary to Cretaceous in Age, spanning the boundary between the Cenozoic and Mesozoic Eras of geologic time. When encountered in a formational state, the rock type tends to be a sandstone with occasional layers or lenses of clay or claystone. No faults or other major structural features were identified on the site. On all of this site, bedrock is obscured by a cover of alluvial deposits of Quaternary Age. The site's stratigraphy will be discussed in more detail in the following section.

SITE STRATIGRAPHY

Two mappable geologic units were identified on this site which, from youngest to oldest, may be identified as follows:

Q_{al} - Alluvium of Holocene Age: These are very recent soil materials associated with stream deposition in the valley floors. They consist primarily of fine grain silty to well graded sands and clayey sand of brown color derived primarily from the weathering and subsequent transportation and deposition by water of the sedimentary sandstone bedrock materials of the Dawson formation.

Q_p /TK_d - This material is a relatively shallow cover of recent soil materials associated with stream deposition over a bedrock. The bedrock material consists of a silty to clayey sandstone of the Dawson sandstone formation.

The approximate location and boundaries of the above described deposits can be found on the Geologic Map attached to this report. Figure No. 1. In some cases, combined symbols are utilized on the map and these are explained on the map legend. No bedrock outcrops of any type were observed on this site; however, the bedrock underlying this site should consist of the Dawson sandstone formation of Paleocene and Upper cretaceous Age (TK_d). This particular rock type does warrant description as it may be encountered in some of the excavations on the site. This material is typically an arkosic (meaning containing feldspar) sandstone. It is typically white to yellowish-gray in color and frequently observed with hard, think ironstone layers and/or claystone layers or lenses.

ENGINEERING GEOLOGY - IDENTIFICATION AND MITIGATION OF GEOLOGIC HAZARDS

As mentioned previously, detailed mapping has been performed on this site to produce an Engineering Geology Map which can be found attached to this report Figure No. 2. This map shows the location of various geologic hazards of which the developer should be aware of during the planning, design, and construction stages of the project. These hazards and their recommended mitigation techniques are described as follows:

b - Bog: In these areas we would anticipate high groundwater conditions with intermittent surface water a potential for the occurrence of organic or peat-rich soils and a severe frost heave potential. Please be advised that compliance with current and pending regulatory requests for development in these areas is beyond the scope of this report.

Mitigation: In such areas we would strongly recommend against building structures with basements or other living space below grade, due to the severe potential for groundwater seepage. Areas containing any organic soils should be avoided, where possible, due to problems with low strength and high consolidation or settlement potential. Should it become necessary to locate a portion of a structure on these organic soils, large magnitudes of settlement should be anticipated and the structure's foundation should be designed accordingly with every attempt made to minimize settlement activity. In dealing with a severe frost heave potential, one should be certain that the foundations penetrate to a sufficient depth as to minimize the potential for the formation of frost lenses beneath foundations. At this location and elevation, a minimum frost depth on the order of 2.5 feet would be recommended.

ECONOMIC MINERAL RESOURCES

Although the Dawson formation is sometimes felt to contain potential resources of strippable coal, this particular area is not identified as one containing any potential coal resources (Lignite). Identifiable coal deposits were not encountered in the exploratory drilling program conducted with this site. Some of the alluvial soils above the bedrock surface could also be considered a low grade deposit of sand resource; however, due to the thinness of these deposits, the limited extent, and relative abundance of similar materials throughout the region, they would be considered to have little significance as a resource.

Water Supply

It is our understanding that the developer wishes for the water supply to come from individual wells drilled by each homeowner. The water supply data is beyond the scope of in this report.

ON-SITE DISPOSAL OF WASTE WATER

As a part of this investigation, 5 percolation tests were performed as located on the attached maps. Average percolation rates at the test location were found to range from 11 minutes per inch to 23 minutes per inch. Specific percolation tests results and test borings which were drilled to a depth of 20 feet at each location will be found attached to this report. Figures 6 through 10.

All of the percolation rates observed were found to be in a range which would be considered acceptable for use of conventional systems using absorption trenches or seepage beds for the disposal of sewage effluent into the subsurface. Soil typically consisted of silty to clayey sand overlying a silty to clayey sandstone. Shallow bedrock was observed in some of the test borings. No free water was observed in the test borings. The terrain on this site consisted of gentle to moderate slopes and rolling topography. It will be necessary in the future to verify percolation rates and depth to any groundwater or bedrock on a site by site basis. The septic systems should be located on each lot away from any groundwater or bedrock areas if possible.

All surface runoff should be directed away from the absorption fields. A spring is present at the north part of the site. The water flows to the south along the drainage gully which is located in the central portion of the site. The septic systems should be placed the required distances away from any water source. Should conditions be encountered on any given site restricting the use of conventional systems, or the problem cannot be resolved by relocation of the proposed system on the lot, then alternate types of treatment systems are available for use, including evapotranspiration systems, above ground mound systems, and in extreme cases, complete self-contained aeration and digestion systems.

CLOSING

We hope that this report has provided you with all of the information that you required and that it has been presented in an understandable way. Should any of the points be unclear or should you require additional information, please do not hesitate to contact our office. It should also be pointed out that because of the nature of data obtained by random sampling of such variable and nonhomogeneous materials such as soil and rock, it is important that we be informed of any differences observed between the surface and subsurface conditions encountered during construction and those assumed and outlined in the body of this report. Construction and design personnel should be made familiar with the contents of this report. Reporting such discrepancies to RMG Engineers, Inc. soon after they are discovered will be greatly appreciated and could possibly help avoid construction and development problems.

The conclusions and information contained in this report are based on the data obtained during drilling of the test borings and detailed field mapping. No investigative methodology can completely eliminate the possibility of obtaining partially imprecise or incomplete information. Thus, we cannot guarantee the nature and extent of subsurface conditions across the project site. Professional judgement was utilized in gathering and analyzing the information obtained. As such, RMG Engineers, Inc. cannot be held responsible for any effect upon liabilities, legal rights, or obligation of any party or effect upon the value of the property or for the occurrence or non-occurrence of any transaction involving the property.

TEST BORING NO. P1
DATE DRILLED: 3-28-96
REMARKS: PROFILE HOLE DRY 3-29-96

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
0	SAND, SILTY TO CLAYEY, LIGHT BROWN TO BROWN, LOOSE TO MEDIUM DENSE, DRY TO MOIST				
5			12	8.9	1
			9	14.2	1
10			14	8.1	1
15			11	15.1	1
20			20	3.5	1
25					

TEST BORING NO. P2
DATE DRILLED: 3-28-96
REMARKS: PROFILE HOLE DRY 3-29-96

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
0	SAND, SILTY TO CLAYEY, LIGHT BROWN TO BROWN, LOOSE TO MEDIUM DENSE, MOIST				
			7	10.3	1
5			5	7.1	1
10			16	6.6	1
15			30	9.1	1
20	SANDSTONE, SILTY TO CLAYEY, LIGHT BROWN TO BROWN, DENSE, MOIST		50/8"	9.6	2
25					

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TEST BORING LOGS

JOB. 26710

FIG. 3

TEST BORING NO. P3
DATE DRILLED: 3-28-96
REMARKS: PROFILE HOLE DRY
3-29-96

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
			11	7.9	1
5			7	24.5	3
			32	4.8	1
10					
			42	11.2	2
15					
			41	16.6	2
20					
25					

SAND, SILTY TO CLAYEY, BROWN, LOOSE, MOIST

CLAY, SLIGHTLY SANDY, MEDIUM STIFF, OLIVE GREEN, MOIST

SAND, SILTY TO CLAYEY, LIGHT BROWN TO BROWN, MEDIUM DENSE DRY TO MOIST

SANDSTONE, SILTY TO CLAYEY, BROWN, DENSE, MOIST

TEST BORING NO. P4
DATE DRILLED: 3-28-96
REMARKS: PROFILE HOLE DRY
3-29-96

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
5			33	6.4	1
			50/10"	6.2	2
10					
			50/10"	8.9	2
15					
			BULK	9.7	2
20					
25					

SAND, SILTY TO CLAYEY, BROWN, DENSE, MOIST

SANDSTONE, SILTY TO CLAYEY, LIGHT BROWN TO BROWN, DENSE, MOIST

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TEST BORING LOGS

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FIG. 4

TEST BORING NO. P5
DATE DRILLED:
3-28-96
REMARKS:
PROFILE HOLE DRY
3-29-96

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
0					
SAND, SILTY TO CLAYEY, BROWN, MEDIUM DENSE, MOIST					
5			18	23.2	1
SANDSTONE, SILTY TO CLAYEY, BROWN, DENSE, MOIST			50/10"	7.9	2
10					
15			BULK	7.3	2
20					
25					

TEST BORING NO.
DATE DRILLED:
REMARKS:

Depth (ft)	Symbol	Samples	Blows per ft.	Water Content %	Soil Type
0					
5					
10					
15					
20					
25					

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TEST BORING LOG

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FIG. 5

Client: David & Alic Mcelhoes

Test Location: P1, NE Corner of Hwy.. 83 & Hodgen Road, El Paso County, CO

Date Holes Prepared: 3-28-96 Date Holes Completed: 3-29-96

PERCOLATION HOLES

Hole No. 1
Depth: 29"

Hole No. 2
Depth: 27"

Hole No. 3
Depth: 29"

Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)
1	10	1-1/2	1	10	½	1	10	2-1/2
2	10	2	2	10	1-1/2	2	10	1
3	10	1-1/2	3	10	1/8	3	10	5/8
4	10	1	4	10	3/8	4	10	7/8

Perc Rate (Min./In)	Perc Rate (Min./In.)	Perc Rate (Min./In)	Average Perc Rate (Min./In)
10	27	12	17

PROFILE HOLE

Date Test Boring Pit Completed: 3-28-96

Depth	Visual Classification	Remarks
0-20'	Sand, silty to clayey, brown, dry to moist.	No groundwater or bedrock was encountered in profile hole.

Required area of absorption field: 0.83 Sq. Ft./gpd Sewage Volume
Required area of absorption field: 186 Sq. Ft./Bedroom
Required wall area for seepage pit: N/A Sq. Ft./Bedroom

Remarks: A conventional absorption field may be placed at this location.

Observer: Robb Feeback By:

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Figure 6
Job No. 26710

Client: David & Alice Mcelhoes

Test Location: P2, NE Corner of Hwy. 83 & Hodgen Road, El Paso County, CO

Date Holes Prepared: 3-28-96 Date Holes Completed: 3-29-96

PERCOLATION HOLES

Hole No. 1 Depth: 30"

Hole No. 2 Depth: 29"

Hole No. 3 Depth: 33"

Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)
1	10	1	1	10	1/4	1	10	1-1/4
2	10	3/4	2	10	3/4	2	10	1-1/2
3	10	½	3	10	½	3	10	1
4	10	½	4	10	½	4	10	3/8

Perc Rate (Min./In)	Perc Rate (Min./In.)	Perc Rate (Min./In)	Average Perc Rate (Min./In)
20	20	27	23

PROFILE HOLE

Date Test Boring Pit Completed: 3-28-96

Depth	Visual Classification
0-16'	Sand, silty to clayey, brown.
16'-20'	Sandstone, silty to clayey, brown.

Remarks
No groundwater was encountered in profile hole.
Bedrock @ 16 feet.

Required area of absorption field: 0.96 Sq. Ft./gpd Sewage Volume
Required area of absorption field: 216 Sq. Ft./Bedroom
Required wall area for seepage pit: N/A Sq. Ft./Bedroom

Remarks: A conventional absorption field may be placed at this location. A minimum distance of 4 feet must be maintained between the absorption field and any bedrock.

Observer: Robb Feeback By:

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Figure 7
Job No. 26710

Client: David & Alice Mcelhoes

Test Location: P3, NE Corner of Hwy. 83 & Hodgen Road, El Paso County, CO

Date Holes Prepared: 3-28-96 Date Holes Completed: 3-29-96

PERCOLATION HOLES

Hole No. 1 Depth: 29"

Hole No. 2 Depth: 46"

Hole No. 3 Depth: 28"

Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)
1	10	1-1/2	1	10	3	1	10	1-1/8
2	10	1-5/8	2	10	2-1/2	2	10	7/8
3	10	1-1/8	3	10	2	3	10	7/8
4	10	7/8	4	10	1-5/8	4	10	3/4

Perc Rate (Min./In)	Perc Rate (Min./In.)	Perc Rate (Min./In)	Average Perc Rate (Min./In)
12	7	14	11

PROFILE HOLE

Date Test Boring Pit Completed: 3-28-96

Depth	Visual Classification
0-4'	Sand, silty to clayey, brown.
4'-7'	Clay, slightly sandy, brown.
7'-12.5'	Sand, silty to clayey, brown.
12.5'-20'	Sandstone, silty to clayey, brown.

Remarks
No groundwater was encountered in profile hole.
Clay @ 4 feet.
Bedrock at 12.5 feet.

Required area of absorption field: 0.67 Sq. Ft./gpd Sewage Volume
Required area of absorption field: 150 Sq. Ft./Bedroom
Required wall area for seepage pit: N/A Sq. Ft./Bedroom

Remarks: A conventional absorption field may be placed at this location. A minimum distance of 4 feet must be maintained between the absorption field and the clay or bedrock.

Observer: Robb Feeback By: _____

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Figure 8
Job No. 26710

Client: David & Alice Mcelhoes

Test Location: P4, NE Corner of Hwy. 83 & Hodgen Road, El Paso County, CO

Date Holes Prepared: 3-28-96 Date Holes Completed: 3-29-96

PERCOLATION HOLES

Hole No. 1 Depth: 24"

Hole No. 2 Depth: 25"

Hole No. 3 Depth: 28"

Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)
1	10	3/4	1	10	1-1/4	1	10	1-1/4
2	10	1/2	2	10	1-1/4	2	10	1-1/8
3	10	½	3	10	1-1/8	3	10	1
4	10	½	4	10	7/8	4	10	3/4

Perc Rate (Min./In)	Perc Rate (Min./In.)	Perc Rate (Min./In)	Average Perc Rate (Min./In)
20	12	14	16

PROFILE HOLE

Date Test Boring Pit Completed: 3-28-96

Depth	Visual Classification	Remarks
0-5.5'	Sand, silty to clayey, brown.	No groundwater was encountered in profile hole. Bedrock @ 5.5 feet.
5.5'-20'	Sandstone, silty to clayey, brown.	

Required area of absorption field: 0.80 Sq. Ft./gpd Sewage Volume
Required area of absorption field: 180 Sq. Ft./Bedroom
Required wall area for seepage pit: N/A Sq. Ft./Bedroom

Remarks: A conventional absorption field may be placed at this location. A minimum distance of 4 feet must be maintained between the absorption field and any bedrock.

Observer: Robb Feeback By:

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Figure 9
Job No. 26710

Client: David & Alice Mcelhoes

Test Location: P5, NE Corner of Hwy. 83 & Hodgen Road, El Paso County, CO

Date Holes Prepared: 3-28-96 Date Holes Completed: 3-29-96

PERCOLATION HOLES

Hole No. 1 Depth: 42"

Hole No. 2 Depth: 29"

Hole No. 3 Depth: 48"

Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)	Trial	Time (Min.)	Water Level Change (In.)
1	10	2	1	10	1-7/8	1	10	3
2	10	1-1/2	2	10	5/8	2	10	3/8
3	10	1-3/4	3	10	1-1/8	3	10	1-3/8
4	10	1-3/8	4	10	3/4	4	10	7/8

Perc Rate (Min./In)	Perc Rate (Min./In.)	Perc Rate (Min./In)	Average Perc Rate (Min./In)
8	14	12	12

PROFILE HOLE

Date Test Boring Pit Completed: 3-28-96

Depth	Visual Classification
0-7'	Sand, silty to clayey, brown.
7'-15' '	Sandstone, silty to clayey, brown.

Remarks
No groundwater was encountered in profile hole. Bedrock @ 7 feet.

Required area of absorption field: 0.70 Sq. Ft./gpd Sewage Volume
Required area of absorption field: 156 Sq. Ft./Bedroom
Required wall area for seepage pit: N/A Sq. Ft./Bedroom

Remarks: A conventional absorption field may be placed at this location. A minimum distance of 4 feet must be maintained between the absorption field and any bedrock.

Observer: Robb Feeback By:

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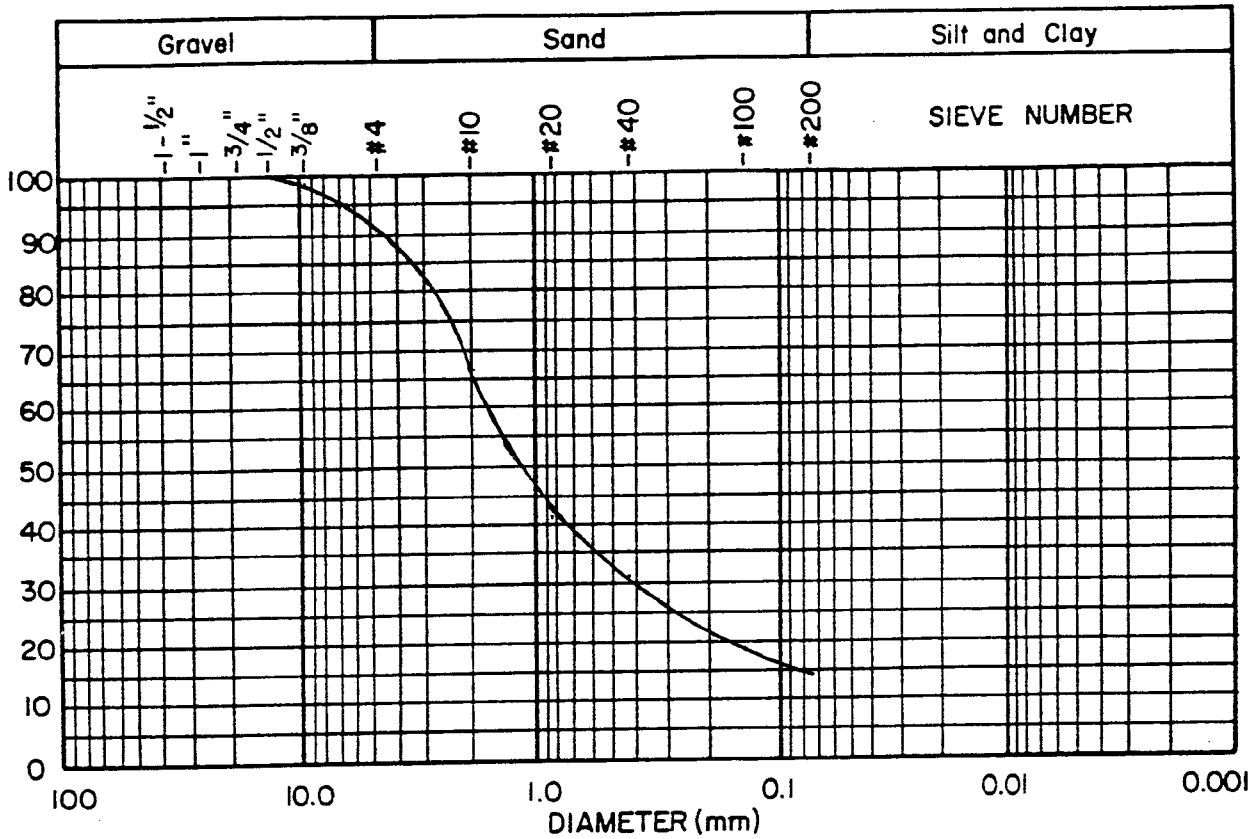
Figure 10
Job No. 26710

SOIL TYPE NO. 1 P2 @ 9' UNIFIED CLASSIFICATION SM TEST BY KBS

PROJECT NE CORNER OF HWY. 83 & HODGEN ROAD



SIEVE SIZE	% PASSING
1-1/2"	
1"	
3/4"	
1/2"	100
3/8"	99.4
# 4	90.2
# 10	66.9
# 20	41.1
# 40	30.8
# 100	19.4
# 200	14.5

ATTERBERG LIMITS

Liquid limit _____
Plastic limit _____
P.I. _____
Shrinkage limit _____

SWELL

_____ % Moisture at start
_____ % Moisture at finish
_____ % Moisture increase
_____ % Volume change
_____ pcf Initial dry density
_____ psf Swell

BEARING

_____ psf Maximum
_____ psf Minimum

SULFATES: _____

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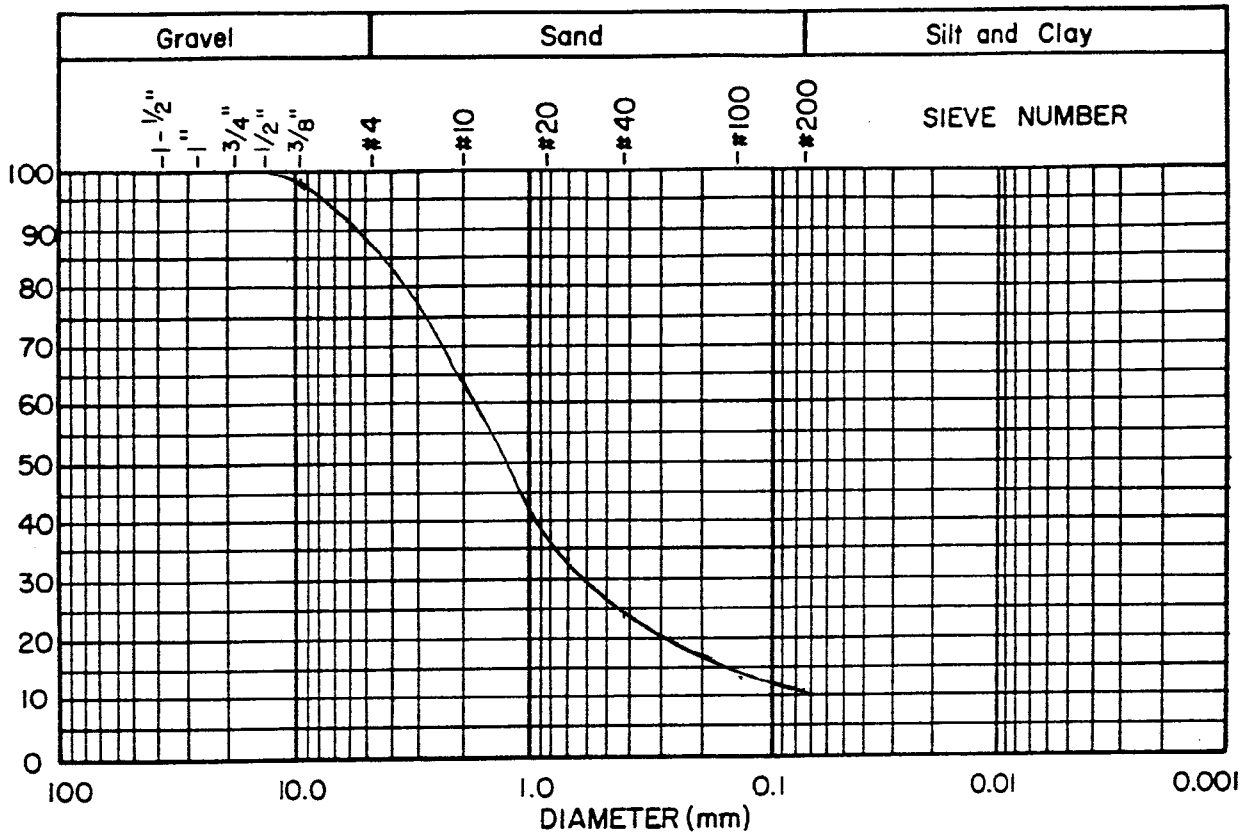
LABORATORY TEST RESULTS

Drawn	Date	Checked	Date
MJG	4.22.96		

Job No. 26710
Fig. No. 11

SOIL TYPE NO. 2 P4 @ 9' UNIFIED CLASSIFICATION SP/SM TEST BY KBS

PROJECT NE CORNER OF HWY 83 & HODGEN ROAD



SIEVE SIZE	% PASSING
1-1/2"	
1"	
3/4"	
1/2"	100
3/8"	98.9
# 4	86.8
# 10	63.0
# 20	37.3
# 40	23.9
# 100	13.1
# 200	10.8

ATTERBERG LIMITS

Liquid limit _____
Plastic limit _____
P.I. _____
Shrinkage limit _____

SWELL

_____ % Moisture at start
_____ % Moisture at finish
_____ % Moisture increase
_____ % Volume change
_____ pcf Initial dry density
_____ psf Swell

BEARING

_____ psf Maximum
_____ psf Minimum

SULFATES: _____

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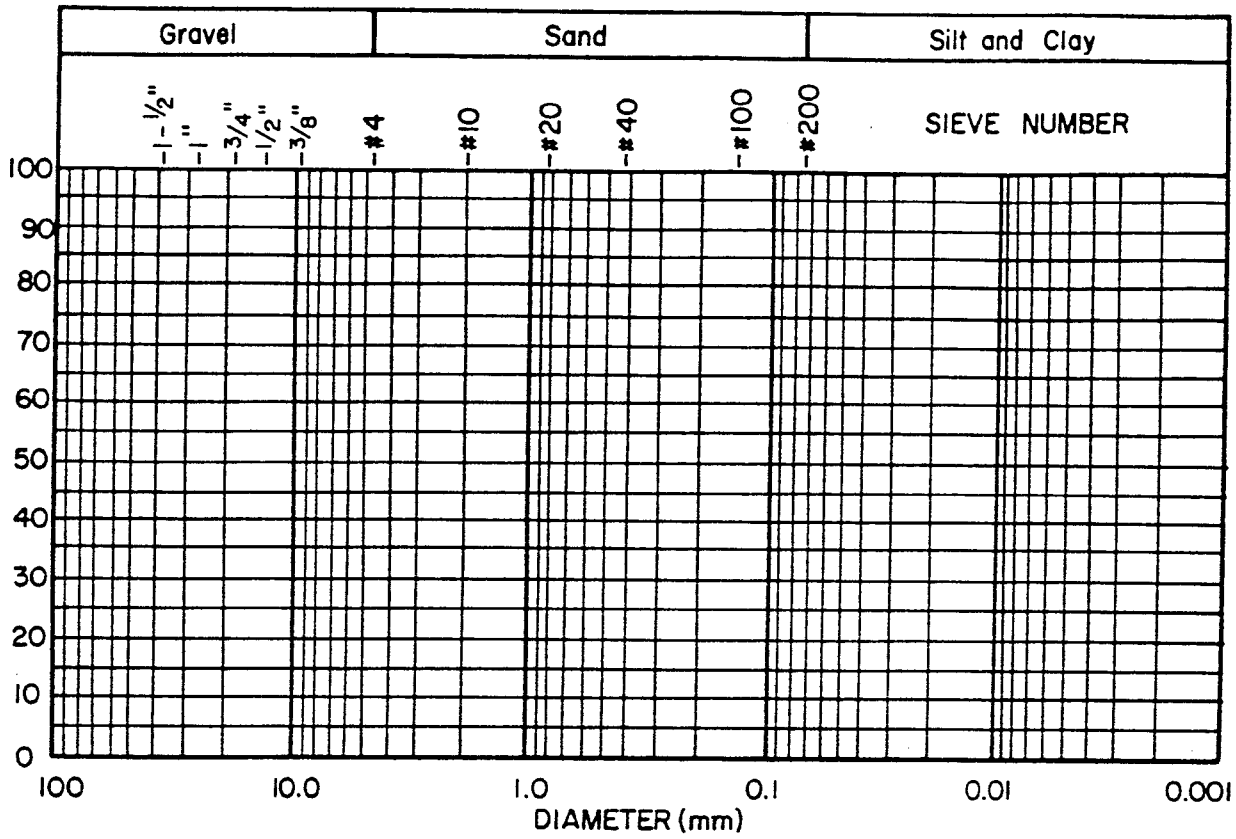
LABORATORY TEST RESULTS

Drawn	Date	Checked	Date
MJG	4.22.96		

Job No. 26710
Fig. No. 12

SOIL TYPE NO. 3 P3 @ 4' UNIFIED CLASSIFICATION CL TEST BY KBS

PROJECT NE. CORNER OF HWY 83 & HODGEN ROAD



SIEVE SIZE	% PASSING
1-1/2"	
1"	
3/4"	
1/2"	
3/8"	
# 4	
# 10	100
# 20	98.5
# 40	98.0
# 100	95.9
# 200	88.8

ATTERBERG LIMITS

Liquid limit _____
Plastic limit _____
P.I. _____
Shrinkage limit _____

SWELL

13.5 % Moisture at start

24.3 % Moisture at finish

10.8 % Moisture increase

0.20 % Volume change

99 pcf Initial dry density

616 psf Swell

BEARING

_____ psf Maximum

_____ psf Minimum

SULFATES: _____

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LABORATORY TEST RESULTS

Drawn	Date	Checked	Date
MJG	4-22-96		

Job No. 26710
Fig. No. 13