GT_002253

DAMES & MOORE

A DAMES & MOORE GROUP COMPANY

Report
Geotechnical Investigation
Proposed Commercial Development
Parkrose Business Center
Portland, Oregon
for
Three Oaks Development
April 9, 1999
Job No. 11414-006-163

5055 NE 122ND AVE

2540/4 IN2E22A 400

BLD 99-01765

Portland, Oregon

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

700 N.E. Multnomah, Suite 1000
Portland, Oregon 97232
503 235 9044 Tel
503 235 9033 Fax

May 7, 1999

Afghan Associates
9320 S.W. Barbur Blvd., Suite 175
Portland, Oregon 97219

Attn: Mr. Jerry Navarra, P.E.

Re: Revision to
Report of Geotechnical Investigation
Proposed Commercial Development, Parkrose Business Center
Three Oaks Development
Portland, Oregon
Dames & Moore Job No. 11414-006-163

Dear Jerry:

As we discussed by telephone this afternoon, we are revising our recommendation for coefficient of friction between the foundation and undisturbed native soils as presented in our Report of Geotechnical Investigation, dated April 9, 1999. For spread footings founded on the native medium stiff to stiff yellow silts, a coefficient of friction of 0.35 may be used. The coefficient of friction between the foundation and compacted granular fill remains unchanged at 0.45.

We appreciate the opportunity to be of service. Should you have any further questions or need further assistance, please contact us at 235-9044.

Very truly yours,

DAMES & MOORE

John Charles Horne, P.E., Ph.D.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
19083PE
OREGON
NOV. 18, 1997
JOHN DUVAL
EXPIRES 12/31/99

5/5/99

John I. Duval, P.E.
Project Engineer

cc: Three Oaks Development,
Ankrom Moison Associated Architects

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DAMES & MOORE
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April 9, 1999

Ankrom Moison Associated Architects
6720 S.W. Macadam, Suite 100
Portland, OR 97219

Attn: Mr. Charles Matschek

Re: Report of
Geotechnical Investigation
Proposed Commercial Development, Parkrose Business Center
Three Oaks Development
Portland, Oregon
Dames & Moore Job No. 11414-006-163

Dear Mr. Matschek:

We transmit herewith our Report of Geotechnical Investigation for the proposed commercial building in the Parkrose Business Center in Portland, Oregon. Mr. Wink Warren, Three Oaks Development, authorized this investigation on March 24, 1999.

This report summarizes our investigation and formally documents our conclusions and recommendations regarding the project.

It has been our pleasure to assist you with project. Should you have any questions regarding the contents of this report, please call us at your convenience.

Very truly yours,

DAMES & MOORE

John Charles Horne, P.E., Ph.D.
Senior Engineer

REGISTERED PROFESSIONAL ENGINEER
19063PE
OREGON
NOV. 18, 1997
JOHN DUVAL
EXPIRES 12/31/99
4/9/99

John I. Duval, P.E.
Project Engineer

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PARKROSE BUSINESS CENTER
PORTLAND, OREGON

1.0 INTRODUCTION

1.1 GENERAL

This report presents the results of a geotechnical investigation performed for Three Oaks Development's proposed commercial building at the Parkrose Business Center. As shown in the Vicinity Map, Figure 1, the Parkrose Business Center site is located in East Portland at the intersection of 122nd Avenue and N.E. Marx Street. The Site Plan, Figure 2, shows the proposed layout of the building and our test pit locations.

The purpose of this investigation was to explore the surface and subsurface conditions at the site, and based on the conditions encountered, provide recommendations for foundation support of the proposed structure and other pertinent geotechnical issues.

The scope of this investigation included subsurface exploration, data analysis, and preparation of design and construction recommendations for the planned development. These recommendations, along with supporting data, are documented in this report.

Based on the results of our study, the geotechnical aspects of the proposed building are considered feasible, providing the recommendations presented in this report are implemented during the design and construction phases.

1.2 PROJECT DESCRIPTION

Three Oaks Development has proposed to build a new commercial structure on vacant land at the east-end of the Parkrose Business Center. The 1.7-acre of rectangular-shaped parcel is bounded by N.E. 122nd Avenue on the east, N.E. Marx Street on the south, N.E. 121st Avenue on the west and commercial property of the north. The site is covered with grass and weeds and is generally flat with a slight rise at the east property boundary with N.E. 122nd Avenue.

Based on the preliminary site plan provided by Mr. Charles Matschek, Ankrom Moison Architects, we understand that the proposed building will be a single-story, L-shaped, precast concrete (tilt-up) structure. We anticipate that the finished floor elevation will conform to existing site grades, requiring only shallow cuts and fills. The proposed building will have a footprint area of 24,000 square foot (sqft) when complete. Mr. Jerry Navarre, Afgan Associates, provided the following maximum foundation loads: 50 kips for individual columns and 2.5 kips per foot for walls. Appurtenant construction will include asphalt concrete parking and driveways along the north and east side of the building. The Site Plan, Figure 2, shows the proposed building footprint in relation to the remainder of the parcel of land.

1.3 SCOPE OF SERVICES

The purpose of this investigation was to evaluate the geotechnical suitability of the site in light of the planned development and provide recommendations for foundation support of the building structure. Specifically, our scope included the following:

1. A review of our existing files for geotechnical information pertaining to this site.

2. A field exploration program consisting of six backhoe-excavated test pits. Soil sampling was conducted in each test pit and soils were transported to our office for further classification and laboratory testing.

3. Recommendations for foundation support of the planned building. Our discussion is limited to a conventional shallow foundation system, allowable bearing capacity, anticipated settlement, and recommended values of base friction and passive pressure to resist lateral loads from wind and seismic events.

4. Recommendations for foundation support of slabs on grade. This includes recommendations for base course, drainage, and design subgrade modulus.

5. Recommendations for foundation support of asphaltic concrete (AC) pavements.

6. Recommendations regarding seismic suitability of the site. We address recommendations regarding the soil type, seismic design parameters, evaluation of liquefaction potential, assigned peak ground acceleration, and landslide potential.

7. Recommendations pertaining to earthwork and foundation construction at the site. We address recommendations for site and drainage control measures.

8. Three copies of this final report containing our findings and recommendations.

2.0 FIELD AND LABORATORY INVESTIGATIONS

2.1 FIELD EXPLORATION

Subsurface explorations were conducted on March 26, 1999. Field work included a series of six exploratory test pits, designated T-1-99 through T-6-99, which were field-located approximately as shown on the Site Plan, Figure 2. The test pits were excavated using a John Deere 410 Backhoe with a 2-foot bucket, under contract to Moe and Sons Excavating, Inc., of Portland, Oregon. Test pits were excavated to depths ranging from 8.0 to 9.0 feet.

A Dames & Moore representative created a log of the test pits, visually classified the soils encountered according to the Unified Classification System, and obtained disturbed bulk samples at selected intervals. The collected samples were transported back to our Portland laboratory for further classification and testing.

Test pits were backfilled with excavated spoils and tamped with the backhoe bucket. The test pit backfill should not be expected to behave as compacted structural fill. *It is important to note that structures, slabs-on-grade, or pavements located over these areas will require additional compaction at the time of earthwork operations. See Section 4.4, Site Preparation for further details.* Appendix A contains summary logs of excavated test pits.

2.2 LABORATORY TESTING

The laboratory test program was limited to the following:

- Soil Classification in general accordance with ASTM C136, D1140, and D4318
- Washed Gradation of soils in general accordance with ASTM Test Method C 136
- Moisture content tests in general accordance with ASTM Test Method D2937

The results of the physical laboratory tests conducted are summarized on the test pit logs in Appendix A.

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

Detailed topographic and site elevation information were not available at the time of preparation of this report. From the Mount Tabor, Oregon-Washington 15 minute topographic quadrangle published by the USGS, the site appears to be situated approximately at Elevation 20 NGVD, and is fairly level with slightly terraced elevations along the eastern boundary of the site.

The proposed site is currently vacant and vegetated with low grass. In some surface areas, there is evidence of rounded cobbles and boulder materials. Drainage at this site occurs through either infiltration or surface water runoff into existing storm drains.

3.2 SUBSURFACE CONDITIONS

A 1-foot thick cultivated zone consisting of sandy silt with variable quantities of fine gravel and common organic materials mantles the site. This zone contains a heavy root mat and a high concentration of natural organic debris. The cultivated zone soils are underlain by medium stiff to stiff yellow-brown silt to depths of approximately 4 feet. The native silt exhibits moderate strength and low compressibility characteristics. At depths ranging from about 4 to 5 feet below ground surface (bgs), the silt transitions to a loose to medium dense silty gravel. Below 6 feet bgs, the silty gravels include increasing percentages of cobbles and boulders in the matrix to 9 feet bgs, the maximum explored depth. Boulders ranged from 2 to 2.5 feet diameter and represented approximately 40% by volume of soil excavated from depths below 6 feet to the bottom of our test pits. All six test pits were terminated in this layer.

The above is a general summary of the soil conditions encountered in the excavated test pits completed for this investigation. A more detailed description of the soils encountered in each test pit is presented on the test pit logs in Appendix A.

3.3 GROUNDWATER

Groundwater was not encountered in any of the test pits at the time of our field exploration. However, we observed mottling in near surface samples collected from our test pits. It is our opinion that the water table varies seasonally, and may affect excavation work, especially during the wet season.

3.4 REGIONAL GEOLOGY

The floors of the lower Columbia River and Willamette Valleys are almost completely covered by recent alluvial deposits of unconsolidated gravel, sand, silts, and clays. Published geologic literature of the region states that these deposits were deposited in the Portland Basin by catastrophic outburst floodwaters originating from glacial Lake Missoula. The flood deposits carried soils ranging from silts and clays to larger gravels, cobbles, and boulders, which are commonly found in the Portland Basin. Cobbles and boulders are found in greater density in East Portland, Troutdale, and Gresham and generally exist within a matrix of silts and clays.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 SEISMIC DESIGN

4.2.1 Seismic Hazards

Seismic hazards relate to risks of injury to people and damage to property resulting from earthquakes. Seismic hazards include surface fault rupture, ground shaking, and associated landslides and liquefaction.

4.2.2 Seismic Zone

The Relative Earthquake Hazard Map of the Portland Metro Region indicates that the site lies within Zone D, the zone of least seismic hazard. The Relative Earthquake Hazard map was developed by combining single hazard maps for ground motion amplification, liquefaction and slope stability. It is not possible to use this relative ranking to ascertain the magnitude of damage sustained in an earthquake resulting from individual earthquake hazard.

For design purposes, the proposed commercial building site lies within Seismic Zone 3 as defined in the 1998 version of the State of Oregon Structural Specialty Code. Published geologic maps of the region indicate that the near surface alluvium is underlain by the very dense Troutdale Formation, which in turn is underlain by basaltic bedrock. As a result, we consider soil profile type S_D (stiff soil profile) to be appropriate for the project site. The seismic response

coefficients that correspond with Z=0.3 and S_D are C_a =0.36 and C_v =0.54 and were obtained from tables 16-Q and 16-R of the 1998 Structural Specialty Code, respectively.

4.2.3 Relative Liquefaction Hazard

Liquefaction is the drastic loss of soil strength due to an increase in pore pressures, and is often compared to "quicksand." Loose, saturated, cohesionless soils can liquefy from earthquake shaking and can produce extensive damage. The Oregon Department of Geology and Mineral Industries (DOGAMI) has categorized the site area to be in the lowest range of susceptibility to earthquake-induced liquefaction hazard. Based on our understanding of the subsurface conditions, the potential for seismically induced liquefaction appears to be low.

4.2.4 Relative Amplification of Peak Ground Acceleration

Amplification of peak rock acceleration from earthquake motions can produce severe damage to man-made structures. Amplification generally occurs in unconsolidated, younger soils as opposed to harder, older bedrock. For design purposes, potential bedrock acceleration at this site is comparable to most areas in the greater Portland Region areas, and is estimated at less than 0.2g for a 500 year recurrence interval (Geomatrix, 1995).

4.2.5 Relative Slope Instability Hazard

Landslides can be triggered by earthquakes within slopes that are either steep or consist of relatively weak materials. Earthquakes can also reactivate former landslide areas that have been dormant. DOGAMI has categorized the site area to have the lowest susceptibility to earthquake-induced landslides. Based on our knowledge of this site, it is our opinion that the risk of earthquake-induced landslides is low.

4.3 FOUNDATION SUPPORT

4.3.1 Shallow Foundation System

Conventional continuous or isolated spread footings may be used to support the proposed building. We recommend that spread footings be designed for a maximum allowable soil pressure of 2,000 psf when the footings bear in the undisturbed native silt. All footings should be located at least 18 inches below the lowest adjacent grade for frost protection and bearing/settlement requirements. Minimum foundation dimensions of 18 inches wide for continuous footings and 24 inches square for column footings are recommended.

The allowable bearing pressure value may be increased by one-third for transient loading conditions from wind and seismic forces. The allowable bearing pressure is a net value, consequently the weight of the foundation and backfill may be neglected when computing dead loads.

We recommend that all excavations for foundations be accomplished with a straight-edged grading bucket to preclude disturbance to bearing surfaces by bucket teeth. Following excavation, the bearing surfaces should be thoroughly cleaned of loosened or disturbed soil, using hand methods if necessary. If footings are prepared during wet weather, we recommend placing a thin lift of compacted crushed rock or lean concrete at the bottom of footings immediately following excavation to prevent disturbance during placement of rebar.

4.3.2 Foundation Settlements

For footings founded as recommended above, we estimate that the settlement of interior columns will be on the order of ¾ inch for an assumed maximum load of 50 kips. The estimated settlement of continuous footings with a maximum load of 2.5 kips per foot or less is on the order of ½ inch. It is anticipated that the majority of the settlements of the non-plastic silts will occur during construction, essentially as the loads are applied. The remainder of the settlement would be expected to occur within several months following application of loads.

4.3.3 Lateral Pressures

Lateral loads can be resisted by friction between the foundation and the native soils, and by passive earth pressure on the face of the footing. The ultimate passive resistance of undisturbed native soil may be taken as equal to an equivalent fluid with a unit weight of 250 pounds per cubic foot (pcf). A coefficient of friction of 0.30 may be used between the foundation and the supporting native soil and 0.45 between the foundation and compacted granular fill.

4.3.4 Slab on Grade

For design purposes, we recommend using a value of 150 pounds per cubic inch (pci) for the modulus of subgrade reaction for the compacted native silt.

We recommend that floor slabs be underlain by a minimum 6-inch thick layer of compacted, well-graded sand and gravel or crushed rock. Gradation requirements of this material should be similar to those specified for 1-inch minus base in Table 02630-1, Grading Requirements-Base Aggregates, of the 1996 Oregon Department of Transportation Standard Specifications for Highway Construction, with the added requirement that no more than 5 percent by weight pass a US Standard No. 200 sieve. We recommend the granular layer be compacted to at least 95 percent of the maximum dry density as determined by the modified Proctor density test.

Even with a capillary break as outlined above, there is the possibility of some floor moisture or dampness. If floor moisture is a critical consideration due to storage of materials directly on the floor slab, or because of the use of glued down impervious floor coverings such as tile or linoleum, we recommend the use of an underslab impermeable membrane. Normally a thin sand layer is placed above and below the membrane to protect it from punctures during

construction, and to assist in the curing of the concrete floor slab. To maximize water tightness, the membrane must be installed in accordance with the manufacturer's recommendations.

4.4 SITE PREPARATION

4.4.1 General

The native near-surface soils are very moisture sensitive. Proceeding with site earthwork on these soils during wet weather can add significant costs to a project. Therefore, we recommend that site clearing, preparation and earthwork be completed during periods of dry weather, when adequate moisture control can be maintained.

4.4.2 Site Clearing and Preparation

All areas that will receive fill, pavement, base rock, or structures should be stripped of all vegetation, heavy root-mat, large cobbles/bouldery materials, and any other deleterious soil conditions that may be encountered. We estimate that stripping depths in building footprint area will be approximately ten to twelve inches. The stripped materials will not generally be suitable for reuse as compacted structural fills and should be either 1) stockpiled for possible later use in landscaped areas, or 2) exported from the site.

4.4.3 General Site Grading and Filling

Site preparation and grading should conform with requirements contained in this report. We anticipate site grading can be performed with conventional earthmoving equipment.

After areas are stripped or excavated to design elevations, we recommend that the resulting subgrade in all areas that will receive fill, pavement, or structures be scarified, brought to near optimum moisture content, and be compacted to at least 95 percent relative compaction. Relative compaction should be based on the modified Proctor test method (ASTM D1557).

4.4.4 Structural Fill Materials

Structural fill (i.e., fill placed below footings, pavements, building areas, sidewalks, etc) may consist of on-site, non-organic silt soils or select, imported granular material as described below. We recommend that structural fill for footings consist of imported, well-graded, crushed rock.

Imported structural fill should be clean, well graded granular material, free from organics, and meeting the requirements of ODOT 1994 Standard Specifications, for "Foundation Material Class A" for general backfill, and "Crushed Surfacing-Base Course" for aggregate base

We recommend that fills, native or imported, intended to support structures or pavements, be placed in horizontal lifts not exceeding about 8 inches in thickness and be compacted to at least 95 percent of the maximum dry density as determined by the modified

Proctor test method (ASTM D 1557). The specified compaction level may be reduced to 85 percent in landscaped areas if the potential for settlements of an inch or so is acceptable.

The procedure to achieve proper density of a compacted fill depends on the size and type of compacting equipment, the number of passes, thickness of the layer being compacted, and certain soil properties. When the size of the excavation restricts the use of heavy equipment, smaller equipment can be used, but the soil must be placed in lifts thin enough to achieve the required compaction. We recommend that methods of compaction be left to the discretion of the contractor.

4.5 SITE DRAINAGE

We recommend that the final site grading provide positive surface grades of at least 1.5% away from the structure. In addition, we recommend that a footing drain be placed around the perimeter of the building as shown in Figure 3. Drains should be connected to the nearest storm drainage system.

Parking areas should be sloped and the drainage gradient maintained to carry surface water off-site. In parking areas, curbs adjacent to landscaping should be deepened to act as a cutoff.

4.6 PAVEMENT RECOMMENDATIONS

We anticipate that vehicle traffic will consist of automobiles, UPS-type delivery trucks, garbage trucks, and occasional semi-tractor trailer rigs. The equivalent 18-kip Axle Load (EAL) in truck travel lanes is estimated at approximately 10,000 for a 20-year design life. It is important to note that the design traffic loading does not include construction traffic. If anticipated traffic is significantly different from the above assumptions, please notify this office for a revised pavement section.

Pavement design was accomplished using the procedures outlined in the Asphalt Institute Thickness Design, Asphalt Pavements for Highways & Streets, Manual Series No. 1 (MS-1), dated February 1991. A resilient modulus (M_R) of 6,000 psi was estimated for the on-site soils compacted to 95% of ASTM D 1557. The recommended pavement sections for truck travel lanes, automobile travel lanes, and parking stalls are presented below:

TABLE 1
RECOMMEND PAVEMENT SECTIONS

Purpose	Asphalt Concrete (inches)	Base Course (inches)
Truck Travel Lanes	3	8
Automobile Travel Lanes	3	6
Parking Stalls	2.5	6

Areas that are to receive pavement should be stripped and prepared in accordance with the recommendations in Section 4.4. We recommend that asphalt concrete be used that conforms to the 1996 Oregon Department of Transportation Standard Specifications for Highway Construction. The aggregate base material should conform to Section 02630 of the Standard Specifications for 38-mm minus material.

5.0 CONSTRUCTION MONITORING AND TESTING

We recommend that Dames & Moore be retained to provide construction monitoring and testing services during earthwork activities and foundation construction. The purpose of our field monitoring services is to confirm that site conditions are as anticipated, to provide field recommendations as required based on conditions encountered, and to document the activities of the contractor to assess compliance with the project recommendations provided by Dames & Moore. We also recommend that Dames & Moore review and comment on the final grading plan, cut slope details and construction dewatering plans. The purpose of the review would be to identify any potential problem areas and to provide cost saving or efficiency improving suggestions, if possible.

6.0 CLOSURE

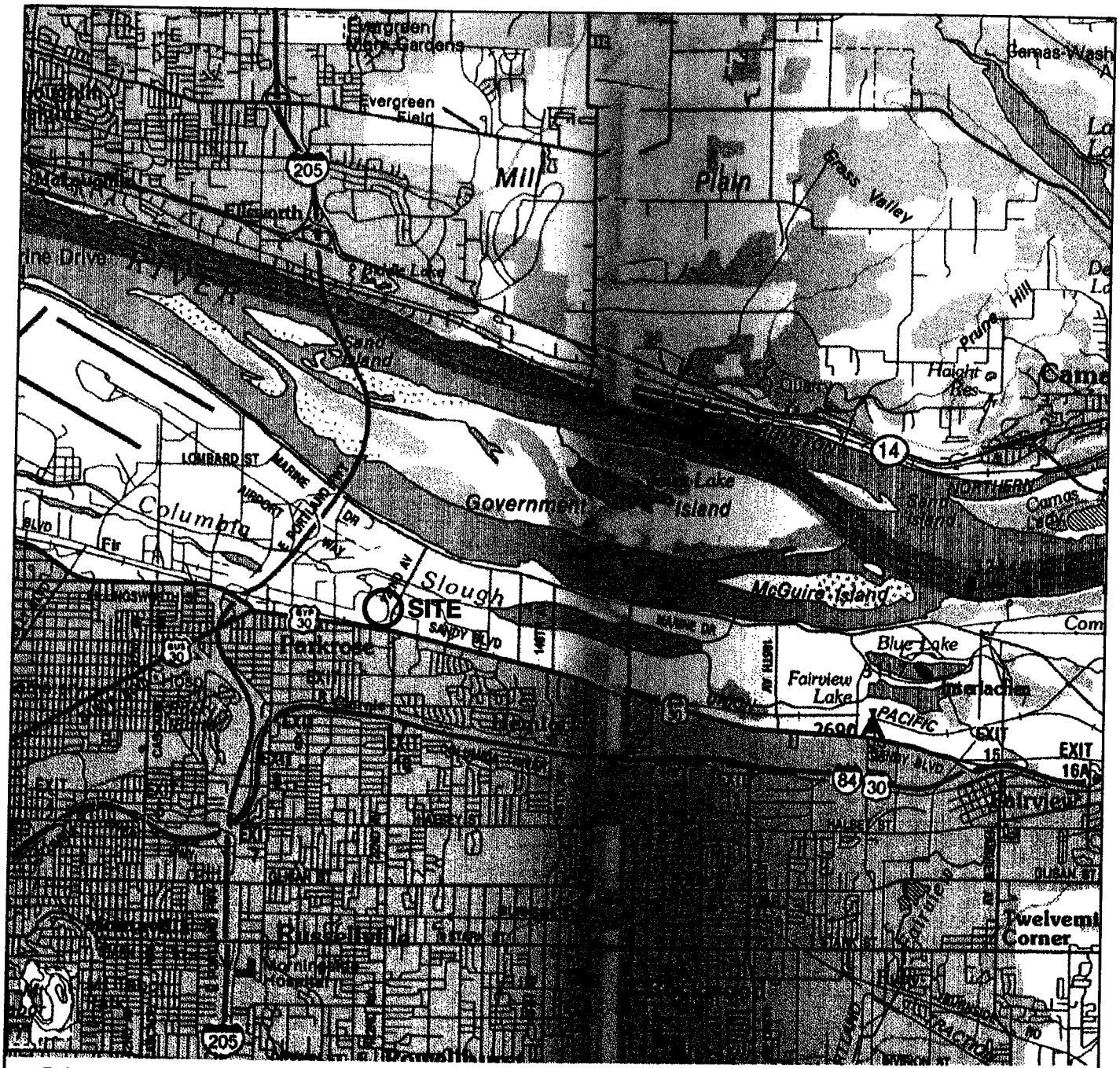
The analyses, conclusions, and recommendations presented in this report are based on site conditions as they existed at the time of our field exploration, and further assume that the conditions encountered in our exploratory test pits are representative of subsurface conditions within our study area. If conditions different from those described in this report are encountered or appear to be present beneath the excavations, Dames & Moore should be advised at once so that additional recommendations may be provided where necessary.

This report was prepared for the exclusive use of Three Oaks Development and its agents and consultants. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions similar to those interpreted from the test pit logs or discussions presented in this report.

♦♦♦

7.0 REFERENCES

Geomatrix Consultants (1995), "Seismic Design Mapping, State of Oegon," Final report Prepared from the Oregon Department of Transportation, Project No. 2442.



VICINITY MAP

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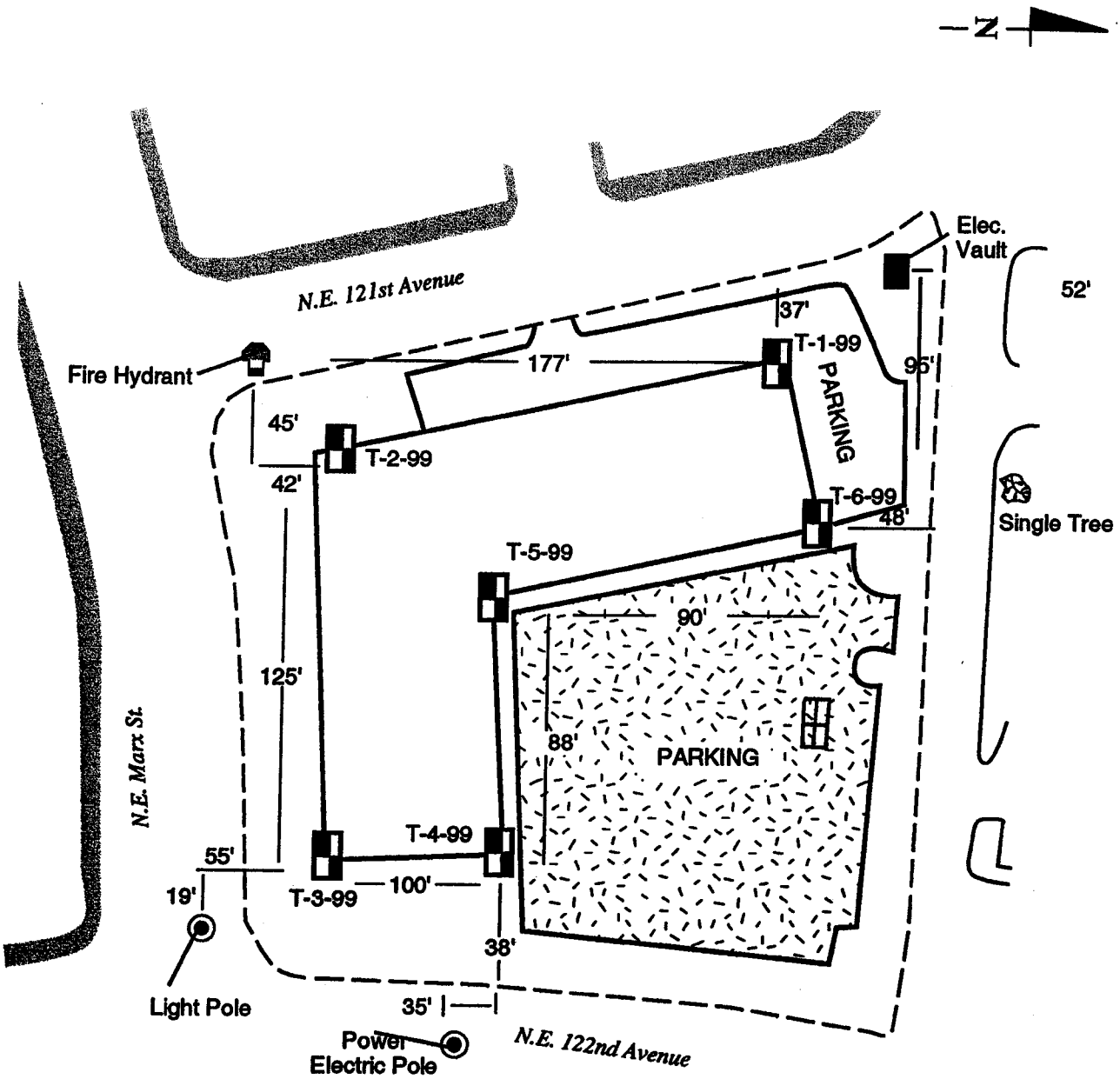
April 1999
11414-006-163

Three Oaks Development
Parkrose Business Center
Portland, Oregon

FIGURE 1



KEY

- Indicates Property Boundary
- T-1-99 Test Pis Conducted by Dames & More, 1999
- T-11-79 Test Pis Conducted by Dames & More, 1979

NOTES:
Distance between test pits are measured center to center.

REFERENCE:
Ankrom Moisan Associated Architects
Parkrose Business CenterSite Plan

SITE PLAN

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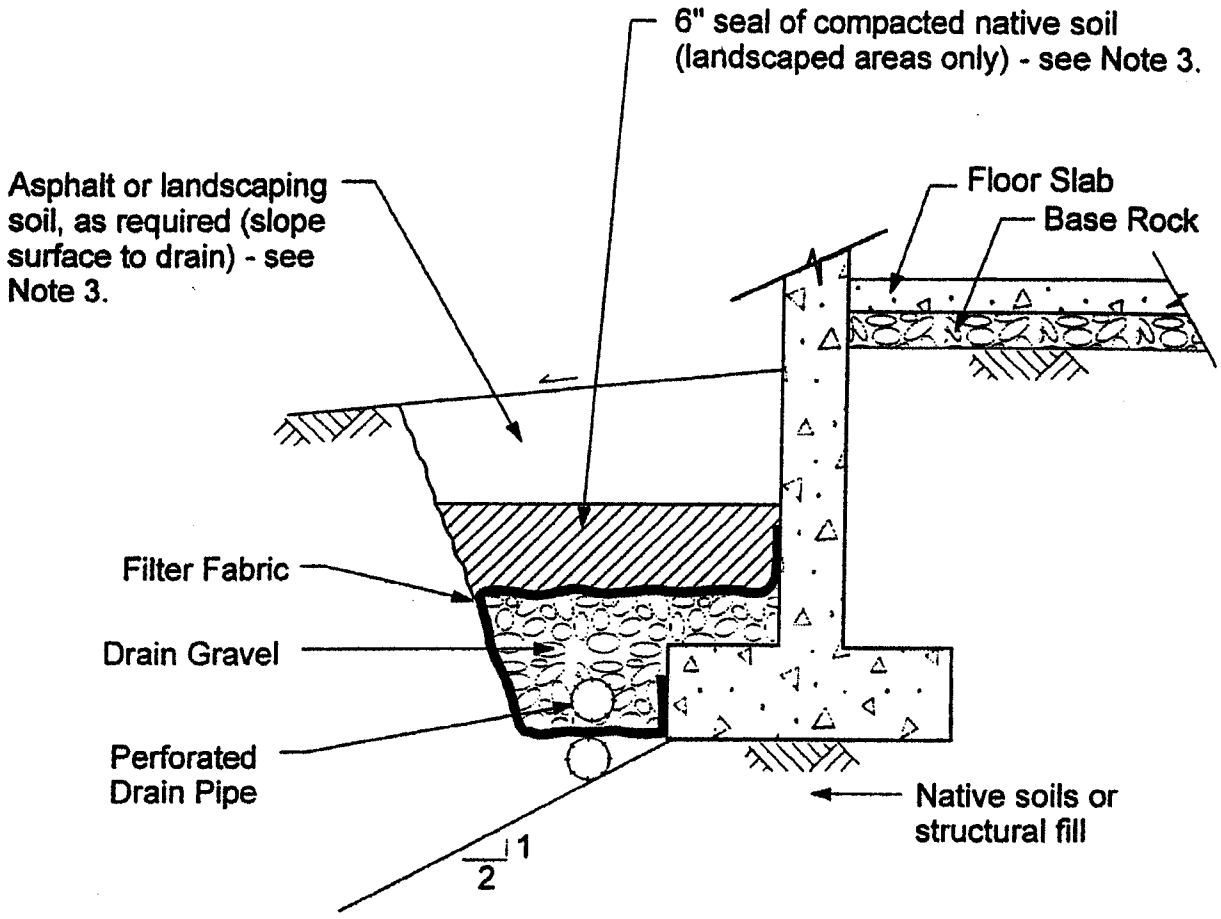
11414-006-163

Three Oaks Development
Parkrose Business Center
Portland, Oregon

FIGURE 2



SCHEMATIC - NOT TO SCALE

1. Filter fabric is non-woven geotextile (Amoco 4545, Mirafi 140N, or equivalent)
2. Lay perforated drain pipe on minimum 0.5% gradient, widening excavation as required. Maintain pipe above 2 :1 slope, as shown. Use rigid PVC pipe.
3. All-granular backfill above filter fabric is recommended for support of slabs, pavements, etc. (see text for structural fill).
4. Drain gravel to be clean, washed, 3/4" to 1 1/2" gravel.

FOOTING DRAIN DETAIL

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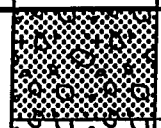
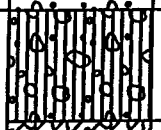
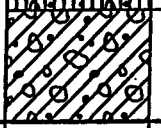
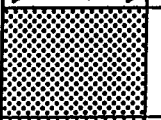
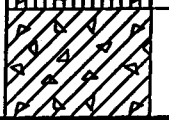
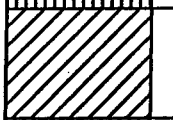
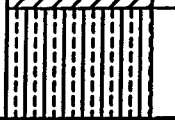
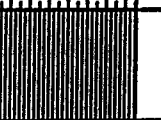
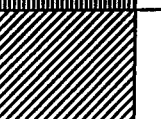
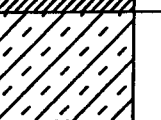
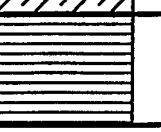
Portland, Oregon

FIGURE 3

Major Divisions			Symbols		Typical Descriptions
			Graph	Letter	
Coarse Grained Soils	Gravel and Gravelly Soils	Clean Gravels (little or no fines)		GW	Well-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
				GP	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
	More than 50% of Coarse Fraction Retained in No. 4 Sieve	Gravels with Fines (appreciable amount of fines)		GM	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC	Clayey Gravels, Gravel-Sand-Clay Mixtures
More than 50% of Material is Larger than No. 200 Sieve Size	Sand and Sandy Soils	Clean Sand (little or no fines)		SW	Well-Graded Sands, Gravelly Sands, Little or no Fines
				SP	Poorly Graded Sands, Gravelly Sands, Little or no Fines
	More than 50% of Coarse Fraction Passing through No. 4 Sieve	Sands with Fines (appreciable amount of fines)		SM	Silty Sands, Sand-Clay Mixtures
				SC	Clayey Sands, Sand-Clay Mixtures
Fine grained Soils	Silts and Clays	Liquid Limit Less than 50%		ML	Inorganic Silts and very Fine Sands, Rock Flour, Silty or Calyey Fine Sands or Clayey Silts with Slight Plasticity
				CL	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean Clays
				OL	Organic Silts and Organic Silty Calys of Low Plasticity
More than 50% of Material is Smaller than No. 200 Sieve Size	Silts and Clays	Liquid Limit Greater than 50%		MH	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
				CH	Inorganic Clays of High Plasticity, Fat Clays
				OH	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils				PT	Peat, Humus, Swamp Soils with High Organic Contents

Note: Dual Symbols are used to indicate borderline soil classifications

LOG OF TEST PIT T-1-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons, Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			37.3			19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace to some fine sand, fine rootlets in upper zone, rust mottling streaks, (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
	79.7		25.3			18.0	2				S-2
						17.0	3				
			8.9			16.0	4				S-3
						15.0	5	GM		*increasing cobbley gravel and some bouldery materials (2 to 3 ft DIA)*	S-4
						14.0	6			*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	
						13.0	7				S-5
						12.0	8			*Test Pit terminated at 8 ft below ground surface (bgs) on 3/26/99, at 12:25 PM. Groundwater seepage was not encountered during excavation.*	

NOTES:

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

LOG OF TEST PIT T-1-99

LOTP PARKROSE.GPJ 4/6/99

LOG OF TEST PIT T-2-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons, Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK-BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			48.4		X	19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace fine sand, fine rootlets in upper zone, rust mottling streaks (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
			26.9		X	18.0	2				
						17.0	3				S-2
			25.3		X	16.0	4				
						15.0	5	GM		*increasing cobbley gravel and occasional boulder (2 to 3 ft DIA)*	S-3
						14.0	6				
			7.6		X	13.0	7			*dense matrix of silt, cobbley medium to coarse gravel, and bouldery deposit*	S-4
						12.0	8				
					X	11.0	9				S-5
										Test Pit terminated at 9 ft below ground surface (bgs) on 3/26/99, at 1:10 PM. Groundwater seepage was not encountered during excavation.	

NOTES:

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LOG OF TEST PIT T-2-99

LOTP PARKROSE.GPJ 4/6/99

LOG OF TEST PIT T-3-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons. Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK-BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			34.1		X	19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace to some fine sand, fine rootlets in upper zone, rust mottling streaks, (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
	73.0		25.1		X	18.0	2				S-2
					X	17.0	3				
			11.7		X	16.0	4	GM		*increasing cobbley gravel and some bouldery materials (2 to 3 ft DIA)*	S-3
						15.0	5				
					X	14.0	6			*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	S-4
					X	13.0	7				S-5
					X	12.0	8				

Test Pit terminated at 8 ft below ground surface (bgs) on 3/26/99, at 1:30 PM. Groundwater seepage was not encountered during excavation.

NOTES:

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LOG OF TEST PIT T-3-99

LOTP PARKROSE.GPJ 4/6/99

LOG OF TEST PIT T-4-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons, Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			46.3			19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace to some fine sand, fine rootlets in upper zone, rust mottling streaks, (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
			28.0			18.0	2				S-2
						17.0	3				
			20.9			16.0	4				S-3
						15.0	5	GM		*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	
						14.0	6			*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	
						13.0	7				S-4
						12.0	8			*Test Pit terminated at 8 ft below ground surface (bgs) on 3/26/99, at 2:20 PM. Groundwater seepage was not encountered during excavation.*	

NOTES:

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LOG OF TEST PIT T-4-99

LOG OF TEST PIT T-5-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons, Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT (%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			50.9		X	19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace fine sand, fine rootlets in upper zone, rust mottling streaks (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
			28.0		X	18.0	2				S-2
						17.0	3				
	79.8		27.4		X	16.0	4				S-3
			18.0		X	15.0	5	GM		*increasing cobbley gravel and some bouldery materials (2 to 3 ft DIA)*	S-4
						14.0	6				
			14.1		X	13.0	7			*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	S-5
						12.0	8				
										Test Pit terminated at 8 ft below ground surface (bgs) on 3/26/99, at 2:35 PM. Groundwater seepage was not encountered during excavation.	

NOTES:

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A DAMES & MOORE GROUP COMPANY

LOG OF TEST PIT T-5-99

LOTP PARKROSE.GPJ 4/6/99

LOG OF TEST PIT T-6-99

PROJECT: **Parkrose Business Center**
PROJECT NO: **11414-006-163**
PROJECT LOCATION: **N.E. Marx & N.E. 122nd Avenue, Portland, Oregon**
CLIENT NAME: **Three Oaks Development**
DATE STARTED: **March 26, 1999**
DATE COMPLETED: **March 26, 1999**
EXCAVATOR: **W.G. Moe & Sons, Inc**
OPERATOR: **Charles**
EQUIPMENT USED: **Backhoe**

WATER LEVEL: ▽ ▼

GROUND SURFACE ELEVATION: **20**
DATUM: **NGVD**
WEATHER **Clear, 50F**
FIELD ENGINEER: **Shaun Persaud**
CHECKED BY: **John Duval, PE**

SAMPLE TYPE KEY:
- Relatively undisturbed sample
- Disturbed sample
- Sample attempt with no recovery
- SPT split spoon sample

SAMPLER DRIVEN (in)	FINES CONTENT(%)	DRY DENSITY (pcf)	MOISTURE CONTENT (%)	BLOWS PER FOOT	SAMPLE TYPE	ELEVATION (ft.)	DEPTH (ft.)	USCS	GRAPHIC SYMBOL	DESCRIPTION	REMARKS
						20.0	0	TS		**DARK BROWN SANDY SILT**, fine root mat, trace organics (moist) **[TOPSOIL]**	
			19.6		X	19.0	1	ML		**LIGHT-BROWN TO YELLOW-BROWN SILT**, trace fine sand, fine rootlets in upper zone, rust mottling streaks (moist to very moist) (medium stiff to stiff) **[ALLUVIUM]**	S-1
	75.6		27.5		X	18.0	2				S-2
						17.0	3				
			13.1		X	16.0	4	GM		*increasing cobbley gravel and occasional boulder (2 to 3 ft DIA)*	S-3
						15.0	5				
			15.1		X	14.0	6			*dense matrix of silt, cobbley medium to coarse gravel and bouldery deposit*	S-4
						13.0	7				
			13.0		X	12.0	8				S-5
						11.0	9			*Test Pit terminated at 8 ft below ground surface (bgs) on 3/26/99, at 3:00 PM. Groundwater seepage was not encountered during excavation.*	

NOTES:

DAMES & MOORE
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LOG OF TEST PIT T-6-99

LOTP PARKROSE.GPJ 4/8/99

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

700 N.E. Multnomah, Suite 1000
Portland, Oregon 97232
503 235 9044 Tel
503 235 9033 Fax

May 7, 1999

Afghan Associates
9320 S.W. Barbur Blvd., Suite 175
Portland, Oregon 97219

Attn: Mr. Jerry Navarra, P.E.

Re: Revision to
Report of Geotechnical Investigation
Proposed Commercial Development, Parkrose Business Center
Three Oaks Development
Portland, Oregon
Dames & Moore Job No. 11414-006-163

Dear Jerry:

As we discussed by telephone this afternoon, we are revising our recommendation for coefficient of friction between the foundation and undisturbed native soils as presented in our Report of Geotechnical Investigation, dated April 9, 1999. For spread footings founded on the native medium stiff to stiff yellow silts, a coefficient of friction of 0.35 may be used. The coefficient of friction between the foundation and compacted granular fill remains unchanged at 0.45.

We appreciate the opportunity to be of service. Should you have any further questions or need further assistance, please contact us at 235-9044.

Very truly yours,

DAMES & MOORE

REGISTERED PROFESSIONAL ENGINEER 19963PE OREGON NOV. 18, 1997 JOHN DUVAL EXPIRES 12/31/99

5/5/99

John Charles Horne, P.E., Ph.D.
Senior Engineer

John I. Duval, P.E.
Project Engineer

cc: Three Oaks Development,
Ankrom Moison Associated Architects

G:\wp\163\11414\02/JCH:JID:lih/11414-006-163

DAMES & MOORE
GROUP
A DAMES & MOORE GROUP COMPANY

700 N.E. Multnomah, Suite 1000
Portland, Oregon 97232
503 235 9044 Tel
503 235 9033 Fax

May 21, 1999

Ankrom Moison Associates Architects
6720 SW Macadam, Suite 100
Portland, OR 97210

Attn: Mr. Charles Matschek

Re: Clarification of Recommendations
Geotechnical Investigation
Parkrose Business Center
Three Oaks Development
Portland, Oregon
Dames & Moore Job No. 11414-006-163

Dear Charlie:

As requested in your meeting of May 13, 1999 with Mr. John Duval, P.E. of our office, we are sending you this letter clarifying recommendations in our April 9, 1999 Report of Geotechnical Investigation. Specifically, this letter addresses depth of stripping and use of a vapor barrier.

First, based on the results of our field exploration program, the site is mantled by a topsoil/cultivated zone that we estimate to be approximately 12 inches thick. We recommend that stripping operations remove all vegetation, heavy rootmat, large cobbles/boulders and any other deleterious materials that may be encountered. The objective is to expose the underlying silt soils. We estimate that the depth of stripping could be as much as 10 to 12 inches; however, suitable materials may be exposed at depths less than 10 to 12 inches. Consequently, we recommend that stripping depth be field-verified to ensure that unsuitable materials have been properly removed.

Next, we would like to clarify our recommendations concerning a vapor barrier under floor slabs. While we continue to recommend the use of an impermeable membrane under floor slabs, we understand that the owners in the adjacent development have been that satisfactory results were obtained without a vapor barrier. This is certainly possible with a properly constructed capillary break under the floor slab. We are not

aware of any code requirement to install a vapor barrier and the decision to do so is completely optional.

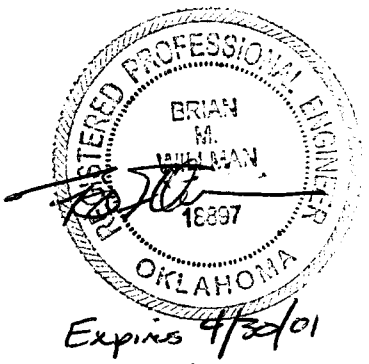
It has been our pleasure to assist you with this project. Should you have any questions regarding the contents of this letter, please call us at your convenience.

Very truly yours,

DAMES & MOORE

Brian M. Willman, P.E., Ph.D.
Project Engineer

for
John I. Duval, P.E.
Project Engineer



A permit to practice in Oregon has been granted to Brian Michael Willman valid only until official action is taken on application for Oregon registration dated January 29, 1999.

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