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GEOTECHNICAL EXPLORATION
AND ENGINEERING STUDY
PROPOSED BAKER ROAD APARTMENTS
CASTRO VALLEY, CALIFORNIA

M E R R I L L, S E E L E Y,
M U L L E N, S A N D E F U R, I N C.

Mr. Peter Shutts, Architect
699 Peters Avenue, Suite A
Pleasanton, California 94566

December 3, 1986
Project 86204

Dear Mr. Shutts,

We are pleased to submit this report which transmits the results of our geotechnical exploration and engineering study for design of the proposed apartments on Baker Road in Castro Valley, California. Our study was conducted in accordance with our proposal dated August 20, 1986.

This report presents our opinions regarding foundations, support of slab-on-grade floors, pavements, earthwork, and other geotechnical aspects of site development. The report also includes the results of our field exploration and laboratory testing programs which serve as the basis for our conclusions and recommendations.

We trust that the information presented herein is clear, concise and responsive to the project needs. Should you have any questions regarding our report, please contact our office. We would be pleased to review our findings and recommendations with you or the local review agencies.

Sincerely yours,
MERRILL, SEELEY, MULLEN, SANDEFUR, INC.

Michael J. Merrill
Principal Engineer

Thomas J. O'Brien
Senior Staff Engineer

MJM/TJO:ste

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PROPOSED BAKER ROAD APARTMENTS
CASTRO VALLEY, CALIFORNIA

INTRODUCTION

This report presents the results of our geotechnical exploration and engineering study performed in conjunction with design of the proposed apartments on Baker Road in Castro Valley, California. The scope of work for this study included a site reconnaissance, subsurface exploration, laboratory testing, engineering analyses of field and laboratory data, formulation of opinions and recommendations regarding foundtion design, support of concrete slabs-on-grade, earthwork, and other geotechnical aspects of site development, and preparation of an engineering report.

Specifically, our scope of work for this project included the following:

- Review readily available information regarding the general geologic and subsurface conditions in the vicinity of the project site;
- Review previous geotechnical studies conducted in the vicinity of the project site;
- Perform a geologic reconnaissance of the site;
- Explore the subsurface conditions at the site by drilling nine (9) exploratory borings;
- Perform laboratory tests on selected representative samples to evaluate the engineering properties of subsurface materials encountered at the site;
- Provide design recommendations regarding types and depths of foundations and design bearing pressures for the proposed apartment complex;
- Provide recommendations concerning support of concrete slab-on-grade floors;
- Provide recommendations for support of pavements;
- Provide recommendations regarding earthwork at the site;
- Render an opinion regarding the potential effects of groundwater and settlement on the proposed apartments;

- Render an opinion regarding the potential effects of geologic hazards;

- Prepare an engineering report summarizing our field exploration and laboratory testing, as well as our opinions and recommendations.

PROJECT DESCRIPTION

The project site is located between Rutledge Road (a private road) and Baker Road, approximately 200 feet southeast of Castro Valley Boulevard, in Castro Valley. The project site is relatively level. Existing structures on the subject property include several wood-frame residential dwellings.

It is our understanding that the approximate southern two-thirds of the project property will be developed, resulting in demolition of some of the existing structures. Present plans call for construction of an apartment complex and a parking area (Hardison, Komatsu, Ivelich & Tucker, 1986). It is our understanding that the proposed apartment complex will be of wood-frame construction with concrete slab-on-grade floors throughout the ground floor. The apartment building will be three stories in height, and will be constructed at or near existing grade. It is also our understanding that areas adjacent to the structure will be paved with asphaltic concrete for parking and access.

No specific information regarding structural loadings is presently available; however, we anticipate that loads will be moderate based on the proposed type of construction. We also anticipate that earthwork at the site will be limited to the excavation and filling necessary to achieve the desired pavement subgrades and building pad grades.

FIELD EXPLORATION AND LABORATORY TESTING

Nine (9) exploratory borings were drilled for this study on August 29, 1986, at the approximate locations shown on the Site Plan and Boring Location Map, Figure 2. A brief summary of subsurface conditions encountered in the exploratory borings is presented in the "Subsurface Conditions" section of this report. More detailed descriptions of subsurface conditions encountered are presented in the Logs of Borings, pages A-4 through A-12.

Representative samples of subsurface materials were recovered from the borings and taken to our laboratory for further examination and testing. The laboratory test results are presented on pages A-4 through A-14. Details regarding the drilling and sampling program and the laboratory testing program are presented on pages A-1, A-2 and A-3.

A geologic reconnaissance of the site was conducted to evaluate the site for evidence of unstable and erosion prone areas. These items are addressed in greater detail in a subsequent report section.

SITE DESCRIPTION

General

The site of the proposed apartment complex is located between Baker and Rutledge Roads, south of Castro Valley Boulevard, in Castro Valley, California. The location of the site relative to local roads and landmarks is presented on the Site Location Map, Figure 1.

The site is relatively level and partially covered with asphaltic concrete paving and portland cement concrete slabs. Existing structures on the subject property include several wood-frame residences and wood and chain-link fences.

Site Geology

Geologic mapping of the site vicinity (Dibblee, 1980) indicates that the site is underlain by alluvial deposits. A trace of the inactive East Chabot fault has also been located in the immediate vicinity of the project site.

The native soils underlying the project site have been mapped as Clear Lake Clay (Welch, 1981). This soil is a very deep, poorly drained soil formed in alluvium. Engineering characteristics of this soil include relatively low strength, low permeability and a high shrink-swell potential.

The project site lies approximately 0.8 miles northeast of the Hayward fault (CDMG, 1982), seven (7) miles southwest of the Calaveras fault, and twenty (20) miles northeast of the San Andreas fault (Jennings, 1975), all of which are considered active by the State Geologist. However, the project site lies outside any Alquist-Priolo Special Studies Zones placed alongside active faults. There is no evidence to indicate that active faults exist closer to the site.

Subsurface Conditions

The subsurface conditions encountered in our exploratory program can generally be described as a thin layer of fill underlain by native soils which, in turn, are underlain by weathered bedrock. The fill is a stiff, moist, brown, gravelly clay one (1) to two (2) feet thick.

The native soils generally consist of a very stiff to hard, dark brown to black, silty clay of medium to high plasticity. The color changed to a grey-brown at depths of approximately three (3) to four (4) feet. In Borings 4 through 8, we encountered silts and sands with varying amounts of clay underlying the aforementioned silty clay.

The bedrock underlying the native soils generally consists of plastic to weak, weathered claystone and shale. The depth to bedrock varied from five and one-half (5½) to twelve (12) feet and generally increased in the north and west directions.

Free groundwater was encountered in Borings 2, 4, 5, 6, 8 and 9 (beneath roughly the east and north portions of the site) at depths of nine (9) to eleven (11) feet. Free groundwater was not encountered in our other exploratory borings.

A more comprehensive description of subsurface conditions encountered in our exploratory borings is presented in the Logs of Borings, pages A-4 through A-12.

CONCLUSIONS

General

It is our opinion, based on the results of our study, that the proposed apartment complex can be developed as planned, provided that the recommendations presented in this report are implemented.

The native soils encountered in our exploration program are relatively uniform and exhibit moderately high strengths and low compressibilities. The native soils below the surficial soils vary in density and are of high plasticity. These soils have a high potential for expansion and could cause cracking and heaving of floor slabs and pavements if used for their direct support. Therefore, recommendations are presented herein to support slab-on-grade floors on a section of select engineered fill. It is also recommended that the existing fill in the area of the building pad be removed.

Groundwater

As previously mentioned, free groundwater was encountered in six (6) of the nine (9) exploratory borings at depths of nine (9) to eleven (11) feet. Also, available subsurface information from the site area indicates that this is a reasonable representation of the groundwater table and does not suggest that a significant rise in the groundwater level is likely. Therefore, it is our opinion that groundwater at the site should have little, if any, effect on construction or performance of the project as proposed.

Land Slippage and Erosion

As discussed previously, a geologic reconnaissance of the site was conducted to search for indications of instability or erosion prone areas. No evidence of instability was noted during the geologic reconnaissance or during our field exploration, primarily because the site is relatively level. Therefore, it is our opinion that the potential for damage due to land slippage is low.

No evidence of erosion was noted during our field exploration or geologic reconnaissance. In addition, the subsurface materials appear to have a low to moderate potential for erosion. Therefore, it is our opinion that the potential for damage due to erosion should be low, provided that the recommendations presented in this report are implemented.

Settlements

The native subsurface materials encountered at the project site exhibit low compressibilities, moderately high strengths, and the anticipated loads from the proposed building are relatively moderate. Therefore, it is our opinion that settlement of the proposed structure should be minimal, provided that the recommendations presented herein are implemented.

Expansive Soils

The native soils encountered at the project site exhibit a moderate to high potential for expansion. These soils can exert significant uplift pressures on shallow foundation elements and on pavements if their moisture content changes. This can result in differential heaving or settlement and damage to structures and pavements. Therefore, it is recommended in subsequent report sections that foundations and slab-on-grade floors be supported on sections of select engineered fill. It is our opinion that the potential for damage due to the expansive soils can be mitigated if the recommendations presented herein are implemented.

Seismic Considerations

Seismic Shaking - The site is not located in an Alquist-Priolo Special Studies Zone; however, it is in an area of potential seismic activity. As will most sites in the Bay area, the subject property will be subjected to strong seismic shaking in the event of a large magnitude earthquake occurring on any of the active faults in the region. Therefore, the proposed structure should be designed for strong seismic ground motions.

Potential for Liquefaction - Soil liquefaction is a phenomenon in which loose, fine-grained, cohesionless soils (sands) located below the groundwater table experience a temporary but essentially total loss of shear strength due to reversing cyclic shear stresses caused by seismic shaking.

Cohesionless soils were encountered in some of our exploratory borings drilled for this study. These sands varied in grain size and were generally dense and contained some silt and clay binder. In addition, they appear to be located at or immediately below the groundwater table. Therefore, it is our opinion that the potential for liquefaction of the subsurface materials encountered in our exploratory borings is low.

RECOMMENDATIONS

General

The subsurface soils at the site generally exhibit moderate to high strengths; therefore, it is recommended that the proposed apartments be supported on spread footing foundations. The native soils also exhibit a high expansion potential; therefore, it is recommended that foundation elements and slab-on-grade floors be supported on a section of select engineered fill. Recommendations regarding pavements are also presented herein. It is also recommended that our firm be retained to review all plans for the apartment complex to check for general compliance with the intent of the recommendations presented herein.

Earthwork

Monitoring of Earthwork - It is recommended that all earthwork associated with this project be performed under the direct, full-time observation of a representative of our firm and in accordance with the recommendations contained in this section and in Appendix B, "Guide Specifications for Earthwork."

Surface Preparation - Prior to commencing earthwork operations, all areas to receive fill should be stripped to remove all surface vegetation, organic-laden topsoil, existing concrete slabs, existing pavement, or debris. These materials should be removed from the site; however, surface vegetation and topsoil can be stockpiled for re-use later in planting areas. These materials should not be re-used for engineered fill.

After stripping has been completed, excavation for the recommended sections of select engineered fill beneath spread footings and floor slabs should be made. Details regarding the recommended sections of select fill are presented in subsequent report sections.

Any loose, badly cracked or weak surficial soils encountered during stripping or at the bottoms of excavations should be removed. When surface preparation has been completed, all exposed soils should be scarified to a depth of at least six (6) inches, brought to a water content one (1) to three (3) percent above the laboratory optimum, and compacted to the requirements of engineered fill.

Fill Placement and Re-Use of On-Site Material - All fill should be compacted to a minimum degree of compaction of 92 percent based on California Test Method 216-F. Fill material should be spread in uniform lifts not exceeding eight (8) inches in uncompacted thickness. The material should be brought to a water content at or near the laboratory optimum and should be mixed thoroughly before compaction to achieve a uniform distribution of moisture. After the surface preparation is completed, the mass filling should commence immediately and proceed until the site is to grade.

On-site materials, if free from organic materials, debris, or other deleterious substances, can be used as general engineered fill. However, on-site materials do not meet the requirement of select fill, which is recommended beneath footings and floor slabs. All material imported to the site for use as fill should be select material as defined in the attached "Guide Specifications for Earthwork."

Utility Trench Backfill - It is recommended that all utility trench backfill be placed in accordance with the compaction requirements and procedures for engineered fill, with the additional recommendations presented in this section and with Appendix B, "Guide Specifications for Earthwork."

Foundations

It is recommended that the proposed apartments be supported on isolated spread footings under columns and on continuous footings under walls. Footings should be underlain by a minimum of twenty-four (24) inches of select engineered fill. It is recommended that interior and exterior footings be embedded a minimum of twenty-four (24) inches below the lowest adjacent finished grade. Continuous wall footings should have a minimum width of eighteen (18) inches; isolated spread footings should have a minimum width of twenty-four (24) inches. Design bearing pressures for footings designed and constructed as recommended herein should not exceed 3,000 psf due to dead loads, 4,000 psf due to dead plus live loads, and 5,000 psf due to all loads, including wind and seismic forces. All select engineered fill beneath footings should be compacted to a minimum degree of compaction of 92 percent.

Resistance to Sliding

Resistance to sliding for the proposed structure can be developed by friction acting on bottoms of spread footings and by passive pressure acting on the faces of spread footings. A coefficient of friction of 0.4 can be used for design, as well as an equivalent fluid weight of 300 pcf, assuming that the footings are poured neat against compacted soil.

Slab-On-Grade Floors

It is our understanding that the floors of the proposed apartments will be of the slab-on-grade type. As discussed in a previous report section, the surficial soils are highly expansive and could cause heaving of floor slabs if used for their direct support. Therefore, it is recommended that the building floor slabs be supported on a minimum thickness of eighteen (18) inches of select engineered fill.

All fill beneath floor slabs should be compacted to a minimum degree of compaction of 92 percent. Concrete slabs should be designed and constructed in accordance with standard engineering recommendations such as those provided by the American Concrete Institute.

It is recommended that a capillary break consisting of four inches of rounded or subangular gravel be placed beneath the floor slab and covered by a moisture-vapor barrier to minimize dampness on the finished slab surface. A two-inch-thick layer of sand is usually placed over the membrane to aid in protecting it from damage during slab construction. Guide specifications for gravel beneath floor slabs are presented in Appendix C. The capillary break should not be considered part of the eighteen (18) inches of select engineered fill recommended above.

Pavements

It is our understanding that pavements will be constructed of asphaltic concrete. We expect that traffic loadings for the apartment complex are likely to range from passenger car parking to occasional garbage truck loading. Based on our past experience, we have provided preliminary pavement sections for three (3) proposed pavement uses. This standard design consists of asphaltic concrete (AC), class 2 aggregate base (AB), and compacted native subgrade (CSG). It is recommended that all baserock and the top six (6) inches of subgrade beneath pavements be compacted to a minimum degree of compaction of 95 percent; it is also recommended that the moisture content of the compacted subgrade be one (1) to three (3) percent above the laboratory optimum.

Based on an assumed R-value of 10, the following pavement sections are recommended:

Proposed Use	Estimated TI	AC (in.)	AB (in.)	CS (in.)
Auto Parking	4	2½	8	6
Access Aisles	5	2½	10½	6
Garbage Truck Loading	-	12	0	6

It is recommended that final parking lot striping include markings designating the area to be used for garbage truck loading (the area with the thickest section of asphaltic concrete pavement).

<u>Surface Drainage and Erosion Control</u>

Good surface drainage is essential to intercept and control surface water runoff and to minimize soil erosion and subsurface infiltration. Ground surfaces should slope away from the structure at a gradient of at least two (2) percent. Care should be taken to grade areas to control and collect surface water runoff. In addition, roof downspouts should be connected to closed collector pipes which outlet into the storm water system.

LIMITATIONS

The recommendations presented in this report are made for a specific development. The opinions and recommendations presented herein have been formulated in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made or should be inferred. If the proposed construction will differ from that planned at the present time, our firm should be notified so that supplementary recommendations can be made. The recommendations contained in this report should be implemented in their entirety unless modifications have been provided by our firm in writing. The recommendations should not be considered applicable if only a portion of the recommendations are implemented.

Our firm should be retained to provide a representative to observe all earthwork on a full-time basis, to verify that the subsurface conditions encountered in the field are as were anticipated in development of these recommendations and to check for general compliance with the intent of these recommendations. The recommendations presented herein should not be considered applicable if our firm has not been retained to observe subsurface conditions encountered in the field during construction, to make supplemental recommendations as appropriate, and to observe construction procedures employed. The opinions and recommendations presented in this report are based in part upon the data obtained from the exploratory borings. The nature and extent of variations between the borings may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

If the contractor encounters subsurface conditions at the site that (a) are materially different from those indicated in this report, or (b) could not have been reasonably anticipated as inherent in this type work, the contractor shall immediately notify the owner verbally and in writing within 24 hours.

The contents of this report are not warranted to present information in the degree of detail that may be required or considered necessary by contractors for competent preparation of bids, or for planning of their construction operations for troublefree, efficient, profitable, or successful performance of their work. Merrill, Seeley, Mullen, Sandefur, Inc. has no objection to bidders or contractors evaluating the information presented in this report to bid, plan and perform their construction operations. Their evaluation of this information should be based on their expertise of the various construction operations.

This report is issued with the understanding that it is the responsibility of the owner to insure that all recommendations contained herein are carried out in the field. It is also the responsibility of the owner to see that the recommendations are called to the attention of the appropriate parties, such as the contractor, the subcontractor, and the municipality or other government organizations that may have jurisdiction. It is the responsibility of the owner to inform Merrill, Seeley, Mullen, Sandefur, Inc., of the intent to commence earthwork operations at least 48 hours prior to their start. Lastly, it is the responsibility of the owner to inform Merrill, Seeley, Mullen, Sandefur, Inc., of the intent to implement any of the recomendations presented in this report and/or to perform any further work on the project.

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING

FIELD EXPLORATION

Nine (9) exploratory borings were drilled for this study at the locations shown on the Site Plan and Boring Location Map, Figure 2. The drilling was done on August 29, 1986, under the supervision of Mr. Barry Butler. The borings were advanced using a 4½-inch-diameter auger. Drive samples were obtained using samplers described on page A-3. The sampler used was driven 18 inches into the soil by a 140-pound hammer free falling 30 inches. The number of blows required to penetrate the last 12 inches or a fraction thereof is shown on the Logs of Borings. When the sampler was withdrawn from the hole, the samples were carefully removed, sealed to minimize moisture loss and returned to our laboratory. Classifications, made in the field from auger cuttings and drive samples, were verified in the laboratory after further examination and testing of the samples.

Conditions between boring locations may vary considerably and it should not be expected that they will be precisely represented by any one of the borings. Soil deposition processes and topographic forming processes are such that soil and rock types and conditions may change in small vertical intervals and short horizontal distances. Stratification lines, as indicated on the Boring Logs, represent approximate changes in soil and rock composition, moisture and color as approximated by field personnel logging the drilling operation and by the engineer in the laboratory from sample recovery data and by observation of the samples. Actual depths to changes in the field may differ from those indicated on the logs, or transitions may occur in a gradual manner and may not be sharply defined by a readily obvious line of demarcation.

Water level readings have been made in the drill holes at times and under conditions stated on the boring logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors at the time water levels were observed.

The location of borings were approximately determined by tape measurement. Elevations of borings were approximately determined by interpolation between contours shown on the topographic and boundary survey of the subject property (Archer, 1986). The location and elevation of the borings should be considered accurate only to the degree implied by the method used.

LABORATORY TESTING

The water content, dry density, and unconfined compressive strength were determined for selected samples to evaluate the strength and compressibility characteristics of the soils. The results of these tests, together with the resistance to penetration of the sampler, are shown at the corresponding sample locations on the Logs of Borings.

Plasticity characteristics of the surficial soils were determined for two (2) samples of fill and native soils by performing Liquid Limit and Plastic Limit tests in accordance with ASTM test methods D423 and D424. The results of these tests are presented on page A-13.

A mechanical grain-size analysis was performed on one (1) sample of the native soils. The portion of the sample retained in a No. 200 sieve (U.S. Standard) was analyzed according to ASTM test method D-422. The results of this test are presented on page A-14.

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. SAMPLE

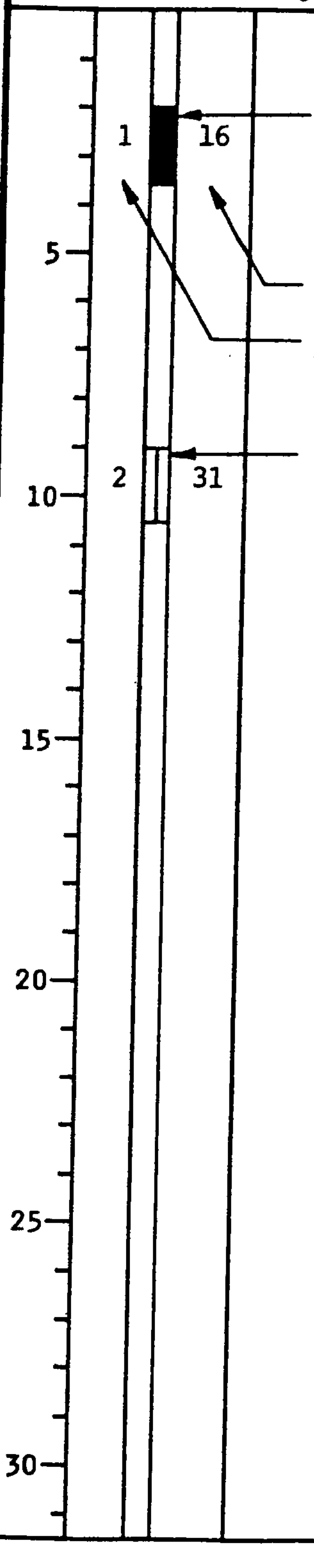
Project Number: 86204

Date Drilled: ___

Type of Boring: ___

Hammer Weight: ___

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	LABORATORY TESTS: Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			Surface Elevation: ---			



Modified California Sampler, 2.5 inches Outside Diameter and 2.0 inches Inside Diameter

Penetration Resistance

Sample Number

Standard "Split Spoon" Penetration Sampler, 2.0 inches Outside Diameter and 1.45 inches Inside Diameter

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 1

Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: 140 lbs.

Surface Elevation: 158.0 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			GRAVELLY CLAY (CL) FILL stiff, moist, brown			
	1	16	SILTY CLAY (CL) very stiff, moist, dark brown to black with traces of coarse sands and weathered light brown sandstone deposits	21	101	5430
	2	10		20	101	5000
5						
	3	47	WEATHERED CLAYSTONE plastic, light brown	24	99	6590
10	4	30*/2"	light grey-brown	--	---	-----
15	5	50*/1"		--	---	-----
20						
25						
30						

Bottom of boring at 15'-1".
No groundwater encountered at time of drilling.
*Blow count during seating of sampler.

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 2

Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: 140 lbs.

Surface Elevation: 157.7 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	LABORATORY TESTS: Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
	1	19	GRAVELLY CLAY (CL) FILL very stiff, moist, mottled orange-brown with silts, sands, and angular rock fragments	12	112	6660
	2	13	SILTY CLAY (CL) very stiff, moist, brown with traces of fine sands and orange-brown sandstone deposits	16	111	5680
5	3	15		16	112	5030
	4	21	orange-brown with fine gravels and coarse sands	11	123	2100
10			▽ **			
	5	30*/3"	WEATHERED CLAYSTONE plastic, orange-brown	--	---	-----
15						
20						
25						
30						

Bottom of boring at 13'-3".
*Blow count during seating of sampler.
**Groundwater at 10'-0" at time of drilling.

Project: Baker Road Apartments Castro Valley, California	# Log of Boring No. 3
Project Number: 86204 **Date Drilled:** August 29, 1986	**Type of Boring:** 4½ inch Auger **Hammer Weight:** 140 lbs.

Surface Elevation: 158.2 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			A.C. pavement approximately 6 inches thick			
	1	17	GRAVELLY CLAY (CL) FILL very stiff, moist, mottled brown	20	101	9850
	2	20	SILTY CLAY (CL) hard, moist, dark brown to black with traces of sands	14	119	13,210
5	3	30/4"	grey-brown with some coarse sands	13	120	6010
	4	37*/6"	WEATHERED CLAYSTONE plastic, brown, indurated	--	---	-----
10			Bottom of boring at 9'-0". No groundwater at time of drilling. *Blow count during seating of sampler.			
15						
20						
25						
30						

Project: Baker Road Apartments, Castro Valley, California	Log of Boring No. 4
Project Number: 86204	Type of Boring: 4½ inch Auger
Date Drilled: August 29, 1986	Hammer Weight: 140 lbs.

Surface Elevation: 157.9 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			GRAVELLY CLAY (CL) FILL stiff, moist, mottled brown with rock fragments			
	1	12		13	104	-----
			SILTY CLAY (CL) hard, moist, dark brown to black with traces of sands			
	2	12		15	111	10,530
5	3	16		14	117	12,820
			CLAYEY SILT (ML) hard, moist, brown with some fine sands			
			CLAYEY SAND (SC-SW) medium dense, moist, brown with varying amounts of silt and clay			
	4	17		17	109	1340
10			wet *** **			
	5	26		--	---	-----
			WEATHERED SHALE plastic, brown			
	6	39		--	---	-----
15	7	20/3"	grey with fine sands stronger with depth	--	---	-----
20	8	50*/2"		--	---	-----
25						
30						

Bottom of boring at 20'-2".
*Blow count during seating of sampler.
**Groundwater at 11'-6" at time of drilling.
***Groundwater at 10'-3" on September 2, 1986.

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 5

Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: 140 lbs.

Surface Elevation: 157.3 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			A.C. pavement and aggregate baserock			
	1	18	SILTY CLAY (CH) hard, moist, black	24	101	8180
5			mottled brown-grey			
	2	14		—	—	—
			SILTY CLAY (CL) stiff, moist, light brown, silt content increasing with depth			
10	3	12		—	—	—
			SANDY SILT-SILTY SAND (ML-SM) stiff, moist, light brown-orange brown with very find sands **			
	4	30*/1"		—	—	—
			WEATHERED SHALE weak, brown			
15						
20						
25						
30						

Bottom of boring at 11'-1".
*Blow count during seating of sampler.
**Groundwater at 11'-0" at time of drilling.

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 6

Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: 140 lbs.

Surface Elevation: 156.8 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			A.C. pavement			
	1	16	GRAVELLY CLAY (CL) FILL stiff, moist, mottled brown	23	97	6520
			SILTY CLAY (CH) very stiff, moist, black			
5	2	13	mottled brown-grey with traces of sands	17	111	6370
			increasing silt content			
10	3	21	SILTY SAND (SM) *▽ dense, moist, mottled orange-brown	--	---	-----
	4	20/5"	WEATHERED SHALE weak, grey with clay seams	--	---	-----
15			Bottom of boring at 12'-11". *Groundwater at 9'-6" at time of drilling.			
20						
25						
30						

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 7

Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: 140 lbs.

Surface Elevation: 158.1 ft.

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			GRAVELLY CLAY (CL) FILL stiff, moist, mottled brown			
	1	11		12	113	17,050
			SILTY CLAY (CL) very stiff to hard, moist, dark brown with scattered organics and fine sands			
	2	11		15	113	6700
5						
	3	15	increasing silt content	--	---	-----
			SANDY SILT-SILTY SAND (ML-SM) hard, moist, mottled dark brown			
	4	46		--	---	-----
10			WEATHERED SHALE weak, light brown			
			Bottom of boring at 10'-0". No groundwater encountered at time of drilling.			
15						
20						
25						
30						

Project: Baker Road Apartments Castro Valley, California	# Log of Boring No. 8
Project Number: 86204 **Date Drilled:** August 29, 1986	**Type of Boring:** 4½ inch Auger **Hammer Weight:** ----

Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			Surface Elevation: 158.0 ft.			
			GRAVELLY CLAY (CL) FILL stiff, moist, mottled brown			
			SILTY CLAY (CL) very stiff, moist, dark brown			
5			mottled brown			
			SILTY SAND (SM) * dense, wet, mottled brown			
10						
			WEATHERED CLAYSTONE weak, brown			
15			Bottom of boring at 13'-0". *Groundwater at 9'-0" at time of drilling.			
20						
25						
30						

(LABORATORY TESTS: Moisture Content, %; Dry Density, pcf; Unconfined Compressive Strength, psf)

Project: Baker Road Apartments
Castro Valley, California

Log of Boring No. 9

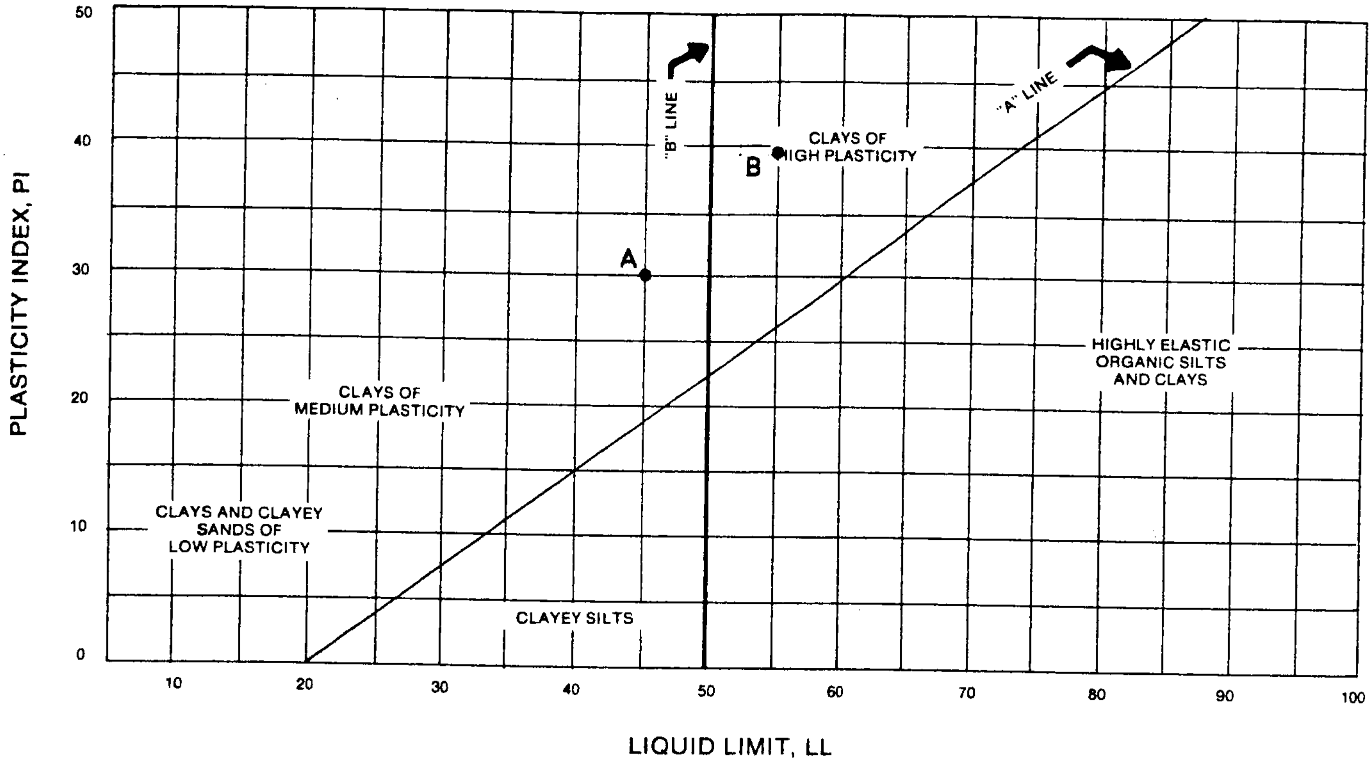
Project Number: 86204

Date Drilled: August 29, 1986

Type of Boring: 4½ inch Auger

Hammer Weight: ----

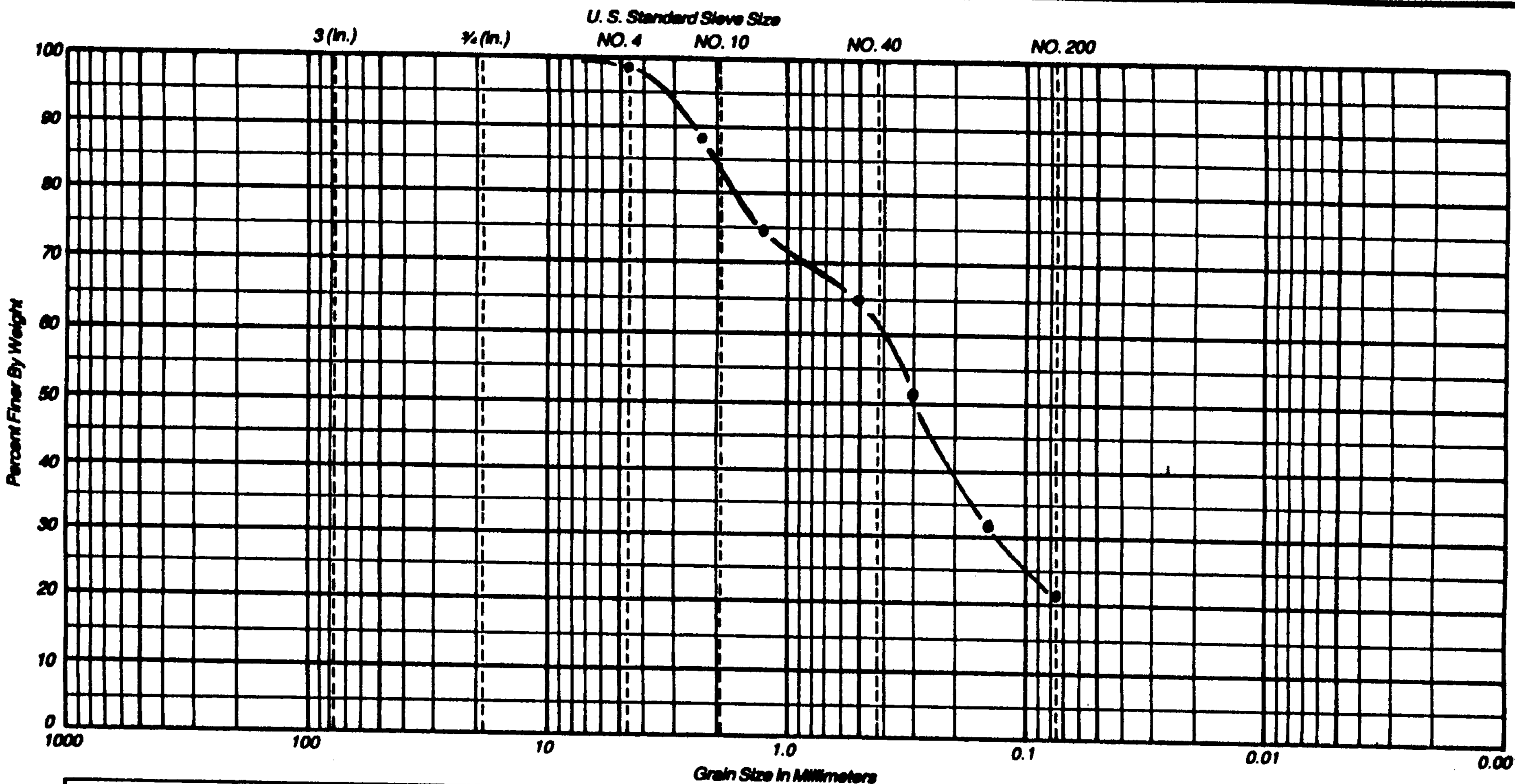
Depth, Ft.	Samples	Blows/Ft.	MATERIAL DESCRIPTION	Moisture Content, %	Dry Density, pcf	Unconfined Compressive Strength, psf
			Surface Elevation: 158.0 ft.			
			GRAVELLY CLAY (CL) FILL stiff, moist, brown			
			SILTY CLAY (CL) very stiff, moist, dark brown			
5			mottled brown			
			GRAVELLY CLAY (CL) very stiff, moist			
10						
			Bottom of boring at 13'-0". No groundwater encountered at time of drilling. Weathered claystone encountered at bottom of boring.			
15						
20						
25						
30						



CLASSIFICATION TEST RESULTS									
SAMPLE IDENTIFICATION			ATTERBERG LIMITS			GRAIN SIZES — % DRY WEIGHT			
LETTER DESIG'N	SAMPLE NO.	DEPTH, FT.	LIQUID LIMIT	PLASTICITY INDEX	PLASTIC LIMIT	SAND	SILT	CLAY	COLLOIDAL
A	1–2	4.0	45	30	15				
B	Bulk 1	<5.0	55	39	16				

PLASTICITY CLASSIFICATION TEST RESULTS

GRADATIO.. CURVES



	COBBLES	GRAVEL		SAND			SILT	CLAY
		Coarse	Fine	Coarse	Medium	Fine		

Boring No.	Sample No.	Depth from (ft.)	Depth to (ft.)	Gradation Agg (%)	C.S. (%)	M.S. (%)	F.S. (%)	Silt (%)	Clay (%)	Plasticity LL (%)	PL (%)	PI (%)	Water Content (%)
4	5	11.5	12.0	1	15	23	39						SW

Boring No.	Sample No.	Depth from (ft.)	Depth to (ft.)	Gradation Agg (%)	C.S. (%)	M.S. (%)	F.S. (%)	Silt (%)	Clay (%)	Plasticity LL (%)	PL (%)	PI (%)	Water Content (%)

APPENDIX B
GUIDE SPECIFICATIONS FOR EARTHWORK

1. GENERAL CONDITIONS

1.1 Definition of Terms

(A) FILL...all soil or rock material placed to raise the natural grade of the site or to backfill excavations.

(B) ON-SITE MATERIAL...that which is obtained from the required excavation on the site.

(C) IMPORT MATERIAL...that which is hauled in from offsite borrow areas.

(D) ENGINEERED FILL...fill upon which the Geotechnical Engineer has made tests and observations to enable him to issue a written statement that in his opinion the fill has been placed and compacted in accordance with the specification requirements.

(E) SELECT MATERIAL...an on-site or imported soil or rock material meeting the requirements set forth in Section 3.2.

(F) MATERIALS MANUAL...State of California, Business and Transportation Agency, Department of Transportation, latest revision.

(G) PERCENT COMPACTION...the ratio, expressed as a percentage, of the dry density of the fill material as compacted in the field to the maximum dry density of the same material determined by California Test Method 216-F. Field densities shall be determined in accordance with ASTM D-1556 or ASTM D-2922-71.

1.2 Duties of the Geotechnical Engineer

The Geotechnical Engineer shall be the Owner's representative to observe the grading operations both during preparation of the site and the compaction of any engineered fill. He shall make visits to the site to familiarize himself generally with the progress and quality of the work. He shall make field observations and tests to enable him to form an opinion and advise the Owner regarding the site preparation, the acceptability of the fill material, and the extent to which the percent compaction of the fill, as placed, meets the specification requirements. He shall recommend that any fill that does not meet the specification requirements be removed and/or recompacted until the requirements are satisfied. He shall not be responsible for checking the grades during construction or final grades. Nothing in this section relieves the contractor of his responsibility under the contract to place all earthwork in accordance with the recommendations and the plans and specifications.

1.3 Subsurface Conditions

A geotechnical investigation has been performed for this site. A contractor shall familiarize himself with the subsurface conditions at the site, whether covered in the report or not, and shall thoroughly understand all recommendations associated with grading.

2. SITE PREPARATION

2.1 Stripping

The site shall be stripped and cleared of all vegetation, debris, concrete slabs, pavement, and organic-laden topsoil. The stripped material shall be hauled from the site unless approval is given to stockpile the material for re-use later as topsoil in future landscape areas. This material shall not be used for engineered fill. Any existing foundations, tanks and utilities encountered during grading shall be removed from the site.

2.2 Excavation

After stripping, the site shall be excavated to the required grades to remove the existing fill. Sub-excavations shall be made as recommended by the Geotechnical Engineer. Existing subsurface soils shall be excavated sufficiently to allow for a minimum thickness of twenty-four (24) inches of fill beneath footings and eighteen (18) inches beneath concrete slabs-on-grade. The bottoms of the excavations shall extend beyond the plan area of the building a distance equal to the depth of the excavation beneath the structure. All excavations shall be carefully made true to the grades and elevations shown on the plans.

The excavated surfaces shall be properly graded to provide good drainage during construction and prevent ponding of water. Earthwork is most expediently accomplished using large, heavy equipment, unimpeded by obstacles. Therefore the entire area should be excavated to the recommended depths at the same time to permit uniform preparation of the subgrade and placement of engineered fill in a uniform, continuous operation.

2.3 Preparation for Filling

All excavations made during the stripping and clearing operations that are below finish grade shall be cleaned of all loose soil and debris and backfilled with engineered fill.

After stripping, all areas to support structures, including pavements, shall be prepared further by removing any loose, weak or badly cracked surficial soils. The depths of these excavations shall be determined by the Geotechnical Engineer.

Once the specified stripping and excavation are complete, the exposed surface and excavation bottom should be scarified a minimum depth of six inches and recompacted to the requirements of engineered fill. If the exposed surface or bottom of the excavation is soft and unstable, and required compaction cannot be achieved, the bottom should be stabilized. Stabilization possibly could be accomplished by additional excavation, use of fabric and replacement with clean dry soil or well-graded rock with sufficient fines to be cohesive, or by use of coarse gravel if approved by the Geotechnical Engineer.

Before placing fill, the Contractor shall obtain the Geotechnical Engineer's approval of the site preparation in the areas to be filled. The excavated materials then can be re-placed as fill if they meet the requirements for fill.

3. MATERIALS USED FOR FILL

3.1 General Requirements for Fill Materials

All fill materials and the re-use of on-site material must be approved by the Geotechnical Engineer. The material shall be a soil or soil-rock mixture which is free from organic matter or other deleterious substances. The fill material shall not contain rocks or lumps over 6 inches in greatest dimension and not more than 15 percent larger than 3 inches.

Materials from the site, if free from organic or other deleterious substances, can be re-used for general engineered fill.

3.2 Requirements for Select Fill Material

In addition to the requirements of Section 3.1, above, select material shall have a Plasticity Index (PI) less than 15 percent and an R-value greater than 25. All import material shall meet the requirements of select fill.

Materials from the site do not appear to meet the requirements for re-use as select fill and should not be used for direct support of concrete footings or slabs-on-grade.

4. PLACING AND COMPACTING FILL MATERIAL

All fill material shall be compacted as specified below or by other methods, if approved by the Geotechnical Engineer, so as to produce a minimum percent of compaction of 92 percent with the exception of subgrades beneath pavements, which should be compacted to a minimum degree of compaction of 95 percent. Fill material should be spread in uniform lifts not exceeding eight inches in uncompacted thickness. Fill material shall be brought to a water content that will permit proper compaction by either: aerating the material if it is too wet; or spraying the material with water if it is too dry. Each lift shall be thoroughly mixed before compaction to ensure a uniform distribution of water content. The moisture content predominantly fine grained fill materials (silts and clays) shall be at or near the optimum moisture content, or slightly less, in order to maintain stability in the fill mass beneath the compacting equipment. Predominantly coarse grained materials (sands and gravels), which are not as sensitive to moisture content with regard to stability, shall not become saturated to the point that a pumping condition occurs. On-site material that is identified by the Geotechnical Engineer in the field as potentially expansive, shall be compacted at a moisture content of at least 3 percent above optimum. The minimum moisture content shall be determined by the Geotechnical Engineer. The grading shall commence immediately after the surface preparation phase and shall proceed in a continuous operation until the site is brought to grade.

5. TREATMENT AFTER COMPLETION OF GRADING

After grading is completed and the Geotechnical Engineer has finished his observation of the work, no further excavation or filling shall be done except with the approval of and under the observation of the Geotechnical Engineer.

It shall be the responsibility of the Grading Contractor to prevent erosion of freshly graded areas during construction and until such time as permanent drainage and erosion control measures have been installed.

6. UTILITY TRENCH BACKFILL

It is recommended that all utility trench backfill be placed in accordance with the compaction requirements and procedures for engineered fill and the additional recommendations presented in this section.

The pipes should first be bedded in accordance with standard practice or as required by the County of Alameda or the particular utility. From 12 inches above the pipe to finish grade, the backfill should be placed in thin lifts and compacted using approved compaction equipment to the minimum degree of compaction specified above. The bedding materials, one foot over the pipes, should be compacted to a minimum of 85 percent compaction. Care should be taken to prevent damage to pipes during the compaction process. Jetting of backfill should not be permitted. The backfill material should consist of a soil material free of organic matter or any other deleterious substances, and should not contain rocks over four inches in greatest dimension or soil lumps greater than two inches in size. Clay soils used for backfill material should meet the moisture requirements for engineered fill. Sand is not recommended for backfill within 18 inches of finish grade.

Prior to the placement of underground utilities, the trench should be examined for subsurface seepage. If seepage is encountered, our firm should be consulted so that recommendations for subsurface drainage can be made. Trenches containing free water should be de-watered prior to backfilling.

It is recommended that trench backfill for major utilities, such as storm sewers, sanitary sewers and water service lines be observed by our firm where such lines are located within the building area, beneath pavements and in close proximity to footings. These particular underground utilities can be identified more fully after utility plans are finalized.

APPENDIX C

GUIDE SPECIFICATIONS FOR GRAVEL BENEATH FLOOR SLABS

A. DESCRIPTION

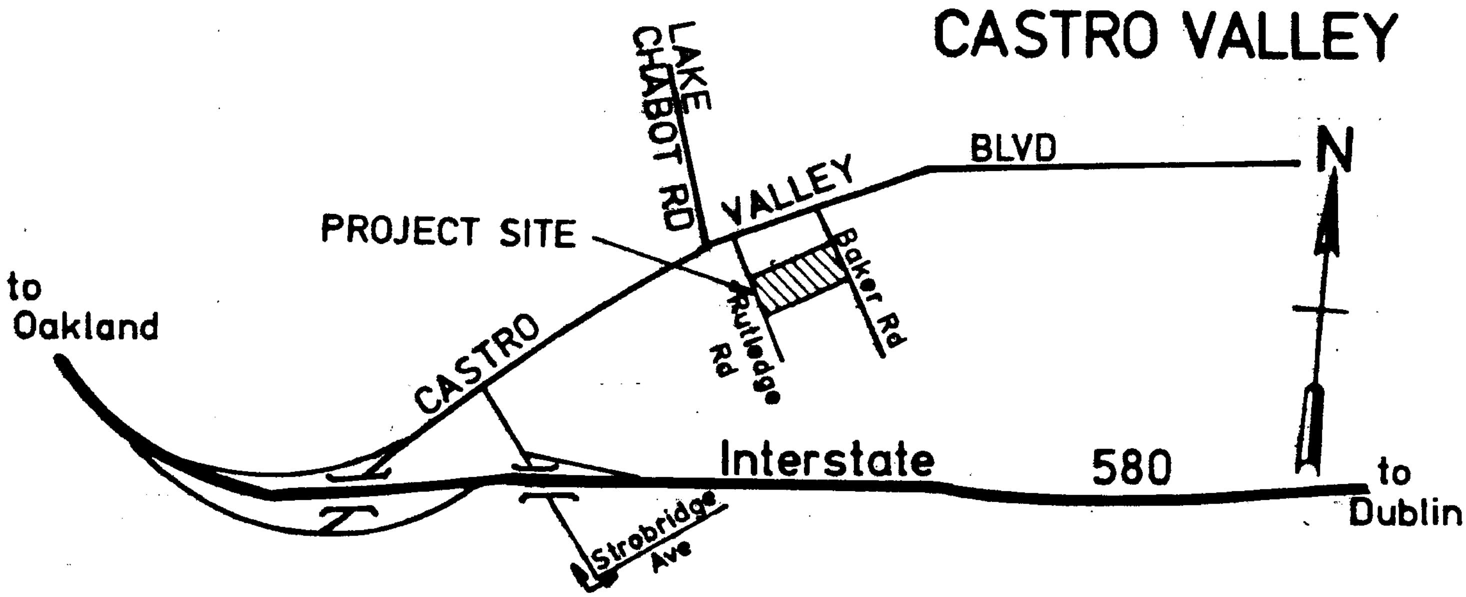
Graded gravel for use beneath floor slabs shall consist of mineral aggregate placed in accordance with the recommendations of this report and in conformity with the dimensions shown on the plans.

The mineral aggregate for use beneath floor slabs shall consist of broken stone, crushed or uncrushed gravel, clean quarry waste, or a combination thereof. The aggregate shall be free from adobe, vegetable matter, loam, volcanic tuff, and other deleterious substances. It shall be of such quality that the absorption of water in a saturated surface dry condition does not exceed 3 percent of the oven dry weight of the sample.

B. GRADATION

The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by laboratory sieves (U.S. Series) will conform to the following gradation:

Sieve Size	Percentage Passing Sieve
1"	100
3/4"	90 - 100
No. 4	0 - 10

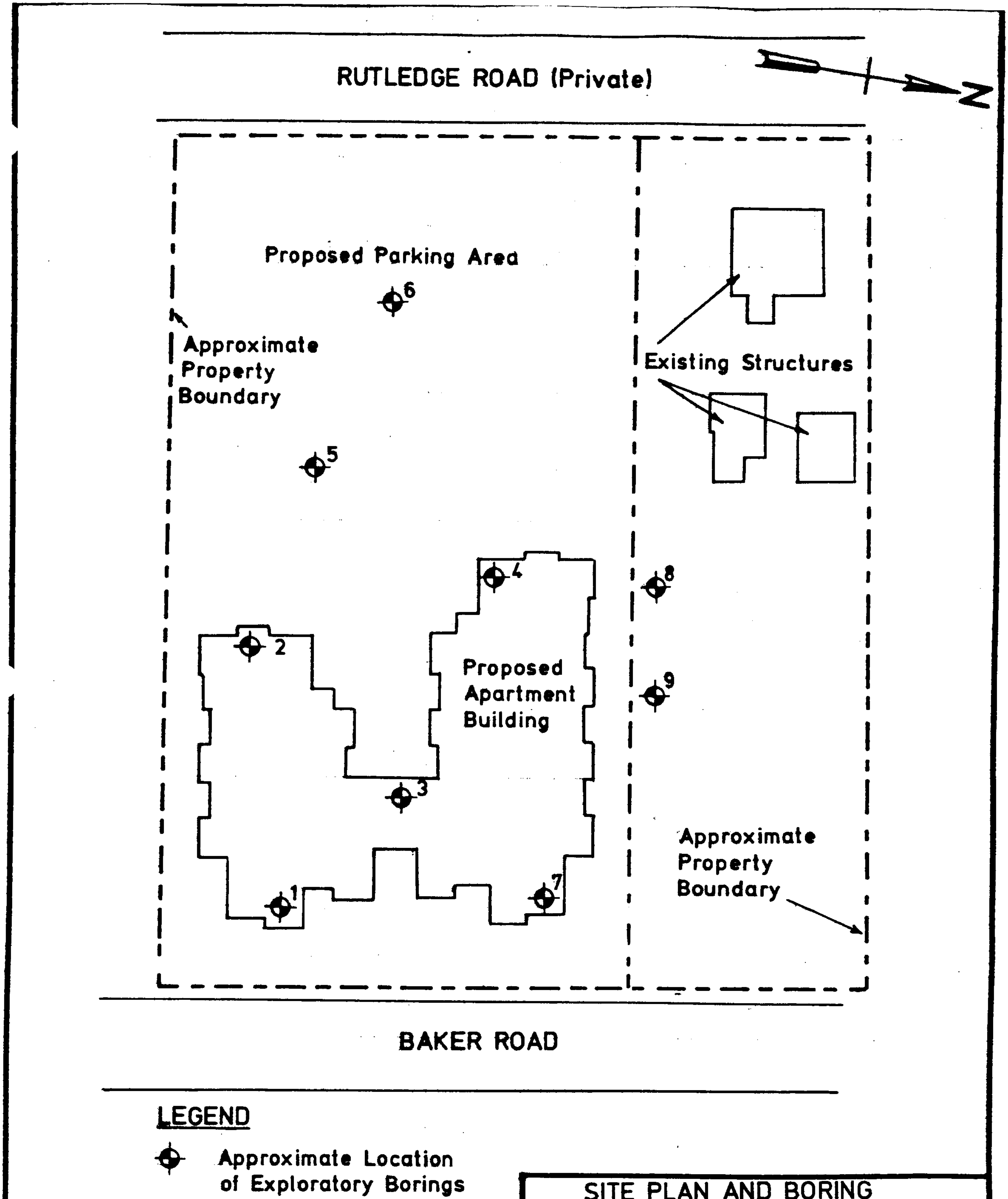


SITE LOCATION MAP

Scale: None

Project: 86204

Figure 1



SITE PLAN AND BORING LOCATION MAP

Scale: None

Project: 86204

Figure 2

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