SOIL INVESTIGATION
on
PROPOSED ONE-STORY COMMERCIAL BUILDING
Village Parkway and
Amador Valley Boulevard
Dublin, California
for
OIL CHANGERS

By

TERRASEARCH, INC.

Project No. 5731-E
16 July 1987

SOIL, FOUNDATION AND GEOLOGICAL ENGINEERS
TERRA SEARCH INC.
1580 NORTH FOURTH STREET, SAN JOSE, CALIFORNIA 95112-4676, (408) 287-9460

Project No. 5731-E
16 July 1987

Oil Changers
386 Railroad Court
Milpitas, CA 95035

Attention: Mr. Seth Bland

Subject: Proposed One-Story Commercial Building
Village Parkway and Amador Valley Blvd.
Dublin, California
SOIL INVESTIGATION

Gentlemen:

In accordance with your authorization, TERRASEARCH, INC., has investigated the soil conditions at the proposed one-story with basement commercial building site in Dublin, California.

The accompanying report presents our conclusions and recommendations based on our investigation. Our findings indicate that the site is physically suitable for this type of development provided the recommendations of this report are carefully followed and are incorporated into the plans and specifications.

Should you have any questions or require additional information, please contact our office at your convenience.

Very truly yours,
TERRASEARCH, INC.

Reviewed by:

Tom S. Makdissy, P.E.
Principal Engineer

Seymour Goodmacher, CEG
Project Geologist

Mark Detterman
Staff Geologist

Copies: 5 to Oil Changers

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SOIL INVESTIGATION

Purpose and Scope

The purpose of the investigation for the proposed one-story commercial development on Village Parkway in Dublin, California, was to determine the surface and subsurface soil conditions at the subject site. Based on the results of the investigation, criteria were established for the grading of the site, the design of foundations for the proposed structures, and the construction of other related facilities on the property. Our investigation included the following:

a. Field reconnaissance by the Soil Engineer;
b. Drilling and sampling of the subsurface soils;
c. Laboratory testing;
d. Analysis of the data and formulation of conclusions and recommendations;
e. Preparation of this written report.

Proposed Construction

The proposed construction is to consist of a one-story building with underground service bays. The bays are to be provided by excavating approximately 6 to 8 feet of the on-site material. It is contemplated that the retaining walls supporting the excavation plus isolated footings will also support the structure.

Site Location and Description

The flat site is located on the southwest corner of the intersection of Village Parkway and Amador Valley Boulevards in Dublin, California. The adjacent area is commercially developed and includes four corner gas stations, a small market, and a number of fast food establishments.

At the time of our exploration, existing structures on the site included a closed Shell gas station consisting of a single-story structure and four pumping islands located on two concrete slabs north and east of the structure. A number of underground fuel storage tanks are also located beneath a concrete slab to the northeast of the structure and between the two pumping areas. The remainder of the lot is under asphaltic concrete.

This description of the site is based on a site reconnaissance by the Soil Engineer and plot plan provided the client.

Soil Conditions

Based on the results of our exploration, the subsurface soils consist predominantly of black to very dark grey-black, stiff to very stiff, silty clays and clayey silts with some green-grey silty fine sands. At the time of our drilling, the slight to very strong odor of hydrocarbons (gasoline, etc) was present in all soil samples and, in particular, the sandier units.

Groundwater was not encountered in our borings at the time of exploration. However, within three hours, Boring 1 contained water at a depth of 11.5 feet. The holes were left open for observation. Fluctuations in the groundwater table are anticipated with variations in the seasonal rainfall.

A more thorough description and stratification of the soils encountered along with the results of the laboratory tests are presented on the respective "Logs of Test Borings", Appendix A. The approximate location of these borings are shown on Figure 1, "Site Plan", Appendix A.

DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

General

1. The site is suitable for the proposed commercial development provided the recommendations presented in this report are incorporated into the project plans and specifications.

2. Our investigation found evidence of soil contamination apparently from the existing underground fuel storage tanks. Prior to any development of the site, we recommend a soil contamination study be performed in accordance with government requirements.

3. All grading and foundation plans for the development as designed by the respective design engineers must be reviewed by the Soil Engineer prior to contract bidding so that plans are reconciled with soil conditions, and sufficient time is allowed for suitable mitigative measures to be incorporated into the final grading specifications.

4. TERRASEARCH, INC., should be notified at least two working days prior to demolition, site clearing, grading, and/or foundation operations on the property. This will give the Soil Engineer ample time to discuss the problems that may be encountered in the field and coordinate the work with the contractor.

5. Field observation and testing during the demolition, grading and/or foundation operations must be provided by representatives of TERRASEARCH, INC., to enable them to form an opinion regarding the adequacy of the site preparation, the acceptability of fill materials and the extent to which the earthwork construction and the degree of compaction comply with the specification requirements. Any work related to the grading and/or foundation operations performed without the full knowledge and under the direct observation of the Soil Engineer will render the recommendations of this report invalid.

Demolition

6. Prior to any grading, demolition of the site should be completed. Demolition should include the complete removal of all subsurface structures, concrete, slabs, storm inlets, foundations, underground tanks, asphalt, debris and trash, with the exception of items specified by the owner for salvage. In addition, all underground structures must be located on the grading plans so that proper removal may be carried out.

7. Excavations made by the removal of any structure should be left open by the demolition contractor for backfill in accordance with the requirements for engineered fill. The removal of underground structures should be done under the observation of the Soil Engineer to assure adequacy of the removal and that subsoils are left in proper condition for placement of engineered fills. Any soil exposed by the demo-

lition operations, which are deemed soft or unsuitable, shall be removed as required by the Soil Engineer during grading. The demolition operation should be approved by the Soil Engineer prior to commencing grading operations. Any resulting excavations should be properly backfilled with engineered fill under the observation of the Soil Engineer.

Grading

8. Due to the expansive in-situ soils at the site, it is pointed out that grading activities during the rainy season will be hampered by excessive moisture. It is recommended that grading be performed during the dry months to minimize potential compaction problems which would require chemical stabilization.

9. Following site stripping and excavation of any loose fill, the top 6 inches of exposed native ground should be scarified, moisture conditioned and compacted to a minimum degree of compaction of 90% at 2 to 3% above optimum moisture content as determined by ASTM D1557-78 Laboratory Test Procedure. After recompacting the native ground soils, the site may be brought to the desired finished grades by placing engineered fill in lifts of 8 inches in uncompacted thickness and compacted to the relative compaction requirements in accordance with the aforementioned test procedure. All soils disclosed during our investigation would be suitable for use as engineered fill.

10. Engineered fill placed outside of the tank excavation areas and comprised of on-site native materials should be compacted to a minimum relative compaction of 90% at 2 to 3% above optimum moisture content. To minimize differential settlement, engineered fill in the tank excavation area shall be compacted to 95% minimum relative compaction to minimize potential settlement beneath the building area. In addition, all fill placed in the tank excavation area should be keyed into the native materials on all sides.

11. Should select import material be used to establish the proper grading for the proposed development, the import material should be approved by the Soil Engineer before it is brought to the site and should meet the following requirements:

a. Have an R-Value of not less than 25;
b. Have a Plasticity Index not higher than 12;
c. Not more than 15% passing the No. 200 sieve;
d. No rocks larger than 6 inches in maximum size;

Import material meeting the requirements stated above should be compacted to a minimum relative compaction of at least 90% as determined by ASTM D1557-78 Laboratory Test Procedure. All engineered fill should be placed in lifts not exceeding 8 inches in uncompacted thickness.

12. The grading requirements presented herein are an integral part of the grading specifications presented in Appendix C of this report and should be considered as such.

Foundations

13. The perimeter walls will probably be supported on the proposed bay retaining walls while interior loads will be supported on isolated spread footing foundations. The footings for both retaining walls and isolated columns should extend to a minimum depth of 24 inches below the lowest adjacent pad grade. At this depth, the footings may be designed for an allowable bearing pressure of 2,200 p.s.f. for dead plus live load and may be increased by one-third to include short-term seismic and wind effects.

14. To accommodate lateral building loads, the passive resistance of the foundation soil can be utilized. Where spread footings are used, the passive soil pressures can be assumed to act against the front face of the footing below a depth of one foot below the ground surface. It is recommended that a passive pressure equivalent to that of a fluid weighing 275 p.c.f. be used. For design purposes, an allowable friction coefficient of 0.35 can be assumed at the base of the spread footings.

15. Should cracks develop in the foundation trenches before the placing of concrete, the trenches should be soaked until all cracks are effectively sealed. The Soil Engineer should observe the soaking in the field prior to the concrete being poured.

Basement Walls

16. The basement walls should be designed to resist lateral pressure exerted from a media having an equivalent fluid pressure of 55 p.c.f. plus an additional uniform pressure of 100 p.s.f. for the entire height of the wall due to restraint. For passive resistance, an equivalent fluid weight of 300 p.c.f. and a coefficient of friction of 0.35 may be used.

17. The above criteria are based on fully-drained conditions. For these conditions, we recommend that a filter material blanket be placed behind the wall. The blanket should be a minimum of 12 inches thick and should extend the full height of the wall to within 12 inches of the surface. If the excavated area behind the wall exceeds 12 inches, the entire excavated space behind the 12-inch blanket should consist of compacted engineered fill or gravel blanket material. A 4-inch perforated drain pipe should be installed in the bottom of the filter blanket and should be underlain by at least 4 inches of filter type material. Adequate gradient shall be provided to discharge water that collects behind the wall to an adequately controlled discharge system away from the structure foundations and nearby engineered fills. The granular crushed rock or gravel filter material should meet the following gradation:

Sieve Size	Percentage Passing
3/4"	100
3/8"	85-100
No. 4	10-80
No. 50	10-30
No. 200	0-2

18. The retaining walls should be supported on the foundation system as specified under the heading "Foundations."

Slab-on-Grade Construction

19. In order to minimize potential cracking of slabs-on-grade due to the highly expansive native soils, the following recommendations are made:

a. All areas to receive slabs should be soaked to saturation prior to placing of concrete. This work should be done under the observation of the Soil Engineer.

b. A minimum of 4 inches of gravel or clean crushed rock material may be placed between the finished subgrade and all the slabs to serve as a capillary break between the subsoil and the slab. See the "Guide Specifications For Rock Under Concrete Slabs", Appendix C.

c. All slabs should be structurally reinforced. Reinforcement should be as specified by the Structural Engineer and should be placed in the center of the slab unless otherwise specified.

d. Slabs should be poured structurally independent of the foundations. A 30-pound felt strip, expansive joint material or other positive separator should be provided around the edge of all floating slabs to prevent bond to the foundation.

e. Slabs at door openings should be constructed with a curl or a thickened edge extending a minimum of 12 inches into native ground or compacted fill.

f. Slabs supporting floor coverings should be provided with measures to prevent condensation caused by temperature differentials from harming floor coverings. One way to protect the floor covering is to place a waterproof membrane between the granular layer and the floor slab. In addition, two inches of wetted sand should be placed over the membrane to minimize puncture and facilitate curing of the concrete. The sand and the membrane are to be placed over the 4-inch layer of gravel or clean sand and crushed rock recommended herein.

g. Exterior slabs should be reinforced with a minimum of wire mesh. Care should be taken to center the reinforcement in the slab.

Pavement Areas

20. Preparation of Subgrade: After underground facilities have been placed in the areas to receive pavement and removal of excess material has been completed, the upper 6 inches of the subgrade soil shall be scarified, moisture conditioned and compacted to a minimum relative compaction of 95% in accordance with the grading recommendations specified in this report.

21. Aggregate Base: All aggregate base material placed subsequently should also be compacted to a minimum relative compaction of 95% based on the ASTM Test Procedure D1557-78. The construction of the pavement in the parking and traffic areas should conform to the requirements set forth by the latest Standard Specifications of the Department of Transportation of the State of California and/or City of Dublin, Department of Public Works.

22. Pavement Sections: No specific tests were performed to determine the pavement section in the proposed parking areas. However, based on our experience with similar soil materials, a tentative pavement section of 2-1/2 inches of asphaltic concrete on 10 inches of aggregate base material may be util ized. When the subgrade is established, the necessary samples can be obtained; and an accurate pavement section can be designed at that time.

General Construction Requirements

23. All finish grades should provide a positive gradient to an adequate discharge point in order to provide rapid removal of surface water runoff away from all foundations. No ponding of water should be allowed on the pad or adjacent to the foundations. Surface drainage should be provided as designed by the project Civil Engineer and maintained by the property owners at all times.

24. Of utmost importance is the provision for proper drainage of the below ground bay areas. A drainage system composed of sumps and pumps must be provided and carried to an adequate discharge system such as a storm manhole or to the street.

25. Flower beds or planters should be avoided adjacent to the building foundations. Should planters be constructed, foliage requiring little irrigation should be installed to prevent water from affecting the foundation.

26. Utility trenches extending under building areas should be backfilled with native on-site soils or approved import materials. Backfill should be properly compacted to ensure against water migration underneath the structure.

27. Utility trenches extending underneath all traffic areas must be backfilled with native or approved import material and compacted to a relative compaction of 90% to within 6 inches of the subgrade. The upper 6 inches should be com-

pacted to 95% relative compaction based on the in-place density or California Impact Test Procedure Method No. 231 and 216. Backfilling and compaction of these trenches must meet the requirements set forth by the City of Dublin, Department of Public Works.

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GUIDELINES FOR REQUIRED SERVICES

The following list of services are the services required and must be provided by Terrasearch, Inc., during the project development. These services are presented in check list format as a convenience to those entrusted with their implementation.

The items listed are included in the body of the report in detail. This list is intended only as an outline of the required services and does not replace specific recommendations and, therefore, must be used with reference to the total report.

The importance of careful adherence to the report recommendations cannot be overemphasized. It should be noted, however, that this report is issued with the understanding that each step of the project development will be performed under the direct observation of Terrasearch, Inc.

The use of this report by others presumes that they have verified all information and assume full responsibility for the total project.

Item Description	Required	Not Required
1. Provide foundation design parameters	X	
2. Review grading plans and specifications	X	
3. Review foundation plans and specifications	X	
4. Observe and provide recommendations regarding demolition	X	
5. Observe and provide recommendations regarding site stripping	X	
6. Observe and provide recommendations on moisture conditioning, removal, and/or pre-compaction of unsuitable existing soils	X	
7. Observe and provide recommendations on the installation of subdrain facilities		X
8. Observe and provide testing services on fill areas and/or imported fill materials	X	
9. Review as-graded plans and provide additional foundation recommendations, if necessary	X	
10. Observe and provide compaction tests on sanitary sewers, storm drain, water lines, and PG&E trenches	X	
11. Observe foundation excavations and provide supplemental recommendations, if necessary, prior to placing concrete	X	
12. Observe and provide moisture conditioning recommendations for foundation areas prior to placing concrete.	X	
13. Provide design parameters for retaining walls	X	
14. Provide geologic observations and recommendations for keyway excavations and cutslopes during grading		X
15. Excavate and recompact all geologic trenches and/or test pits		X

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LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. It should be noted that it is the responsibility of the owner or his representative to notify TERRASEARCH, INC., in writing, a minimum of forty-eight (48) hours before any demolition, stripping, grading, or foundation excavation activities can commence at this site.

2. The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed during our investigation. Should any variations or undesirable conditions be encountered during the development of the site, TERRASEARCH, INC., will provide supplemental recommendations as dictated by the field conditions.

3. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the information and recommendations contained herein are brought to the attention of the Architect, Engineer, and Contractor for the project and incorporated into the plans and that the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.

LIMITATIONS AND UNIFORMITY OF CONDITIONS
(continued)

4. At the present date, the findings of this report are valid for the property investigated. With the passage of time, significant changes in the conditions of a property can occur due to natural processes or works of man on this or adjacent properties. In addition, legislation or the broadening of knowledge may result in changes in applicable standards. Changes outside of our control may render this report invalid, wholly or partially. Therefore, this report should not be considered valid after a period of two (2) years without our review, nor should it be used, or is it applicable, for any properties other than those investigated.

5. Not withstanding, all the foregoing applicable codes must be adhered to at all times.

APPENDIX A

Field Investigation

Site Plan

Logs of Test Borings

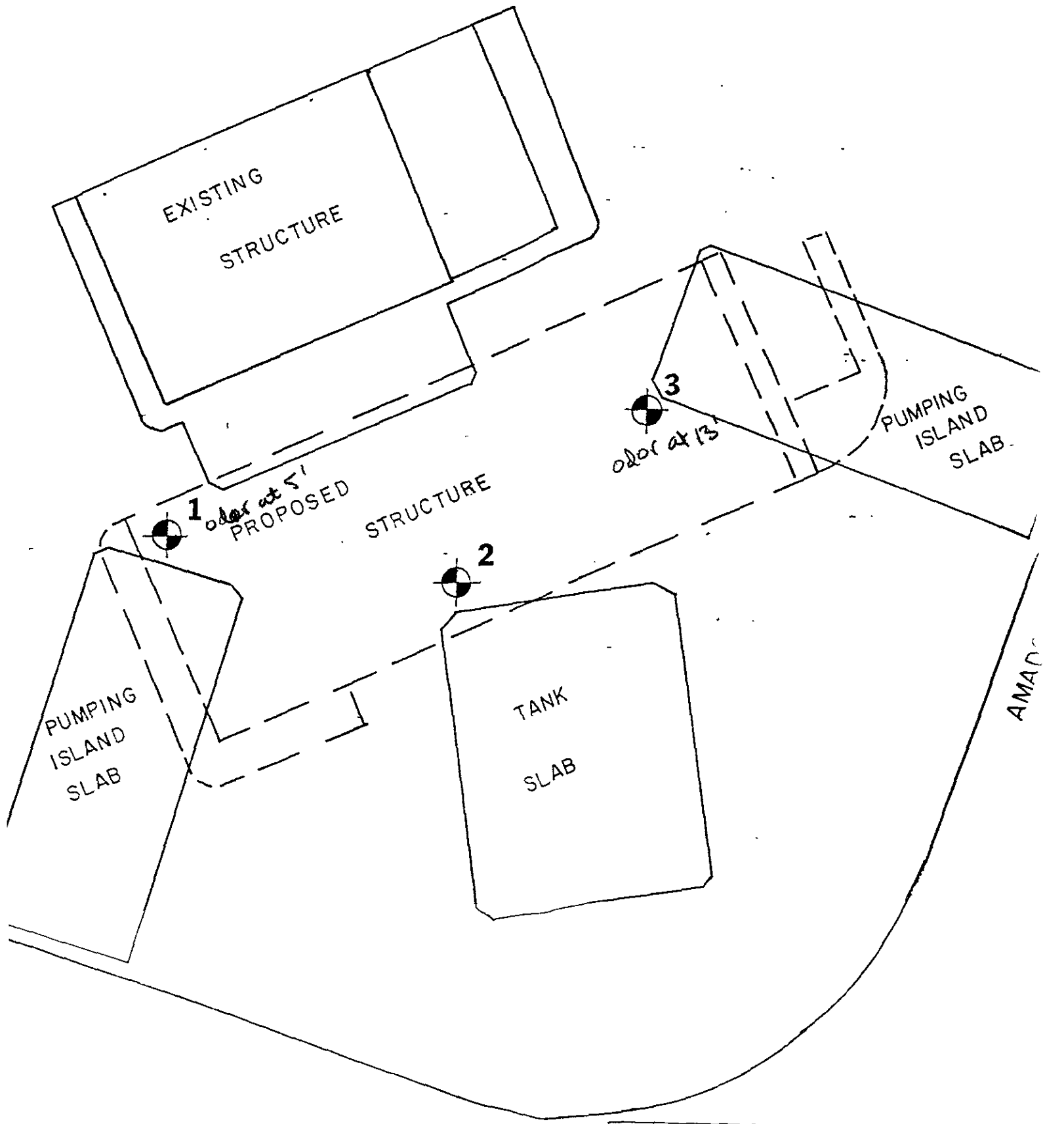
FIELD INVESTIGATION

The field investigation was performed on 8 July 1987 and included a reconnaissnce of the site and the drilling of 3 exploratory borings at the approximate locations shown on Figure 1, "Site Plan."

The borings were drilled to a maximum depth of 19.5 feet below the existing ground surface. The drilling was done with a truck-mounted rig using power-driven, four-inch diameter, continuous flight augers. Visual classifications were made from the auger cuttings and the samples in the field. As the drilling proceeded, undisturbed core samples were obtained by means of a 2-1/2 inch O.D. split-tube sampler. The samples were driven into the in-situ soils under the impact of a 140-pound hammer having a free fall of 30 inches. The number of blows required to advance the sampler 12 inches into the soil were adjusted to the standard penetration resistance (N-Value).

The samples were sealed and returned to our laboratory for testing. Classifications made in the field were verified in the laboratory after further examination and testing.

The stratification of the soils, descriptions, location of undisturbed soil samples and standard penetration resistance are shown on respective "Logs of Test Borings."


EXISTING
STRUCTURE
1
odor at 5'
PROPOSED
STRUCTURE
2
3
odor at 13'
PUMPING
ISLAND
SLAB
PUMPING
ISLAND
SLAB
TANK
SLAB
AMAD

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D BY MD DATE DRILLED 7/8/87 BORING DIAMETER 4" BORING NO. 1

Sample no. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs.	Qu - t. s. f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
		2" asphaltic concrete, 4" aggregate base Tan Silty SAND w/Gravel						
1-1 b a		Black Silty CLAY, moist, stiff w/pebbles and lenses of dark grey Clayey Silt, hydrocarbon odor		12		90	27	
		More Silty, soft drilling						
1-2		Dark grey Clayey SILT, moist, stiff w/rootlets, wet, soft drilling Interlayers with black Silty Clay	ML/ MH	15		96	20	
		(water at 11.5')						
1-3		Black Silty CLAY, wet, stiff	CH/ CL	17		82	30	
		Boring terminated at 13 feet. Water encountered at 11.5 feet within 3 hours Hole caved at 13 feet.						

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FIGURE NO. [illegible] - LOG OF TEST BORING

LOGGED BY MD DATE DRILLED 7/3/87 BORING DIAMETER 4" BORING NO. 2

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs.	Qu - t. s. f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			1" asphaltic concrete, 4" aggregate base Tan Silty SAND w/Gravel						
	2-1		Black Silty CLAY, moist, stiff	CH	11				No recovery
5	2-2 b		Dark green-grey Clayey SILT, stiff, moist, easy drilling	ML/MH	11		102	20	
	a						96	13	
			Green-grey Silty fine SAND, moist, medium dense	SM					C=680 psf Ø=7 degrees
	2-3 b		Grades stiffer, slightly stiffer		14		86	38	Strong smell of hydrocarbon
	a								
10			Black Silty CLAY w/organics, moist, stiff easy drilling	CH					Slight smell of hydrocarbon
15			Very dark grey-black Silty Clay, moist						
			Boring terminated at 18 feet. Dry at time of drilling. Hole caved at 3 feet.						

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FIGURE NO. 5 - LOG OF TEST BORING

LOGGED BY MD DATE DRILLED 7/8/87 BORING DIAMETER 4" BORING NO. 3

Depth, ft.	Sample No. and type	Symbol	SOIL DESCRIPTION	Unified Soil Classification	Blows/foot 350 ft-lbs.	Qu - t. s. f. Penetrometer	Dry Density p.c.f.	Moisture % dry wt.	MISC. LAB RESULTS
			1" Asphaltic concrete, 4" aggregate base						
			Tan Silty SAND w/cobbles						
			Black to very dark grey Silty CLAY, moist, stiff	CH					
	3-1 b		Gravel lense		15		98	20	LL=55
	a		cobble lense (to 2")				110	13	PI=36
5			Very dark grey Clayey SILT	ML/MH					
	3-2 b				9		92	24	
	a		Very dark grey Silty fine SAND, very moist, firm, medium dense	SM					
			Black Silty CLAY w/caliche veins and rootlets, moist, firm	CH					
10			Grades to very dark grey						
			No rootlets						
	3-3 b		Smells of gas		11		86	34	Qu=1,390 psf
	a								
15			Very moist						
			Boring terminated at 18 feet. Dry at time of drilling. Hold caved at 3 feet.						

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FIGURE NO. 1 - LOG OF TEST BORING

APPENDIX B

Laboratory Investigation

Summary of Laboratory Test Results

LABORATORY INVESTIGATION

The laboratory testing program was directed towards providing sufficient information for the determination of the engineering characteristics of the site soils so that the recommendations outlined in this report could be formulated.

Moisture content and dry unit weight tests were performed on all undisturbed soil samples in order to determine the consistency of the soil and moisture variation throughout the explored soil profile and estimate the compressibility of the underlying soils.

The strength parameters of the foundation soils were determined from unconfined compression and direct shear tests performed on selected undisturbed soil samples.

Field penetration resistance (N) assisted in the determination of the strength parameters of the soils. The standard penetration resistance are recorded on the respective "Logs of Test Borings."

The expansion characteristics of the near-surface soils were evaluated by means of an Atterberg Limit Test in accordance with ASTM D-423 and D-424.

A summary of all laboratory test results is presented on TABLE I of this appendix and on the respective "Logs of Test Borings", Appendix A.

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TABLE I

Summary of Laboratory Test Results

Hole No.	Depth (ft.)	Dry Density (p.c.f.)	Moisture Content (% Dry Wt.)	Atterberg Limits		Unconfined Compressive Strength (p.s.f.)	Direct Shear	
				Liquid Limit (%)	Plasticity Index		Cohesion (p.s.f.)	Angle of Internal Friction (degree)
1-1a	3.0	90	27					
1-2	7.0	96	26					
1-3	13.0	82	30					
2-2b	5.0	102	20					
2-2a	6.0	96	13					
2-3a	9.0	86	38				680	7
3-1b	3.5	98	20	55	36			
3-1a	4.5	110	13					
3-2b	6.5	92	24					
3-2a	14.0	86	34			1,390		

APPENDIX C

Recommended Grading Specifications

Guide Specifications For Rock Under Floor Slabs

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RECOMMENDED GRADING SPECIFICATIONS
on
PROPOSED COMMERCIAL DEVELOPMENT
Village Parkway
Dublin, California

1.1 General Description

1.11 These specifications have been prepared for the grading and site development of the subject commercial development. TERRASEARCH, INC., hereinafter described as the Soil Engineer, should be consulted prior to any site work connected with site development to ensure compliance with these specifications.

1.12 The Soil Engineer should be notified at least two working days prior to any site clearing or grading operations on the property in order to observe the stripping of surface contaminated material and to coordinate the work with the grading contractor in the field.

1.13 This item shall consist of all clearing or grubbing, preparation of land to be filled, filling of the land, spreading, compaction and control of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades, and slopes as shown on the accepted plans. The Soil Engineer is not responsible for determining line, grade elevations or slope gradients.

The property owner, or his representative, shall designate the person or organizations who will be responsible for these items of work.

2.1 Tests

2.11 The standard test used to define maximum densities of all compaction work shall be the ASTM Test Procedure D1557-78. All densities shall be expressed as a relative compaction in terms of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

3.1 Clearing, Grubbing, and Preparing Areas To Be Filled

3.11 All pavement and soil deemed soft or unsuitable by the Soil Engineer shall be removed from all structural areas and areas to be filled.

3.12 All underground structures shall be removed from the er site such as old foundations, abandoned pipe lines, and gasoline tanks.

3.13 The final stripping excavation shall be approved by the Soil Engineer during construction and before further grading is started.

3.14 After the site has been cleared, stripped and scarified, it shall be disked or bladed until it is uniform and free from large clods. The exposed native subgrade soils shall be moisture conditioned and compacted to the require-

ments as specified in the grading sections of this report. Final grade within cut areas shall be prepared as above to provide uniform compaction of disrupted surface soils.

4.1 Materials

4.11 All fill material shall be approved by the Soil 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% larger than 2-1/2 inches. Materials from the site below the stripping depth are suitable for use in fills provided the requirements of Section 5.1 are met.

4.12 Materials existing on the site are suitable for use as compacted engineered fill after the removal of all debris and organic material. All fill soils shall be approved by the Soil Engineer in the field.

4.13 Should import material be required, it may be obtained from the areas adjacent to the street improvements after stripping of organic material.

5.1 Placing, Spreading and Compacting Fill Materials

5.11 The fill materials shall be placed in uniform lifts of not more than 8 inches in uncompacted thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to obtain uniformity of material in each

layer. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either (a) aerating the material if it is too wet, or (b) spraying the material with water if it is too dry.

5.12 After each layer has been placed, mixed and spread evenly, either import material or native material shall be compacted to a relative compaction of not less than 90%, and at a moisture content 2 to 3% above the optimum moisture content as determined by ASTM Test Procedure D1557-78. Backfill in the excavated tank area shall be compacted to 95% relative compaction.

5.13 Compaction shall be by footed rollers or other types of acceptable compacting rollers. Rollers shall be of such design that they will be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is within the specified moisture content range. Rolling of each layer shall be continuous over its entire area and the roller shall make sufficient trips to ensure that the required density has been obtained. No ponding or jetting shall be permitted.

5.14 Field density and moisture tests shall be made in each compacted layer by the Soil Engineer in accordance with ASTM Test Procedure D1556-64, D2922-81, or D3017-78. When footed rollers are used for compaction, the moisture density tests shall be taken in the compacted material below the surface disturbed by the roller. When these tests indicate that the moisture or density of any layer of fill, or portion thereof,

does not meet the required specifications, the particular layer, or portion thereof, shall be reworked until the compaction requirements have been met.

5.15 No soil shall be placed or compacted during periods of rain nor on ground which contains free water. Soil which has been soaked and wetted by rain or any other cause shall not be compacted until completely drained and until the moisture content is within the limits hereinbefore described or approved by the Soil Engineer. Approval by the Soil Engineer shall be obtained prior to continuing the grading operations.

6.1 Pavement

6.11 The proposed subgrade under pavement sections, native soil and/or fill shall be compacted to a minimum relative compaction of 95% and at 2 to 3% above optimum moisture content for a depth of 6 inches.

6.12 All pavement materials and construction methods used shall conform to the applicable sections of the latest edition of the Cal-Trans Specifications for Pavements, State of California, Department of Transportation and/or the City of Dublin, Department of Public Works.

7.1 Utility Backfill

7.11 The utility trenches extending under concrete slabs-on-grade shall be backfilled with native on-site soils or approved import materials and compacted to the requirements pertaining to the adjacent soil. No ponding or jetting will be permitted.

7.12 Utility trenches extending under all pavement areas shall be backfilled with native or approved import material and properly compacted to meet the requirements set forth by the City of Dublin, Department of Public Works. No ponding or jetting will be permitted.

7.13 Where any opening is made under or through the perimeter foundations for such items as utility lines and trenches, the openings must be resealed so that they are watertight to prevent the possible entrance of outside irrigation or rain water into the underneath portion of the structures. No ponding or jetting will be permitted.

8.1 Subsurface Line Removal

8.11 The methods of removal will be designated by the Soil Engineer in the field depending on the depth and location of the line. One of the following methods will be used.

8.12 Remove the pipe and fill and compact the soil in the trench according to the applicable portions of sections pertaining to compaction and utility backfill.

8.13 The pipe shall be crushed in the trench. The trench shall then be filled and compacted according to the applicable portions of Sections 5.1.

8.14 Cap the ends of the line with concrete to prevent entrance of water. The length of cap shall not be less than 5 feet. The concrete mix shall have a minimum shrinkage.

9.1 Unusual Conditions

9.11 In the event that any unusual conditions not covered by the special provisions are encountered during the grading operations, the Soil Engineer shall be immediately notified for additional recommendations.

10.1 General Requirements

Dust Control

The contractor shall conduct all grading operations in such a manner as to preclude wind blown dirt and dust and related damage to neighboring properties. The means of dust control shall be left to the discretion of the contractor and he shall assume liability for claims related to wind blown material.

Project No. 5731-E
16 July 1987

GUIDE SPECIFICATIONS FOR ROCK UNDER FLOOR SLABS

Definition

Graded gravel or crushed rock for use under slabs-on-grade shall consist of a minimum thickness of mineral aggregate placed in accordance with these specifications and in conformity with the dimensions shown on the plans. The minimum thickness is specified in the accompanying report.

Material

The mineral aggregate shall consist of broken stone, crushed or uncrushed gravel, quarry waste or a combination thereof. The aggregate shall be free from deleterious substances. It shall be of such quality that the absorption of water in a saturated dry condition does not exceed 3% of the oven dry weight of the sample.

Grading

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

Sieve Size	Percentage Passing
3/4"	90-100
No. 4	25-60
No. 8	18-45
No. 200	0-3

Placing

Subgrade, upon which gravel or crushed rock is to be placed, shall be prepared as outlined in the accompanying soil report.