April 11, 1980

Mr. Ronald Mearns
Engineering Geologist #554
801 North First Street
San Jose, CA. 95110

Dear Ron:

We are placing on open file the following report, reviewed and approved by the City of San Jose in compliance with the Alquist-Priolo Special Studies Zones Act:

Engineering geologic study for six lots on Kaylene Drive, San Jose, CA.; by JCP; April 1, 1980.

Sincerely yours,

Earl W. Hart
Office of the State Geologist
CED 935

EWH/dew

cc: A-P file
Dear Mr. Hart:

Enclosed for your files is a copy of a report titled "Engineering Geologic Study for Six Lots on Kaylene Drive, San Jose, California" and dated April 1, 1980.

The report, prepared by JCP Engineers and Geologists, is in support of a proposed 6-lot subdivision. A soils report has also been submitted on a portion of the site.

Using literature review and surface reconnaissance, it is concluded that no active or potentially active faults occur on the site.

I have accepted this report as meeting the requirements of the Alquist-Priolo Act because of the wealth of data in the areas surrounding the subject site which support the conclusions reached in this report.

Very truly yours,

Ronald Mearns
Engineering Geologist #554

Enclosure
ENGINEERING GEOLOGIC STUDY

FOR SIX LOTS ON

KAYLENE DRIVE

SAN JOSE, CALIFORNIA
April 1, 1980

Project No. JCP-570

Mr. Stan Terras
3483 Ramstad Drive
San Jose, California 95127

Re: Engineering Geologic Services for proposed development on Kaylene Drive, San Jose, California
APN: 612-35-040, 041, & 042

Dear Mr. Terras:

In accordance with your authorization dated March 3, 1980, we have performed an engineering geologic study for the subject property. The accompanying report presents the results of our field and office studies and geologic analyses. The geologic and seismic conditions are discussed and appropriate conclusions and recommendations are presented.

Based on our studies as described and detailed herein, we are of the opinion that from an engineering geologic standpoint, the site is suitable for development provided the recommendations and conditions contained herein are adhered to.

We refer you to the text of the report for a detailed discussion of our findings. If you have any questions, please call.

Very truly yours,

JCP-Engineers & Geologists, Inc.

[Signature]

James C. Prendergast
President

JCP:cs
Copies: Addressee (6)
ENGINEERING GEOLOGIC STUDY

For:

SIX LOTS LOCATED ON KAYLINE DRIVE
SAN JOSE, CALIFORNIA

To:

MR. STAN TERRAS
3483 RAMSTAD DRIVE
SAN JOSE, CALIFORNIA 95127

MARCH 1980
ENGINEERING GEOLOGIC STUDY
FOR SIX LOTS ON
KAYLENE DRIVE
SAN JOSE, CALIFORNIA

INTRODUCTION

In this report we present the results of our engineering geologic study performed for the subject property consisting of six lots located on Kaylene Drive in San Jose, California as shown on the attached Location Map, Figure 1.

The objectives of this study were to (1) evaluate whether any potential geologic hazards exist at the site, as required by the City of San Jose, and (2) analyze the effects, if any, that such hazards might have on the development of the subject property. The subject site is located within a State of California Special Studies Zone for the Evergreen Fault.

PROPOSED CONSTRUCTION

It is our understanding that the proposed residences will be single-family, wood-frame structures with building loads typical for this type of relatively light construction.

Earthwork associated with the construction will consist of nor grading for the access driveways and cut and fill grading for the building pad areas. Presently 2 building pads exist on the subject property. The proposed buildings will be connected to the existing sewers.

SCOPE OF WORK

The scope of work which was outlined in our proposal letter dated February 27, 1980, included a detailed review of existing geologic literature, a detailed reconnaissance of the site, geological analyses of the field and office data, and the preparation of this report. The data were obtained and the analyses have been performed for the purpose of determining the existence of any fault traces or landslides in the development area. A bibliography is included herein; it cites the geologic reference materials used in this report.

SITE INVESTIGATION

A detailed geologic reconnaissance and review of pertinent reports in the vicinity of the site was performed on the site in early
March by this engineering geologist. Soil investigation, dated January 5, 1979, was conducted on Lots #1-4 by Applied Soils Mechanics, Inc.

SITE DESCRIPTION

The sub-rectangularly shaped subject property is located several hundred feet northeast of the intersection of Kaylene Drive and Clayton Road, as shown on the attached location map, Figure 1. The subject site, consisting of six lots, slopes downhill to the southwest at inclinations of 2:1 to 6:1, horizontal to vertical. An existing swale located in the eastern portion of the site area trends across the property in a southwesterly direction.

Two existing building pads, consisting of cut and fill are located on Lots #2 and #5. Several dumped piles of dirt and debris were observed in the eastern portion of Lot #2. Vegetation observed on the subject property consisted of a dense ground cover of grass. Surface soils observed on the subject site consist of a sandy clay that contain varying amounts rock fragments.

GEOLOGY

The area studied lies within the San Francisco Bay Region which is bonded by mountain ranges of the coast range Geomorphic Province. The subject site is located near the base of the western most foothills of the Diablo Mountain Range east of central San Jose.

The subject site and vicinity was mapped by Thomas Dibblee (1972) at a scale of one inch is equal to 2000 feet. Dibblee mapped the bedrock underlying the site as Oakland Conglomerate (Kcg). Our field studies revealed that the subject property is underlain by several different lithologic bedrock types, us belonging the the Oakland Conglomerate (Kcg). An interbedded sandstone and an olive drab colored siltstone was observed in a cut slope along Kaylene Drive, in the cut slope along the paved road along the eastern boundary of the subject site in and the exploratory borings drilled by Applied Soils Mechanics (1979) on Lots #3 and #4. A conglomerate with a course grain sand matrix and well-rounded pebbles and cobbles was observed on the cut slope along Kaylene Drive and the cut slope above building pad #5. According to Applied Soils Mechanics, Inc. (1979) sandstone was encountered on Lot #1 and on portions of Lot #2. Bedding orientations exposed the cut slope along Kaylene Drive revealed that the bedrock is striking N25 degrees east and dipping approximately 55 degrees to the southeast.

The subject property is located in the Hayward Fault Zone, as mapped by Dibblee (1972). The closest fault trace is the mapped trace of the Evergreen Fault located approximately 200 feet southwest of the subject property near Clayton Road. Additional
traces located in the vicinity of the subject site are the Quimby Fault (1600 feet northeast), the Hayward Fault (6400 feet northeast), and the Calaveras Fault (2 miles northeast).

Several reports completed on adjacent properties and properties located within the vicinity of the subject site (Soil Foundation Systems, Inc., February 1977 and Soil Foundation Systems, Inc., August 1978) encountered several localized shears and liniations consisting of caliche, serpentine, and associated silica-carbonate rocks. The localized shear zone trend in a northerly direction contrary to the northwesterly trend of the active faults associated with the Hayward Fault Zone, indicating they represent a separate and distinctive structural event. These localized phenomena are interpreted by others as the result of intrusive action of the silica-carbonate rock into the surrounding sedimentary bedrock and the result of structural faulting associated with the tectonic uplift of the Diablo Mountain Range. A several hundred foot long exploratory trench excavated from Clayton Road northeasterly along Kaylene Drive by Soil Foundations Systems, Inc. (February 1977) encountered no evidence for the Evergreen Fault indicating that the Evergreen Fault does not trend across our studied site.

Signs of major instability or landsliding was not observed on the subject property nor within the vicinity of the subject site. Two moderately sized building pads comprised of cut and fill are located on Lots #2 and #5. Surface soils observed on the subject site consist of sandy clay that contains varying amount of rock fragments.

C. SEISMICITY

EARTHQUAKE HAZARDS

California is one of the most seismically active areas in the world. Historical records show that large earthquakes have occurred more frequently in the San Francisco Bay Region than in any other part of California.

An earthquake occurs when the rocks deep within the earth suddenly release stored energy by rupturing. The zone of rupture is termed a FAULT and rupture of the ground surface along the fault trace usually accompanies large earthquakes. Shaking of the ground surface in the general area of the fault occurs during large earthquakes, and gives rise to the term 'earthquake'.

Historically, most earthquakes in the greater San Francisco Bay Area have occurred on the major fault zones. The San Andreas, Hayward, and Calaveras Fault Zones are the longest of the major earthquake-producing faults mapped through the Bay Area (See Figure 2). There are also many other, smaller faults in the Bay Area which are capable of producing major earthquakes.

The studied site is located approximately 17 miles northeast of
the 1906 trace of the active San Andreas Fault, 6400 feet southwest of the active Hayward Fault, and 2 miles southwest of the active Calaveras Fault. The main trace of the potentially active Evergreen Fault is located approximately 200 feet southwest of the studied site. In addition, a trace of the potentially active Quimby Fault is located 1600 feet northeast of the site.

The San Andreas Fault is one of the longest and most active faults in the world and extends from the Gulf of California to north of Cape Mendocino. It has ruptured and produced at least four large damaging earthquakes during recorded history (1808, 1838, 1865 and 1906). Geologic evidence suggests that such movements and the resulting earthquakes have been occurring for at least 30 million years, averaging 5 to 10 feet of offset every 100 years. The 1906 San Andreas Fault rupture extended 270 miles along the fault and offsets of up to 21 feet were measured. The 1906 earthquake was felt in California, Nevada and Oregon and caused damage to buildings more than 70 miles from the fault.

The Hayward Fault is a branch of the San Andreas Fault and is located on the east side of San Francisco Bay. At least two major earthquakes on the Hayward Fault with surface rupturing were experienced by residents of the Bay Area (1836 and 1868). Both earthquakes caused extensive damage, and offsets of several feet were recorded near the City of Hayward. In addition, tectonic creep of the fault has been documented at several locations since 1960.

The Calaveras Fault branches from the San Andreas Fault south of the town of Hollister. A major earthquake (1861) is attributed to the Calaveras Fault. In addition, tectonic creep has recently been detected at the Cochrane Bridge where the fault crosses Anderson Reservoir in Santa Clara County.

Many other fault traces, subsidiary to the major fault zones exist, and may be the source of damaging earthquakes in the future. The historic record clearly shows that damaging earthquakes have occurred a number of times in the past. A simple understanding of the nature of fault mechanisms indicates that large earthquakes and associated phenomenon will continue to occur.

In summary, surface rupture, strong ground shaking, and other secondary effects from earthquakes can damage structures. As discussed above, there are many active and potentially active faults in the San Francisco Bay Area and earthquakes have occurred in the past and will continue to occur again in the future. Their effects constitute a significant geologic hazard. The degree of the geologic hazard depends on a number of factors.

PRIMARY EARTHQUAKE EFFECTS

The presence of an active fault trace on a property indicates that there has been fault offset (surface rupture) in the past. Offset
occurs when the ground on one side of a fault moves relative to the other side. Active faults are expected to move again at some time in the future. The movement can be vertical or horizontal or a combination of both. The offset can occur either in fractions of an inch over many years (tectonic creep) and/or in relative movement of several feet in just a few seconds (rupture). The degree of offset hazard imposed by a fault to a given site is determined by 1) the proximity of the fault to the site, 2) the amount of fault offset anticipated, and 3) the frequency of fault related movement.

When a fault ruptures, large amounts of energy are released which causes the ground in the surrounding areas to shake. The intensity of shaking is dependent upon:

1. The amount of energy released (Richter Magnitude scale is commonly used).
2. The distance the site is away from the source fault as shaking generally decreases over distance.
3. The types of subsurface materials underlying the site as well as their densities and strengths.

In general, 1) the longer the fault rupture, the larger the amount of energy released, 2) the closer to the fault the more severe the ground shaking; and 3) the thicker and weaker the subsurface soils, the more severe the ground shaking.

SECONDARY EFFECTS

Certain types of subsurface deposits are more adversely affected by earthquake vibrations. Loose, partially consolidated deposits can densify causing the ground surface to settle unevenly. Landsliding can be triggered by vibrations causing downslope movements. Loose, saturated, granular deposits can liquify. These and other effects may produce distortion of the ground surface. There are also several other secondary effects including tsunami, seiche, and lateral spreading.

The chances of a large earthquake occurring in the future is a major factor in assessing the degree of earthquake hazard. Recurrence relationships have been calculated for several major faults based upon the historic record. However, the several-hundred-year period of existing records is relatively short compared to the millions of years involved in the evolution of fault systems. A precise understanding of how often faults cause earthquakes has not yet been developed. Some researchers have worked out relatively crude, statistically-based relationships. Forecasting based upon calculated probabilities can give a general idea of possible future events. Techniques for accurately forecasting earthquakes are currently being researched, but at present no reliable methods are available.
Another approach to the assessment of earthquake probability is to recognize that the relatively high seismicity of the San Francisco Bay Region means that the site will most likely be subjected to strong ground shaking sometime during the economic life of the proposed development.

**EARTHQUAKE RISK**

The actual risk at a site can be evaluated by defining the hazards present and considering the effects of economical mitigating measures.

Because of the traumatic and inescapable nature of earthquakes, there is a very strong and natural tendency for the people to take an emotional rather than a rational approach to the subject of earthquake risk. While we do not wish to downgrade the risks involved in development in areas of high seismic activity, we believe that the risks should be assessed in relation to other risks that the public accepts. In other words, judgements of earthquake risk should be approached in the same manner as judgments of other risks, where the factor of safety against failure is weighted against the consequences of failure.

The following four general categories of earthquake phenomena can be used to evaluate the earthquake risk at a site:

1. **Fault Creep**

   Buildings that straddle an active fault trace can be slowly distorted by relative ground displacement along a fault trace due to tectonic creep.

   Tectonic creep is a rare phenomenon that has been documented in only a few locations in California (i.e. the Hayward Fault in Berkeley and Fremont and the Calaveras Fault in Hollister).

2. **Surface Rupture**

   Buildings that straddle an active fault trace can be distorted along the fault trace during and earthquake.

   If a major earthquake of Richter Magnitude of 6 or greater were to occur along any of the major fault systems in the San Francisco Bay Area, there would probably be ground breakage along at least one of the main fault traces. However, it does not necessarily follow that there would be ground breakage on all fault traces or even other fault traces within that system causing such an earthquake. In other words, if either the Hayward or Calaveras Faults ruptured, there is little likelihood that the Quimby or Evergreen Faults would also rupture.
3. Ground Shaking

Buildings can be damaged by ground shaking caused by earthquakes. The arrival of energy from the earthquake causes the ground surface to shake and vibrations are transmitted to the structure founded in the ground.

It has been fairly well established that the magnitude of the accelerations and intensity of the shaking caused by earthquakes is not totally dependent upon the proximity of an area to the fault which releases the earthquake energy. The magnitude of the shaking effects are, to a large degree, dependent upon the types of bedrock and character of materials overlying the bedrock at a particular site. In general the most severe shaking and worst damage will occur on sites underlain by thick deposits of weaker or softer materials.

4. Secondary Effects

Buildings can be damaged by landsliding, lurch cracking, tsunami, liquefaction or other secondary seismic hazards.

Secondary earthquake effects are extremely varied. The most common and damaging secondary effect is that of landslides which are triggered by the shaking. Other secondary effects are relatively rare and occur only where 'special' geotechnical conditions exist. Applicable secondary earthquake effects for the subject site are discussed in the GEOLOGY and CONCLUSIONS Sections of this report.

The risk of damage or failure which might result from an earthquake should be analyzed on an individual basis. The analysis should generally consider the type of structure, the potential seismic hazards, the probability of occurrence, the consequences of failure, possible mitigating measures, and the costs of mitigating measures. These analyses should be appropriately tempered considering the concept of risk acceptance.

CONCLUSIONS AND RECOMMENDATIONS

Based on our studies, we conclude that from an engineering geologic standpoint, the site is suitable for development if the recommendations presented herein are adhered to. The site is located in the Hayward Fault zone, as mapped by Thomas Dibblee (1972). The closest mapped faults to the subject property are the Evergreen Fault (200 feet), the Quimby Fault (1600 feet), the
the Quimby Fault (1600 feet), the Hayward Fault (6400 feet), and
the Calaveras Fault (2 miles). Evidence of active faulting was
not detected on or adjacent to the subject property and it is our
opinion that a fault trace does not exist on the subject property.
Therefore, the probability of fault rupture across the subject
property during the design life of the proposed structures is very
low and constitutes an acceptable risk.

Secondary seismic effects such as tsunami, lateral spreading and
differential settlement are unlikely to occur due to the nature of
the bedrock materials underlying the subject property. It is our
opinion that during a major seismic event, that any loose fills or
soils on steep slopes could become unstable and form localized
sloughs or slides. Such localized sliding should not
significantly affect the proposed building structure if the
recommendations presented herein are adhered to. Evidence that
landsliding exists on the studied property (development area) was
not found and we are of the opinion that the building sites are
presently stable.

There are several areas of significant fills of unknown quantity
and quality on the subject property as shown on Figure 4. We
recommend that the soil engineer test and evaluate these fills.
In addition, we recommend that the soil engineer review the
drainage in the eastern portion of the subject property and make
appropriate recommendations to conform with the requirements of
the City of San Jose.

Slope stability analyses to evaluate the possibility of major
landsliding that would involve the entire site vicinity (several
acres in area) were beyond the scope of this report. However, we
feel that the possibility of such major landsliding is very low.

The subject site is expected to be subjected to strong seismic
shaking at least once during the design life of the planned
structure. This seismic shaking hazard is one that is shared by
all structures in the San Francisco Bay Area and is normally
considered in the structural design of the buildings. In our
opinion, design according to the seismic criteria contained in the
1976 Uniform Building Code is sufficient for the planned
structures.

LIMITATIONS

Our services consist of professional opinions and recommendations
made in accordance with generally accepted engineering geology
principles and practices. This warranty is in lieu of all other
warranties either expressed or implied.
If you have any questions concerning our report, please call. Figures and appendices are attached and complete this report.

Very truly yours,

JCP-Engineers & Geologists, Inc.

Robert Wilson
Geologist

James C. Prendergast
E.G. 955

JCP:jm
BASE: Barclay Maps LoCaido,
Santa Clara County Street Atlas

ENGINEERS
JCP
GEOLOGISTS

LOCATION MAP

TERRAS PROPERTY - KAYLENE DRIVE

PROJECT NO. DATE Figure
JCP-570 MARCH 1980 1
EXPLANATION

1. Mud
2. Unconsolidated sediments
3. Moderately consolidated to well-consolidated sedimentary rocks
4. Volcanic rocks

Franciscan assemblage
KJF-sandstone and shale
Kentucky, metamorphic rocks,
limestone, sheared rocks
(Metamorphic)
KJV - volcanic rocks

Sandstone, shale, and conglomerate, locally
in oldest part basaltic
volcanic rock and chert

Serpentine and gneissite

Granitic rocks

Contact
Dashed where approximately
located.

Fault known to be active
Dotted where concealed
Fault not known to be active
Dotted where concealed Only selected
faults shown. Question indicates
uncertainty as to existence of fault

Ora sheets published by the California Div. of Mines and
Geology, 1955 to 1960, and from U.S. Coast and Geodetic Survey
Geologic sheets of surveys of San Francisco Bay of
1953 and later.

SCALE 1:500,000

BY J. SCHLOCKER
USGS-HUD BDC NO. 8

ENGINEERS
CPC
GEOLOGISTS

TERRAS PROPERTY - KAYLENE DRIVE

PROJECT NO DATE Figure 2
JCP-570 MARCH 1980

REGIONAL GEOLOGIC MAP
**Surface Deposits**
- Qg: stream gravel and sand
- Qf: fan gravel
- Qa: alluvium, gravel, sand, and clay
- Qs: landslide debris

**UNCONFORMITY**
- Goa

**Santa Clara Formation**
- Qsc: valley gravel and clay
- Qm: sandstone, siltstone, clay
- Tbr

**Briones Sandstone**
- Marine sedimentary rocks
- Ksh: marine shale
- Kcg: conglomerate

**Torrey Pines Sandstone**
- Marine sedimentary rocks
- Ksh: marine shale
- Kcg: conglomerate

**Franciscan rocks**
- Mixed rocks (mostly graywacke and shale, pervasively sheared)
- Sandstone (graywacke)
- Chert
- Greenstone
- Glauconite blueschist (glaucophane)

**Exposed Sandstone Bed**
- Inclined
- Overturned

**Map Symbols**
- Contact (dashed where gradational or approximately located)
- Fault (dashed where inferred; dotted where concealed; U-upthrown block; D-downthrown block, relatively; single arrow indicates observed dip of fault; double parallel arrows indicate probable lateral movement; arrow (>) indicates existence or position of fault)

**Exposed Sandstone Bed**
- Anticline
- Syncline
- Axis of fold

**Source:** Dibblee, 1972

**Approximate Scale**
- 1000 feet

**Area Geologic Map**
- Terras Property - Kaylene Drive

**Engineers**
- JCP

**Geologists**
- JCP

**Product No.:** JCP-070
**Date:** March 1980
**Figure:** 3
Note: This map is a schematic illustration of observed geologic data and should not be used for any other purpose. Contours are approximate.

Base Supplied By William Jay Hammond

ENGINES
GEOLoGISTS

SITE PLAN AND GEOLOGIC MAP
TERRAS PROPERTY - KAYLENE DRIVE
PROJECT NO. JCP-570 DATE MARCH 1980
Figure 4
Approximate orientation of contact between conglomerate and interbedded sandstone and olive drab siltstone: N25°E 55°SE

NOTE: This cross section is a schematic illustration of general geologic relationships and should not be used for any other purpose.

See Figure 4 for EXPLANATION
BIBLIOGRAPHY

California Division of Mines and Geology, 1966, Geologic Map of California, San Jose Sheet.

Cooper-Clark and Associates, 1974, "Geotechnical Investigation in City of San Jose's Sphere of Influence for City of San Jose".


Reports by Others:


Rose, R. Burton, "In-Depth Geologic, Seismic Survey Report, Garcia Minor Subdivision, 4 Lots, APN: 612-36-022, 2.3 acres, Story Lane, off Clayton Road, Santa Clara County, California", File C-74-99, October 1979.


MAINTENANCE OF A HILLSIDE HOMESITE

During the wet weather season, home owners, particularly those living in houses placed on fills (man-placed earth) or in the vicinity of excavated (cut) or fill slopes, become concerned about the condition of their building site. In general, modern design and construction practices minimize the probability of serious landsliding (slope failure). The grading codes of the local jurisdictions (cities and counties) in California concerned with filled land, excavation, terracing and slope construction are adequate to meet almost any natural occurrence. Therefore, the concern of the home owner should be directed toward maintaining slopes and drainage facilities so that they will perform as intended.

The following discussion, general recommendations and simple precautions are presented to help the home owner maintain his hillside building site.

The general public often regards the natural terrain as stable—"terra firma". This is, of course, an erroneous concept. Nature is always at work altering the landscape. Hills and mountains are worn down by mass wasting processes (erosion, sliding, creeping, et cetera) and in the valleys and lowlands their products are deposited. Thus the natural processes tend to level the terrain over time. Conversely, over tens of millions of years major land movements rebuild mountains and hills and the leveling processes begin over again.

Development of hillsides for residential use is carried out, in so far as possible, in a manner which enhances the natural stability of the site and minimizes the chances of instability resulting from the necessary grading. The earthwork plan and design is generated by the developer on the basis of geologic and soil investigations. In order to insure success, slope and drainage provisions and facilities must be maintained by the home owner.

Home owners are accustomed to maintaining their homes; they expect to paint their house periodically, replace wiring, clean-out clogged plumbing, repair roofs, et cetera. Maintenance of the homesite, particularly on hillside properties, should be considered in the same way because neglect can ultimately result in catastrophic slope failure. In most cases, lot and site maintenance consists of a minor amount of periodic work and is less costly than repair after neglect.
Most slope and hillside stability problems are associated with excess water. Uncontrolled water from a broken pipe, leach field or other water source tends to trigger landslides. Wet weather is the largest cause of slope problems in California where rain is seasonal and may be torrential. Drainage and erosion control are the most important aspects of homesite stability and these provisions must not be altered without competent professional advice; maintenance must be carried out to assure their continued operation.

As geologists and engineers concerned with the problems of building sites in hillside areas, we offer the following list of recommended "Do's and Don'ts" as a guide to home owners.

**DO'S**

1. Check roof drains, gutters and down spouts to be sure that they are clear. Depending on your location roofs can shed tremendous quantities of water during a rainstorm. Without gutters or other adequate drainage facilities, water falling from the eaves may collect against the foundation and/or basement walls. This is very undesirable.

2. Clear surface and terrace drainage ditches. Check them frequently during the rainy season; ask your neighbors to do the same.

3. Check all drainage ditch outlet drains. If blockage is evident, clear the drain.

4. Check drains at the top of slopes; they should be clear of debris so that water will not overflow onto the slope.

5. Keep subsurface drain openings clear of debris.

6. Check for loose fill materials above and below your property. Any loose fills could move during the rainy season.

7. Watch for water backup of drains inside the house which may indicate drain or sewer blockage.

8. Stay alert for abnormal occurrences; they may foretell damage or danger.

**DON'TS**

1. DO NOT block terrace drains and brow ditches. Ditches are designed to carry runoff water to a place where it can be safely disposed of. Generally, shovel work will remove an accumulation of dirt or debris which may clog the drain. Maintain the ground surface upslope of lined ditches to ensure that surface water is collected in the ditch and is not permitted to be trapped behind or under the lining.
2. **DO NOT** permit water to collect or pond on your homesite. Ponded water will tend to seep into the ground saturating the subsurface soils, possibly causing instability, or will flow over slopes causing erosion. Erosion, once started, is difficult to control and damage may result rather quickly.

3. **DO NOT** permit water to flow over slopes, serious erosion may result.

4. **DO NOT** connect roof drains and gutters or down spouts to subsurface drains. Subdrains are constructed to remove subsurface water and are not designed for an overload from roof drains.

5. **DO NOT** place loose soil or debris on slopes. Loose soil soaks up water more readily than dense soils and will tend to slide. Sliding may clog terrace drains or may compromise the slope stability.

6. **DO NOT** discharge surface water into septic tanks or leaching fields. This will increase water pressures in the subsurface, which in turn, will decrease stability.

7. **DO NOT** over water vegetation on slopes. Excess water on slopes may compromise slope stability.

8. **DO NOT** let water collect against foundation walls, retaining walls and basement walls. Such walls are designed for moisture in the ground and are, where necessary, accompanied by subdrains to carry off excess moisture. Ponded water may damage walls or cause other damage.

9. **DO NOT** compact earth behind walls or in trenches by flooding with water.

10. **DO NOT** block or divert ditches which have been graded around your house or the lot. Such shallow ditches have been constructed to quickly remove water toward the driveway, street or other positive outlet.
TYPICAL SLOPE SECTION

SHOWING

TERMS USED IN ABOVE DISCUSSION

NOT TO SCALE

CONDITIONS:

1. FILL SLOPE
2. DRAINAGE TERRACE
3. DRAIN PIPE PROVIDED WITH POSITIVE OUTLET ON A PAVED SURFACE.
4. DOWNSPOUT
5. ROOF GUTTER
6. DRAINAGE SWALE
7. KEEP HOLES THRU RETAINING WALL
8. SURFACE DRAIN
9. ORIGINAL GROUND SURFACE
10. RETAINING WALL
11. BROW DITCH
12. FILL COMPACTED TO ENGINEERING SPECIFICATIONS AND KEYED INTO FIRM GROUND.
13. SUBDRAIN
14. FRENCH DRAIN
15. SUBDRAIN
16. CUT SLOPE
17. CURB TO PREVENT SLOPE EROSION
18. LINED DRAINS AND/OR DITCHES

NOTE: Acknowledgment is hereby made to the SAN DIEGO CHAPTER of the CALIFORNIA COUNCIL OF CIVIL ENGINEERS AND LAND SURVEYORS.