This section of the EIR evaluates geology, geotechnical, and soil resources within the project site and evaluates the suitability of the project site for residential uses. This analysis is based on a review of the project description, as well as data collected from the *Geological and Geotechnical Feasibility Study* prepared by D&M Consulting Engineers in August 2001. This report is included as **Appendix E**.

3.5.1 ENVIRONMENTAL SETTING

The Monterey Bay Area occurs along the edge of the Coast Range Geomorphic Province, and is comprised of a discontinuous series of northwest trending mountain ranges, ridges and intervening valleys characterized by intense, complex folding and faulting.

The project site consists of terrain that is somewhat varied with rolling hills and ridges with intervening drainages. The project site contains approximately 96 acres of steep slopes in excess of 30 percent; 40 acres of softer slopes ranging from 20 to 30 percent; and 23 acres with slopes ranging from 0 to 20 percent. The elevation of the project site varies approximately 700 feet, ranging from 330 feet in the northeastern portion of the project site to 1,020 feet in the southeastern portion.

GEOLOGY

The project site is situated near the northern end of the Sierra de Salinas Mountain Range. The crystalline basement rock, at depths of as much as 3,600 feet, consists of granitic rocks of the Salinian block and the older Sur Series metasedimentary rocks. The oldest geologic unit in the area is Plio-Pleistocene Continental Deposits, which has been identified as the Paso Robles Formation. The estimated maximum thickness of the Paso Robles Formation is approximately 500 feet. Underlying the Paso Robles Formation is Santa Margarita Sandstone Formation, a very fine to coarse-grained arkosic (feldspar-rich) sandstone up to 1,300 feet thick. Both of these formations constitute significant regional aquifers. Quaternary alluvium is mapped overlying the Paso Robles Formation in the major regional drainages. The geology within the project vicinity is provided in **Figure 3.5-1, Regional Geologic Map**.

Bedrock in the vicinity of the project site is gently to moderately inclined, and is folded into a series of alternating synclines and anticlines with complex structural trends of both north-south and east-west geomorphic ridge expressions associated with variations of the bedding inclinations. Four regional geologic units were mapped within the vicinity of the project site. These include the surficial units such as: Colluvium, Qc; Alluvial Deposits, Qal; Quaternary Landslide Deposits, Qls; and the underlying bedrock unit, the Paso Robles Formation/Continental Deposits Undivided, QTc.

> **Colluvium, Qc (Holocene)**: Unconsolidated, heterogeneous deposits of moderately to poorly sorted silt, sand, and gravel, which where found on the project site consisted mostly of sand and silty sand. Compaction ranged from loose to very loose conditions in surface exposures, to compact and medium dense where

underlying relatively level valley areas. Where these materials exist in loose to very loose conditions along slopes, they are subject to local sand runs and slow downslope creep.

Alluvial Deposits, Qal (Holocene): Unconsolidated, heterogeneous deposits of moderately sorted silt and sand with discontinuous lenses of clay and silty clay, and local gravel. These materials were found in a compact and consolidated position in those areas explored in the generally level valley portions of the site.

Landslide Deposits, Qls: Based upon aerial photo analysis, field analysis, exploration pits, and a review of previous studies, there is sufficient information to conclude that four slides may be present on-site. Two small and relatively recent landslides were observed on the eastern portion of the project site.

Paso Robles Formation/Continental Deposits, QTc: A series of non-marine, semi-consolidated, oxidized, poorly sorted, fine to coarse grained sand beds with pebble and cobble interbeds.

FAULTS AND SEISMIC HAZARDS

Regional Faulting

The project site is located in the seismically active San Francisco, Monterey Bay region, but outside of the Alquist-Priolo Earthquake Fault Zone established by the Alquist-Priolo Earthquake Fault Zoning Act of 1972. This region lies adjacent to the San Andreas Fault System, which has created predominantly northwest-southeast trending geologic structure and topographic features. The San Andreas Fault System constitutes the boundary between the Pacific and North American tectonic plates, and active faults are abundant in the region.

Figure 3.5-2, Regional Fault Map, shows the locations of the faults listed on maps, produced by the California Department of Conservation, Division of Mines and Geology and published by the International Conference of Building Officials (ICBO), which have been classified as Type A and Type B faults for the purpose of evaluating potential seismic impacts associated with these faults. Type A faults have a higher potential for seismic impacts. The project site is located about 33 kilometers southwest of the San Andreas (Pajaro) Fault, the closest Type A fault. The maximum expected magnitude of an earthquake for this segment is 7.9. The closest Type B faults are the Rinconada Fault, which is located approximately 2.8 miles northeast of the project site, and the Monterey Bay-Tularcitos Fault, which is located approximately 6.3 miles southwest of the project site. These Type B faults are expected to generate earthquakes with a maximum magnitude of 7.3 and 7.1, respectively.

Insert Figure 3.5-1 (Regional Geological Map)

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Insert Figure 3.5-2 (Regional Fault Map)

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The Harper Fault and Harper Canyon Fault are located in the vicinity of the project site, approximately 2,000 feet east and 1,300 feet southwest, respectively. Although these faults are not designated as Type A or Type B faults, the *Monterey County General Plan* and *Toro Area Plan* recognize the Harper and Harper Canyon Faults as active faults within Monterey County. However, according to the *Geological and Geotechnical Feasibility Study*, a review of regional studies found inconclusive evidence regarding the likelihood of seismic activity from these faults. No known active faults traverse the project site.

Seismic activity from active faults can trigger earthquakes, which can cause primary and secondary hazards. Primary hazards include ground shaking and ground displacement or rupture. These primary hazards can create secondary hazards such as ground failure, seismic-induced water waves, and dam failure.

The characteristics of the soils and sediments underlying the project site are important site-specific determinants of a project site's response to a seismic event. As discussed above, a relatively thin mantle of colluvial deposits overlying bedrock of the sedimentary Paso Robles Formation generally underlies the project site. Based on the subsurface exploration of the project site during preparation of the *Geological and Geotechnical Feasibility Study*, and known subsurface geology of the project vicinity, the upper 100 feet of soil can be classified as very dense soil with a shear wave velocity between 260 and 760 meters per second (m/s).

According to the *Toro Area Plan*, small areas along the southern portion of the project site (portions of Lot #17 and the remainder parcel) are located in a very high seismic hazard zone. However, the majority of the project site is located in a moderately high seismic hazard zone.

Ground Failure

Seismically induced ground failure is a result of strong ground motions generated by earthquakes. These types of failures include liquefaction, lateral spreading, dynamic compaction, and seismically induced landslides.

Liquefaction

Soil liquefaction occurs where saturated, cohesionless or granular soils undergo a substantial loss in strength due to excess build-up of water pressure within the pores during cyclic loading such as earthquakes. Due to the loss of strength, soils gain mobility that can result in significant deformation, including both horizontal and vertical movement where the liquefied soil is not confined. Intensity and duration of seismic shaking, soil characteristics, overburden pressure and depth to water are all primary factors affecting the occurrence of liquefaction. Soils most susceptible to liquefaction are saturated, loose, clean, uniformly graded, Holocene age, and fine grained sand deposits. Silts and silty sands have also been proven to be susceptible to liquefaction or partial liquefaction. The occurrence of liquefaction is generally limited to soils within 50 feet of the ground surface.

Perched groundwater conditions where identified within one to two feet of the ground surface on Lots #2, #8, #9, #11, #13, and #16. The perched groundwater occurs at the contact point between the more permeable colluvium and the dense, often cemented, Paso Robles Formation below. Should strong shaking occur when seasonal perched groundwater conditions are present, the potential for liquefaction would be low to moderate. According to the *Geological and Geotechnical Feasibility Study*, the dense subsurface geologic unit underlying the project site is not susceptible to liquefaction.

Lateral Spreading

Lateral spreading is a potential hazard commonly associated with liquefaction where extensional ground cracking and settlement occur as a response to lateral migration of liquefied subsurface materials beneath a slope, or even beneath level ground if an open topographic face is nearby. With the low to moderate potential for liquefaction, there is a corresponding low to moderate potential for seismic induced lateral spreading to occur on the project site.

Dynamic Compaction and Seismic Settlement

Another type of seismically induced ground failure that can occur as a result of seismic shaking is dynamic compaction or seismic settlement. Such occurrences typically occur in unsaturated loose granular soils or uncompacted fill. The potential impact of dynamic compaction is settlement of the ground surface. The loose to medium dense colluvial soils found on the project site have a low to moderate potential to undergo some settlement where building loads and/or fill soils endure strong ground shaking.

Landslides

Landslide debris is a rough mixture of unconsolidated, heterogeneous deposits of moderately to poorly sorted silt, sand and angular rock fragments also deposited by down slope mass movement but driven by the weight of the mass. An older landslide formed more than 11,000 years ago may be considered dormant whereas, a landslide formed during Holocene time may still be subject to movement depending on present conditions and disturbance of the area. Landslides from both eras exist within the project site. The locations of existing landslides on the project site are presented in **Figure 3.5-3, Geologic Site Map**.

When considering slope stability during seismic shaking, there is a potential for sloughing of the face of the steeper slopes resulting in a deposition of loose materials at the base of the slopes. This would result in increased potential for slides to occur below the slopes within the Paso Robles Formation. The Paso Robles Formation is highly susceptible to erosion, resulting in relatively loose colluvial deposits below the surface. These materials on sloping bedrock surfaces are prone to surficial sliding where seasonal perched groundwater conditions develop, and where fine soils prevent rapid drainage. Evidence of this can be seen in the two smaller and relatively recent slides mapped on Lots #14 and

Insert Figure 3.5-3, Geologic Site Map

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#15. Surface conditions indicate that this process may also be occurring on Lots #8 and #9, and to a lesser extent on Lot #17. Based on PMC's review of the Geological and Geotechnical Feasibility Study prepared by D&M Consulting Engineers. due to the perched groundwater conditions and hummocky terrain observed on Lots #8 and #9, and the orientation of the these lots relative to the existing landslide on Lot #11, Lots #8 and #9 should be treated similar to Lot #11 and Lots #13 through #16. Another contributing factor is the west-trending dip-slope bedding of the Paso Robles Formation that can result in soil creep or surficial landsliding, as observed at Lot #11, and Lots #13 through #16 in the *Geological and Geotechnical Feasibility Study*.

SOILS

The soils on the project site are derived from complete weathering of the underlying bedrock or other geologic material. These soils are between two and five feet thick and are derived from underlying materials, overlying the Paso Robles Formation. The soils primarily consist of medium dense to dense clayey to silty sand. Granitic cobbles are typical at a depth of about three feet, and one to two foot diameter boulders of arkosic sandstone at a depth of about one to two feet.

According to the *Soil Survey of Monterey County* (USDA NRCS 1978), the majority of the project site is comprised of the Arnold loamy sand, 9 to 15 percent slopes (AkD) soil series; and the Arnold loamy sand, 15 to 50 percent slopes (AkF) soil series. The Arnold soils consist of somewhat excessively drained soils that form from weathered soft sandstone. The southern portion of the project site also contains Badlands (Ba) and Xerorthents, dissected (Xd) soil series. The Badland (Ba) soil series is barren land that has a thin layer of soil over bedrock. The Xerorthents, dissected (Xd) soil series consists of steep to extremely steep soils on bluffs along the banks of deeply entrenched gullies.

Erosion

According to the *Soil Survey of Monterey County* the Arnold soils series (AkD and AkF) are somewhat excessively drained soils, with very low to medium runoff and rapid permeability above the sandstone and slow in the sandstone. The Badland (Ba) soil series are highly erodible. The Xerorthents (Xd) have very rapid runoff, permeability is rapid and hazard of erosion is high.

Expansive Soils

Expansive soils shrink and swell with moisture content. This shrink swell feature of expansive soils can cause distress and damage to structures. According to the *Soil Survey of Monterey County* the Arnold soils series has a low shrink swell potential. Due to the lack of clay, shrink swell is not applicable to the Badlands (Ba) or Xerorthents (Xd) soil series.

3.5.2 REGULATORY SETTING

CALIFORNIA AND UNIFORM BUILDING CODE (TITLE 24)

The California Building Code (Title 24) and the Uniform Building Code provide standards for testing and building construction, as well as safety measures for development within earthquake prone areas. Table 16-J of the 1997 California Uniform Building Code (UBC) requires that a site be classified into one of five soil profile types. These soil profile types are based on the average shear wave velocity of the upper 30 meters, or Standard Penetration Test (SBT) blow counts, or undrained shear strength. Soil Profile Types of S_F require site-specific evaluation per §1629.31 UBC.

ALQUIST-PRIOLO SPECIAL STUDIES ACT

The Alquist-Priolo Earthquake Fault Zoning Act was passed in 1972 to mitigate the hazard of surface faulting to structures for human occupancy. This state law was a direct result of the 1971 San Fernando Earthquake, which was associated with extensive surface fault ruptures that damaged numerous homes, commercial buildings, and other structures. The Act only addresses the hazard of surface fault rupture and is not directed toward other earthquake hazards. The Seismic Hazards Mapping Act, passed in 1990, addresses non-surface fault rupture earthquake hazards, including liquefaction and seismically induced landslides.

The law requires the State Geologist to establish regulatory zones (known as Earthquake Fault Zones) around the surface traces of active faults and to issue appropriate maps. ["Earthquake Fault Zones" were called "Special Studies Zones" prior to January 1, 1994.] The maps are distributed to all affected cities, counties, and state agencies for their use in planning and controlling new or renewed construction. Local agencies must regulate most development projects within the zones. Projects include all land divisions and most structures for human occupancy. Single-family wood-frame and steel-frame dwellings up to two stories that are not part of a development of four units or more are exempt. However, local agencies can be more restrictive than state law requires.

Before a project can be permitted, cities and counties must require a geologic investigation to demonstrate that proposed buildings will not be constructed across active faults. A licensed geologist must prepare an evaluation and written report for a specific site. If an active fault is found, a structure for human occupancy cannot be placed over the trace of the fault and must be set back from the fault (generally 50 feet).

COUNTY OF MONTEREY

Monterey County General Plan

Goals, Objectives and Policies regarding Environmental Constraints to development, including seismic and other geologic hazards, are found in Chapter II of the *Monterey County General Plan* (1982). Goal 15 aims to "Minimize loss of life, injury, damage to

property, and economic and social dislocations resulting from seismic and other geologic hazards." Listed below are policies that achieve this goal:

Policies

3.1.1 Erosion control procedures shall be established and enforced for all private and public construction and grading projects.

3.2.2 Land having a prevailing slope above 30 percent shall require adequate special erosion control and construction techniques.

15.1.2 Faults classified as "potentially active" shall be treated the same as "active faults" until geotechnical information demonstrating that a fault is not "active" is accepted by the County.

15.1.3 The lands within one eighth mile of active or potentially active faults shall be treated as a fault zone until accepted geotechnical investigations indicate otherwise.

15.1.4 All new development and land divisions in designated high hazard zones shall provide a preliminary seismic and geologic hazard report which addresses the potential for surface ruptures, ground shaking, liquefaction and landslides before the application is considered complete. This report shall be completed by a registered geologist and conform to the standards of a preliminary report adopted by the County.

15.1.5 A detailed geological report shall be required for all standard subdivisions. In high hazard areas, this report shall be completed by a registered geologist, unless a waiver is granted, and conform to the standards of a detailed report adopted by the County.

15.1.8 The County should require a soils report on all building permits and grading permits within areas of known slope instability or where significant potential hazard has been identified.

15.1.11 For high hazard areas, the County should condition development permits based on the recommendations of a detailed geological investigation and soils report.

Toro Area Plan

Policies

3.2.4 Except in areas designated as medium or high density residential or in areas designated as commercial or industrial where residential use may be

allowed, the following formula shall be used in the calculation of maximum possible residential density for individual parcels based upon slopes:

1. those portions of parcels with cross-slope of between zero and 19.9 percent shall be assigned one building site per each one acres;

2. those portions of parcels with a cross-slope of between 20 and 29.9 percent shall be assigned one building site per each two acres;

3. those portions of parcels with a cross-slope of 30 percent or greater shall be assigned zero building sites;

4. the density for a particular parcel shall be computed by determining the cross-slope of the various portions of the parcel applying the assigned densities listed above according to the percent of cross-slope and by adding the densities derived from this process. The maximum density derived by the procedure shall be used as one of the factors in final determination of the actual density that shall be allowed on a parcel.

Where an entire parcel would not be developable because of plan policies, an extremely low density of development should be allowed.

15.1.16 The Toro Seismic Hazards Map included in this report shall be used to delineate high seismic hazard areas addressed by the countywide General Plan. Areas shown as "moderately high, high, and very high hazard" shall be considered high hazard areas for the purpose of applying general plan policies in Toro. These maps may be revised as new accepted geotechnical investigations dictate.

16.2.11 Practices which contribute to siltation and flood hazards of Toro Creek shall be prohibited.

Erosion Control Ordinance

Development within the planning area will be subject to the requirements of the County's Erosion Control Ordinance (Section 16.12). This ordinance requires submittal of an Erosion Control Plan indicating proposed methods for the control of runoff, erosion and sediment movement prior to permit issuance for building, grading or land clearing.

3.5.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

The following thresholds for measuring a project's environmental impacts are based on CEQA Guidelines and standards used by the County of Monterey. For the purposes of this

EIR, impacts are considered significant if the following could result from implementation of the proposed project:

1) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving,

    a) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;

    b) Strong seismic ground shaking;

    c) Seismic-related ground failure including liquefaction; or,

    d) Landslides;

2) Result in a substantial soil erosion or the loss of topsoil;

3) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;

4) Be located on an expansive soil, creating substantial risks to life or property; or

5) Contributes significantly to any cumulative geological, soils or seismicity impact.

METHODOLOGY

The following impact evaluation is largely based on information found within the *Monterey County General Plan* (Monterey County 1982), the *Toro Area Plan* (Monterey County 1983), and the findings and recommendations contained in the *Geological and Geotechnical Feasibility Study prepared* by D&M Consulting Engineers, Inc. in August 2001, which is included in **Appendix E**.

The field investigation performed for this report consisted of digging exploratory pits and geotechnical test borings across the project site. The excavations and borings were used to verify and supplement information derived from published studies and aerial photographs. The feasibility study included recommendations regarding design and construction of the proposed project.

PROJECT IMPACTS AND MITIGATION MEASURES

Exposure to Ground Rupture

No faults are mapped across the project site and the project site is not located within an Alquist-Priolo Fault Zone, as mapped by the State Geologist. The San Andreas Fault, a Type A fault with the highest potential for seismic impacts is located approximately 20

miles southwest of the project site. This fault is expected to have an earthquake with a maximum magnitude of 7.9. The closest faults with the next highest potential for seismic impacts are the Rinconada Fault, which is located approximately 2.8 miles northeast of the project site, and the Monterey Bay-Tularcitos Fault, which is located approximately 6.3 miles southwest of the project site. These faults have the potential for seismic impacts, but less so than the San Andreas Fault and are expected to generate earthquakes with a maximum magnitude of 7.3 and 7.1, respectively. The Harper and Harper Canyon Faults are the closest faults to the project site. The Harper Fault is located approximately 2,000 feet east of the project site and the Harper Canyon Fault is located approximately 1,300 feet southwest of the project site. Both faults are mapped trending northwest to southeast along San Benancio Road. Although, these faults are not evaluated for their potential seismic impact by the California Department of Conservation, Division of Mines and Geology, the *Monterey County General Plan* and *Toro Area Plan* recognize the Harper and Harper Canyon Faults as two of 15 potentially active faults within Monterey County. However, according to the *Geological and Geotechnical Feasibility Study* prepared by D&M Consulting, a review of regional studies found inconclusive evidence regarding the likelihood of seismic activity from these faults. Based on the distance of the nearest faults to the project site, the proposed project would not expose people or property to ground rupture and **no impact** is expected. Therefore, no mitigation is required.

Exposure to Seismic Ground Shaking

Impact 3.5-1 Placement of new structures at the project site could result in potential structural damage and associated human safety hazards resulting from seismic ground shaking caused by earthquakes on nearby active and potentially active faults. This would be considered a **potentially significant impact.**

According to the *Toro Area Plan*, seismic hazards at the project site are considered moderately high. According to the *Geological and Geotechnical Feasibility Study*, the project site will likely experience at least one moderate to severe earthquake (magnitude 5.0 to 7+) and associated seismic ground shaking during the lifetime of the proposed project. More frequent earthquakes of less magnitude are more likely. As a result, the proposed project may be exposed to some structural damage and associated human safety hazards due to stronger shaking. This would be considered a **potentially significant impact**. All structures within Monterey County, including the proposed project, are required to be designed in accordance with the latest edition of the California Building Code criteria for Seismic Zone IV. In addition, the following mitigation measure would reduce this impact to a less than significant level.

Mitigation Measure

MM 3.5-1 Prior to building permit approval, the Monterey County Building Services Department shall require that the project applicant consult with a qualified engineer to prepare design level geotechnical reports in

accordance with the current edition of the California Building Code and the recommendations contained within the *Geologic and Geotechnical Feasibility Study* prepared by D&M Consulting Engineers in August 2001. Said reports shall be submitted for plan check with any improvement plans including earthwork or foundation construction. The *Geological and Geotechnical Feasibility Study* provides specific recommendations regarding site preparation and construction of foundations, retaining walls, utilities, sidewalks, roadways, subsurface drainage, and landscaping features based on the lot characteristics and proximity to the fault at the project site. In addition, *Geological and Geotechnical Feasibility Study* provides specific recommendations regarding slope stability and energy dissipation measures, the recommended location of homesites on Lots #8, #9, #11, and Lots #13 through #16, and reconstruction of the steep slope near Lots #8 and #9. All slope stability and energy dissipation measures shall be incorporated into the site grading plans and constructed concurrent with grading activities.

During the course of construction, the project applicant shall contract with a qualified engineering geologist to be on site during all grading operations to make onsite remediation and recommendations as needed, and perform required tests, observations, and consultation as specified in the *Geological and Geotechnical Feasibility Study*. Prior to final inspection, the project applicant shall provide certification from a qualified professional that all development has been constructed in accordance with all applicable geologic and geotechnical reports.

Implementation of mitigation measure **MM 3.5-1** would ensure that design level geotechnical reports are prepared for individual lots and that residential development at the project site is constructed in accordance with the most current California Building Code. Therefore, the seismic shaking impact associated with the proposed project would be reduced to a **less than significant** level.

Exposure to Landslides

Impact 3.5-2 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards resulting from slope-failure hazards such as landslides. This would be considered a **potentially significant impact**.

The project site primarily consists of medium to loose colluvial deposits on flat and steep terrain. Approximately 84 acres of the 164 acres proposed for development (excluding the remainder parcel) contain slopes greater than 20 percent. There is a potential for sloughing of the face of steeper slopes resulting in deposition of loose materials at the base of the slopes during seismic shaking. Furthermore, according to the *Geological and Geotechnical Feasibility Study,* there is evidence of two large dormant landslides near Lots #11 and #13

and two relatively recent slides on Lots #14 and #15, as shown in **Figure 3.5-3, Geologic Site Map**. Lots #8, and #9, and to a lesser extent Lot #17, have hummocky terrain, which is evident of past slides similar to those observed on Lots #14 and #15. Based on the existing landslides, the soil conditions, and the steep terrain, the proposed project may result in permanent structural damage and associated human safety hazards caused by slope failure and landslide hazards, which would be considered a **potentially significant impact.**

Implementation of mitigation measure **MM 3.5-1** shall require preparation of design level geotechnical reports for individual lots, which would ensure that the exposure to landslides is minimized by implementing slope stability and energy dissipation measures and site homesites away from potential landslide areas as recommended by the *Geological and Geotechnical Feasibility Study* prepared by D&M Consulting Engineers in August 2001. In addition, the following mitigation measure has been provided to reduce the potential for slope failure to occur on the project site due to the steep terrain.

Mitigation Measure

MM 3.5-2a Prior to issuance of building permits, the Monterey County Planning Department shall require that the project applicant design the building envelopes to minimize slope failure on Lot #17 by restricting development of structures on the north facing slope of Lot #17, due to the steep terrain. The homesite and driveway for Lot #17 shall be placed on the south side of the ridge similar to the driveway and building envelope design shown in **Figure 3.5-4, Potential Driveway and Building Envelope for Lot #17** and subject to review and approval by the recommending engineering geologist and the County of Monterey.

MM 3.5-2b Prior to final subdivision map approval, the Monterey County Planning Department shall require that the project applicant update the Subdivision Map to reflect the revised and approved driveway and building envelope deign for Lot #17.

Implementation of the mitigation measures **MM 3.5-1** and **MM 3.5-2** would ensure that home sites are located away from potential landslide deposits and slope failures, and divert and dissipate potential landslide flows. In addition, implementation of mitigation measure **MM 3.5-3** would reduce the potential for surficial sliding of the colluvial soils near perched groundwater. Therefore, the structural and human health hazards associated with landslides would be reduced to a **less than significant impact.**

Exposure to Liquefaction and Lateral Spreading

Impact 3.5-3 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards resulting from direct and indirect slope-failure related to hazards such as liquefaction and lateral spreading**.** This would be considered a **potentially significant impact**.

Insert Figure 3.5-4, Potential Driveway and Building Envelope for Lot #17

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The occurrence of liquefaction is generally limited to soils located within approximately 50 feet of the ground surface. Liquefaction can result in a loss of bearing capacity and/or ground settlement, which can cause structural damage. According to the *Geological and Geotechnical Feasibility Study* prepared by D&M Consulting Engineers, the potential for liquefaction to occur on the project site is low to moderate where perched groundwater conditions are present.

Lateral spreading is a potential hazard commonly associated with liquefaction. Lateral spreading causes ground cracking and settlement in response to lateral movement of the liquefied subsurface caused by liquefaction. Since the potential for liquefaction to occur on the project site is low to moderate, the potential for lateral spreading is also low to moderate. However, where perched groundwater occurs on slopes at Lots #2, #8, #9, and Lots #13 through #16, the soils can potentially mobilize and spread downslope. Lot #10 was saturated in March 2001, indicating the presence of shallow (perched) groundwater. In addition, seven minor springs were identified on the project site: two along the unpaved road near the boundary of Lot #17, two on Lot #15, one on Lot #13, and two on Lot #11. According to D&M Consulting Engineers, the springs found on Lot #11 and #13 and one of the springs found on Lot #15 appear to be associated with nearby landslides. This would be considered a **potentially significant impact**.

Mitigation Measure

MM 3.5-3 Prior to issuance of grading and building permits, Monterey County Planning Department and Building Services Department shall require that the project applicant contract with a certified engineer to design subsurface drainage system where perched groundwater exists on the project site, including but not limited to Lots #2, #8, #9, #10, #11 and Lots #13 through #16. Subsurface drainage system shall be designed and installed in accordance with the recommendation provided in the *Geological and Geotechnical Feasibility Study* prepared by D&M Consulting Engineers in August 2001. These improvements shall be included in the final improvement plans for the proposed project and installed concurrent with site preparation and grading activities associated with future residential development.

Implementation of mitigation measures **MM 3.5-1** and **MM 3.5-3** would aid in reducing the potential for liquefaction and lateral spreading to occur by moving the perched groundwater via a subsurface drainage system. Therefore, the impact would be reduced to a **less than significant** level.

Dynamic Compaction

Impact 3.5-4 Implementation of the proposed project may result in potential permanent structural damage and associated human safety hazards

resulting from dynamic compaction**.** This would be considered a **potentially significant impact**.

Dynamic compaction occurs in unsaturated loose granular soil material or uncompacted fill soils, which results in ground settlement. The loose to medium density colluvial soils on the project site have a low to moderate potential to undergo ground settlement. Implementation of mitigation measure **MM 3.5-1** would ensure that structures are developed on suitable soils. Therefore, this impact would be reduced to a **less than significant** level.

Weak Surface Soils

Impact 3.5-5 Implementation of the proposed project would develop 17 residential lots and associated roadway improvements on potentially weak surface soils that may have limited capacity to support embankments, roadways or houses. This would be considered a **potentially significant impact**.

The soils on the project site generally consist of colluvial deposits that extend three to five feet below surface. These colluvial deposits are comprised of silty and gravelly sands that are generally medium dense to loose. These soils may have limited capacity to support embankments, roadways or structures, especially during seismic shaking. In addition, where roadways are planned in areas near hillsides, potentially unstable conditions may exist if existing soils are left in place. Implementation of mitigation measure **MM 3.5-1** would ensure that roadways and structures are constructed on suitable soils. Therefore, this impact would be reduced to a **less than significant** level.

Short- and Long-term Erosion

Impact 3.5-6 Implementation of the proposed project would result in temporary and permanent disturbance of highly erodible soils on steep slopes, thereby increasing the risk of accelerated erosion with impacts to water quality and the slope stability of erosion gullies on- and off-site. This would be considered a **potentially significant impact**.

The proposed project involves removal of vegetation and grading activities associated with the construction of roads, driveways, building pads, and associated infrastructure. The loosening and exposure of soil makes it susceptible to erosion by rainfall and wind. The proposed project would also increase the amount of impervious surfaces, which may affect the natural drainage pattern on the project site. During unusually high rainfall over a short duration, excessive erosion may occur. Soil particles may be carried by stormwater to receiving water bodies such as El Toro Creek located along State Route 68, resulting in sedimentation. The effects of increased sediment loading could include increased turbidity and reduced light penetration, reduction of light available for photosynthesis, clogging of gills and filters of fish and aquatic invertebrates, reduced spawning and juvenile fish

survival, smothering of bottom-dwelling organisms, changes in substrate composition, and reduction in aesthetic values.

As noted by the presence of significant erosion gullies at the project site, the slopes and high erosion hazard ratings of the soil types on the project site increase the potential for erosion to occur once site preparation activities begin. Grading shall be in accordance with the *Monterey County Grading Ordinance* and *Erosion Control Ordinance***.** All plans shall be subject to review by Monterey County Public Works Department and Monterey County Water Resources Agency. The removal and disturbance of soil during grading activities will directly affect the rate of erosion. Short- and long-term accelerated erosion on the project site would be considered a **potentially significant impact**. The following mitigation measures have been provided to reduce the potential for erosion to occur on the project site.

Mitigation Measure

MM 3.5-6 Prior to grading permit issuance, Monterey County Public Works Department, Planning Department, and Water Resources Agency shall require that the project applicant contract with a registered engineer to prepare an erosion control plan and a Storm Water Pollution Prevention Plan (SWPPP) that documents best management practices (filters, traps, bio-filtration swales, etc.) to ensure that urban runoff contaminants and sediment are minimized during site preparation, construction, and post construction periods. The erosion control plan and SWPPP shall incorporate best management practices consistent with the requirements of the National Pollution Discharge Prevention System and *Monterey County Ordinance 16.12.80, Land Clearing*. The erosion and sediment control plan shall specify which erosion control measures necessary to control runoff shall be in place during the rainy season (November 1 through April 15) and which measures shall be in place year round. The SWPPP shall be consistent with the Central Coast Water Quality Control Board standards.

Implementation of the above mitigation measure, in combination with mitigation measure **MM 3.5-1,** would reduce impacts to accelerated erosion to a **less than significant** level.

Expansive Soils

Expansive soils were not encountered or documented as being present at the project site. Therefore **no impact** is expected.

CUMULATIVE IMPACTS AND MITIGATION MEASURES

The proposed project will not combine with any other factors or projects and, thus, is not significant due to the localized, site-specific nature of geotechnical and seismic impacts. Therefore, no significant cumulative impacts are anticipated relative to geology or geologic hazards.

REFERENCES/DOCUMENTATION

D&M Consulting Engineers, Inc./Terratech. *Geological and Geotechnical Feasibility Study*. August 6, 2001.

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