4.3 GEOLOGY AND SOILS

4.3.1 INTRODUCTION

This EIR section describes existing geologic and soil conditions in the Project area, identifies associated potential geotechnical impacts related to development in accordance with the proposed Newport Banning Ranch Project, and sets forth measures designed to mitigate identified significant adverse impacts. Information within this section is based upon the *Report of Geotechnical Studies, Proposed Newport Banning Ranch Development* prepared by GMU Geotechnical, Inc. (GMU 2010), the *City of Newport Beach General Plan* and Environmental Impact Report (Newport Beach 2006a and 2006b), and the California Division of Mines and Geology's Seismic Hazards Mapping (1998 and 2008). The GMU report is included as Appendix B to this EIR.

This analysis evaluates the environmental impacts relating to the development of the Project, and includes an evaluation of the grading activities proposed for the Project in the Newport Banning Ranch Master Development Plan (Development Plan). Grading, for the purposes of this analysis, includes bluff/slope restoration and remedial grading to address geotechnical and soils issues, and mass grading within the proposed development areas. Cumulative impacts are addressed in Section 5.0 of this EIR.

4.3.2 REGULATORY SETTING

Federal

International Building Code

The International Building Code (IBC) is the national model building code providing standardized requirements for construction. The IBC replaced earlier regional building codes (including the Uniform Building Code) in 2000 and established consistent construction guidelines for the nation. In 2006, the IBC was incorporated into the 2007 California Building Code, and currently applies to all structures being constructed in California (ICC 2008). The national model codes are therefore incorporated by reference into the building codes of local municipalities, such as the California Building Code discussed below. The California Building Code includes building design and construction criteria that take into consideration the State's seismic conditions.

State

California Building Code

The California Building Code (also known as the "California Building Standards Code" or CBC) is promulgated under the *California Code of Regulations* (CCR), Title 24 (Parts 1 through 12) and is administered by the California Building Standards Commission (CBSC) (CBSC 2009). The national model code standards adopted into Title 24 apply to all occupancies in California except for modifications adopted by State agencies and local governing bodies. The CBSC published the 2007 triennial edition in July 2007, which incorporates the 2006 IBC, discussed above, and became effective January 1, 2008. The California Building Code may be adopted wholly or with revisions by State and local municipalities.

Title 24 sets forth the fire, life safety and other building related regulations applicable to any structure fit for occupancy statewide for which a building permit is sought. Title 24 establishes general standards for the design and construction of buildings, including provisions related to seismic safety. The California Building Code provides standards that must be met to safeguard life or limb, health, property, and public welfare by regulating and controlling the design, construction, quality of materials, use and occupancy, location, and maintenance of all buildings and structures within its jurisdiction. Title 24 applies to all occupancies in California except for modifications adopted by State agencies and local governing bodies. Chapter 18 of the California Building Code, Soils and Foundations, specifies the required level of soil investigation, required by law in California. Requirements in Chapter 18 apply to building and foundations systems and consider reduction of potential seismic hazards.

Alquist-Priolo Earthquake Fault Zoning Act of 1972

The Alquist-Priolo Earthquake Fault Zoning Act (Alquist-Priolo Act) was adopted by the State of California in 1972 in order to mitigate surface fault rupture hazards along known active faults (*Public Resources Code* [PRC] §2621 et seq.). The purpose of the Alquist-Priolo Act is to reduce the threat to life and property, specifically from surface fault rupture, by preventing the construction of buildings used for human occupancy on the surface trace of active faults. Under the Alquist-Priolo Act, the State California Geological Survey (CGS) has defined an “active” fault as one that has had surface displacement during the past 11,000 years (Holocene time). This law directs the State Geologist to establish Earthquake Fault Zones (known as “Special Studies Zones” prior to January 1, 1994) to regulate development within designated hazard areas. In accordance with the Alquist-Priolo Act, the State has delineated “Earthquake Fault Zones” along identified active faults throughout California. City and County jurisdictions must require a geologic investigation to demonstrate that a proposed development project, which includes structures for human occupancy, is adequately set back (generally at least 50 feet) from an active fault prior to permitting (CGS 2010).

Seismic Hazards Mapping Act

The Seismic Hazards Mapping Act (Act) was passed in 1990 and directs the State of California Department of Conservation Division of Mines and Geology (CDMG) to identify and map areas subject to earthquake hazards such as liquefaction, earthquake-induced landslides, and amplified ground shaking (PRC §2690–2699.6). Passed by the State legislature after the 1989 Loma Prieta Earthquake, the Act is aimed at reducing the threat to public safety and minimizing potential loss of life and property in the event of a damaging earthquake event. Seismic Hazard Zone Maps are a product of the resultant Seismic Hazards Mapping Program and are produced to identify Zones of Required Investigation; most developments designed for human occupancy within these zones must conduct site-specific geotechnical investigations to identify the hazard and to develop appropriate mitigation measures prior to permitting by local jurisdictions. The Act establishes a statewide public safety standard for the mitigation of earthquake hazards. CGS Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, provides guidance for the evaluation and mitigation of earthquake-related hazards for projects within designated zones of required investigations.

The State’s criteria for project approval within zones of required investigation are defined in CCR Title 14, Section 3724, from which the following has been excerpted:

> “The following specific criteria for project approval shall apply within seismic hazard zones and shall be used by affected lead agencies in complying with the provisions of the Act:

(a) A project shall be approved only when the nature and severity of the seismic hazards at the site have been evaluated in a geotechnical report and appropriate mitigation measures have been proposed.

(b) The geotechnical report shall be prepared by a registered civil engineer or certified engineering geologist, having competence in the field of seismic hazard evaluation and mitigation. The geotechnical report shall contain site-specific evaluations of the seismic hazard affecting the project, and shall identify portions of the project site containing seismic hazards. The report shall also identify any known off-site seismic hazards that could adversely affect the site in the event of an earthquake. The contents of the geotechnical report shall include, but shall not be limited to, the following:

(1) Project description.

(2) A description of the geologic and geotechnical conditions at the site, including an appropriate site location map.

(3) Evaluation of site-specific seismic hazards based on geological and geotechnical conditions, in accordance with current standards of practice.

(4) Recommendations for appropriate mitigation measures as required in Section 3724(a), above.

(5) Name of report preparer(s), and signature(s) of a certified engineering geologist and/or registered civil engineer, having competence in the field of seismic hazard evaluation and mitigation.

(c) Prior to approving the project, the lead agency shall independently review the geotechnical report to determine the adequacy of the hazard evaluation and proposed mitigation measures and to determine the requirements of Section 3724(a), above, are satisfied. Such reviews shall be conducted by a certified engineering geologist or registered civil engineer, having competence in the field of seismic hazard evaluation and mitigation."

City of Newport Beach

General Plan Safety Element

The primary goal of the *City of Newport Beach General Plan's* Safety Element is to reduce the potential risk of death, injuries, property damage, and economic and social dislocation resulting from natural and human-induced hazards. The Safety Element specifically addresses coastal hazards, geologic hazards, seismic hazards, flood hazards, wildland and urban fire hazards, hazardous materials, aviation hazards, and disaster planning. The Project's consistency with applicable General Plan safety goals and policies is provided later in this EIR section.[1]

Newport Beach Building Code

The City of Newport Beach (City) has adopted its own building code that regulates excavation and grading activities, drainage conditions, erosion control, and earthwork construction (including fills, embankments, and the use of earth materials as a structural component). This

[1] For ease of reading, the policy tables are located at the end of this EIR section.

code provides for the approval of grading and building plans and inspection of grading construction and drainage control for projects in compliance with the current Municipal Separate Storm Sewer System (MS4) Permit issued by the California Regional Water Quality Control Board, Santa Ana Region (Santa Ana RWQCB) on January 18, 2002, under the National Pollutant Discharge Elimination System (NPDES).

On May 22, 2009, the Santa Ana RWQCB re-issued the MS4 Permit for the Santa Ana Region of Orange County (Order No. R8-2009-0030). Re-issuance of the fourth term of this permit will result in future changes to the 2003 Drainage Area Management Plan (DAMP) and the City's Local Implementation Plan (LIP) and storm water program. This updated fourth-term permit includes new requirements pertaining to hydromodification[2] and low impact development (LID) features associated with new developments and redevelopment projects. Within 12 months after the permit adoption, the County of Orange, as the Principal Permittee, must finalize a new Model Water Quality Management Plan (WQMP) that incorporates feasibility criteria for LID and hydromodification requirements. Following the Santa Ana RWQCB's approval of the Model WQMP, the City will be required to update their LIP and storm water programs and incorporate the new Model WQMP into their discretionary approval processes for new development and redevelopment projects.

The he Newport Beach Building Code incorporates by reference the 2007 Edition of the California Building Code (Volumes 1 and 2, including Appendices F and I, and Appendix A1 of Part 10) and all national codes and standards referenced therein, based on the International Building Code. The Project would be processed by the City in accordance with the City's Building Code.

4.3.3 METHODOLOGY

The technical analyses supporting the impact conclusions in the following section were completed by GMU as presented in the GMU 2010 Report. Data from this report was supplemented through literature review and application of policies and guidelines of the *City of Newport Beach General Plan,* the Alquist-Priolo Act, and the CGS' Special Publication 117. Consideration of Standard Conditions and Project Design Features has been incorporated into the impact analyses and is reflected in the impact summary statements.

Area seismicity and faulting on or near the Project site was determined through literature review and field investigations performed by GMU in support of the GMU 2010 Report. Analysis of field data recovered (prior to trenching and cone penetrometer testing) was conducted by GMU (2010) on or in the vicinity of the Project site. Additional trenching to expose subsurface strata and to identify the location and level of activity for faults on the Project site was performed on site to supplement existing data or to provide data for portions of the Project site not covered by prior investigations. GMU recovered fault trench data in areas of thick, natural soil development to determine (1) whether offsets in the soil horizons could be identified and potentially dated, and to investigate fault age and (2) possible correlation to Holocene (recent) movement (which would, in turn, indicate active faulting).

A Probabilistic Seismic Hazard Analysis (PSHA) was prepared to assess future earthquake ground motion that could occur at the Project site. A PSHA is a mathematical process based on probability and statistics that is used to estimate the mean number of events per year (annual Frequency of Exceedance) in which the level of some ground motion parameter exceeds a specified risk level. The commercial computer program EZ-FRISK (version 7.22) was used to

[2] Hydromodification is generally defined as the alteration of natural flow characteristics.

make the mathematical computations for this analysis. The risk level for the analysis was a 10 percent probability of exceedance in 50 years. In addition, seismic design parameters in accordance with specified criteria contained in the California Building Code were also provided (GMU 2010).

Ground motions at the site were also evaluated in accordance with current California Department of Transportation (Caltrans) procedures as this type of analysis applies to the Project's proposed pedestrian and bicycle bridge over West Coast Highway. As noted by GMU (2010), the analysis evaluated ground motions at the site using Caltrans ARS Online Version 1.0.4, which is a web-based program that calculates deterministic and probabilistic acceleration response spectra based on Appendix B of Caltrans' Seismic Design Criteria.

Bluff retreat rates were calculated through analysis of the movement of the 75-foot contour interval over time using historical U.S. Geological Survey (USGS) topographic maps between 1932 and 1965. Measurements were made in ten locations between 16th Street and 18th Street, and were compared with aerial photography. Analysis of aerial photography was used to confirm consistency of bluff retreat rates in recent years with the historical topographic data and also as part of the slope stability assessment. The stability of existing bluff slopes was evaluated, and three bluff cross sections were selected to represent general worst-case conditions (i.e., highest and steepest slope) for analysis. Buoyant conditions representative of soils below groundwater were modeled below an elevation of 0 feet. GMU also performed rotational and traditional surficial stability analyses to evaluate the maximum proposed fill slope.

Geotechnical laboratory testing characterized the soil materials at the Project site. Sieve analyses, Atterberg limits (to characterize fine grained soil characteristics), expansion index, and hydrometer tests were performed to determine soil index properties (please see Appendix B for descriptions of these testing procedures). Consolidation and hydro-collapse tests were performed to evaluate the potential for consolidation, and direct shear tests were performed to develop a strength model to analyze both existing natural slopes and proposed slopes. In addition, chemical testing and compaction testing were performed to further characterize the on-site soil and rock materials.

Data and conclusions from the analyses discussed above were used to determine potential impacts from the Project to and from Project site geology and soils parameters. These impacts were compared against the Thresholds of Significance set forth below in Section 4.3.6 to determine their significance.

4.3.4 EXISTING CONDITIONS

Site Topography

The Project site is comprised of two distinct geomorphic regions. Approximately 254 acres of the 401-acre in the southeast portion of the Project site are located atop the Newport Mesa (referred to herein as the "Upland"), a broad flat-topped mesa situated at an elevation of approximately 50 to 110 feet above mean sea level (msl). The highest elevation is at 105 feet above msl and is located at the eastern-central portion of the Project site. This portion of the Project site was used for agricultural purposes prior to the initiation of oil production activities in the early 1940s. Oil production facilities and associated access roads have topographically altered the surface of this portion of the site. Bluffs[3] subject to surficial slumping and gully

[3] As set forth in the Newport Beach Municipal Code Section 20.70, "bluff" is a "high bank or bold headland that slopes down to a body of water or a plain. A bluff may consist of a gently sloping upper area and a steeper lower area".

erosion represent the western edge of the Upland area and rise approximately 50 to 90 feet above the adjacent Santa Ana River floodplain. This floodplain comprises the northwestern one-third of the Project site. Two major arroyos, the Northern Arroyo and Southern Arroyo (the Southern Arroyo being the largest), have incised into the bluff as a result of surface flows and storm drainage over the bluff edge.

The Lowland area encompasses approximately 147 acres in the northwest portion of the Project site at an average elevation of 1 to 10 feet above msl. This area consists of remnants of the Santa Ana River floodplain and contains channels conveying drainage from surrounding areas at higher elevations to the Santa Ana River through the Semeniuk Slough (also known as Oxbow Loop) (see Exhibit 3-3, Existing Topographic Site Conditions, Section 3.0, Project Description).

Geologic Setting

Seismic Environment, Faulting and Surface Rupture

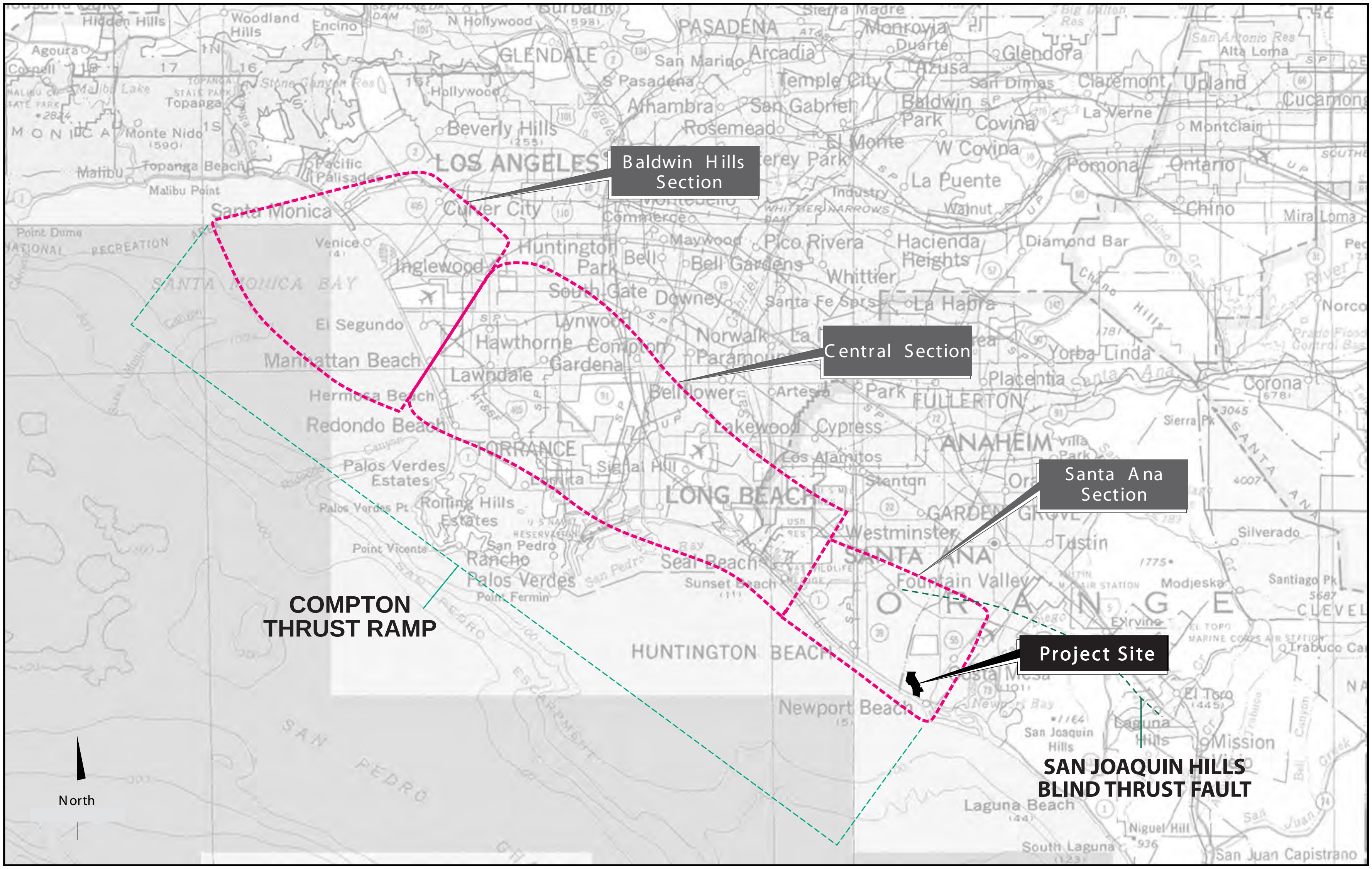
Regional Faulting

Three regional fault systems are within approximately six miles of the Project site: the Compton Thrust Ramp, the Newport-Inglewood Fault Zone, and the San Joaquin Hills Blind Thrust Fault. Exhibit 4.3-1, Regional Fault Map: Compton Thrust Ramp, depicts the Project site in relationship to the Compton Thrust Ramp and the San Joaquin Hills Blind Thrust Fault. Where present, the depth of the Compton Thrust Ramp is believed to be approximately three to six miles below ground surface (GMU 2010). Horizontal offsets in the Compton Thrust Ramp's geologic fold structure imply that the fault can be divided into three segments (the Baldwin Hills, Central, and Santa Ana segments). The Project site may be located above the Santa Ana segment of the Compton Thrust Ramp, but the lateral extent of this segment is poorly constrained. The Compton Thrust Ramp would not pose a risk of surface rupture within the Project site because it is a buried thrust fault. Based on published studies which document the lack of fault deformation in deposits (as old as 15,000-20,000 years), the Compton Thrust Ramp was removed as a seismic source from the 2008 National Seismic Hazards Maps and California Uniform Earthquake Rupture forecast.

The Newport-Inglewood Fault is a northwest-southeast trending feature within ½ mile of the Project site that poses the closest source of active seismic activity for the Project. This fault system enters the region from the Los Angeles basin and passes offshore at Newport Beach. The fault zone runs onshore between Beverly Hills and Newport Bay. South of Newport Bay, the fault zone heads offshore and coincides with submarine faults and the existing submarine canyon located off the end of the Newport Pier. Further offshore, it is believed that the Newport-Inglewood Fault Zone coincides with the Rose Canyon fault, which runs through the City of San Diego.

The Newport-Inglewood Fault Zone can be divided into two segments based upon local characteristics and level of seismic activity. North of Signal Hill, the fault zone orients more to the north. South of Signal Hill, geomorphic expressions[4] of the fault zone can be found in topographic features including Signal Hill (Long Beach), Landing Hill (in Seal Beach), Bolsa Chica Mesa, Huntington Mesa, and Newport Mesa. As shown on Exhibit 4.3-2, Regional Faulting: Newport-Inglewood Fault Zone, the segment of this fault zone south of Signal Hill can

4 Geomorphic expression: Generalized description of deformational features at the surface that are related to the fault or fold, such as the size and shape of scarps, offset streams, sag ponds, grabens, shutter ridges, and faceted spurs (Source: USGS 2009).



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Source: GMU Geotechnical, Inc. 2010

Regional Fault Map: Compton Thrust Ramp

Exhibit 4.3-1

Newport Banning Ranch EIR

BonTerra CONSULTING

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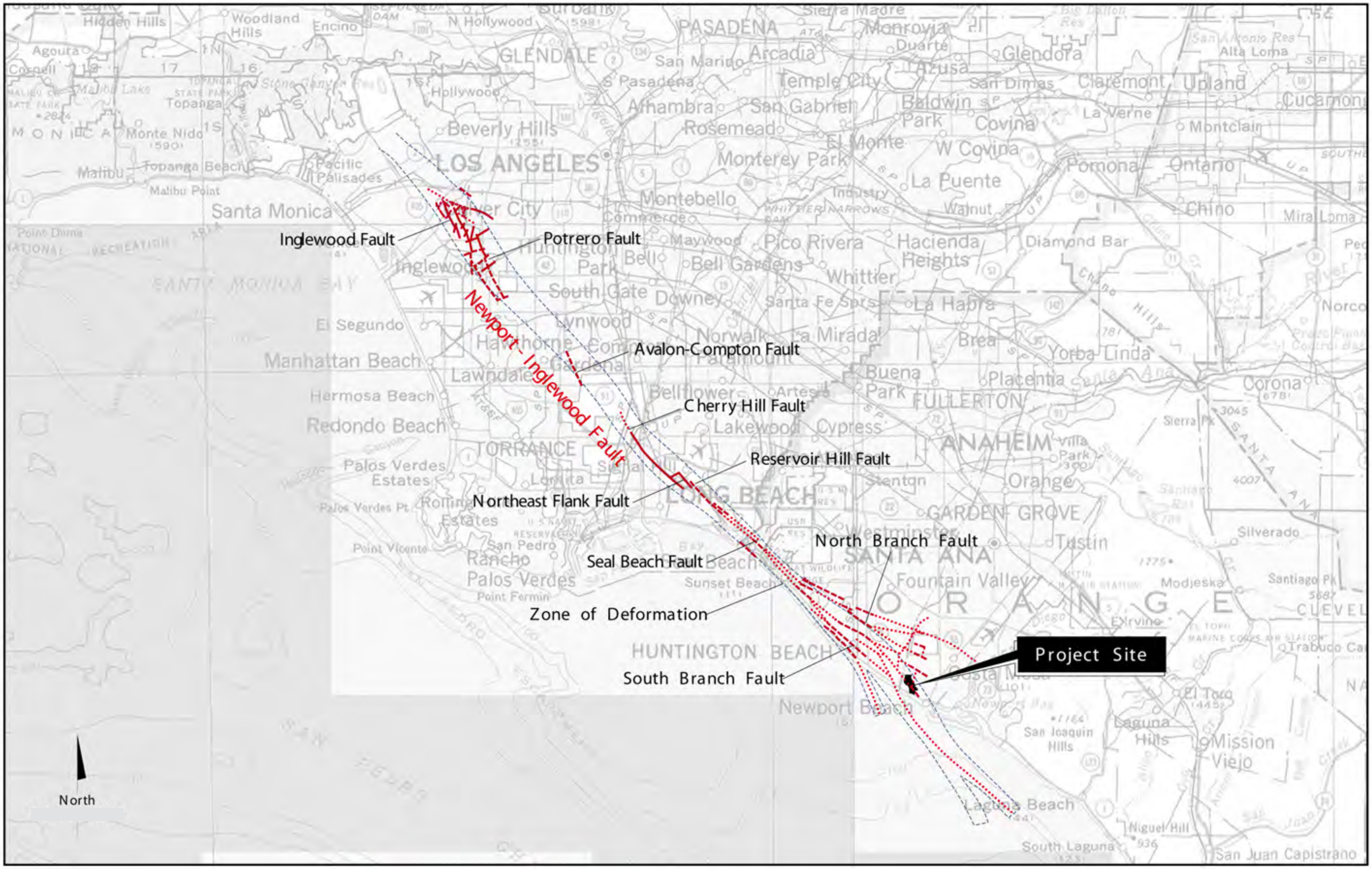

Source: GMU Geotechnical, Inc. 2010

Regional Faulting: Newport-Inglewood Fault Zone

Exhibit 4.3-2

Newport Banning Ranch EIR

BonTerra CONSULTING

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D:/Projects/Newport/J015/Graphics/Ex_NIFZ.ai be further divided into sections, including (from north to south) the Cherry Hill, Northeast Flank, Reservoir Hill, Seal Beach, and North and South Branch Faults. Since 1920, approximately 15 earthquakes greater than or equal to magnitude 4.0 have occurred along this fault zone north of Newport Bay. The 1933 Long Beach earthquake was one of the largest of these events, with a magnitude of 6.9 on the Richter scale. The Project area appears to be within the southern limits of the 1933 aftershock zone.

South of the City of Huntington Beach, the Newport-Inglewood Fault Zone has a northwesterly orientation which diverges into splay faults. Splay faults are smaller faults that branch off the main fault, and constitute zones of seismic activity. Splay faults on the Project site are part of the "North Branch" of the Newport-Inglewood Fault Zone. Evidence of the North Branch splay faults on the Project site have been identified through review of prior investigations and existing literature, as well as GMU's field trenching and subsequent analysis of associated data.

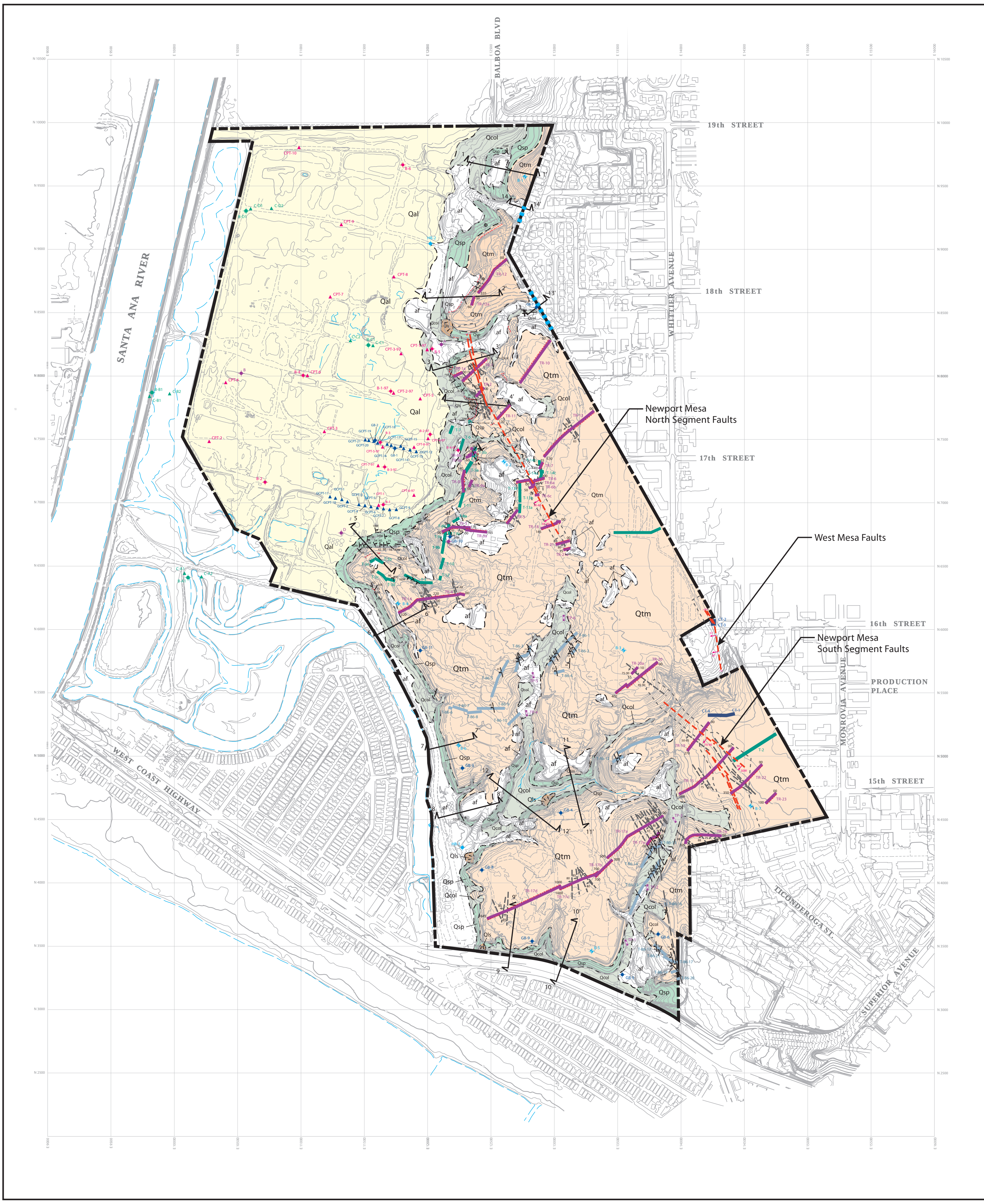
As depicted on Exhibit 4.3-3, Geologic Map, two fault segments associated with the Newport-Inglewood Fault Zone's North Branch—Newport Mesa North Segment and the Newport Mesa South Segment—are generally less than 1,800 feet long and are separated by 1,300 feet of sediments and soils that do not show signs of Holocene fault activity. Within the Project site, the two segments terminate and do not appear to have experienced a high degree of seismicity in recent times (evidenced by infrequent movement and low slip rates). Although they have no obvious geomorphic expression reflected in surface landforms, trench data indicate that portions of these fault segments could not be proved to be inactive (i.e., pre-Holocene) based on California criteria. Therefore, these fault segments are identified as "faults that could not be proven to be inactive" and "Fault Setback Zones" have been established to be conservative (GMU 2010).

Ground Motion

Most of Southern California is subject to ground shaking (ground motion) as a result of movement along active and potentially active fault zones in the region. A probabilistic seismic hazard analysis (PSHA) of horizontal ground shaking was performed to evaluate the likelihood of future earthquake ground motion occurring at the site. The PSHA uses seismic sources and attenuation equations consistent with the 2008 USGS National Seismic Hazard Maps. Table 4.3-1 presents a list of active earthquake faults that are located within 50 miles of the Project site. Because the aforementioned Compton Thrust Ramp was removed as a seismic source from the 2008 National Seismic Hazards Maps and California Uniform Earthquake Rupture Forecast, it is not defined as a seismic source in the PSHA ground motion analysis and not included in Table 4.3-1.

Surficial Deposits, Soils and Stratigraphy

Three basic stratigraphic units are present on the Project site: the San Pedro Formation (Qsp), marine terrace deposits (Qtm), and river alluvium (Qal). The San Pedro Formation, is the oldest geologic unit at the Project site, which constitutes a bedrock unit and is comprised of siltstone and clayey-siltstone that is interbedded with fine to coarse sandstone (Exhibit 4.3-3). Sediments covering the Project site's higher elevations are comprised of a 40- to 50-foot layer of marine terrace deposits with the remnant components of an active tidal zone, which includes rounded cobbles, angular shells with mollusk borings, and shell. These deposits consist of sands that contain lenses of finer (silt to clayey-silt) material.



EXPLANATION

- Qal — Alluvium
- af — Man-Made Fill (Artificial), Where Observed or Inferred to be Greater Than About 2 Feet Thick
- Qcol — Colluvium/Slopewash Deposits
- Qls — Landslide Deposits (Surficial Slump Debris)
- Qtm — Marine Terrace Deposits
- Qsp — San Pedro Formation
- Strike and Dip of Beds
- Horizontal Bedding
- Geologic Contact, Approximately Located, Dotted Where Concealed and Dashed Where Uncertain
- Continuous, Unbroken Pre-Holocene Age Deposits
- Active Fault (Orange), Showing Strike and Dip
- Inactive Fault (Black), Showing Strike and Dip
- Paleo-Channel in Qsp Formation Deposits
- Landslide, Showing Movement Direction
- CPT-10, CPT-4-97 — Leighton & Associates CPT Sounding (1997)
- B-6, B-1-97 — Leighton & Associates Hollow Stem Auger Boring (1997)
- GCPT-1 — Goffman, McCormick & Urban, Inc., CPT Sounding (1998)
- GB-1 — Goffman, McCormick & Urban, Inc., Bucket Auger Boring (1998)
- B-7 — Pacific Soils Engineering Bucket Auger Boring (1993)
- HB-2 — Pacific Soils Engineering Hollow Stem Auger Boring (1993)
- C-B1 — Woodward Clyde Consultants CPT Sounding (1985)
- TR-9 — Fault Trench, by Goffman, McCormick & Urban, Inc., This Study, Showing Station "00"
- T-86-15 — Fault Trench by Earth Technology (1986)
- CT-3 — Fault Trench by Converse Consultants (1994)
- T-3a — Fault Trench By ECI, Inc., for Leighton & Associates, Inc. (1997)
- TP-6 — Test Pits by Goffman, McCormick & Urban, Inc. (1998)
- B-B1 — Woodward Clyde Consultants Hollow Stem Auger Boring (1985)
- D — Groundwater Monitoring Well Installed by GeoSyntec (1994)
- Hilfiker Wall
- Geologic Cross Section Line

Source: GMU Geotechnical, Inc. 2010

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Geologic Map

Exhibit 4.3-3

Newport Banning Ranch EIR

N W E S

BonTerra CONSULTING

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TABLE 4.3-1
FAULT ZONES IN THE VICINITY OF NEWPORT BANNING RANCH[a]

Fault Name	Distance (km/miles)	Seismology Parameters		
		Maximum M_W	Fault Type	Slip Rate (mm/yr)
Newport-Inglewood (Los Angeles Basin)	<1.0/<1.0	7.1	rl-ss	1.0
San Joaquin Hills Blind Thrust	4.6/2.9	6.6	bt	0.5
Newport-Inglewood (Offshore)	5.4/3.6	7.1	rl-ss	1.5
Palos Verdes	19.1/11.9	7.3	rl-ss	3.0
Puente Hills Thrust	33.3/20.7	7.1	bt	0.4
Whittier	33.6/20.9	6.8	rl-ss	2.5
Chino-Central Avenue	37.1/23.1	6.7	rl-r-o	1.0
Elsinore-Glen Ivy	37.6/23.4	6.8	rl-ss	5.0
Coronado Bank	40.5/21.2	7.6	rl-ss	3.0
San Jose	45.6/28.3	6.4	ll-r-o	0.5
Elysian Park Thrust (upper)	50.6/31.4	6.4	r	1.3
Elsinore-Temecula	55.2/34.3	6.8	rl-ss	5.0
Raymond	56.7/35.2	6.5	ll-r-o	1.5
Sierra Madre	56.8/35.3	7.2	r	2.0
Cucamonga	58.3/36.2	6.9	r	5.0
Verdugo	58.7/36.5	6.9	r	0.5
Hollywood	60.2/37.4	6.4	ll-r-o	1.0
Clamshell-Sawpit	60.8/37.8	6.5	r	0.5
Santa Monica	64.8/40.3	6.6	ll-r-o	1.0
Malibu Coast	70.2/43.6	6.7	ll-r-o	0.3
Rose Canyon	74.4/46.2	7.2	rl-ss	1.5
San Jacinto-San Bernardino	76.6/47.6	6.7	rl-ss	12.0
San Jacinto-San Jacinto Valley	78.4/48.7	6.9	rl-ss	12.0
Northridge (East Oak Ridge)	78.8/49.0	7.0	bt	1.5
Sierra Madre (San Fernando)	78.8/49.0	6.7	r	2.0
Anacapa-Dume	79.8/49.6	7.5	r-ll-o	3.0

rl: right-lateral; ll: left-lateral; ss: strike-slip; r: reverse; o: oblique; bt: blind thrust; km: kilometers; M_w: moment magnitude; mm/yr: millimeter(s) per year
[a] CDMG Statewide Fault Database (CDMG OFR 96-08)
Source: GMU 2010.

Thick, dark reddish-brown soils have formed over the marine terrace deposits in the Project site's Upland area. These soils, up to ten feet thick, are fairly old with well developed soil horizons. Thick clay films occur on many horizon surfaces and are overlain by a grayish or bleached zone. These soils are used as markers to identify whether fault movement has occurred within a timeframe that would denote fault activity (i.e., the Holocene period). Given the relatively old age of these soils, a lack of disturbance within these in-situ soil horizons would indicate that a fault is not active.

The Lowland area is comprised of alluvial material (Qal) that has been deposited within recent time (i.e., the Holocene) by Santa Ana River flows and tributary drainages. This alluvial deposit is approximately 100 feet thick and appears to have been deposited above a late Pleistocene channel of the Santa Ana River as a result of prior periodic flooding events. Sediment grain sizes in this area contain gravel, sand, and clay deposits with a coarse to fine gradient toward the surface. Near the base of the bluffs and forming the western edge of the Upland, this alluvial material is interfingered with colluvial material (Qcol) from shallow bluff erosion and slumping. In some areas, these colluvial interbeds consist of fairly thick lenses of material (primarily sandy and silty clays) at the bluff bases and within arroyos and gullies formed as erosional features on the face of the steeper slopes. Pockets of artificial fill (Qaf) have also been identified throughout the Project site, and are largely attributed to construction and oil production facilities (Exhibit 4.3-3).

Seismic Hazard Zones

Seismic Hazard Zones are regulatory zones that encompass areas prone to liquefaction and earthquake-induced landslides. As shown on Exhibit 4.3-4, Seismic Hazard Zones, the CDMG has mapped two seismic hazard zones on the Project site (CDMG 2008); these areas are also identified within the *City of Newport Beach General Plan* (Newport Beach 2006a). The majority of the on-site, west-facing bluff slopes have been identified as zones of required investigation for earthquake-induced landslides; the Lowland area of the Project site has been identified as a zone of required investigation for liquefaction. There are no designated Alquist-Priolo Fault Zones within the Project site.

Seismically Induced Ground Shaking

The Project site is subject to fairly high levels of seismically induced ground motion due to its proximity to the Newport-Inglewood Fault Zone and other significant regional faults. An analysis of horizontal ground shaking (GMU 2010) was performed to quantify the peak ground acceleration (PGA) that could be expected at the Project site. (Please refer to Section 4.3.3 above for an overview of the methodology for this analysis; additional details can be found in the PSHA in the GMU 2010 Report). Assuming a risk level of 10 percent probability of exceedance in 50 years (i.e., approximate 475-year average return period), the analysis indicates that the Peak Horizontal Ground Acceleration (PHGA) is approximately 0.37g.[5] Because the Project proposes a pedestrian and bicycle bridge over West Coast Highway, GMU also conducted a seismic hazard analysis consistent with Caltrans requirements. This analysis indicates a deterministic PHGA of 0.60g. The PHGA values reported above are considered to be relatively high although not uncommon for developments throughout Southern California.

Liquefaction and Lateral Spreading

Liquefaction is the loss of soil strength or stiffness due to a buildup of water pressure between soil particles during severe ground shaking. This condition is associated primarily with loose (low density), saturated, fine- to medium-grained, cohesionless soils that often make up alluvial materials. Lateral spreading is the finite, horizontal movement of material associated with pore pressure build-up or liquefaction. This process can occur in a shallow underlying deposit during an earthquake in areas susceptible to liquefaction. In order to occur, lateral spreading requires the existence of a continuous and laterally unconstrained liquefiable zone.

The *City of Newport Beach General Plan* (Newport Beach 2006a) and the Seismic Hazard Zone Map for the Newport Beach Quadrangle (CDMG 1998) indicate that the entire Lowland area of the Project site is susceptible to liquefaction and associated lateral spreading (Exhibit 4.3-4). Prior testing of the alluvial soils within the Lowland area confirms this potential for liquefaction (GMU 2010). In contrast, most of the soil materials within the Project site's Upland area (i.e., the

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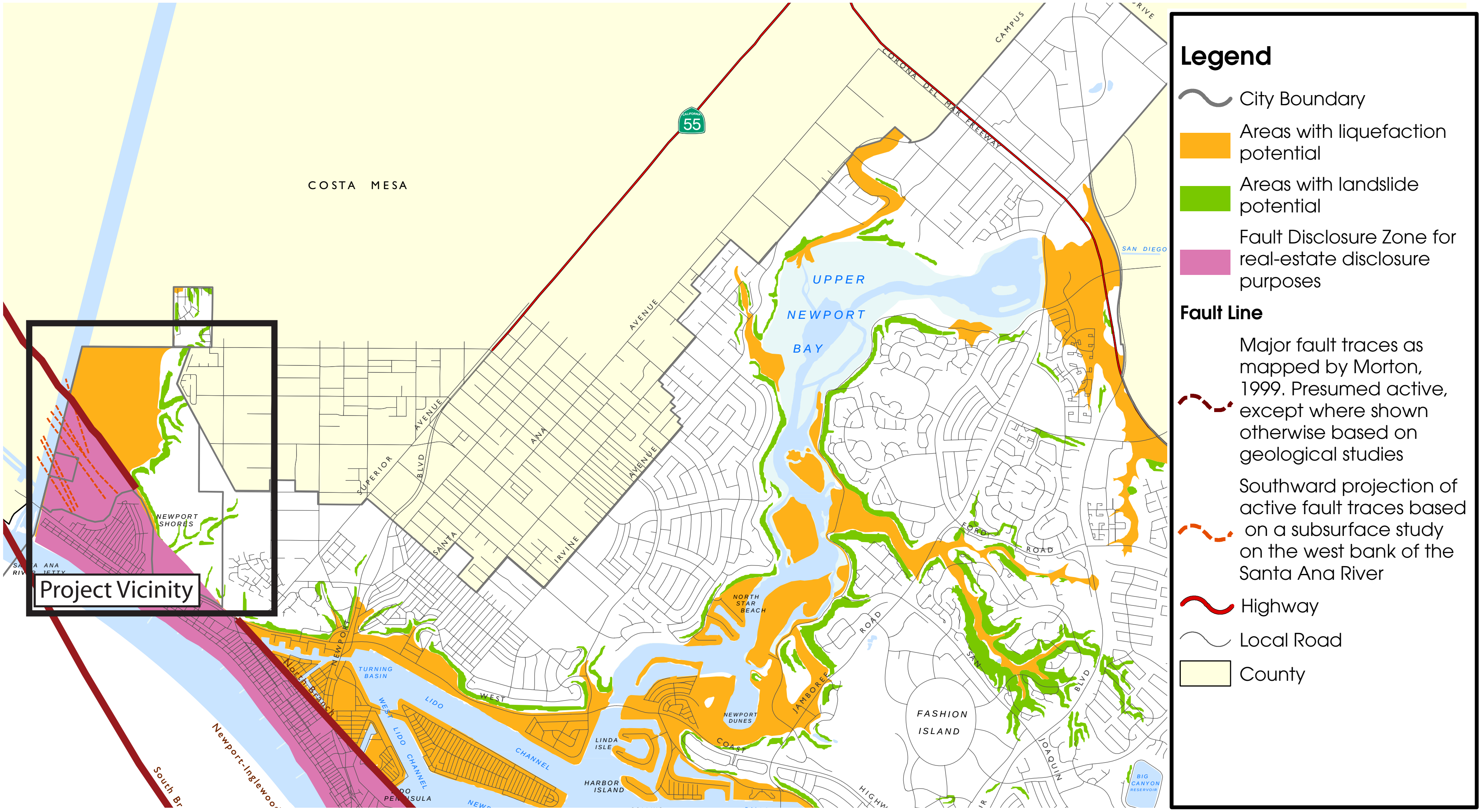
5 Site acceleration during a seismic event is measured as a percent of gravity, or "g". For instance, 0.76g is 76 percent of the force of gravity.



Source: City of Newport Beach 2006

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Seismic Hazard Zones

Exhibit 4.3-4

Newport Banning Ranch EIR

BonTerra CONSULTING

(REV: 072911 sje) R:/Projects/Newport/J015/Graphics/EIR/ex4.3-4_seismic.pdf area proposed for development) are the San Pedro Formation and overlying terrace deposits. These soils are either too dense or too far above the water table for liquefaction and lateral spreading to occur. There are pockets of colluvial and artificial fill deposits in the Upland on the top of the bluff within the development area which could be subject to liquefaction if they become saturated (Exhibit 4.3-3). However, these areas are so far above the groundwater table they are not anticipated to reach saturation. As identified in the GMU 2010 Report, colluvium and artificial fill would be removed by corrective grading below development areas.

Subsidence

Subsidence is a lowering or settlement of the ground surface through collapse of subsurface void space. This condition can occur in areas where oil or groundwater has moved out of an area and has created a void space unable to sustain the materials above it or in areas where subsurface materials are dissolved, leaving little or no support for surface soils or features. Subsidence can be a dangerous condition for structures and facilities if not accounted for in project planning and design. There are and have historically been active oil operations on the Project site; subsidence has been known to occur in oilfields as the space occupied by the oil deposit collapses as the oil is removed. As noted by GMU, the most recent technical study for subsidence at or near the Project site was completed by Woodward Clyde in 1985. The study concluded that ground subsidence from oilfield operations in the West Newport Oilfield has not occurred (GMU 2010). The conclusions of the Woodward Clyde technical study were consistent with the results of field investigations performed by GMU which did not indicate any evidence of subsidence.

Compressible and Collapsible Soils

Alluvial deposits in the Lowland area contain 1-foot-thick to 5-foot-thick zones of highly compressible materials in the upper 15 feet of the soil. These materials would undergo significant settlement upon loading and would require an extended period of time to reach a stable condition. It should be noted that the Project proposes only open space, trails, and habitat restoration within the Lowland area.

The terrace deposits within the Upland area contain an upper soil zone that ranges from a few feet thick to over ten feet thick. Based on consolidation testing, these materials are considered to be low to moderately compressible. Artificial fills anywhere on the Project site range from stockpile fills to unengineered fills that are considered highly compressible. Standard corrective grading practices include ensuring that the geotechnical engineer of record oversee grading operations and perform additional field testing and observations on site during grading in order to provide direction on removal and recompaction of compressible materials discovered during grading.

Colluvial soils present at the base of the Upland slopes, in ravines, and in arroyos are a combination of slope wash and talus[6] deposits, generally identified as soft and porous when encountered during field trenching. These colluvial soils are considered moderately to highly compressible and would be removed and recompacted underneath development areas during grading.

Collapsible soils are defined as soils that undergo a significant reduction in volume when inundated with water. This process is commonly referred to as "hydro-collapse". Alluvial sediments in the Lowland area are not susceptible to hydro-collapse due to the high water table

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6 A sloping mass of rocky fragments at the base of a cliff or slope; a slope.

under these sediments and the fact that the sediments have been flooded or under water numerous times in recent geologic history. This level of saturation does not result in residual capacity for additional hydro-collapse. Based on geotechnical laboratory testing (GMU 2010), the marine terrace deposits and underlying San Pedro Formation sediments in the Upland area generally have a low potential for hydro-collapse; however, certain pockets may be locally porous and require corrective grading when encountered. As described above, a geotechnical engineer of record would be on site during grading operations to visually identify and test these materials and to provide required supplemental corrective grading measures (i.e., local deeper removals).

Bluff Slope Stability

Bluffs comprising the western and southern edge of the Upland area have been historically subject to bluff retreat from Santa Ana River flooding, coastal wave erosion, surface flow, and oil production activities. In recent decades, the most significant factors affecting bluff retreat are surficial weathering, erosion, and oil production activities. These bluffs generally have slopes of 30 to 40 degrees with locally flatter and steeper sections and show signs of erosive weathering in the form of gullies and arroyos. Slopes that descend into the 2 primary arroyos on site are relatively flatter than the outer bluff slope faces and average about 20 degrees in steepness. Evidence of shallow slumping has been encountered in the sediments overlying the San Pedro Formation. These slope failures have been attributed to surface runoff, erosion, and possibly previous seismic events (GMU 2010). There was no evidence found of large, deep-seated landslides or slope failures on the Project site.

An analysis of bluff stability at the Project site indicates that significant causal factors for historic bluff erosion include (1) Santa Ana River flooding; (2) direct wave action; (3) slope failure; (4) rainfall and channel development on the mesa; and (5) oilfield activities (i.e., earthwork for oilfield facility construction and consequent concentration of storm water runoff over the bluff face). However, since the 1940s, improvements along the Santa Ana River system have removed Santa Ana River flooding as a factor in future bluff alteration. Earthwork for oil facility construction increased bluff slope retreat rates by physically modifying the terrain and locally increasing runoff and associated erosion. Oilfield activities, shallow slumping along the bluff faces, and rainfall and channel development on the mesa have become the primary factors in bluff erosion in recent years; of these three factors, oilfield activities have probably had the greatest effect.

Consequently, although average historical bluff retreat rates have been calculated at 2 feet per year with a potential annual variation of between 0.6 and 4.2 feet, future bluff retreat is not likely to continue at the same average rate. These historic bluff retreat rates are statistically skewed by the effects of the flood of 1938 (which caused greater bluff retreat) and grading activities on the Upland associated with oil production facilities. Completion of off-site flood-control improvements along the Santa Ana River has removed the potential for riverine erosion of the bluffs by the Santa Ana River.

Global climate change and sea level rise have become considerations in project design throughout the State of California, potentially influencing future Project performance as well as Project effects. The range of global climate change and sea level rise scenarios constitute predictions based on current understanding of the underlying causal processes at work; therefore, there is a degree of uncertainty in how the future scenarios would unfold. In May 2009, the California Climate Change Center (CCCC), with funding from three California State agencies, published a paper entitled "*The Impacts of Sea-level rise on the California Coast".* This study proposes a worst-case prediction of sea level rise along the California coast of

55 inches, or 4.6 feet, by 2100 (CCCC 2009b). This potential scenario is similar to other studies regarding sea level rise along the California coast (Fuscoe 2010b).

Global climate change and sea level rise could potentially result in flood flows backing up into the Lowland under severe flood events. Sea level rise could increase the potential for high flood water depths in the Semeniuk Slough to occur against the toe of the existing bluffs bordering the development areas. Sea level rise is not expected to result in direct wave attack on the bluff faces and associated coastal bluff erosion; this issue is address later in the impacts analysis.

Groundwater

Shallow groundwater levels (less than 50 feet below the ground surface [bgs]) are known to occur along the coast, around Newport Bay, and along the major drainages in the Newport Beach area; these levels are achieved from percolation of Santa Ana River flow, infiltration of precipitation, and injection into wells. There are no designated groundwater recharge areas in the City (Newport Beach 2006b). Field monitoring well and exploratory boring data collected between 1985 and 1998 indicate that groundwater elevation is generally at mean sea level in the Lowland and Upland areas. Perched groundwater above mean sea level may exist sporadically within the Upland. Although groundwater flow direction is to the west in the northern portion of the Project site, no evidence of seepage through the bluff face was observed in 1998 field investigations (GMU 2010). Groundwater flow direction close to the Santa Ana River beneath the Lowland is generally to the south and parallel to the river.

Mineral Resources

Oil drilling in Newport Beach began as early as 1904 when oil production became the primary mineral extraction activity in and around the City. Two separate production and reserve areas exist within the City's Sphere of Influence: (1) the Newport Oilfield, which lies under the Pacific Ocean but has land-based tanks and extraction pumps just outside the municipal boundary in West Newport and (2) the West Newport Oilfield, which is located in the Newport Banning Ranch area. The majority of the Project site has been developed for oil operations and is currently in active oil production (see Exhibit 3-4, Oil Operations, in Section 3.0, Project Description).

The Project site contains 489 oil well sites and related oil facility infrastructure, including but not limited to pipelines, storage tanks, power poles, machinery, improved and unimproved roadways, buildings, and oil processing facilities. Of the approximately 489 oil well sites, the City operates 16 wells and an oil processing facility near the southwestern boundary of the Project site, as accessed from West Coast Highway near the southwest corner of the Project site. Private access to the oil operations undertaken by West Newport Oil Company[7] is at West Coast Highway and at the terminus of 17th Street at the easterly boundary of the Project site.

4.3.5 PROJECT DESIGN FEATURES AND STANDARD CONDITIONS

Project Design Features

PDF 4.3-1 Habitable structures will be set back a minimum of 60 feet from the tops of bluff edges, as required in the Master Development Plan and the Newport Banning Ranch Planned Community Development Plan, and will not be constructed within identified fault setback zones.

7 West Newport Oil Company and the mineral resources are wholly owned by Horizontal Drilling LLC, an entity separate and independent of the surface owners.

PDF 4.3-2 The Master Development Plan identifies drainage devices to be constructed along slopes adjacent to the development edge to eliminate existing surface flow over bluffs to the extent feasible. Landscape and irrigation plans will be designed to minimize irrigation near natural areas/slopes through the use of drought-tolerant vegetation and low-flow irrigation.

PDF 4.3-3 The Master Development Plan includes a Bluff/Slope Restoration Plan that requires eroded portions of bluff slopes to be repaired and stabilized. In order to stabilize slopes and help avoid erosion, bluff areas devoid of vegetation after repair and stabilization efforts will be planted with native vegetation that does not require permanent irrigation.

Standard Conditions and Requirements

SC 4.3-1 Prior to the issuance of any grading permits, the City of Newport Beach Community Development Department, Building Division Manager or his/her designee shall review the grading plan for conformance with the grading shown on the approved tentative map. The grading plans shall be accompanied by geological and soils engineering reports and shall incorporate all information as required by the City. Grading plans shall indicate all areas of grading, including remedial grading, and shall extend to the limits outside of the boundaries of an immediate area of development as required by the City. Grading shall be permitted within all Land Use Districts and outside of an area of immediate development, as approved by the City, for the grading of public roads, highways, park facilities, infrastructure, and other development-related improvements. Remedial grading for development shall be permitted in all Land Use Districts and outside of an immediate development area, as approved by the City, to adequately address geotechnical or soils conditions. Grading plans shall provide for temporary erosion control on all graded sites scheduled to remain unimproved for more than 30 days. If the Applicant submits a grading plan that deviates from the grading shown on the approved tentative map (specifically with regard to slope heights, slope ratios, pad elevations or configurations), as determined by the Building Manager, s/he shall review the plan for a finding of substantial conformance. If the Building Manager finds the plan not to be in substantial conformance, the Applicant shall process a revised tentative map or, if a final map has been recorded, the Applicant shall process a new tentative map. A determination of CEQA compliance shall also be required.

SC 4.3-2 Prior to the recordation of a subdivision map or prior to the issuance of any grading permit, whichever comes first, and if determined necessary by the City of Newport Beach Community Development Department, Building Division Manager, the Applicant shall record a Letter of Consent from any affected property owners permitting off-site grading, cross lot drainage, drainage diversions, and/or unnatural concentrations. This process will ensure that construction activities requiring encroachment permits or having temporary effects on adjacent parcels are properly noticed and coordinated.

4.3.6 THRESHOLDS OF SIGNIFICANCE

The following significance criteria are from the City of Newport Beach Environmental Checklist. The Project would result in a significant impact related to geology and soils if it would:

Threshold 4.3-1 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death from 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.

Threshold 4.3-2 Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking.

Threshold 4.3-3 Expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death from seismic-related ground failure, including liquefaction.

Threshold 4.3-4 Expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death from landslides.

Threshold 4.3-5 Result in substantial soil erosion or the loss of topsoil.

Threshold 4.3-6 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.

Threshold 4.3-7 Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property.

Threshold 4.3-8 Conflict with any applicable plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect.

As previously discussed in Section 1.6.1, Effects Found Not to be Significant, the City has determined that the proposed Project would not have a significant impact for the following thresholds because the Project would not use septic systems or alternative waste water disposal systems.

- Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water.

4.3.7 ENVIRONMENTAL IMPACTS

Threshold 4.3-1 ***Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death from 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?

Threshold 4.3-2 ***Would the project expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving strong seismic ground shaking?***

The Project site is not located within an Alquist-Priolo Earthquake Fault Zone (Exhibit 4.3-1). The site encompasses a portion of the North Branch of the Newport-Inglewood Fault zone. Within this fault zone, local faults generally trend to the northwest, dip steeply to the southwest, and displace San Pedro Formation materials. However, many of these faults do not displace the thick soils in the Upland area, which indicates inactivity during the Holocene (recent) period at a minimum.

The CGS and the USGS have placed the City in an area designated to have a moderate to high potential for ground shaking associated with regional earthquake activity (CGS and USGS 2008). A site-specific analysis of the Project site's potential to experience significant seismic ground motion was conducted and concludes that, although the Project site is not located within a designated Alquist-Priolo Earthquake Fault Zone, strong ground shaking due to regional seismic activity is anticipated.

The *City of Newport Beach General Plan* indicates that, in 50 years, the Newport Beach area has a 10 percent chance of experiencing ground acceleration in the high to very high range for Southern California. These levels of shaking can be expected to cause damage particularly to older and poorly constructed buildings (Newport Beach 2006b). All existing on-site buildings would be demolished as a part of the Project. Seismic design of on-site structures (excluding bridges) would be in accordance with the 2007 California Building Code (CBC) criteria. Seismic design of the proposed pedestrian and bicycle bridge would be in accordance with Caltrans standards. The CBC provides minimum standards for building design in California. Chapter 16 of the California Building Code deals with General Design Requirements, including (but not limited to) regulations governing seismically resistant construction (Chapter 16, Division IV) and construction to protect people and property from hazards associated with excavation cave-ins and falling debris or construction materials. Chapters 18 and A33 deal with site demolition, excavations, foundations, retaining walls, and grading, including but not limited to requirements for seismically resistant design, foundation investigations, stable cut and fill slopes, and drainage- and erosion-control measures. All Project development would be required to comply with these design standards. To accommodate the effects from seismic shaking, all on-site Project structures would be required to comply with the seismic design standards contained within the California Building Code as adopted by the City. Policies contained in the City's General Plan would ensure that adverse effects caused by seismic and geologic hazards (such as strong seismic ground shaking) are minimized through Project consistency with General Plan policies. In addition, a rationally designed stiffened slab (such as a post-tensioned slab) would be required (GMU 2010). This would serve to structurally tie the foundation system together forcing it to act more monolithically during a seismic event. The comprehensive geotechnical investigation conducted for the proposed Project as a part of this EIR adequately addresses the potential impacts and recommends mitigation to mitigate risks associated with seismic hazards. Mitigation Measure (MM) 4.3-1 requires a design-level geotechnical investigation based on the approved development plan to determine specific geotechnical measure to ensure compliance with building and seismic State and local requirements.

There are two discrete segments of the Newport-Inglewood Fault Zone North Branch (the Newport Mesa North Segment and the Newport Mesa South Segment) potentially within the

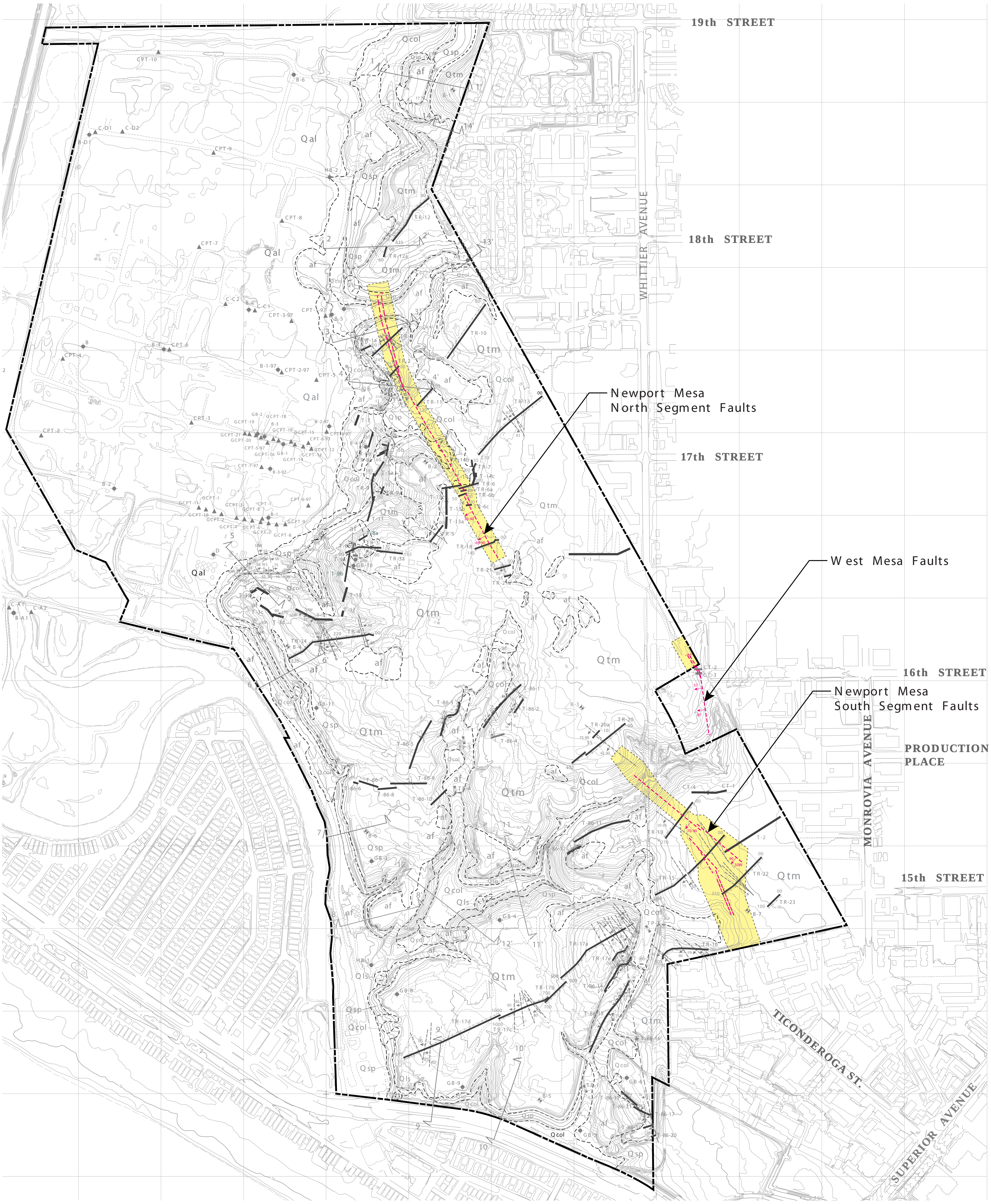
Project site. Portions of these fault segments were not conclusively shown to have Holocene surface rupture, and therefore are not demonstrably "active". However, some faults could not be proven to be pre-Holocene (i.e., "inactive") due to uncertainty in dating the latest fault rupture events. Using a conservative assumption, the faults that could not conclusively be shown to be pre-Holocene (i.e., "inactive") and which exhibited evidence for disturbance of more recent soils were treated as "active". More appropriately, these faults are classified as "faults that could not be proved to be inactive"; therefore, Fault Setback Zones were established. Fault and bluff setbacks have been incorporated into the Project as a Project Design Feature (PDF) to accommodate seismic site features and mitigate the potential for any slope instability impacting proposed structures. Bluff setbacks are in excess of those required by the California Building Code. These setbacks are reflected in the Project development assumptions (see PDF 4.3-1) and the grading plan (see Exhibit 3-20, Soil Disturbance Map, in Section 3.0, Project Description).

As depicted in Exhibit 4.3-5, Fault Setback Zones, the Project assumes the extension of conservative fault setback zones off the ends of each fault segment, where fault projection is uncertain. These setback zones would assure no potentially significant impact to proposed Project development from surface fault rupture. If the Applicant proposes to modify or reduce these setbacks, Mitigation Measure (MM) 4.3-2 requires that additional trenching occur in the 1,300-foot-long gap area between the 2 fault setback zones to provide additional data on fault activity and the risk of surface rupture. Therefore, these setback zones may be altered, reduced, or increased once the additional trenching data become available as a part of more detailed development plans for the proposed Project. Additional trenching data and incorporation of updated fault setback zones would refine setback limits in compliance with existing State standards.

Extensive fault trenching has already been performed at the Project site providing technical support for development of the fault setback zones incorporated into Project design. Existing trench data suggests that surface faulting is not present in the gap area between the fault setback zones, but additional fault trenching would be performed as a conservative precaution if final development plans include structures in the gap area between the two proposed fault setback zones. Since conservative setback distances have been incorporated into the proposed Project, Project impacts from the risk of surface rupture would be less than significant.

State laws and local ordinances require that, prior to construction, potential seismic hazards be identified and mitigated, as needed, to protect public health and safety from substantial risks through appropriate engineering practices. Compliance with PDF 4.3-1, SCs 4.3-1 and 4.3-2, and MMs 4.3-1 through 4.3-3 would ensure that impacts related to strong seismic ground shaking remain at a less than significant level. PDF 4.3-1 identifies that habitable structures on the Project site would be set back a minimum of 60 feet from the top of bluff edges. SC 4.3-1 identifies that the issuance of grading permits is subject to approval of geological and soils engineering reports. SC 4.3-2 provides directive if off-site grading or infrastructure connections are required. MMs 4.3-2 and 4.3-3 require additional trenching in the Upland prior to preparation of final site plans to determine if the identified fault setback zone must be modified. Supplemental geotechnical analysis would be prepared as necessary.

Impact Summary: ***Less Than Significant With Mitigation.*** The Project site is in a seismically active area with faults within the proposed development that could not be proven to be inactive. Habitable structures on the Project site near these faults are subject to fault setback zones and seismic design parameters that would appropriately address seismic building standards. Impacts associated with surface fault rupture and seismic shaking would



EXPLANATION

- Strike and Dip of Beds
- Horizontal Bedding
- Geologic Contact, Approximately Located, Dotted Where Concealed and Dashed Where Uncertain
- Continuous, Unbroken Pre-Holocene Age Deposits
- Active Fault (Red), Showing Strike and Dip
- Inactive Fault (Black), Showing Strike and Dip
- Paleo-Channel in Qsp Formation Deposits
- Landslide, Showing Movement Direction
- CPT-10, CPT-4-97 — Leighton & Associates CPT Sounding (1997)
- B-6, B-1-97 — Leighton & Associates Hollow Stem Auger Boring (1997)
- GCPT-1 — Goffman, McCormick & Urban, Inc., CPT Sounding (1998)
- GB-1 — Goffman, McCormick & Urban, Inc., Bucket Auger Boring (1998)
- B-7 — Pacific Soils Engineering Bucket Auger Boring (1993)
- HB-2 — Pacific Soils Engineering Hollow Stem Auger Boring (1993)
- C-B1 — Woodward Clyde Consultants CPT Sounding (1985)
- TR-9 — Fault Trench, by Goffman, McCormick & Urban, Inc., This Study, Showing Station "00"
- T-86-15 — Fault Trench by Earth Technology (1986)
- CT-3 — Fault Trench by Converse Consultants (1994)
- T-3a — Fault Trench By ECI, Inc., for Leighton & Associates, Inc. (1997)
- TP-6 — Test Pits by Goffman, McCormick & Urban, Inc. (1998)
- B-B1 — Woodward Clyde Consultants Hollow Stem Auger Boring (1985)
- D — Groundwater Monitoring Well Installed by GeoSyntec (1994)
- Hilfiker Wall
- A' — Geologic Cross Section Line

Source: City of Newport Beach 2006

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Fault Setback Zones

Exhibit 4.3-5

Newport Banning Ranch EIR

N W E S

BonTerra CONSULTING

(REV: 072911 sje) R:/Projects/Newport/J015/Graphics/EIR/Ex4.3-5_FSZ.pdf be mitigated to a level considered less than significant with the incorporation of fault setback zones (which may be refined after additional trenching data becomes available) and with the implementation of PDF 4.3-1, SCs 4.3-1 and 4.3-2, and MMs 4.3-1 through 4.3-3.

Threshold 4.3-3 ***Would the project expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death from seismic-related ground failure, including liquefaction?***

Threshold 4.3-4 ***Would the project expose people or structures to potential substantial adverse effects including the risk of loss, injury, or death from landslides?***

Threshold 4.3-6 ***Would the project 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?***

Proposed Grading Overview

Grading is required for several purposes: mass grading; bluff restoration; remediated soil disposition; and open space grading. Mass grading is the over-excavation and cut and fill associated with the land development plan (see Exhibit 3-20, Soil Disturbance Map, and Exhibit 3-21, Cut and Fill Map, in Section 3.0, Project Description). For the proposed Project, mass grading is considered to be within the development envelope and includes the parks, roads, and development lots. Mass grading also includes the over-excavation and recompaction of soils, as required. Buff restoration is needed along portions of the south- and west-facing bluffs to restore areas impacted by oil operations, uncontrolled drainage and erosion, and soil degradation. These areas would require grading in order to restore and revegetate the bluff/slope edge and to limit further degradation; these areas are assumed within the limits of grading/soil disturbance for the proposed Project. As part of the oil well consolidation process, the existing oil wells within development and habitat restoration areas would be abandoned or reabandoned and remediated. Hydrocarbon-laden soils would be treated, tested, and placed in deep fills or outside the proposed development areas. Grading would also be required in the open space to establish trail grades; prepare habitat mitigation areas; implement bluff restoration; and allow for public access, maintenance access, and water quality basin creation areas. Proposed grading in the open space areas would be conducted in a manner that would minimize impacts to open space resources. For example, to the extent feasible, the multi-use trails would be located over existing oil roads. In areas where habitat mitigation or restoration is proposed, minor grading to repair localized erosion features or compact loose soil is anticipated. It is expected that this work effort would be done by hand or with small equipment.

As conceptually proposed, grading activities would occur subsequent to remediation of the Project site and is proposed to occur in stages (see Table 3-3, Proposed Implementation Plan, in Section 3.0, Project Description). The first stage of grading is anticipated to take approximately nine months; the second is anticipated to take an additional nine months. Grading may extend into the development area associated with subsequent development to achieve an overall earthwork balance.

Table 4.3-2 summarizes the earthwork quantities for the proposed Project. Total excavation on the site is estimated to total approximately 2,500,000 cubic yards (cy) including approximately 900,000 cy of cut and fill and 1,455,000 cy of cut and fill corrective grading. To the extent feasible, all grading would be balanced on site. However, an estimated 25,000 cy of export is assumed for removing remediated materials that are not suitable for retention on site.

TABLE 4.3-2
EARTHWORK QUANTITIES

Activity	Cut (cy)	Fill (cy)
Mass Excavation	900,000	833,500
Corrective Grading	1,455,100	1,455,100
Lowland Remediation/ Recycled Soil	156,000	156,000
Subtotal Grading	2,511,100	2,444,600
Mass Grading Shrinkage (4%)	(36,000)	n/a
Corrective Grading Shrinkage	(64,500)	n/a
Lowland Remediation/ Recycled Soil Shrinkage (4%)	(6,000)	n/a
Subtotal Shrinkage	(106,500)	0
Subtotal (grading and shrinkage)	2,404,600	2,444,600
Import from Sunset Ridge Park Site	40,000	0
Total	**2,444,600**	**2,444,600**[a]

cy: cubic yards
[a] Total excavation is 2,511,100 cy.
Source: Fuscoe Engineering 2009.

Cuts are anticipated to vary from 1 foot to 10 feet with localized cuts up to approximately 25 feet. Fills are anticipated to vary between 1 foot and 30 feet but may be up to 60 feet associated with bluff repairs with gradients between 2:1 and 3:1. The larger fills would be placed in selected arroyos where the bluffs would undergo repair and restoration from erosion damage.

Corrective/remedial grading is expected to be from 3 feet to 30 feet below the proposed landform elevations. Oil consolidation and remediation operations would produce bio-remediated soils, asphalt-like materials, and concrete from abandoned oil production facilities; these materials would likely be used in deep fills (fills ten feet or greater from finished grade) or placed outside of the residential and commercial building areas. The primary location for placement of the treated soil would be in the deeper over-excavation portions of the northern development area.

Liquefaction/Lateral Spreading

On-site soils subject to liquefaction and lateral spreading are located in the Lowland (Exhibit 4.3-5). As identified by GMU, site investigations and analysis by Leighton & Associates in 1997 concluded that local soils in the Lowland area were subject to liquefaction and seismic settlement of one to six inches (GMU 2010). No habitable structures are proposed as a part of the Project in the Lowland; this area is proposed for open space, trails, and oil facilities and their associated infrastructure. Residential, commercial, active recreation, and resort inn uses would only occur in the Upland area.

Soils in the Upland, except for existing colluvial deposits when subjected to saturated conditions, are too dense, cemented, or too far above the water table for liquefaction and lateral spreading to occur. Colluvial materials would be removed down to competent San Pedro Formation or terrace deposits. These corrective grading practices would result in replacement of unsuitable materials with suitable engineered fill materials over San Pedro Formation or terrace deposits. The resulting configuration (i.e., engineered fill over San Pedro Formation or terrace deposits) would not be subject to liquefaction. An assessment of hazards related to landslides and liquefaction and the incorporation of PDFs to mitigate this hazard has been completed consistent with the standards set forth in the California Building Code and the CGS Special Publication 117. There are no known geologic conditions on the Project site that would render the required design features infeasible. The City has also included policies in its Safety Element to achieve the goal of minimizing the risk of injury, loss of life, and property damage caused by earthquake hazards or geologic disturbances. Policies S 4.1 through S 4.6 require new development to be in compliance with the most recent seismic and other geologic hazard safety standards, and help protect community health and safety through the implementation of effective, state-of-the-art standards for seismic design of structures. Therefore, the risk associated with seismic-related ground failure and associated liquefaction, lateral spreading, or subsidence is less than significant.

Subsidence

GMU (2010) performed geotechnical field investigations and observations at the Project site that concluded the site conditions relative to subsidence history and potential are consistent with those cited in a prior investigation by Woodward Clyde in 1985. These field investigations and the Woodward Clyde report concluded that significant ground subsidence from oilfield operations has not occurred (GMU 2010). There is no surficial evidence of subsidence on the Project site, and there have been no reports of subsidence-related impacts on oil production facilities. Accordingly, subsidence is not considered a significant risk to or from Project implementation and impacts from subsidence are considered less than significant.

Collapsible/Compressible Soils

Some materials within the area proposed for development on the Project site have the potential for compression and hydro-collapse. Hydro-collapse is the condition under which soils undergo a significant reduction in volume following inundation with water. For development proposed for the Upland area (i.e., residential, commercial, active recreational, mixed-use, and resort inn uses), corrective grading would remove and recompact at least the upper three to five feet of the soil horizon as well as any locally compressible and/or porous zones within the terrace deposits. These actions would provide uniform bearing conditions for proposed structures and would offset the effects of collapsible and compressible soils. Locally, deeper removal zones would extend to depths of five to ten feet, if necessary. Surface drainage and subdrains below bioswales would reduce the amount of surface flow infiltration into on-site soils further reducing any hydro-collapse potential. Colluvial soils have a low to moderate potential for hydro-collapse. Standard corrective grading practices and excavation of these colluvial soils down to competent terrace deposits or San Pedro Formation material would result in no significant impacts to the Project from these soils. In addition, the cut portion of proposed lots or building pads that occurs across cut and fill transitions would be over-excavated to provide a more uniform bearing condition.

The alluvial materials in the Lowland contain highly compressible material in the uppermost one to five feet of soil. As previously indicated, the proposed Project does not include structural development within the Lowland area where recent alluvial deposits susceptible to compression are most common.

Impacts from the Project relative to on- or off-site landslides are less than significant with the incorporation of the PDF 4.3-1, SCs 4.3-1 and 4.3-2 described in the Mitigation Program. In addition, MMs 4.3-1 through 4.3-3 would ensure that impacts related to strong seismic ground shaking remain at a less than significant level.

Impact Summary: ***Less Than Significant With Mitigation.*** Two fault segments on the Project site have not been confirmed as inactive, and development setbacks have incorporated into the Project (PDF 4.3-1). The fault setback zones would reduce the risk of surface fault rupture. Based on the GMU 2010 Report, strengthened building foundations and structural design would accommodate strong seismic shaking on the Project site, and habitable structures would be restricted to the Upland area, avoiding soils that may liquefy or undergo lateral spreading. The *City of Newport Beach General Plan* and the CDMG (1998) indicate that there is some existing on-site potential for landslides under dynamic seismic conditions. Where necessary, corrective grading would ensure all structures are placed on competent foundation materials. With the incorporation of PDF 4.3-1, SCs 4.3-1 and 4.4-2, and MMs 4.3-1 through 4.4-3, impacts from seismic-related ground failure, liquefaction, lateral spreading, soil collapse, and landslides would be less than significant.

Threshold 4.3-5 ***Would the project result in substantial soil erosion or the loss of topsoil?***

Due to the highly erosive nature of both the on-site soil materials and bluff slopes, surface drainage elements would be incorporated into the Project to prevent ponding adjacent to, and runoff onto, any graded or natural slopes. Areas within the bluff slope setback zone would contain drainage devices to minimize the surface flow over the bluff slopes. In addition, surface drainage and bluff slope erosion-control plans would be developed in areas where bluff slopes are to remain natural. Construction best management practices (BMPs) described in Section 4.4, Hydrology and Water Quality, would ensure that construction-related impacts on soil erosion would be less than significant, and post-Project operation and occupancy would not generate surface flows that result in loss of topsoil or induce erosion. Impacts from the Project on soil erosion and loss of topsoil would be less than significant. PDFs 4.3-2 and 4.3-3 as well as the construction BMPs as described in Section 4.4, Hydrology and Water Quality, are applicable. PDF 4.3-2 requires drainage devices to be constructed to preclude surface flows over bluffs. PDF 4.3-3 requires eroded bluff slopes to be repaired and stabilized.

Natural bluff areas bordering the western edge of the Upland would remain a prominent geomorphic feature of the site upon Project implementation. As demonstrated by analysis of historical bluff retreat rates and topographic changes, erosion of the bluff face by surface runoff and local drainage has resulted in shallow erosion, slumping, and localized surficial bluff instability. Future bluff retreat rates would be expected to be lower than historic bluff retreat rates since removing oil production activities in the Upland would reduce runoff rates over the bluffs. Project drainage improvements discussed in Section 4.4, Hydrology and Water Quality, would also serve to reduce surface runoff over the bluffs and resulting bluff face erosion; however, surface runoff from precipitation and nuisance flows would not cease entirely. The Project would also implement subdrain systems to capture infiltrated water and direct it away from the bluff faces on the Project site, thereby reducing the risk of bluff instability related to post-development groundwater.

Deep seated bluff stability analyses indicate that the existing bluff slopes meet City requirements for stability under static and seismic conditions.[8] The results under static conditions indicate that the slopes in their current condition possess safety factors in excess of 1.5 (i.e., acceptable) for deep seated rotational stability. Under pseudo-static conditions, the slopes possess safety factors in excess of 1.1 (i.e., acceptable). Additional seismic analyses also show that the level of ground shaking corresponding to a site PGA as determined by a site-specific PSHA for both 475 and 975 year earthquake return periods would not exceed the level at which significant bluff failure would occur. Consequently, the potential for major slope failure during a seismic event is considered low. Shallow slumping on steeper portions of the natural slope faces may still occur under conditions of extreme moisture and/or during a seismic event. GMU also performed rotational and traditional surficial stability analyses to evaluate the maximum proposed fill slope. These analyses indicate adequate safety factors; no significant impact would be anticipated.

As the sediments within the bluffs possess a fairly high erosion potential, the topographic alteration of the bluffs would take the form of shallow erosion and surficial slumping of bluff faces. This process is likely to be reduced, but would continue after Project implementation since localized surface runoff and precipitation continue to exert erosive forces on bluff sediments. The Master Development Plan addresses landform restoration and discusses actions to be taken as part of the Project for bluff stability.[9] Areas that have suffered from erosion would require careful grading in order to restore and revegetate the bluff/slope edge and to limit further degradation. The drainage overtopping the bluff/slope edge would be intercepted along the public trail system and redirected into the Project drainage system.

The proposed locations for bluff restoration are depicted on Exhibit 4.3-6, Bluff Restoration Plan Bluff restoration in areas where erosion damage to the existing bluff is not readily evident would consist of carefully removing invasive plants and asphalt-like material where feasible and revegetating the bluff face with native, drought-tolerant species. In areas where more than 300 linear feet of bluff edge/face have visibly been impacted by ongoing weathering processes and/or oil operations, conventional grading techniques and equipment would be used to regrade and stabilize the impacted area to existing bluff slope gradients. Slope-reinforcing fabric or similar materials would be used where slope gradients exceed 2:1. In areas where localized sloughing of bluff material has delivered significant amounts of sediment to the Lowland and has undercut the bluff edge, the sloughed material would be removed, and the bluff face restored to a stable grade. In this case, repair techniques would use small equipment operating adjacent to the bluff face, and materials (including fabric and/or soil cement) would also be used as needed to stabilize the new bluff slope face. In areas showing minor erosion, storm water runoff and surface flows would be directed away from the bluff edge. Potential locations of bluff stabilization activities plan (see Exhibit 3-22, Bluff Restoration Plan, in Section 3.0, Project Description). Consistency with the City's General Plan requires that slope designs adhere to the standards contained in Appendix Chapter A33, Excavation and Grading, of the City's Building Code.

In order to evaluate the long-term cumulative impacts of sea level rise on local area flooding over the next 90 years (i.e., through 2100), the Project grading plan was overlaid onto the worst-case sea level rise water elevation data provided by the Pacific Institute. Sea level rise would increase the potential for future flood water depths to increase near the base of the existing slopes that border the Upland development areas. Sea level rise is not expected to result in

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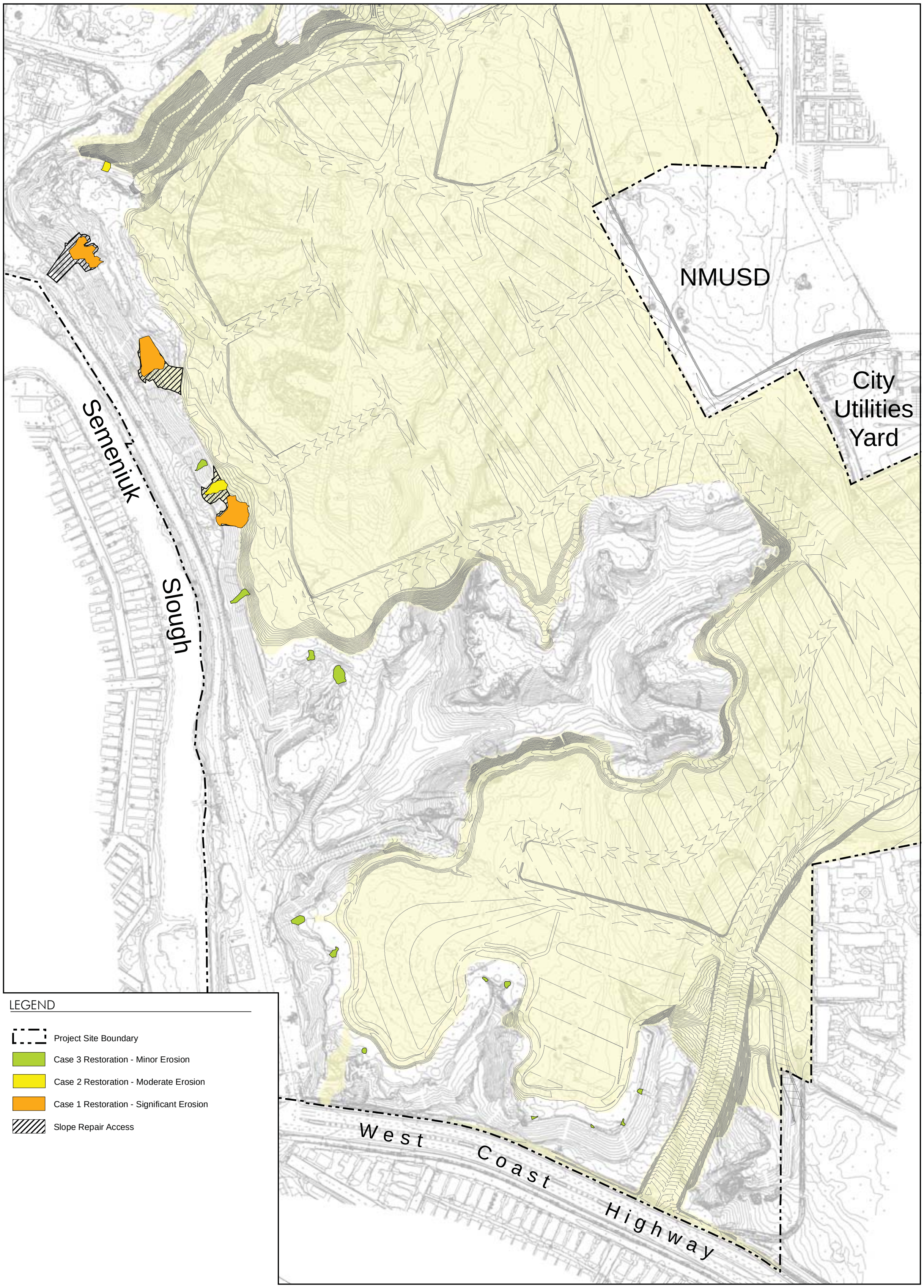
8 The City of Newport Beach relies on the County of Orange standards.

9 See Chapter 11, Landform Restoration and Grading Plan, of the *Newport Banning Ranch Master Development Plan* on file at the City of Newport Beach Community Development Department and available for review during regular business hours.



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Source: FORMA 2011

Bluff Restoration Plan

Exhibit 4.3-6

Newport Banning Ranch EIR

N W E S

BonTerra CONSULTING

(Rev 072511 KFD) R: Projects\Newport\J015\Graphics\EIR\Ex4.3-6_BluffResto.pdf direct wave attack on the bluff faces and associated coastal bluff erosion. There is a remote possibility that the increased flood water depths could lead to potential instability at some point in the future. In the future, adaptive management practices may be required to mitigate bluff instability under a future sea level rise scenario. Such measure could include the protection of the lower three feet of the face of the slopes against erosion through the installation of rip rap or coating the area with soil cement and/or geofabric. These measures are not required as a part of the Project. With respect to flooding risk, please refer to Section 4.4, Hydrology and Water Quality.

PDF 4.3-3 provides for the development of a detailed bluff face repair/improvement plan to maintain the integrity of bluff slopes and to minimize the potential for shallow slumping to occur. In addition, PDF 4.3-1 requires development setbacks to ensure structural development is adequately protected by appropriate safety features. Facilities and activities within the bluff setback zones would be limited to trails, lighting, and minor grading for surface drainage control. Existing arroyos and erosional ravines on bluff faces would be repaired through precise grading and filling and would be restored to a condition consistent with the existing bluff slope parameters. The Mitigation Program would ensure that bluff top and bluff face landscaping would require no permanent irrigation.

Impact Summary: ***Less Than Significant.*** Grading activities would increase the potential for soil erosion and loss of top soil. Analysis has indicated that there is a risk of shallow slumping on bluff faces associated with surface runoff; however, Project drainage improvements are expected to reduce runoff compared to existing conditions. With the incorporation of construction BMPs as described in Section 4.4, Hydrology and Water Quality, Project impacts on soil erosion and loss of topsoil would be less than significant. Upon completion of the Project, soil erosion and the loss of topsoil would be minimized through the use of engineered grading, surface drainage improvements, and landscaping (e.g., PDFs 4.3-2 and 4.3-3).

Threshold 4.3-7 ***Would the project be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?***

Expansion index (EI) tests were performed to evaluate the expansion potential of on-site soils. These test results indicate the presence of expansive soils. Without correction, expansive soils can be unsuitable for building. Expansive soils can be accommodated through strengthened and stiffened building foundation design that is capable of resisting the effects of expansive soils. As identified in MM 4.3-3, compliance with the recommendations of the preliminary geotechnical report (GMU 2010) would require this type of foundation system for proposed structures. Significant impacts associated with expansive soils can be mitigated to a level that is considered less than significant. SCs 4.3-1 and 4.3-2 and MMs 4.3-1 through 4.3-3 are applicable. SC 4.3-1 identifies that the issuance of grading permits is subject to approval of geological and soils engineering reports. SC 4.3-2 provides directive if off-site grading or infrastructure connections are required. MMs 4.3-2 and 4.3-3 require additional trenching in the Upland prior to preparation of final site plans to determine if the identified fault setback zone must be modified. Supplemental geotechnical analysis would be prepared as necessary.

Impact Summary: ***Less Than Significant With Mitigation.*** On-site soils have a low to medium expansion potential. With the incorporation of SCs 4.3-1 and 4.3-2 and MMs 4.3-1 through 4.3-3, impacts from the Project associated with expansive soils would be less than significant.

Threshold 4.3-8 ***Would the project conflict with any applicable plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?***

Tables 4.3-3 and 4.3-4[10] evaluate the consistency of the proposed Project with the applicable goals and policies of the City's General Plan and the California Coastal Act, respectively.

Impact Summary: ***No Impact.*** As identified in Tables 4.3-3 and 4.3-4, the proposed Project would be consistent with the intent of the soils and geology-related goals and policies of the *City of Newport Beach General Plan* and the California Coastal Act.

4.3.8 MITIGATION PROGRAM

Project Design Features

PDFs 4.3-1 through 4.3-3 are integrated into the Project and are applicable to geology and soils.

Standard Conditions and Requirements

SCs 4.3-1 and SC 4.3-2 are applicable.

Mitigation Measures

MM 4.3-1 The Applicant shall submit to the City of Newport Beach Community Development Department, Building Division Manager or his/her designee for review and approval, a site-specific, design-level geotechnical investigation prepared for each development parcel by a registered geotechnical engineer. The investigation shall comply with all applicable State and local code requirements and:

a) Include an analysis of the expected ground motions at the site from known active faults using accepted methodologies;

b) Determine structural design requirements as prescribed by the most current version of the California Building Code, including applicable City amendments, to ensure that structures can withstand ground accelerations expected from known active faults;

c) Determine the final design parameters for walls, foundations, foundation slabs, utilities, roadways, parking lots, sidewalks, and other surrounding related improvements;

Project plans for foundation design, earthwork, and site preparation shall incorporate all of the mitigations in the site-specific investigations. The structural engineer shall review the site-specific investigations, provide any additional necessary measures to meet Building Code requirements, and incorporate all applicable recommendations from the investigation in the structural design plans

[10] For ease of reading, the policy tables are located at the end of this EIR section.

and shall ensure that all structural plans for the Project meet current Building Code requirements.

The City's registered geotechnical engineer or third-party registered engineer retained to review the geotechnical reports shall review each site-specific geotechnical investigation, approve the final report, and require compliance with all geotechnical requirements contained in the investigation in the plans submitted for the grading, foundation, structural, infrastructure and all other relevant construction permits.

The City shall review all Project plans for grading, foundations, structural, infrastructure and all other relevant construction permits to ensure compliance with the applicable geotechnical investigation and other applicable Code requirements.

MM 4.3-2 Prior to the approval of any applicable final tract map, the Applicant shall have completed, by a qualified geologist, additional geotechnical trenching and field investigations and shall provide a supplemental geotechnical report to confirm the adequacy of Project development fault setback limits in accordance with the mandates of the Alquist-Priolo Earthquake Fault Zoning Act. The trenching and report shall be subject to the review and approval of the City of Newport Beach Public Works Director.

MM 4.3-3 Prior to the approval of any applicable final tract map, development setbacks from the Upland fault segments, revised as necessary based upon the findings of additional trenching investigations, shall be incorporated into the Project consistent with requirements set forth in the California Building Code and the *City of Newport Beach General Plan.* Bluff setbacks consistent with the regulatory requirements for habitable structures shall be incorporated into the Project consistent with the beach bluff setback standards in the *City of Newport Beach General Plan.* Where applicable, setback distances consistent with recommendations in the Project's Geotechnical Report (GMU 2010) shall be incorporated. Prior to the preparation of final Project plans and specifications, additional trenching shall be conducted within the 1,300-foot gap between the 2 parts of the existing Fault Setback Zone. This additional trenching shall provide more information about the potential for active faulting in this portion of the Project site. If necessary, the development fault setback zones shall be modified after this information is obtained and analyzed in accordance with the mandates of the Alquist-Priolo Earthquake Fault Zoning Act. This information shall be subject to the review and approval of the City of Newport Beach Public Works Director and Community Development Director.

4.3.9 LEVEL OF SIGNIFICANCE AFTER MITIGATION

With implementation of the PDFs, SCs, and MMs described above, all impacts would be reduced to a less than significant level.

TABLE 4.3-3
CITY OF NEWPORT BEACH GENERAL PLAN CONSISTENCY ANALYSIS

City of Newport Beach General Plan Relevant Goals, Policies, and Programs	Consistency Analysis
Harbor and Bay Element	
Policies	
HB Policy 8.12: Reduction of Infiltration Include equivalent BMPs that do not require infiltration, where infiltration of runoff would exacerbate geologic hazards. (Policy NR 3.12)	The Project is consistent with this policy. The Project contains a storm drain system that ensures infiltrated water is directed away from the bluff faces on the Project site. This storm drain system, which includes bioswale subdrains, would ensure that the risk of bluff instability is minimized and that a geologic hazard does not develop. The Project's subdrain systems would capture infiltrated water and direct it away from the bluff faces on the Project site, thereby reducing the risk of bluff instability related to groundwater. (Please also see Section 4.4, Hydrology and Water Quality.)
HB Policy 8.16: Siting of New Development Require that development be located on the most suitable portion of the site and designed to ensure the protection and preservation of natural and sensitive site resources that provide important water quality benefits. (Policy NR 3.16)	The Project is consistent with this policy. Development is sited away or buffered from the arroyos and bluffs on the Project site. Bluff setbacks and a linear bluff edge park have been incorporated into the site design to ensure bluff and arroyo vegetation are protected. Development is also set away and buffered from wetlands. Bluff restoration and stabilization would occur as a part of the Project to maintain bluff stability and respond to changing conditions over time related to sea level rise.
Natural Resources Element	
Policies	
NR Policy 3.12: Reduction of Infiltration Include equivalent BMPs that do not require infiltration, where infiltration of runoff would exacerbate geologic hazards. (Policy HB 8.12)	The Project is consistent with this policy. Please refer to the response to HB Policy 8.12.
NR Policy 3.16: Siting of New Development Require that development be located on the most suitable portion of the site and designed to ensure the protection and preservation of natural and sensitive site resources that provide important water quality benefits. (Policy HB 8.16)	The Project is consistent with this policy. To the degree feasible, the Project has been designed to avoid significant impacts. Site-design concepts have been applied to the Project that maintain site drainage patterns and incorporate existing natural drainage features into site design. Natural swales and treatment-control BMPs ensure that flow rates are controlled and runoff is treated prior to discharge (see also Section 4.4, Hydrology and Water Quality).
Natural Resources Element Goal NR 23	
Development respects natural landforms such as coastal bluffs.	The Project is consistent with this goal. The Project site has been subject to prior and ongoing modification through oil operations, site erosion, and grading. As a part of the Project, the topography of the site would be modified through grading and development for proposed land uses, associated infrastructure (e.g., roads), and site remediation. However, preservation of the existing natural coastal bluffs on site would be achieved through the incorporation of (1) appropriate bluff setback distances; (2) a bluff edge linear park; (3) bluff restoration providing for bluff face re-vegetation; and (4) Project drainage features that reduce runoff infiltration near the bluff face. Bluff restoration and stabilization would minimize alteration of these natural coastal bluffs by ensuring long-term bluff face stability

TABLE 4.3-3 (Continued)
CITY OF NEWPORT BEACH GENERAL PLAN CONSISTENCY ANALYSIS

City of Newport Beach General Plan Relevant Goals, Policies, and Programs	Consistency Analysis
	and reduction in causal factors of bluff face deterioration.
Policies	
NR Policy 23.1: Maintenance of Natural Topography Preserve cliffs, canyons, bluffs, significant rock outcroppings, and site buildings to minimize alteration of the site's natural topography and preserve the features as a visual resource.	The Project is consistent with this policy. Please refer to the response to Goal NR 23.
NR Policy 23.4: New Development on Blufftops Require all new blufftop development located on a bluff subject to marine erosion to be set back based on the predominant line of development. This requirement shall apply to the principal structure and major accessory structures such as guesthouses and pools. The setback shall be increased where necessary to ensure safety and stability of the development.	The Project is consistent with this policy. The coastal bluffs on the Project site are not subject to marine erosion. Notwithstanding, habitable development within the Upland area of the Project site would be set back an appropriate distance from the existing bluff edge to protect bluffs and to maintain existing natural topography.
NR Policy 23.5: New Accessory Structures on Blufftops Require new accessory structures, such as decks, patios and walkways that do not require structural foundations to be sited at least 10 feet from the edge of bluffs subject to marine erosion. Require accessory structures to be removed or relocated landward when threatened by erosion, instability or other hazards.	The Project is consistent with this policy. All habitable development would be set back from the bluff edge and separated by a linear park area.
Safety Element	
Safety Element Goal S 4	
Adverse effects caused by seismic and geologic hazards are minimized by reducing the known level of risk to loss of life, personal injury, public and private property damage, economic and social dislocation, and disruption of essential services.	The Project is consistent with this goal. All proposed habitable structures on the Project site would be excluded from fault setback zones. Additional field trenching would provide more information within the "gap" area, and fault setback zones would be adjusted accordingly. All habitable development would also be set back from the bluff edges and separated from the edge by a linear park.
Policies	
S Policy 4.7: New Development Conduct further seismic studies for new development in areas where potentially active faults may occur.	The Project is consistent with this policy. Extensive field testing and geotechnical trenching has been conducted to provide data on seismic conditions at the Project site. Additional trenching shall be conducted on the site during preparation of the final Geotechnical Report to provide more information about the location of potentially active fault traces within the "gap" area on the Project site. This information would be used in adjusting fault setback zones, if necessary, to ensure seismic hazards are minimized.

TABLE 4.3-4
CALIFORNIA COASTAL ACT CONSISTENCY ANALYSIS

Relevant California Coastal Act Policies	Consistency Analysis
Development	
Section 30253 Minimization of adverse impacts New development shall do all of the following: (a) Minimize risks to life and property in areas of high geologic, flood, and fire hazard. (b) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. (c) Be consistent with requirements imposed by an air pollution control district or the State Air Resources Board as to each particular development. (d) Minimize energy consumption and vehicle miles traveled. (e) Where appropriate, protect special communities and neighborhoods that, because of their unique characteristics, are popular visitor destination points for recreational uses.	The Project is consistent with this policy. A comprehensive list of Project Design Features, Standard Conditions, and Mitigation Measures has been incorporated into the Project. These would help to minimize seismic hazards to proposed Project features and structures. These features, conditions, and measures would also provide for structural setbacks from bluff edges to protect existing natural landforms and to maintain public safety; they would work in concert with best management practices (BMPs) to ensure that geologic instability caused by surface erosion or infiltration in the vicinity of the coastal bluffs does not occur. Compliance with air quality, energy consumption, and land use compatibility are addressed in Sections 4.10, 4.11, and 4.1, respectively.

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