APPENDIX A

Mitigation Monitoring and Reporting Program

APPENDIX A
MITIGATION MONITORING AND REPORTING PROGRAM

INTRODUCTION

The California Environmental Quality Act (CEQA) requires the adoption of feasible mitigation measures to reduce the severity and magnitude of potentially significant environmental impacts associated with project development. In order to ensure that the mitigation measures and project revisions identified in the environmental impact report (EIR) are implemented, the public agency shall adopt a program for monitoring and reporting on the revisions that it has required in the project and the measures it has imposed to mitigate or avoid significant effects (Section 15097(a) of the State CEQA Guidelines). The State CEQA Guidelines require that a Mitigation Monitoring and Reporting Program (MMRP) be adopted upon certification of an EIR to ensure mitigation measures identified in the EIR are implemented. The MMRP for the Rancho de Paseo Valencia (RdPV) project is under the jurisdiction of the City of Corona (City).

According to Section 15097 (c) of the State CEQA Guidelines, "reporting" generally consists of a written compliance review that is presented to the decision-making body or authorized staff person. A report may be required at various stages during project implementation or upon completion of the mitigation measure. "Monitoring" is generally an ongoing or periodic process of project oversight. This program identifies, at a minimum, the entity responsible for the monitoring, what is to be monitored, how the monitoring shall be accomplished, and the monitoring and reporting schedule.

The MMRP assigns responsibility for monitoring mitigation measures incorporated into the project. Under this program, the Project Planner with the City of Corona's Community Development Department (Development Department) would be responsible for the implementation and monitoring of these measures during permitting, design and construction (including landscaping) phases of the project unless otherwise stated herein. The City is responsible for reporting on the implementation of the mitigation measures discussed in this MMRP, in accordance with Section 15097 of the State CEQA Guidelines. Reporting consists of establishing and maintaining a record that a mitigation measure is being or has been implemented.

A record of the MMRP will be maintained at the City of Corona Community Development Department, 400 South Vicentia Avenue, Corona, California 92882.

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PROJECT SUMMARY

The proposed project would result in the subdivision of 64.3 acres into 34 single-family detached residential lots. As 39.9 acres is located in the City of Corona, 25.5 acres (which includes 1.1 acres that are not a part of the subdivision proposed project site) would require annexation from the unincorporated area of Riverside County in the City's Sphere of Influence. Project approvals include a Tentative Tract Map to subdivide the site into 34 single family residential lots, an amendment to the Mountain Gate Specific Plan to include the annexed 25.5 acres into the specific plan and zone it for residential purposes, and an annexation to incorporate the adjacent 25.5 acres into the City of Corona making the overall size of the project 65.4 acres within the City. The project will also include certification of an EIR by the City Council.

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Table A-1
MMRP Summary – Rancho de Paseo Valencia

Mitigation Measure Number	Rancho de Paseo Valencia EIR Mitigation Measures	Implementation Action	Method of Verification	Timing of Verification	Responsible Person	Verification Date
Land Use and Planning - No mitigation measures required						
Air Quality						
AQ-1	Consistent with South Coast Air Quality Management District's Rule 403, this measure requires that fugitive dust generated by grading and construction activities be kept to a minimum with a goal of retaining dust on the site. During construction, fugitive dust will be controlled by the following measures: a. During clearing, grading, earth moving, excavation, or transportation of cut or fill materials, water trucks or sprinkler systems shall be used to prevent dust from leaving the site and to create a crust after each day's activities cease. b. During construction, water truck or sprinkler systems shall be used to keep all areas of vehicle movement damp enough to prevent dust from leaving the site. At a minimum, this would include wetting down such areas later in the morning and after work is completed for the day and whenever winds exceed 15 mph. c. Soil stockpiled for more than 2 days shall be covered, kept moist, or treated with soil binders to prevent dust generation. d. All vehicles traveling on unpaved roads shall not travel more than 15 mph. e. All grading and excavation operations shall cease when wind speeds exceed 25 mph. f. Dirt and debris spilled onto paved surfaces at the project site and on the adjacent roadways shall be swept, vacuumed, and/ or washed at the end of each workday. g. Although import and export of soil materials is not required, all trucks hauling any dirt, sand, soil, or other loose material to and from the construction site shall be tarped and maintain a minimum 2 feet of freeboard. h. A pad consisting of washed gravel (minimum size: 1 inch) shall be installed at the junction of the project site and adjacent paved roadways.	Project Applicant to submit Dust Control Plan approved by SCAMQD to City for review and approval	City to review and approve Dust Control Plan	Prior to issuance of grading permit	Public Works Engineer	

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	The pad shall be maintained in a clean condition to a depth of at least 6 inches and extending at least 30 feet wide and at least 50 feet long (or as otherwise directed by South Coast Air Quality Management District).					
AQ-2	The applicant shall use architectural coatings with zero VOC content during project construction/application of paints and other architectural coatings to reduce O_3 precursors. If zero-VOC paint cannot be utilized, the applicant shall avoid application of architectural coatings during the peak smog season: July, August, and September. The applicant shall procure architectural coatings from a supplier in compliance with the requirements of South Coast Air Quality Management District's Rule 1113 (Architectural Coatings).	Project Applicant shall assure compliance	City inspectors to verify	Ongoing during construction	City Inspectors	
Biological Resources						
BIO-1	If grading or site disturbance is to occur between February and August, within no more than 72 hours of grading (or site disturbance), a nesting bird survey shall be conducted by a qualified biologist (per the City of Corona) to determine the presence of nests or nesting birds. All work within 300 feet of an active nest will be halted until that nesting effort is finished. The on-site biologist will review and verify compliance with these nesting boundaries and will verify the nesting effort has finished. Work can resume when no other active nests are found. Upon completion of the survey and any follow-up construction avoidance management, a report shall be prepared and submitted to the City for mitigation monitoring compliance record keeping.	Biologist shall conduct a nesting bird survey within 72 hours of commencement of grading to occur between February and August	Biologist shall submit monitoring reports during construction and a final report after completion of work	Prior to issuance of grading permits for final phase	Planning Department-Project Planner	
BIO-2	Prior to issuance of a grading permit, the applicant shall provide a set of grading plans which will include the following contractor requirements: • A 10-foot high noise attenuation wall shall be erected (see Figure 5.4-4: Noise Attenuation Wall Locations). Daily noise monitoring by a qualified acoustician would be required during all earth moving activity. The noise levels must remain at or below 60 dBA Leq-h at nearby sensitive habitat areas. If noise measurements exceed 60 dBA Leq-h, the acoustician must notify the construction manager and the City Mitigation Monitor and Reporting Manager. The monitoring acoustician and contractor shall formally dictate additional methods for attenuation below 60 dBA Leq-h. Should noise attenuation below 60 dBA Leq-h prove infeasible near sensitive habitat areas, all work generating noise levels above 60 dBA Leq-h within 300 feet of an active nest will be halted until that nesting effort is finished as set forth	Project applicant to submit grading plans to City	City to review and approve plans	Prior to issuance of grading permits	Planning Department-Project Planner	

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	in Mitigation Measure BIO-1. The on-site biologist will review and verify compliance with these nesting boundaries and will verify the nesting effort has finished. Work can resume when no other active nests are found.					
BIO-3	In order to mitigate impacts to wetland resources on site, one of the following options shall be implemented in order to mitigate for the permanent loss of 0.075 acre of riparian habitat: 1) Conserve 0.225 acre of riparian habitat (3:1 ratio). This habitat must be of similar or greater quality than the existing riparian habitat associated with Drainage A. Further, this conservation must occur on-site and in perpetuity. 2) Conserve 0.375 acre of riparian habitat (5:1 ratio) through participation in a CDFG-approved habitat conservation program or bank. Participation in the bank or regional conservation program shall ensure that conservation is in perpetuity. Prior to issuance of a grading permit, the applicant must provide the City with written documentation from CDFG and the Regional Water Quality Control Board indicating that this mitigation requirement has been fulfilled to these agencies' satisfaction.	Project Applicant to provide copies of written documentation from CDFG and RWQCB	City to verify completion of mitigation requirements	Prior to issuance of grading permits	Planning Department-Project Planner	
BIO-4	Prior to issuance of a grading permit, the applicant shall provide the City with a drainage management plan (which may be combined with the Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System) that describes the measures that will be taken throughout construction and operation of the project to ensure that water flow is maintained to off-site drainages. Measures may include, but are not limited to a rerouted subterranean drainage system to convey water around the project site or a new water source input at the downstream edge of the proposed project footprint. Further, this plan shall also include parameters for ensuring that drainage water quality is maintained at predevelopment levels. Moreover, compliance with the National Pollutant Discharge Elimination System and implementation of a Storm Water Pollution Prevention Plan would ensure that no significant impacts to water quality that could affect biological resources would occur, as all water quality standards would be maintained pursuant to the Clean Water Act.	Project Applicant to provide City a copy of the Drainage Management Plan	City to review and approve plan	Prior to issuance of grading permits	Planning Department-Project Planner	

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BIO-5	Prior to grading permit issuance, adequate and appropriate measures to control chemicals or bioproducts that are potentially toxic or may adversely affect wildlife species, habitat, or water quality shall be developed and included in the Storm Water Pollution Prevention Plan. Specific measures shall include the following: • Avoidance of aerial application on days with winds exceeding 2 miles per hour. • Containment of all pollutants on the project site. • All pollutants and runoff will be conveyed off-site and disposed of according to standard procedures. • Any spillage into conserved areas shall be immediately cleaned up. • Permanent adequate control measures for manure and similar pollutants resulting from human use of the site will be incorporated into the requirements for the development of such facilities as horse stables, pesticide and insecticide storage facilities, and landscaping sheds.	Project Applicant to prepare Storm Water Pollution Prevention Plan and submit copy to the City	City to review and approve plan	Prior to issuance of grading permits	Planning Department-Project Planner	
BIO-6	Prior to issuance of a grading permit, a construction lighting plan shall be submitted to the City to indicate the potential location and management of all construction lighting. Lighting shall be directed downward and specifically toward work areas so as to avoid stray lighting to sensitive off-site habitats. If construction is not planned during evening hours, a plan would not be required.	Project Applicant to submit lighting plans for review and approval	City to review and approve plan	Prior to issuance of building permits	Planning Department-Project Planner	
BIO-7	The street improvement plan shall indicate the type, intensity, and notes regarding direction of all street, entry way, tennis court, and other common area lighting. Night lighting shall be directed away from sensitive habitat areas and toward the ground. Shielding shall be incorporated in project designs to ensure ambient lighting in the adjacent sensitive habitat areas is not increased.	Project Applicant to prepare street improvement plan and submit to City for review	City to review and approve plan	Prior to issuance of building permits	Planning Department-Project Planner	
BIO-8	The final landscape plan shall avoid the use of all invasive, non-native species listed in Table 6-2 of the MSHCP. No plants producing windblown seeds will be used in the landscape palette. The covenants, conditions, and restrictions (CC&Rs) associated with all lots that abut exterior project boundaries shall be specifically prohibited from using species listed on Table 6-2 of the MSHCP in any planned front yard or backyard landscaping.	Project Applicant to prepare final landscape plan and submit to City for review	City to review and approve plan	Prior to issuance of building permits	Planning Department-Project Planner	

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BIO-9	Lots 20, 21, and 22 shall be required to maintain 6-foot high masonry walls or wrought iron fencing at the rear of their property lines to establish a distinct separation from developed and undeveloped areas.	Project Applicant to indicate compliance on all building plans	City to review and approve	Prior to issuance of building permits	Planning Department-Project Planner	
BIO-10	Prior to issuance of a grading permit, the City shall ensure that all grading is maintained within the proposed project footprint. No temporary grading shall be allowed in land outside of the proposed project boundary. Further, no manufactured slopes shall extend beyond the project boundary unless properly assessed for biological resources and authorized by the City Planning Department.	Project applicant to submit grading plans to City	City to review and approve plans	Prior to issuance of grading permits	Planning Department-Project Planner	
BIO-11	Prior to issuance of a grading permit, the project applicant shall be required to pay a MSHCP mitigation fee in order to offset impacts to MSHCP-related biological resources.	Project Applicant shall submit written documentation showing payment of MSHCP mitigation fees	City to verify payment of mitigation fees	Prior to issuance of grading permits	Planning Department-Project Planner	
Cultural Resources						
CUL-1	The applicant shall retain a qualified archaeological monitor, who shall prepare an Archaeological Resources Mitigation and Monitoring Plan. The archaeologist shall attend all pre-grading meetings to inform the grading and excavation contractors of the archaeological resource mitigation program and shall consult with them with respect to its implementation. The archaeological monitor shall be on site at all times during the initial phases of clearing and rough grading to inspect cuts for contained archaeological resources. If such resources are discovered, the archaeological monitor shall recover them. In instances where recovery requires an extended salvage time, the archaeologist or monitor shall be allowed to temporarily direct, divert, or halt grading to allow recovery of resource remains in a timely manner. Recovered archaeological resources, along with copies of pertinent field notes, photographs, and maps, shall be deposited in a scientific institution with archaeological collections and the resources shall be recorded in the California Archaeological Inventory Database. A final monitoring report shall be submitted to the City within 30 days of the end of monitoring activities.	Project Applicant to retain qualified personnel to monitor grading; monitor to submit final monitoring report to City	City inspector to verify monitoring-City to review final monitoring report	Monitor to be retained prior to issuance of grading permits; final monitoring report to be submitted within 30 days of the end of monitoring activities.	City Inspector; Development Department-Project Planner	

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CUL-2	All grading, excavation, and ground-breaking activities shall be monitored by a tribal monitor. The project applicant shall pay all fees associated with such tribal monitors. The tribal monitors will have the authority to temporarily stop and redirect grading activities, in conjunction with the archaeological monitor and the City.	Project Applicant to retain qualified tribal monitor.	City inspector to verify monitoring	Monitor to be retained prior to issuance of grading permits	City Inspector	
CUL-3	Prior to issuance of grading permits, the applicant shall be required to enter into a Treatment Agreement with the Pechanga Band of Luiseño Indians. This agreement will address the treatment and disposition of cultural resources and human remains, including those that may be inadvertently uncovered during construction as well as the provisions for the tribal monitors.	Project Applicant to submit documentation verifying Treatment Agreement	City to review and verify agreement	Prior to issuance of grading permits	Development Department-Project Planner	
CUL-4	The applicant shall relinquish ownership of all cultural resources discovered on site. This may include sacred items, burial goods, and all archaeological artifacts that are found on the project site. All items shall be recovered by the consulting archaeologist and subsequently subjected to laboratory analysis to record, analyze and document all recovered artifacts, excluding human remains. Following completion of all scientific study, artifacts shall be turned over to the appropriate Indian tribe for proper treatment and disposition.	Project Applicant to retain qualified personnel to monitor grading (per measure CUL-1); monitor to submit final report after grading	City inspector to verify monitoring-City to review final monitoring report	Monitor to be retained prior to issuance of grading permits; final monitoring report to be submitted within 30 days of the end of monitoring activities.	City Inspector; Development Department-Project Planner	
CUL-5	The applicant shall retain a qualified paleontological monitor who shall prepare a Paleontological Resources Mitigation and Monitoring Plan. The paleontologist shall attend all pre-grading meetings to inform the grading and excavation contractors of the paleontological resource mitigation program and shall consult with them with respect to its implementation. The paleontological monitor shall be on site at all times during mass grading and excavation and shall observe all utility trenching activities.	Project Applicant to retain qualified personnel to monitor grading; monitor to submit final monitoring	City inspector to verify monitoring-City to review final monitoring	Monitor to be retained prior to issuance of grading permits;	City Inspector; Development Department-Project Planner	

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	Paleontological monitoring is not required within coarse grained alluvial fan materials as depicted by Figure 5.6-1 (see Section 5.6). If any fossils are discovered, the paleontological monitor shall recover them. In instances where recovery requires an extended salvage time, the paleontologist or monitor shall be allowed to temporarily direct, divert, or halt grading to allow recovery of resource remains in a timely manner. Recovered fossils, along with copies of pertinent field notes, photographs, and maps, shall be deposited in a scientific institution with paleontological collections or in accordance with the Society of Vertebrate Technology recommendations. A final monitoring report shall be submitted to the City within 30 days of the end of monitoring activities.	report to City	report	final monitoring report to be submitted within 30 days of the end of monitoring activities.		
CUL-6	If human remains are encountered during site preparation or construction, the provisions of California Health and Safety Code Section 7050.5 shall be followed. If remains are uncovered, the Riverside County Coroner shall be immediately notified. Code Section 7050.5 states that no further disturbance shall occur until the Riverside County Coroner has made the necessary findings as to the origin of such remains. Further, pursuant to California Public Resources Code Section 5097.98(b), remains shall be left in place and free from disturbance until a final decision as to the treatment and disposition has been made. If the Riverside County Coroner determines that the remains are Native American, the Native American Heritage Commission shall be contacted within a reasonable timeframe. Subsequently, the Native American Heritage Commission shall identify the "most likely descendant." The "most likely descendant" shall then make recommendations and engage in consultations concerning the treatment of the remains as provided for in Public Resources Code Section 5097.98.	Project Applicant to retain qualified personnel to monitor grading (per measure CUL-1); monitor to submit final report after grading	City inspector to verify monitoring-City to review final monitoring report	Monitor to be retained prior to issuance of grading permits; final monitoring report to be submitted within 30 days of the end of monitoring activities.	City Inspector; Development Department-Project Planner	
	Geology and Soils					
GEO-1	Geotechnical recommendations regarding necessary testing, monitoring and inspecting at various stages throughout project design and implementation are made in the following documents, attached as Appendix E of this EIR, and shall be consulted and implemented to the satisfaction of the City of Corona Engineer during project design and construction: • Updated Preliminary Geotechnical Investigation, and Updated Fault Rupture Hazard Evaluation, Tentative Tract 34760, Corona, Riverside	Project Applicant to incorporate and comply with all geotechnical recommendations	City Inspector to verify grading	During project design, construction and operation	City Engineer	

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	County, California 92882, dated October 9, 2006, by GeoSoils, Inc. • Memorandum "Slope Stability and Value Engineering, Existing Slope-Non-Grading Option, Tentative Tract No. 34760, City of Corona, Riverside County, California," dated November 20, 2007, by GeoSoils, Inc. • Memorandum "Tentative Tract Map Review, Tentative Tract No. 34760, Corona, Riverside County, California," dated June 12, 2008, by GeoSoils, Inc. • Memorandum "Geotechnical Review of Fire Protection/Fuel Modification Plan, Tentative Tract No. 34760, Corona, Riverside County, California," dated November 6, 2008, by GeoSoils, Inc. The recommended observations and/or testing shall be performed by GSI at each of the following construction stages: • During grading/recertification. • During excavation. • During placement of subdrains, toe drains, or other subdrainage devices, prior to placing fill and/or backfill. • After excavation of building footings, retaining wall footings, and free standing walls footings, prior to the placement of reinforcing steel or concrete. • Prior to pouring any slabs or flatwork, after presoaking/presaturation of building pads and other flatwork subgrade, before the placement of concrete, reinforcing steel, capillary break (i.e., sand, pea-gravel, etc.), or vapor retarders (i.e., visqueen, etc.). • During retaining wall subdrain installation, prior to backfill placement. • During placement of backfill for area drain, interior plumbing, utility line trenches, and retaining wall backfill. • During slope construction/repair. • When any unusual soil conditions are encountered during any construction operations, subsequent to the issuance of this report. • When any developer or homeowner improvements, such as flatwork, spas, pools, walls, etc., are constructed, prior to construction. GSI shall review and approve such plans prior to construction. • A report of geotechnical observation and testing shall be provided					

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	at the conclusion of each of the above stages, in order to provide concise and clear documentation of site work, and/or to comply with code requirements. • GSI shall review project sales documents to homeowners/homeowners associations for geotechnical aspects, including irrigation practices, the conditions outlined above, etc., prior to any sales. At that stage, GSI will provide homeowners maintenance guidelines which shall be incorporated into such documents. The following mitigation measures are contained within the geotechnical reports titled "Geotechnical Review of Fire Protection/Fuel Modification Plan, Tentative Tract No. 34760, Corona, Riverside County, California," "Slope Stability and Value Engineering, Existing Slope-Non-Grading Option, Tentative Tract No. 34760, City of Corona, Riverside County, California," and "Updated Preliminary Geotechnical Investigation, and Updated Fault Rupture Hazard Evaluation, Tentative Tract 34760, Corona, Riverside County, California 92882." All mitigation measures shall be implemented to the satisfaction of the City of Corona Engineer during project design, construction and operation.					
GEO-2	Prior to the start of the grading operation, the site shall be cleaned of all vegetation (including roots), trash, construction and other deleterious materials.	Project Applicant to ensure compliance	City Inspector to verify	Prior to issuance of grading permit	City Engineer	
GEO-3	Only the amount of irrigation necessary to sustain plant life shall be provided. Over-watering the landscape areas will adversely affect proposed site improvements. Graded slope areas shall be planted with drought resistant vegetation. Consideration shall be given to the type of vegetation chosen and their potential effect upon surface improvements (i.e., some trees will have an effect on concrete flatwork with their extensive root systems). Trees planted in close proximity to improvements have been known to adversely or negatively impact the long-term performance of the improvement. The location of tree planting shall be considered in light of this geotechnical concern. Consideration shall be given to providing retaining devices, up-hill and down-hill, for significant plantings that are "benched" into slope faces to mitigate the potential for slope creep. From a geotechnical standpoint leaching is not	Project Applicant to submit landscape plan and grading plans to City	City to review and approve	Prior to issuance of grading permit	City Engineer	

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	recommended for establishing landscaping. If the surface soils are processed for the purpose of adding any amendments, they shall be recompacted to 90 percent minimum relative compaction.					
GEO-4	Water has been shown to weaken the inherent strength of all earth materials over time. Slope stability is significantly reduced by overly wet soil conditions. Positive surface drainage away from slopes shall be maintained and only the amount of irrigation necessary to sustain plant life shall be provided for planted slopes. Over-watering shall be avoided as it adversely affects site improvements, and causes perched groundwater conditions. Graded slopes constructed utilizing on-site materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Compaction to the face of fill slopes would tend to minimize short-term erosion until vegetation is established. Plants selected for landscaping shall be light weight, deep rooted types that require little water and are capable of surviving the prevailing climate. Jute-type matting or other fibrous covers may aid in allowing the establishment of a sparse plant cover. Utilizing plants other than those recommended above will increase the potential for perched water, staining, mold, etc., to develop. A rodent control program to prevent burrowing shall be implemented. Irrigation of natural (ungraded) slope areas is generally not recommended. These recommendations regarding plant type, irrigation practices, and rodent control shall be provided to each homeowner. Over-steepening of slopes shall be avoided during building construction activities and landscaping.	Project Applicant to submit grading plans to City HOA to provide homeowners with landscaping practices	City to review and approve	Prior to issuance of grading permit Upon occupancy	City Engineer	
GEO-5	Based on our analyses, an adequate factor of safety (FS>1.5) for the natural slope can be achieved if the groundwater level is kept below an elevation of ±1445 mean sea level (MSL). Therefore, to facilitate proper slope drainage, we recommend the placement of either hydro-auger drains to be drilled into the slope to an appropriate depth, or construction of a french drain system along the existing access trails located at the bottom and middle of the slope.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-6	The proposed pad grades of the lots below the subject slope be raised ±5 feet, to approximate elevations of 1398 and 1410 MSL, respectively, in order to accommodate the potential total volume of landslide material on the slope. In addition, we recommend the construction of a debris wall along the southeast property boundaries for the upper most lots on the street cul-de-sac.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-7	Considering the noncohesive nature of some of the on-site material, some caving and sloughing may be expected to be a factor in subsurface excavations and trenching. This would be primarily associated with trenches excavated for utilities and foundation systems. Additional shoring or laying back excavations may be necessary to mitigate caving or sloughing. All trench excavations shall conform to OSHA and local safety ordinances.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-8	On-site materials may be reused as compacted fill provided that major concentrations of vegetation and debris are removed prior to fill placement.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-9	In fill areas where cavities or loose soils remain after surficial processing, the loose areas shall be cleaned out, observed by the soil engineer, processed, and replaced with fill which has been moisture conditioned to at least optimum moisture content. The soils shall be compacted to at least 90 percent of the laboratory standard.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-10	Any existing surficial/subsurface structures, major vegetation, and any miscellaneous debris shall be removed from the areas of proposed grading.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-11	Cavities or loose soils (including all previous exploratory test pits) remaining after demolition and site clearance shall be cleaned out, inspected by the soils engineer, processed, and replaced with fill that has been moisture conditioned to at least optimum moisture content and compacted to at least 90 percent of the laboratory standard (ASTM D-1557).	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-12	Removal of all undocumented artificial fill, colluvium, alluvium, surficial landslide deposits, and generally near surface weathered Tertiary Silverado Formation materials will be necessary prior to fill placement, in areas proposed for development. GSI believe that most of the alluvium, and all of the colluvium and undocumented fill will be removed during remedial grading. However, for preliminary planning purposes, removal depths are estimated to	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	be on the order of ±1 to ±12 feet, with locally deeper removals, in areas proposed for development. Generally, removals shall extend to non-porous, competent materials (dry density of 105 pcf and/or 85 percent saturation [which has been previously demonstrated as acceptable mitigation]), be moisture conditioned, and recompacted if not removed by proposed excavation within areas proposed for settlement-sensitive improvements.					
GEO-13	Where planned cuts are equal to or greater than the recommended removal depth, the area shall be cut to grade, subgrade observed and tested by the geotechnical consultant, then the upper 12 inches below finish grade shall be scarified, brought to at least optimum moisture content, and recompacted to a minimum relative compaction of 90 percent of the laboratory standard.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-14	Where the planned cuts are less than the recommended removal depth, the additional removals to attain the recommended removal shall be accomplished. The exposed removal surface shall be scarified to a depth of 12 inches, moisture conditioned (if necessary), and then compacted prior to fill placement to finish pad grade.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-15	Removed colluvium, alluvium, landslide deposits, and Tertiary Silverado Formation materials, may be reused as compacted fill provided that major concentrations of organic material (roots and tree remains), and miscellaneous trash and debris are removed prior to fill placement. Rock or earth particles of greater than 12 inches may be cleared from these soils. Due to the expansive nature of some of the Tertiary Silverado Formation materials, fill soils derived from this unit shall not be placed closer than 7 feet from finish grade, on a preliminary basis.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-16	Fill materials shall be brought to at least optimum moisture, placed in thin 6- to 8-inch lifts and mechanically compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-17	Fill materials shall be cleansed of major vegetation and debris prior to placement.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-18	Any oversized rock materials greater than 8 inches in diameter shall be stockpiled and placed under the observation of the soils engineer. As per UBC (ICBO, 1997) requirements, no rock materials greater than 12 inches in diameter shall be placed within 10 feet of finish grade, unless prior approval has been granted by the governing agency and geotechnical engineer.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-19	Basal fill materials below a fill depth of 50 feet shall be compacted to 95 percent of the laboratory standard.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-20	Note that some of the claystone layers in the Silverado Formation have high plasticity and could result in high expansion (E.I. >90) if used as fill. Highly expansive soils shall be placed deeper than 7 feet from finish grade. Non-plastic, very low expansive granular soils, such as poorly graded sands, shall be blended with silts, clays, and gravels, prior to use in the outer portions of slopes.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-21	Subdrains are recommended within drainage/canyon areas where proposed fills exceed 10 feet in height, as well as in some abutting areas where the as-built fill thickness exceeds 10 feet. Additionally, subdrainage systems for the control of localized groundwater seepage shall be anticipated following grading due to excess irrigation or precipitation. Subdrains in stabilization fills are also recommended.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-22	Subdrains shall be constructed of a minimum 6-inch perforated pipe (SDR 35, or equivalent, with perforations oriented downward) encased in clean, crushed gravel, and wrapped in filter fabric (Mirafi 140 or equivalent). Subdrains greater than 500 feet in linear feet shall be constructed per the recommendations stated above. However, the diameter of the perforated pipe shall be increased to 8 inches. Subdrains shall be constructed to flow at a 1 percent gradient to a suitable outlet, in accordance with the recommendations of the design civil engineer. For subdrain details in keyways/buttress designs, refer to Appendix G.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-23	All slopes shall be designed and constructed in accordance with the minimum requirements of the UBC (ICBO, 1997) and/or the County and the following: 1. Fill or stabilized fill over cut slopes shall be designed and constructed at a 2:1 (h:v) gradient, or flatter, and shall not exceed about 135 feet in height, otherwise, further evaluation will be necessary. Fill slopes shall be properly built and compacted to a minimum relative compaction of 90 percent	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	throughout, including the slope surfaces. Fill slopes may be properly overbuilt by ±3 to ±5 feet and trimmed/cut back to proposed finish grades. Guidelines for slope construction are presented in Appendix G. 2. Cut slopes with favorable geology shall be designed at gradients of 2:1 (h:v), or flatter, and shall not exceed about 30 feet in height at a 2:1 inclination. Otherwise, further evaluation will be necessary. Stabilization of most cut slopes is anticipated, as in the southern and middle portions of the tentative tract. Locally adverse geologic conditions (i.e., daylighted joints/fractures, severely weathered fan deposits, or sandy lenses) may be encountered which may require remedial grading, stabilization, or laying back of the slope to an angle flatter than the adverse geologic condition. 3. Daylight cut lots will have some potentially compressible/erodible colluvium/topsoil exposed at the cut/natural interface adjoining slopes. This area will be more subject to erosion, and down-slope movement. Accordingly, improvements and/or foot traffic shall not be allowed in this area, and proper drainage is imperative to the stability of this zone. This potential will be mitigated by the recommended setbacks, from a geotechnical viewpoint. These conditions will need to be disclosed to all homeowners and any homeowners association as well as all interested/affected parties. The actual location of this zone shall be evaluated during grading. 4. Local areas of highly to severely weathered Tertiary Silverado Formation materials may be present. Should these materials be exposed in cut slopes, the potential for long term maintenance or possible slope failure exists. Evaluation of cut slopes during grading would be necessary in order to identify any areas of severely weathered materials or cohesionless sands. Should any of these materials be exposed during construction, the soils engineer/geologist, would assess the magnitude and extent of the materials and their potential effect on long-term maintenance or possible slope failures. Recommendations would then be made at the time of the field inspection. 5. Landslides have been mapped on site. Surficial localized earth failures (i.e., slumps, slopewash, etc.) were noted on some existing natural slopes/cliffs associated with the incised canyon drainage courses on site. In general, these surficial slumps will be completely removed by the					

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	proposed grading, and as such, shall not pose a major constraint to development, providing our recommendations are properly implemented. This discussion does not include the existing slopes boundary at the residence that may remain as depicted in Cross-Section D-D'. The potential for mass wasting, mudflow debris and rock fall, shall be properly mitigated in site locations as indicated on plans (Plate 1). Additional walls or mitigation may be recommended elsewhere. It is recommended that debris impact walls or other comparable mitigative devices (GSI, 1995a) be incorporated into the project design, in accordance with the recommendations of the design civil engineer. Should other mass wasting features be encountered in natural or cut slopes above the proposed residential development, and not be removed by the proposed grading, then appropriate mitigation shall be considered by the design engineer, where these features intercept the proposed development and/or cut slopes. 6. Loose rock debris and fines remaining on the face of the cut slopes shall be removed during grading. This can be accomplished by high pressure water washing or by hand scaling, as warranted. 7. Where loose materials are exposed on the cut slopes, the project's engineering geologist would require that the slope be cleaned as described above prior to making their final inspection. Final approval of the cut slope can only be made subsequent to the slope being fully cut and cleaned.					
GEO-24	To reduce the potential for differential settlements between cut and fill materials, and/or materials of differing expansion potentials, the entire cut portion of cut/fill transitions shall be overexcavated to a minimum depth of 3 feet below finish grade, or to a maximum ratio of fill thickness of 3:1 (maximum to minimum), and replaced with compacted fill. A maximum/minimum fill thickness ratio shall be constructed such that 25 feet maximum fill differential is maintained within a lot, in order to keep differential settlements within tolerance. Overexcavation may also be necessary in deep cuts for heave mitigation. In these deep cut areas (more than 50 feet of Silverado Formation is removed), a 10-foot overexcavation and replacement with compacted fill is recommended.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-25	Based on our rock hardness evaluation, trenching for foundations and underground utility improvements will likely encounter difficulty and/or refusal at depths generally greater than ±25 feet below the existing grade. Therefore, overexcavation, during grading, of cut lots to provide a 3-foot compacted fill blanket and street right-of-ways to 1 foot below the lowest utility invert elevation in areas where finish grade/finish surface is generally greater than ±25 feet below the existing grade may be considered to better facilitate trenching. A minimum of 2 feet of fill is recommended below all shallow foundation elements. Drilled pier supported improvements may penetrate cut fill transitions with adequate design/capacity.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-26	"Slot cuts" will need to be excavated for Cross-Section A-A' buttress backcut as previously discussed. The possible instability of temporary cut slopes during stabilization and shear key excavation, or canyon clean-out, cannot be precluded, and shall be emphasized to the grading contractor. The temporary stability depends on many factors, including the slope angle, structural features in the bedrock, shearing strength along planes of weakness, height of the slope, groundwater conditions, and the length of time the cut remains unsupported and exposed to equipment vibrations and rainfall. The possibility of temporary cut slopes failing during canyon clean-outs, stabilization key excavations, etc., may be reduced by: 1. Minimizing the operations extent, in both duration and physical dimensions. 2. Limiting the length of a cut exposed to destabilizing forces at any one time. 3. Cutting no steeper than those backcut inclinations specified by the geotechnical consultant. 4. Avoiding operation of heavy equipment or stockpiling materials on or near the top of the backcut or trench. All OSHA requirements with regard to excavation safety shall be implemented by the grading contractor and subcontractors, especially concrete pump trucks. 5. Provide temporary drainage and diversion retarders for the grading work to reduce the potential for ponding and erosion.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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<tr><td>GEO-27</td><td>The volume change of excavated on-site materials upon recompaction is expected to vary with materials, density, insitu moisture content, location, and compaction effort. The in-place and compacted densities of soil materials vary and accurate overall determination of shrinkage and bulking cannot be made. Therefore, we recommend site grading include, if possible, a balance area or ability to adjust grades, slightly to accommodate some variation. Based on our experience with similar materials, the following values are provided as guidelines:
<table><tr><th colspan="2">Earthwork Shrinkage and Bulking Estimates</th></tr><tr><th>Geologic Unit</th><th>Estimated Shrinkage/Bulking</th></tr><tr><td>Colluvium/Slopewash/Topsoil/ Younger Alluvium/Landslide Deposits</td><td>10 to 25 percent shrinkage</td></tr><tr><td>Silverado Formation</td><td>-5 percent shrinkage to 15 percent bulking</td></tr></table>These values shall be considered estimates only and will be dependent upon the average relative compaction obtained during grading, which is determined by the grading contractor. If possible, we suggest that provisions be made to allow for final adjustment of grades to balance the earthwork operations. Contractors shall review available in-situ densities, relative compaction curves, and evaluate shrinkage and bulking based on local experience. If deemed necessary, contractors may wish to provide independent boring programs to evaluate shrinkage and bulking. Subsidence in bedrock areas is estimated to be nil.</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
<tr><td>GEO-28</td><td>Dynamic densification may increase the post-construction settlement effects and was estimated as 0.25 percent within artificial fills. The differential settlement of 0.75 to 1.5 inches over 40 lateral feet on site is possible given fill thickness of up to approximately 100 feet. GSI shall re-evaluate these estimates of dynamic densification at the 40-scale plan review. The estimated of dynamic densification do not include the effects of lateral slope deformation on foundations. Mitigation of grading settlements may include a combination of:
1. Decreasing the slope of the cut/fill transition under building areas;
2. Using either post-tensioned slabs, or mat foundations; and/or,
3. Monitoring of engineered fill settlements.</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
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<tr><td>GEO-29</td><td>Any settlement-sensitive structures shall be evaluated and designed for the combination of site-specific soil parameters and the estimated settlements and angular distortion values provided below. The 1997 UBC setbacks shall be adhered to when planning improvements on the deeper fill lots. Time estimates of settlements as well as settlement magnitudes shall be revisited during grading when fill materials are being placed. Where not already specified in fill (fill slopes) the use of drains within the upper 50 feet of fills may be considered to reduce wait times for settlements.
<table>
<tr><th>Depth of Fill (feet)</th><th>Ultimate Differential Settlement (in)</th><th>Ultimate Angular Distortion (Build at Completion of Grading)</th><th>Suggested building Wait Period Until 50% Primary Consolidation (months)</th><th>Estimated Angular Distortion after Waiting Period**</th></tr>
<tr><td>0-25</td><td><1</td><td>1/480</td><td>0 to 3</td><td>1/480</td></tr>
<tr><td>25-50</td><td>1½</td><td>1/400*</td><td>1 to 4</td><td>1/480</td></tr>
<tr><td>50-110</td><td>3</td><td>1/275*</td><td>3 to 15</td><td>1/480</td></tr>
</table>
* Non-buildable immediately after grading.
** After the waiting period differential settlement is approximately 1/480, or 1 inch in 40 feet. Does not include the effects of seismic deformation or lateral slope deformation.</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
<tr><td>GEO-30</td><td>The proposed foundation systems shall be designed and constructed in accordance with the guidelines contained in the UBC (ICBO, 1997) and the differential settlement and angular distortion discussed previously and herein. Conventional foundations may be utilized for soils with an E.I. of less than 90 (i.e., very low to medium classification) and fill depths under 25 feet in thickness. Where expansive soils are exposed at finish grade and/or compacted fills in excess of 25 feet in thickness exist, post-tensioned slabs will likely be required.</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
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Mitigation Measure Number	Rancho de Paseo Valencia EIR Mitigation Measures	Implementation Action	Method of Verification	Timing of Verification	Responsible Person	Verification Date
GEO-31	Mitigation of foundation design includes: 1. Conventional spread and continuous footings may be used to support the proposed residential structures provided they are founded entirely in properly compacted fill or other suitable bearing material (excluding the highly expansive Tertiary Silverado Formation). 2. Analyses indicate that an allowable bearing value of 1,500 pounds per square foot (psf) may be used for design of footings which maintain a minimum width of 12 inches (continuous) and 24 inches square (isolated), and a minimum depth of at least 12 inches into the properly compacted fill or competent fan deposits, or the Tertiary Silverado Formation bedrock unit. The bearing value may be increased by one-third for seismic or other temporary loads. This value may be increased by 200 psf for each additional 12 inches in depth, to a maximum of 2,500 psf. 3. For lateral sliding resistance, a 0.35 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load. 4. Passive earth pressure may be computed as an equivalent fluid having a density of 250 pcf with a maximum earth pressure of 2,500 psf. 5. When combining passive pressure and frictional resistance, the passive pressure component shall be reduced by one-third. 6. All footings shall maintain a minimum 7-foot horizontal distance between the base of the footing and any adjacent descending slope, and minimally comply with the guidelines depicted on Figure No. 18-I-1 of the UBC (ICBO, 1997).	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-32	Mitigation of lateral pressure includes: 1. For lateral sliding resistance, a 0.35 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load. 2. Passive earth pressure may be computed as an equivalent fluid having a density of 225 pcf with a maximum earth pressure of 2,500 psf. 3. When combining passive pressure and frictional resistance, the passive pressure component shall be reduced by one-third.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-33	The following preliminary conventional foundation construction recommendations are for soils in the top 7 feet of finish grade, which will have a very low to medium expansion potential, for planning and design considerations. 1. Conventional continuous footings shall be founded at a minimum depth of 12 inches below the lowest adjacent ground surface for one-story floor loads and 18 inches below the lowest adjacent ground surface for two-story floor loads. Interior footings may be founded at a depth of 12 inches below the lowest adjacent ground surface. Footings for one-story floor loads shall have a minimum width of 12 inches, and footings for two-story floor loads shall have a minimum width of 15 inches. All footings shall have one No. 4 reinforcing bar placed at the top and one No. 4 reinforcing bar placed at the bottom of the footing. Isolated interior or exterior footings shall be founded at a minimum depth of 24 inches below the lowest adjacent ground surface. 2. A grade beam, reinforced as above, and at least 12 inches square, shall be provided across the garage entrances. The base of the reinforced grade beam shall be at the same elevation as the adjoining footings. 3. Concrete slabs in residential and garage areas shall be a minimum of 5 inches thick, and underlain with a vapor retarder consisting of a minimum of 10-mil, polyvinyl-chloride membrane with all laps sealed. This membrane shall be covered, above and below with a minimum of 2 inches of sand (total of 4 inches) to aid in uniform curing of the concrete and to prevent puncture of the vapor retarder. 4. Concrete slabs, including garage slabs, shall be reinforced with No. 3 reinforcement bars placed on 18-inch centers, in two horizontally perpendicular directions (i.e., long axis and short axis). All slab reinforcement shall be supported to ensure proper mid-slab height positioning during placement of the concrete. "Hooking" of reinforcement is not an acceptable method of positioning. 5. Garage slabs shall be poured separately from the residence footings and be quartered with expansion joints or saw cuts. A positive separation from the footings shall be maintained with expansion joint material to permit relative movement. 6. The residential and garage slabs shall have a minimum thickness of 5	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	inches, and the slab subgrade shall be free of loose and uncompacted material prior to placing concrete. 7. Presaturation is not necessary for these soil conditions; however, the moisture content of the subgrade soils shall be equal to or greater than optimum moisture to a depth of 12 inches below the adjacent ground grade in the slab areas, and verified by this office within 72 hours of the vapor retarder placement. 8. Soils generated from footing excavations to be used on site shall be compacted to a minimum relative compaction 90 percent of the laboratory standard, whether it is to be placed inside the foundation perimeter or in the yard/right-of-way areas. This material must not alter positive drainage patterns that direct drainage away from the structural areas and toward the street. 9. Foundations near the top of slope shall be deepened to conform to the latest edition of the UBC (ICBO, 1997) and provide a minimum 7-foot horizontal distance from the slope face. Rigid block wall designs located along the top of slope shall be reviewed by a soils engineer. 10. Based on post-construction settlement analyses, areas where compacted fill materials in excess of 25 feet exist, an engineered post-tension foundation system will likely be required. 11. Post-tension foundations will likely be required if medium to highly expansive soils are exposed at finish grade, minimum to maximum fill thickness variation does not comply with recommendations herein, or if fills exceed about 25 feet in thickness. 12. As an alternative to conventional foundation systems, an engineered post-tension foundation system may be used. Recommendations for post-tensioned slab design are provided in following sections.					
GEO-34	From a soil expansion/shrinkage standpoint, a fairly common contributing factor to distress of structures using post-tensioned slabs is a significant fluctuation in the moisture content of soils underlying the perimeter of the slab, compared to the center, causing a “dishing” or “arching” of the slabs. To mitigate this possible phenomenon, a combination of soil presaturation and construction of a perimeter “cut-off” wall grade beam shall be employed. Perimeter foundations shall be a minimum of 12, 18, and 24 inches deep for	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	very low to low, medium, and highly expansive soils, respectively. Slab thickness shall be a minimum of 5 inches and may need to be creased by the slab design based on steel reinforcement/cable requirements. The walls shall be a minimum of 12 inches in thickness. In moisture sensitive slab areas, a vapor retarder shall be utilized and be of sufficient thickness to provide a durable separation of foundation from soils (10-miles thick). The vapor retarder shall be sealed to provide a continuous water-proof retarder under the entire slab. The vapor retarder shall be sandwiched by two 2-inch thick layers of sand (SE>30). Specific soil presaturation is not required for very low to low expansive soils; however, the moisture content of the subgrade soils shall be at or above the soils' optimum moisture content to a depth of 12 inches below grade. On a preliminary basis, specific soil presaturation is required for medium to highly expansive soils. For medium expansive soils, the slab subgrade moisture content shall be at or slightly above 120 percent of the soil's optimum moisture content to a depth of 18 inches below grade. For highly expansive soils, the slab subgrade moisture content shall be at or slightly above 130 percent of the soil's optimum moisture content to a depth of 24 inches below grade. Post-tensioned slabs shall be designed. Based on review of laboratory data for the on-site materials, the average soil modulus subgrade reaction K, to be used for design, is 100 pounds per cubic inch (pci). This is equivalent to a surface bearing value of 1,000 psf. Post-tensioned slabs shall be designed using sound engineering practice and be in accordance with the recommendations of the Post-Tensioning Institute Method, as well as local and/or national code requirements. Soil related parameters for post-tensioned slab design are presented below: Allowable surface bearing value 1,000 psf Modulus of subgrade reaction 75 psi per inch Coefficient of friction 0.35 Passive pressure 250 pcf Post-Tensioning Institute Method: Post-tensioned slabs shall have sufficient stiffness to resist excessive bending due to non-uniform swell and shrinkage of subgrade soils. The differential movement can occur at the corner, edge, or center of slab. The potential for differential uplift can be evaluated using the					

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<tr><td></td><td>1997 UBC Section 1816, based on design specifications of the Post-Tensioning Institute. The following table presents suggested minimum coefficients to be used in the Post-Tensioning Institute design method.<table><tr><td>Thornthwaite Moisture Index</td><td>-20 inches/year</td></tr><tr><td>Correction Factor for Irrigation</td><td>20 inches/year</td></tr><tr><td>Depth to Constant Soil Suction</td><td>7 feet</td></tr><tr><td>Constant soil Suction (pf)</td><td>3.6</td></tr><tr><td>Modulus of Subgrade Reaction (pci)</td><td>75</td></tr><tr><td>Moisture Velocity</td><td>0.7 inches/month</td></tr></table>Deepened footings/edges around the slab perimeter must be used to minimize non-uniform surface moisture migration (from an outside source) beneath the slab. An edge depth of 12 inches shall be considered a minimum. The bottom of the deepened footing/edge shall be designed to resist tension, using cable or reinforcement (“passive” steel reinforcement bars) per the structural engineer.</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>GEO-35</td><td>Footings shall maintain a horizontal distance, X, between any adjacent descending slope face and the bottom outer edge of the footing. For top of slope, the horizontal distance, X, may be calculated by using X = h/3, where h is the height of the slope. X shall not be less than 7 feet, nor need not be greater than 40 feet. X may be maintained by deepening the footings. For bottom (toes) of slopes, setbacks shall be X/2, but need not exceed 15 feet (see UBC [ICBO, 1997], Figure 18-I-1).</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
<tr><td>GEO-36</td><td>Concrete slabs shall be a minimum of 5 inches thick for very low expansive soil conditions, and be minimally reinforced as previously discussed. All slab reinforcement shall be supported to provide proper mid-slab height positioning during placement of the concrete. “Hooking” of reinforcement is not an acceptable method of positioning. Increase of concrete slab thickness would tend to reduce moisture vapor transmission though slabs.</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
<tr><td>GEO-37</td><td>Concrete slab underlayment shall consist of a 10-mil to 15-mil vapor retarder, or equivalent, with all laps sealed per the UBC/CBC (ICBO, 1997 and 2001) and the manufacturer’s recommendation. The vapor retarder shall comply with the ASTM E-1745 Class A or B criteria and be installed per the</td><td>Project Applicant to ensure compliance</td><td>City Inspector to verify</td><td>Ongoing during construction</td><td>City Engineer</td><td></td></tr>
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	recommendations of the manufacturer, including all penetrations (i.e., pipe, ducting, rebar, etc.). The manufacturer shall provide instructions for lap sealing, including minimum width of lap, method of sealing, and either supply or specify suitable products for lap sealing (ASTM E-1745). In order to break the capillary rise of soil moisture, the vapor retarder shall be underlain by 2 inches of fine or coarse, washed, clean gravel (80 to 100 percent greater than #4 sieve) and be overlain by at least 2 inches of clean, washed sand (SE >30) to aid in concrete curing.					
GEO-38	Concrete shall have a maximum water/cement ratio of 0.50.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-39	Where slab concrete compressive strength is increased, add mixtures used, and water/cement ratios are adjusted herein, the structural consultant shall also make changes to the concrete in the grade beams and footings in kind so that the concrete used in the foundation and slabs are designed and/or treated for more uniform moisture protection.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-40	The use of a penetrating slab surface sealer may be considered in rooms where permeable floor tile or wood will be used. In all planned floorings, the waterproofing specialist shall review the manufacturer's recommendations and adjust installation as needed. Homeowner(s) shall be advised which areas are suitable for tile or wood floors.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-41	The design parameters provided below assume that either very low expansive soils (Class 2 permeable filter material or Class 3 aggregate base) or native materials are used to backfill any retaining walls. The type of backfill (i.e., select or native), shall be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, shall be water-proofed. Footings shall be embedded a minimum of 18 inches below adjacent grade (excluding landscape layer, 6 inches) and shall be 24 inches in width. There shall be no increase in bearing for footing width. Preliminary recommendations for specialty walls (i.e., crib, earthstone, geogrid, etc.) are provided below.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-42	Any retaining walls that will be restrained prior to placing and compacting backfill material or that have re-entrant or male corners, shall be designed for an at-rest equivalent fluid pressure (EFP) of 65 pcf, plus any applicable	Project Applicant to ensure	City Inspector to verify	Ongoing during construction	City Engineer	

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	surcharge loading. For areas of male or re-entrant corners, the restrained wall design shall extend a minimum distance of twice the height of the wall (2H) laterally from the corner.	compliance				
GEO-43	The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Design parameters for walls less than 3 feet in height may be superceded by City and/or County standard design. Active earth pressure (Equivalent Fluid Pressure or Weight, EFW) may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions due to traffic, structures, seismic events or adverse geologic conditions. These EFWs do not include the effects of expansive soils. When wall configurations are finalized, the appropriate loading conditions for superimposed loads can be provided upon request. Considering the level of PHSA (10 percent probability of exceedance in 50 years), GSI recommends that, for walls over 6 feet in height and in close proximity to residences or main access roads, the designer consider using a seismic increment of 15H be used for a surcharge, to model seismic loadings. The pressure shall be added as a uniform pressure where H is the height of the wall from footing bottom (excluding keys) to top of backfill.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-44	Positive drainage must be provided behind all retaining walls in the form of gravel wrapped in geofabric and outlets. A backdrain system is considered necessary for retaining walls that are 2 feet or greater in height. Backdrains shall consist of a 4-inch diameter perforated PVC or ABS pipe encased in either Class 2 permeable filter material or ½-inch to ¾-inch gravel wrapped in approved filter fabric (Mirafi 140 or equivalent). For low expansive backfill, the filter material shall extend a minimum of 1 horizontal foot behind the base of the walls and upward at least 1 foot. For native backfill that has up to medium expansion potential, continuous Class 2 permeable drain materials shall be used behind the wall. This material shall be continuous (i.e., full height) behind the wall, and it shall be constructed in accordance with the enclosed Detail 1 (Typical Retaining Wall Backfill and Drainage Detail). For limited access and confined areas, (panel) drainage behind the wall may be constructed in accordance with Detail 2 (Retaining Wall Backfill and Subdrain	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	Detail Geotextile Drain). Materials with an E.I. potential of greater than 90 shall not be used as backfill for retaining walls. For more onerous expansive situations, backfill and drainage behind the retaining wall shall conform with Detail 3 (Retaining Wall and Subdrain Detail Clean Sand Backfill). Outlets shall consist of a 4-inch diameter solid PVC or ABS pipe spaced no greater than ±100 feet apart, with a minimum of two outlets, one on each end. The use of weep holes in walls higher than 2 feet shall not be considered. The surface of the backfill shall be sealed by pavement or the top 18 inches compacted with native soil (E.I. 90). Proper surface drainage shall also be provided. For additional mitigation, consideration shall be given to applying a water-proof membrane to the back of all retaining structures. The use of a waterstop shall be considered for all concrete and masonry joints.					
GEO-45	The geotechnical design parameters provided below are for the proposed ±17-foot high segmental retaining wall to be located along approximately 870 feet of the eastern site boundary. These design parameters assume that either non-expansive soils (typically Class 2 permeable filter material or Class 3 aggregate base) or native on-site materials (up to and including an E.I. of 30, P.I. <10) are used to backfill any segmental retaining walls. The type of backfill (i.e., select or native), shall be specified by the wall designer, and clearly shown on the plans. Building walls, below grade, shall be water-proofed or damp-proofed, depending on the degree of moisture protection desired.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-46	The following mitigation measures are intended to mitigate any potential impacts resulting from slope design: 1. Prior to excavation for the wall base, the alignment and grade for the wall shall be established in the field by the project civil engineer or project surveyor. 2. The contractor shall have a qualified grade checker on site to continually verify the gradient (or batter) and alignment of the base excavation and wall during construction. 3. The project surveyor shall spot-check wall gradient (face of wall slope) and alignment at least every 10 feet vertically and 50 feet horizontally. 4. When locating the base of the wall, structural setbacks established by the governing agency, and/or geotechnical engineer shall be followed. 5. Walls shall be founded on compacted fill, bedrock, or other suitable	Project Applicant to retain qualified grade checker	City Inspector to verify	Ongoing during construction	City Engineer	

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	materials, as described in our referenced reports. 6. The recommended equivalent fluid pressure for design of the segmented walls shall be 45 pcf for level backfill and 65 pcf for 2:1 backfill, assuming a select very low to low expansive granular backfill material (E.I. <30, P.I. <10, φ = 28 degrees, c = 200). These equivalent fluid pressures are based solely on static soil conditions and do not include seismic, footing surcharge, earthwork surcharge, or traffic loading which will need to be included, as necessary. 7. Utilize a seismic increment of 10 to 15H when evaluating internal gridwall stability in accordance with the Retaining Wall section of this report. For global stability of gridwalls, a seismic factor (pseudo-static) of 0.15 *i*, shall be used. 8. A bearing value of 1,500 psf may be utilized for a 1 foot deep footing. A friction coefficient of 0.35 may be used for a concrete to soil contact. A friction angle of 25 degrees and a soil unit weight of 115 to 130 pcf may be utilized for the compacted fill, dense competent Silverado Formation, as verified by observation and/or testing. In addition, a cohesion value of 0 psf, for reinforced fill, 100 psf for retained fill, and 100 psf for foundation fill may be utilized. 9. Prior to placement of the segmented members, the base excavation shall be observed by representatives of this firm. 10. A concrete/crushed stone leveling pad may be used to provide a uniform surface for the wall base. It is recommended that a concrete slab base be provided. 11. If it is necessary to locally deepen the wall base to obtain suitable bearing materials, the contractor shall consult the project design engineer to determine if the wall location or design of the wall is affected. 12. Segmented wall height at the terminal ends of the wall shall not exceed 4 feet unless lateral support is provided.					
GEO-47	1. Backfill within, behind, and in front of the segmented walls, which do not utilize geogrid fabric, shall be compacted to a minimum of 90 percent relative compaction unless otherwise specified by the manufacturer. Backfill behind segmented walls, which utilize geogrid fabric, shall be compacted to a minimum of 95 percent relative compaction. Any backfill other than the "unit core fill (0.75	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	inch crushed rock or stone)" shall be placed in controlled lifts not to exceed 6 inches in thickness, and moisture-conditioned as necessary to achieve at least optimum moisture content. Backfill within and immediately behind the walls shall also be as indicated on the (precise and rough) grading plans. 2. Backfill materials shall be free draining, and free from organic materials, with a maximum of 15 percent fines passing the No. 200 sieve. Lifts shall be placed horizontally and compaction equipment shall not be allowed to damage the geogrid fabric, if utilized. 3. If gravel or other select granular material is used as backfill within or behind the segmented wall, it shall be capped with a minimum 18 inches compacted fill composed of relatively impervious material. 4. During construction, the unfilled section of wall shall not be stacked more than 2 feet above the fill behind the wall. If gravel is used to fill the wall, the wall may be stacked 3 feet above adjacent grades. The maximum gravel size shall be less than 0.75 inches. 5. Adequate space shall be provided both behind and in front of the wall so that sufficient compaction can be obtained for all backfill. The slope of the geogrid walls and beaching (in cross section and alignment) shall be in accordance with the manufacturers recommendations and as approved by the geotechnical consultant.					
GEO-48	A drainage system shall be installed behind segmented walls in excess of 3 feet. The design of the system will depend on specific conditions. For most cases, a schedule 40 perforated collector pipe, wrapped in Mirafi 140 or equivalent, may be placed at the heel of the wall with a full height gravel drain, separated from the native backfill materials by Mirafi 140 or equivalent. In areas where native bedrock and/or terrace deposits are retained, a secondary backdrain system, as indicated previously, shall also be placed at the rear of the backcut. If necessary, outlets may pass below the base of the wall at a minimum 2 percent gradient. Outlets shall be tight-lined to an approved outlet area. The trenches for the outlets may be filled with either compacted material or gravel. If gravel is used, a concrete cut-off wall shall be provided at the soil/gravel interface. Seepage shall be anticipated below all segmented walls, and this shall be disclosed to all homeowners and any homeowners association, and all interested/affected parties.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-49	Only sound segmented wall members that meet all required specifications shall be used for construction of walls. Members shall be free of honeycombing, cracks, broken lugs, or slumped bearing surfaces. All geogrid fabric utilized shall comply with the required technical specifications. Geogrid fabric shall be placed horizontally to the required length/width behind the wall.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-50	It is recommended that settlement-sensitive structures be built behind a 1:1 (h:v) projection above the heel of the foundation for the segmented wall. In addition, all footings shall be setback behind a 1:1 projection from the heel of the geogrid reinforced excavation. If structures are located between the two 1:1 projections, the segmented wall shall be designed to accommodate the additional surcharge loading from the structure, and deepened building footings may be required depending on the height of the segmented wall. All appurtenant structures (i.e., A/C pads, screen walls, light standards, pools, spas, etc.) shall be placed outside a 1:1 (h:v) projection upward from the heel of the wall. Alternately, footings may be constructed such that bearing surfaces are below the 1:1 projection. Appurtenant structures, including pools, utilities, and landscaping, shall not disrupt the geogrid behind the walls. All structures proposed within the setback zone will be subject to both horizontal and vertical deflections. All construction proposed within the setback area shall be reviewed by the design civil engineer and GSI.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-51	A potential for mudflow and possible rock fall exists for lots located below significant proposed cut slopes or below re-entrant canyons. Consequently, these lots shall be protected with reinforced concrete-deflector walls designed to intercept and contain mudflow debris and rock fall. The deflector walls shall be constructed along the tops of uphill-graded slopes bordering the lots located below these cut slopes. Locations of walls will vary depending on as-graded conditions upon completion of rough grading. GSI has depicted the proposed locations on Plate 1. Design parameters for walls shall also be based on as-graded site conditions and on a determination of probable quantities of mudflow debris that may accumulate behind the walls, as evaluated by the design engineer. In lieu of concrete-deflector walls, suitable alternates may possibly consist of debris basins, or raising pad grades, so that there is an ascending minimum ±5-foot slope at the toe of the descending proposed significant cut slopes. However, locations, capacities, and other design considerations shall be based on as-	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	graded site conditions. Figure 5 (Debris Device Control Methods) may be used for alternative methods to contain potential debris or mud. For design purposes, the active earth pressures shall utilize an EPF of 125 pcf. Impact and debris walls shall be designed in a similar manner. The debris walls and impact walls shall be supported by footings with a minimum embedment of 18 inches into competent bedrock. Consideration shall be given to supporting debris and impact walls on 12-inch diameter drilled piers embedded a minimum 6 feet into engineered fill or competent bedrock. The actual design for the piers or footings shall be performed by the structural consultant using the foundation parameters in this report.					
GEO-52	The developer shall provide information regarding the possibility for expansive soils to affect structures and property to any homeowners and homeowners association.					
GEO-53	Due to the potential for slope creep for slopes higher than about 10 feet, some settlement and tilting of the walls/fence with the corresponding distresses shall be expected. To mitigate the tilting of top of slope walls/fences, we recommend that the walls/fences be constructed on a combination of grade beam and caisson foundations, for slopes comprised of expansive soils with an E.I. greater than 50. The grade beam shall be at a minimum of 12 inches by 12 inches in cross section, supported by drilled caissons, 12 inches minimum in diameter, placed at a maximum spacing of 6 feet on center, and with a minimum embedment length of 7 feet below the bottom of the grade beam. The strength of the concrete and grout shall be evaluated by the structural engineer of record. The proper ASTM tests for the concrete and mortar shall be provided along with the slump quantities. The concrete used shall be appropriate to mitigate sulfate corrosion, as warranted. The design of the grade beam and caissons shall be in accordance with the recommendations of the project structural engineer, and include the utilization of the following geotechnical parameters: **Creep Zone:** 5-foot vertical zone below the slope face and projected upward parallel to the slope face. **Creep Load:** The creep load projected on the area of the grade beam shall be taken as an equivalent fluid approach, having a density of 60 pcf. For the caisson, it shall be taken as a uniform 900 pounds per linear foot	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	of caisson's depth, located above the creep zone. **Point of Fixity:** Located a distance of 1.5 times the caisson's diameter, below the creep zone. **Passive Resistance**: Passive earth pressure of 300 psf per foot of depth per foot of caisson diameter, to a maximum value of 4,500 psf may be used to determine caisson depth and spacing, provided that they meet or exceed the minimum requirements stated above. To determine the total lateral resistance, the contribution of the creep prone zone above the point of fixity, to passive resistance, shall be disregarded. **Allowable Axial Capacity**: **Shaft capacity:** 350 psf applied below the point of fixity over the surface area of the shaft. **Tip capacity:** 4,500 psf					
GEO-54	To reduce the likelihood of distress related to expansive soils, the following recommendations are presented for all exterior flatwork: 1. The subgrade area for concrete slabs shall be compacted to achieve a minimum 90 percent relative compaction, and then be presoaked to 2 to 3 percentage points above (or 125 percent of) the soils' optimum moisture content, to a depth of 18 inches below subgrade elevation. The moisture content of the subgrade shall be verified within 72 hours prior to pouring concrete. 2. Concrete slabs shall be cast over a relatively non-yielding surface, consisting of a 4-inch layer of crushed rock, gravel, or clean sand, that shall be compacted and level prior to pouring concrete. The layer shall wet-down completely prior to pouring concrete, to minimize loss of concrete moisture to the surrounding earth materials. 3. Exterior slabs shall be a minimum of 4 inches thick. Driveway slabs and approaches shall additionally have a thickened edge (12 inches) adjacent to all landscape areas, to help impede infiltration of landscape water under the slab. 4. The use of transverse and longitudinal control joints are recommended to help control slab cracking due to concrete shrinkage or expansion. Two ways to mitigate such cracking are: a) add a sufficient amount of reinforcing steel, increasing tensile strength of the slab; and, b) provide	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	an adequate amount of control and/or expansion joints to accommodate anticipated concrete shrinkage and expansion. In order to reduce the potential for unsightly cracks, slabs shall be reinforced at mid-height with a minimum of No. 3 bars placed at 18 inches on center, in each direction. The exterior slabs shall be scored or saw cut, ½ to d inches deep, often enough so that no section is greater than 10 feet by 10 feet. For sidewalks or narrow slabs, control joints shall be provided at intervals of every 6 feet. The slabs shall be separated from the foundations and sidewalks with expansion joint filler material. 5. No traffic shall be allowed upon the newly poured concrete slabs until they have been properly cured to within 75 percent of design strength. Concrete compression strength shall be a minimum of 2,500 psi. 6. Driveways, sidewalks, and patio slabs adjacent to the house shall be separated from the house with thick expansion joint filler material. In areas directly adjacent to a continuous source of moisture (i.e., irrigation, planters, etc.), all joints shall be additionally sealed with flexible mastic. 7. Planters and walls shall not be tied to the house. 8. Overhang structures shall be supported on the slabs, or structurally designed with continuous footings tied in at least two directions.					
GEO-55	Suitable mitigative measures to reduce the potential of lateral deformation typically include: setback of improvements from the slope faces (per the 1997 UBC and/or adopted CBC), positive structural separations (i.e., joints) between improvements, and stiffening and deepening of foundations. Expansion joints in walls shall be placed no greater than 20 feet on-center, and in accordance with the structural engineer's recommendations. All of these measures are recommended for design of structures and improvements. The ramifications of the above conditions, and recommendations for mitigation, shall be provided to each homeowner and/or any homeowners association.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-56	Water has been shown to weaken the inherent strength of all earth materials. Slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from slopes shall be maintained and only the amount of irrigation necessary to sustain plant life shall be provided for planted slopes. Over-watering shall be avoided as it adversely affects site	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	improvements, and causes perched groundwater conditions. Graded slopes constructed utilizing on-site materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Compaction to the face of fill slopes would tend to minimize short-term erosion until vegetation is established. Plants selected for landscaping shall be light weight, deep rooted types that require little water and are capable of surviving the prevailing climate. Jute-type matting or other fibrous covers may aid in allowing the establishment of a sparse plant cover. Utilizing plants other than those recommended above will increase the potential for perched water, staining, mold, etc., to develop. A rodent control program to prevent burrowing shall be implemented. Irrigation of natural (ungraded) slope areas is generally not recommended. These recommendations regarding plant type, irrigation practices, and rodent control shall be provided to each homeowner. Over-steepening of slopes shall be avoided during building construction activities and landscaping.					
GEO-57	Adequate lot surface drainage is a very important factor in reducing the likelihood of adverse performance of foundations, hardscape, and slopes. Surface drainage shall be sufficient to prevent ponding of water anywhere on a lot, and especially near structures and tops of slopes. Lot surface drainage shall be carefully taken into consideration during fine grading, landscaping, and building construction. Therefore, care shall be taken that future landscaping or construction activities do not create adverse drainage conditions. Positive site drainage within lots and common areas shall be provided and maintained at all times. Drainage shall not flow uncontrolled down any descending slope. Water shall be directed away from foundations and not allowed to pond and/or seep into the ground. In general, the area within 5 feet around a structure shall slope away from the structure. We recommend that unpaved lawn and landscape areas have a minimum gradient of 1 percent sloping away from structures, and whenever possible, shall be above adjacent paved areas. Consideration shall be given to avoiding construction of planters adjacent to structures (buildings, pools, spas, etc.). Pad drainage shall be directed toward the street or other approved area(s). Although not a geotechnical requirement, roof gutters, down spouts, or other appropriate means may be utilized to control roof	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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	drainage. Down spouts, or drainage devices shall outlet a minimum of 5 feet from structures or into a subsurface drainage system. Areas of seepage may develop due to irrigation or heavy rainfall, and shall be anticipated. Minimizing irrigation will lessen this potential. If areas of seepage develop, recommendations for minimizing this effect could be provided upon request.					
GEO-58	Where significant slopes intersect pad areas, surface drainage down the slope allows for some seepage into the subsurface materials, sometimes creating conditions causing or contributing to perched and/or ponded water. Toe of slope/toe drains may be beneficial in the mitigation of this condition due to surface drainage.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-59	Cut and fill slopes will be subject to surficial erosion during and after grading. On-site earth materials have a moderate to high erosion potential. Consideration shall be given to providing hay bales and silt fences for the temporary control of surface water, from a geotechnical viewpoint.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
GEO-60	Only the amount of irrigation necessary to sustain plant life shall be provided. Over-watering the landscape areas will adversely affect proposed site improvements. We would recommend that any proposed open-bottom planters adjacent to proposed structures be eliminated for a minimum distance of 10 feet. As an alternative, closed-bottom type planters could be utilized. An outlet placed in the bottom of the planter, could be installed to direct drainage away from structures or any exterior concrete flatwork. If planters are constructed adjacent to structures, the sides and bottom of the planter shall be provided with a moisture retarder to prevent penetration of irrigation water into the subgrade. Provisions shall be made to drain the excess irrigation water from the planters without saturating the subgrade below or adjacent to the planters. Graded slope areas shall be planted with drought resistant vegetation. Consideration shall be given to the type of vegetation chosen and their potential effect upon surface improvements (i.e., some trees will have an effect on concrete flatwork with their extensive root systems). From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils are processed for the purpose of adding amendments, they shall be recompacted to 90 percent minimum relative compaction.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	

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GEO-61	1. All interior utility trench backfill shall be brought to at least 2 percent above optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of the laboratory standard. As an alternative for shallow (12-inch to 18-inch) under-slab trenches, sand having a sand equivalent value of 30 or greater may be utilized and jetted or flooded into place. Observation, probing and testing shall be provided to evaluate the desired results. 2. Exterior trenches adjacent to, and within areas extending below a 1:1 plane projected from the outside bottom edge of the footing, and all trenches beneath hardscape features and in slopes, shall be compacted to at least 90 percent of the laboratory standard. Sand backfill, unless excavated from the trench, shall not be used in these backfill areas. Compaction testing and observations, along with probing, shall be accomplished to evaluate the desired results. 3. All trench excavations shall conform to CAL-OSHA, state, and local safety codes. 4. Utilities crossing grade beams, perimeter beams, or footings shall either pass below the footing or grade beam utilizing a hardened collar or foam spacer, or pass through the footing or grade beam in accordance with the recommendations of the structural engineer.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Engineer	
	Hazards and Hazardous Materials					
HAZ-1	If during the course of grading or other construction activity, any previously undiscovered tanks or other potentially hazardous materials are detected (as indicated by odor, discolored soil, etc.), all work shall cease until the City is notified. The City will notify the appropriate state, federal, or local regulatory agency (Department of Environmental Health, Regional Water Quality Control Board, etc.) as appropriate to ensure that proper investigation plan is conducted. The applicant shall be responsible for conducting all contaminant remediation and removal activities in accordance with pertinent local, state, and federal regulatory guidelines. A remediation report shall be prepared documenting the contaminant discovered and remediation activity completed. This report shall be forwarded to the relevant federal, state, and/or local regulatory agency to ensure that remediation has occurred in accordance with	Project Applicant to prepare remediation report documenting any contamination discovered and remediation activity completed; Applicant to submit report to	City to verify documentation that report was submitted	Ongoing during construction	Development Department-Project Planner	

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	all guidelines and to the satisfaction of said agency. Once the agency has determined that the remediation activity is completed in a satisfactory manner, project construction work can resume.	appropriate agencies				
HAZ-2	Prior to issuance of a grading permit, the applicant shall submit a final tract map that depicts the natural slope Fuel Modification treatment recommended in the Fire Protection Plan (FIREWISE 2000, Inc. 2008).	Project Applicant to submit Final Tract Map	City to verify depiction of recommended Fuel Modification treatment	Prior to issuance of grading permits	Public Works Engineer	
HAZ-3	Prior to approval of the final tract map, the applicant shall submit a draft of the Rancho de Paseo Valencia Community Covenants, Conditions, and Restrictions (CC&Rs) for review by City staff. The CC&Rs shall require the Home Owner's Association (HOA) to keep the fuel modification treatment area cleared in accordance with its original design. All manufactured slopes shall be vegetated and irrigated as directed by the Fire Protection Plan (FIREWISE 2000, Inc. 2008). Further, for all lots that abut the fuel modification treatment area, the individual lot CC&Rs shall specifically state that all private land owners must engage in upkeep of the fuel modification zone consistent with all City and/or County directives. Disturbances of native or fill soils in slope areas should shall be minimized or avoided during implementation of fuel modification zone activities. Loosened/disturbed soils would have an increased potential for erosion and/or instability. A representative of GSI should shall observe fuel modification activities (i.e., thinning and/or pruning) to evaluate and/or comment on the effects on site soils.	Project Applicant to submit CCR to City	City to review and approve CCRs	Prior to approval of final tract map	Development Department-Project Planner	
HAZ-4	Prior to approval of any single lot architectural plan, the City shall ensure that all structures will be designed to have a Class A roof. For roof coverings where the profile allows a space between the roof covering and roof decking, the space at the eave ends shall be “fire stopped” to preclude entry of flames or embers.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	

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HAZ-5	Prior to approval of any single lot architectural plan, the City shall ensure that all structures that contain exterior walls facing the urban/wildland interface comply with the following requirements: • The exterior wall surface materials shall be non-combustible or an approved alternate. In all construction, exterior walls are required to be protected with 2-inch nominal solid blocking between rafters at all roof overhangs. Wood shingle and shake wall covering shall be prohibited. • Wood siding of 0.375-inch plywood or 0.75-inch drop siding is permitted but must have an underlayment of 0.5-inch fire rated gypsum sheathing that is tightly butted or taped and mudded.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-6	Prior to approval of any single lot architectural plan, the City shall ensure that all structures' attic ventilation openings or ventilation louvers shall not be permitted in soffits, rakes, in eave overhangs, between rafters at eaves, or in other similar exterior overhanging areas in the urban/wildland interface area. In the urban/wildland interface area, paper-faced insulation shall be prohibited in attics or ventilated spaces.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-7	Prior to approval of any single lot architectural plan, the City shall ensure that all roof vents, dormer vents, gable vents, foundation ventilation openings, ventilation openings in vertical walls, or other similar ventilation openings shall be louvered and covered with 0.25-inch, noncombustible, corrosion-resistant metal mesh or other approved material that offers equivalent protection. Turbine attic vents shall be equipped to allow one-way direction rotation only; they shall not spin freely in both directions.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-8	Prior to approval of any single lot architectural plan, the City shall ensure that all combustible eaves, fascias, and soffits shall be enclosed. Eaves of heavy timber construction are not required to be enclosed as long as attic venting is not installed in the eaves. Heavy timber construction shall consist of a minimum of 4×6 rafter ties and 2× decking.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	

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HAZ-9	Prior to approval of any single lot architectural plan, the City shall ensure that all homes with skylights shall be tempered glass except when the structure is protected with an automatic fire sprinkler system. No skylights are allowed on the roof assembly facing hazardous vegetation.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-10	Prior to approval of any single lot architectural plan, the City shall ensure that all glass or other transparent, translucent, or opaque glazing shall be tempered glass, multilayered glass panels, glass block, have a fire-protection rating of not less than 20 minutes, or other assemblies approved by the City Fire Department. Glazing frames made of vinyl materials shall have welded corners, metal reinforcement in the interlock area, and be certified to ANSI/AAMA/NWWDA 101/I.S.2-97 structural requirements.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-11	Prior to approval of any single lot architectural plan, the City shall ensure that all chimneys, flues, or stovepipes have an approved spark arrester. An approved spark arrester is defined as a device constructed of non-flammable materials, 12-gauge minimum thickness or other material found satisfactory by the City of Corona Fire Department. It must have 0.5-inch perforations for arresting burning carbon or sparks and be installed to be visible for the purposes of inspection and maintenance.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-12	Prior to approval of any single lot architectural plan, the City shall ensure that all rain gutters and downspouts shall be constructed of noncombustible material. Gutters shall be designed to reduce the accumulation of leaf litter and debris that contributes to roof edge ignition.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-13	Prior to approval of any single lot architectural plan, the City shall ensure that all exterior doors shall be constructed of approved non-combustible construction, solid core wood not less than 1.75 inches thick or have a fire protection rating of not less than 20 minutes. Windows within doors and glazed doors shall comply.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	

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HAZ-14	Prior to approval of any single lot architectural plan, the City shall ensure that the first 5 feet of fences and other items attached to a structure shall be constructed of non-combustible material or meet the same fire-resistive standards as the exterior walls of the structure.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-15	Prior to approval of any single lot architectural plan, the City shall ensure that all enhanced homes are sprinklered. The interior sprinkler system shall meet National Fire Protection Standard 13D (Installation of Sprinkler Systems in Residential Occupancies).	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-16	Prior to approval of any single-lot architectural plan, the City shall ensure that all side yard fence and gate assemblies (fences, gate, and gate posts) when attached to the home, shall be of non-combustible material. The first five feet of fences and other items attached to a structure shall be of non-combustible material.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-17	Prior to approval of any single-lot architectural plan, the City shall ensure that all windows shall be provided with 0.125-inch mesh metal or similar noncombustible screens to prevent embers from entering the structure during high wind conditions.	Project Applicant to ensure compliance	City to review single lot architectural plans	Prior to approval of any single lot architectural plan	Development Department-Project Planner	
HAZ-18	Prior to approval of the final tract map, the City shall ensure that hydrants, mains, and water pressure systems have been designed to comply with all City Municipal Code requirements to maintain adequate fire flow.	Project Applicant to submit Final Tract Map	City to verify	Prior to issuance of grading permits	Public Works Engineer	
HAZ-19	Prior to final tract map approval, the applicant shall provide the City with a draft of the CC&Rs. The CC&Rs must contain the following: • The lot/home owner is personally responsible for all required fuel treatment measures within his or her lot.	Project Applicant to submit CC&Rs	City to review and approve	Prior to final tract map approval	Development Department-Project Planner	

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	• The HOA Board has the authority for enforcing required fuel treatment measures on all lots and restrictions on combustible structures on all restricted lots. • The Fuel Treatment Zones must be shown on the CC&Rs and recorded against all lots. The HOA Board will be responsible for enforcing all required fuel modification treatments on all lots. • All property owners are members of the HOA and will financially support the annual maintenance of all required designated open space areas. • The HOA Board is responsible to the Fire Marshal for the completion of all required fuel modification treatments prior to the annual fire season. • All individual lot landscaping plans, including construction of primary residence and additional structures, must be approved by the HOA Board and shall comply with the Fire Protection Plan (FIREWISE 2000, Inc. 2008). • Any disputes relating to the HOA Board approval of individual lot landscaping with regard to interpretation of the Fire Protection Plan shall be decided by the Fire Marshal or his/her designee within the City of Corona Fire Department. The Fire Marshal's decision shall be final and binding on the lot owner.					
HAZ-20	Prior to issuance of a grading permit, the City shall ensure that the Fuel Treatment Location Map, included in the Fire Protection Plan (FIREWISE 2000, Inc. 2008) prepared for the project, is accurately depicted on project plans.	Project Applicant to provide copies of Fuel Treatment Location Map	City to review and approve	Prior to issuance of grading permit	Development Department-Project Planner	
	Hydrology and Water Quality					
HYD-1	Prior to issuance of a grading permit, the project applicant will demonstrate compliance with all applicable regulations established by the United States Environmental Protection Agency (EPA) as set forth in the National Pollutant Discharge Elimination System (NPDES) permit requirements for urban runoff and stormwater discharge, and any regulations adopted by the City of Corona pursuant to the NPDES regulations or requirements. Applicable guidelines and measures and the applicant's approach to meeting each shall be spelled out in the Storm Water Pollution Prevention Plan. Further, the applicant shall	Project Applicant to submit Storm Water Pollution Prevention Plan to City; Project Applicant to submit copy of NOI submitted for	City to review and confirm	Prior to issuance of grading permit	Development Department-Project Planner	

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	file a Notice of Intent with the State Water Resources Control Board to obtain coverage under the NPDES General Permit for Storm Water Discharges Associated with Construction Activity and shall implement a Storm Water Pollution Prevention Plan concurrent with the commencement of grading activities. The Storm Water Pollution Prevention Plan shall include both construction and post-construction pollution prevention and pollution control measures. An example of a construction control measure would be that prior to any severe weather event the project applicant shall ensure that any exposed slopes are stabilized using a bonded fiber matrix coupled with placement of straw waddles spaced appropriately on the slope based on slope gradient and silt fences at the toe of the slope. An example of a post-construction control measure includes ensuring that sediment accumulation near culverts and channels does not exceed 3 inches at any spot or cover vegetation. This plan shall also identify funding mechanisms for post-construction control measures.	NPDES permit to City				
HYD-2	During construction, the project will incorporate all City of Corona construction best management practices (BMPs) in order to control the discharge of pollutants and to avoid the tracking of sediments into streets and storm water conveyance channels. This measure shall be implemented to the satisfaction of the City Community Development and Public Works Directors. These BMPs may include, but are not limited to, the following: • Where necessary, temporary and/or permanent erosion control devices, as approved by the Public Works Department, shall be employed to control erosion and provide safety during the rainy season from October 15 to April 15. The erosion control devices shall include hillside stabilization structures (i.e., fiber matrix on slopes and construction access stabilization mechanisms, etc.) and runoff control devices (i.e., drainage swales, gravel bag barriers/chevrons, velocity check dams, etc.). • All removable erosion protective devices shall be in place at the end of each working day when the 5-day rain probability forecast exceeds 40%. • After a rainstorm, all silt and debris shall be removed from streets, check berms, and basins.	Project Applicant to submit Storm Water Pollution Prevention Plan to the City	City to review and approve SWPPP	Prior to issuance of a grading permit	Development Department-Project Planner; Public Works Engineer	

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	• Graded areas on the permitted area perimeter must drain away from the face of the slopes at the conclusion of each working day. Drainage is to be directed toward desilting facilities. • Silt fences shall be installed along limits of work, the project construction site, or both. Other sediment controls could include surface roughening, tree or natural vegetation preservation and protection, temporary gravel construction entrance/exit, temporary diversions, permanent diversions, outlet stabilization, inlet protection, temporary sediment basins, and gravel bay barriers • All construction vehicles shall be adequately maintained and equipped to minimize/eliminate fuel spillage. All equipment maintenance work shall occur off site or within the designated construction staging area. • Water shall be applied to the site as needed during grading operations to minimize dust and wind erosion. Prior to issuance of a grading permit, the applicant shall submit a Storm Water Pollution Prevention Plan that describes the specific measures that will be employed during construction to ensure that applicable and appropriate City-approved BMPs are implemented.					
HYD-3	The project applicant shall ensure that all Site Design, Source Control, and Treatment Control BMPs outlined in the proposed project's Water Quality Management Plan (May 27, 2009) be implemented in order to control potential discharge and runoff from the residential use of the site once constructed. These BMPs may include, but are not limited to, the following: • Permanent seeding shall be applied to all exposed slopes to minimize erosion. • Streets and driveways shall be swept to maintain cleanliness of the pavement. At a minimum, all impervious surfaces would be thoroughly swept four (4) times per year, or more often as necessary, with particular emphasis for thorough cleaning prior to the rainy season. • Sediment traps, forebays, inlet/outlet structures, overflow spillways and trenches shall be cleaned out if necessary and the first layer of	Project Applicant to submit Water Quality Management Plan to City; Project Applicant to ensure all BMPs are implemented	City to review Water Quality Management Plan	Prior to issuance of grading permit	Development Department-Project Planner; Public Works Engineer	

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	aggregate and filter fabric replaced if clogging appears on the surface. • Visual inspections of the project site shall be performed annually to ensure that proper litter/debris controls are maintained and that proper landscaping, fertilizer, and pesticide practices are upheld. The final Water Quality Management Plan will be subject to review and approval by the Directors of the City of Corona Community Development and Engineering Departments.					
	Aesthetics					
AES-1	All graded slopes would be replanted with native and drought tolerant plant species. The landscape plan shall adhere to the City's landscape design guidelines as they pertain to water friendly plant materials (it should be noted that the City's landscape design guidelines are consistent with the University of California Cooperative Extension Service's Water Use Classification of Landscape Plants guidelines).	Project Applicant to submit landscape plan	City to review and approve	Prior to issuance of grading permit	Development Department-Project Planner	
AES-2	All project streetlights shall be designed in accordance with the City's Municipal Code and shall be pointed downward. The Municipal Code provides for several streetlight specifications that help ensure that sufficient lighting is available as a public health and safety measure but at the same time avoid substantial new light sources that might be considered a nuisance to adjacent land uses or open space areas such as exist on adjacent hillsides.	Project Applicant to submit lighting plan and ensure compliance with Code	City Inspector to verify compliance	Prior to issuance of building permit; ongoing during construction	Development Department-Project Planner; City Inspector	
AES-3	Prior to issuance of a grading permit, the applicant shall submit a lighting plan to City Community Development Staff for the tennis courts showing how proposed lights would not result in nuisance spill-over to adjacent properties or open space. Further, any lighting proposed for the tennis courts shall be pointed downward and be affixed to a timer, which will ensure that lights remain off when the courts are not in use.	Project Applicant to submit lighting plan to City	City to review and approve plan	Prior to issuance of a grading permit	Development Department-Project Planner	
AES-4	Prior to issuance of a grading permit, the applicant shall provide the specifications for any entryway or entryway monument lighting. These specifications shall be consistent with the City's Municipal Code, which mandates that all light sources be retained on site so as to avoid nuisance spill-over to adjacent properties.	Project Applicant to submit specification for entryway	City to review and approve	Prior to issuance of grading permit	Development Department-Project Planner	

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Minerals – No mitigation measures required						
Noise						
NOI-1	Equipment staging and material stockpiling areas shall be located at the furthest feasible distance from identified sensitive receptors to ensure construction-related noise sources are reduced to the greatest extent possible. Staging areas should be located at least 500 feet from the nearest occupied residential structure to the project site. Construction operations, including equipment maintenance, shall not occur outside permitted construction hours as delineated in the City and County noise ordinances.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Inspector	
NOI-2	Prior to grading permit issuance, the developer shall ensure that all construction equipment, fixed or mobile, is equipped with properly operating and maintained mufflers. Additionally, the use of electric air compressors and similar power tools, rather than diesel equipment, shall be used where feasible.	Project Applicant to ensure compliance	City Inspector to verify	Prior to issuance of grading permit	City Inspector	
NOI-3	If traffic control and construction signs that require power for lighting or flashing are located near existing residents, the source of power should be batteries, solar cells or another quiet source. Gas or diesel fueled internal combustion engines shall not be allowed.	Project Applicant to ensure compliance	City Inspector to verify	Ongoing during construction	City Inspector	
Population and Housing – No mitigation measures required						
Public Services and Utilities						
PUB-1	Prior to issuance of a grading permit, a cross-staffed brush engine will be required to be available at all times to assist with a fire during construction. If said equipment is not available from the Corona Fire Department, the applicant shall be required to secure such equipment/staffing.	Project Applicant to provide verification that engine is available	Department of Public Works to confirm	Prior to issuance of grading permit	City Fire Chief	
PUB-2	Prior to the issuance of a grading permit, the applicant shall make a fair share contribution to fund any needed improvements to the City's communications equipment as identified by the City Fire Department. Any required improvements to the City's communications equipment shall be installed prior to project occupancy. This measure shall be implemented to the satisfaction of the City Fire Chief or his/her designee.	Project Applicant to make fair share contribution	Department of Public Works to confirm	Prior to issuance of grading permit	City Fire Chief	

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PUB-3	Prior to final tract map approval, in order to offset any potential impacts to the Corona-Norco Unified School District, the applicant would be required to pay state-mandated single family residential school facilities fees. The fee amount shall be determined based on the school fee schedule in place at the time of final tract map approval. These fees may be used to enhance, expand or develop new school facilities per the District's master facilities plan.	Project Applicant to pay school facilities fees	District to confirm	Prior to final tract map approval	Corona-Norco Unified School District	
PUB-4	Prior to issuance of occupancy permits, the applicant shall pay an in-lieu fee for dedication of parkland as set by resolution of the City Council, or a combination of the respective amounts to be determined in the sole discretion of City, so long as the aggregate fair market value of the land and recreational facilities plus in-lieu fees does not exceed the limits established in Chapter 16.35 of the City's Municipal Code. The department of Parks and Community Services has determined that the payment of in lieu fees rather than parkland dedication will be adequate to mitigate any potential impacts. According to Chapter 16.35, Section 16.060 (E) of the Corona Municipal Code, a subdivision with fifty or less dwelling units shall pay fees because the amount of land dedicated would be less than 3 acres, which is the minimum the City would accept. Additionally, sufficient neighborhood and community parks exist within the immediate project area and funds would be more useful augmenting the Capital Improvement Program (C.I.P) Budget to be used for new park improvement costs (Garcia 2010b).	Project Applicant to pay in-lieu fee for dedication of parkland	Department of Parks and Community Services to confirm	Prior to issuance of occupancy permits	Department of Parks and Community Services	
Recreation – No mitigation measures required						
Traffic						
TRF-1	Prior to final tract approval, the applicant shall install an all-way stop at the intersection of Malaga Street and Shepard Crest Drive to facilitate circulation. Further, this traffic stop will slow northbound traffic coming off the proposed project's entrance incline.	Project Applicant to install all-way stop	City Inspector to verify	Prior to final tract map approval	Development Department-Project Planner; traffic engineer	

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	Greenhouse Gas Emissions					
GHG-1	In the year 2020, emission factors will be less than or equal to requirements such as that which will require automakers to boost fleet wide gas mileage averages to 35 mpg. This increase in average gas mileage will reduce energy needs for project vehicles by up to 40% (Brain F. Smith and Associates 2010). This reduction would be expected to reduce project related CO2e by 264.14 tons or 29.4% per year. The EPA and the US Department of Energy recommend building homes and habitable areas to achieve energy star compliance, as they are at least 15% more efficient than homes built to the 2004 International Residential Code (IRC), and include additional energy-saving features that typically make them 20%–30% more efficient than standard homes (Brian F. Smith and Associates 2010). Each residential unit shall achieve energy star compliance, as they would consume only 85% of the business as usual energy requirements. Once building permits are requested, the City of Corona shall verify that design will meet the EPA's energy star compliance guidelines. Achievement of energy star compliance is expected to reduce CO2e for both natural gas and electricity levels by 31.16 tons.	Project Applicant to submit building plans including details on EPA energy star compliance	City to review and approve	Prior to issuance of building permits	Development Department-Project Planner	