ENTRIX, Inc., June 2010, Revised Focused Special-Status Fish Species Habitat Assessment -- Santa Clara River and Tributary Drainages, Newhall Ranch, Los Angeles County, California

ERRATA SLIPSHEET

ENTRIX, Inc., June 2010, "Revised Focused Special-Status Fish Species Habitat Assessment -- Santa Clara River and Tributary Drainages, Newhall Ranch, Los Angeles County, California"

The ENTRIX report included in the Draft EIS/EIR (April 2009) has been revised and included under **Appendix F4.5** of the Final EIS/EIR (June 2010). The nature of the two specific revisions to the report are as follows: (1) Appendix D erroneously included a series of graphics that depicted PACE-prepared "Riparian Velocity Comparisons" actually meant to support analysis of Draft EIS/EIR **Section 4.2**, Geomorphology and Riparian Resources; the Riparian Velocity Comparison graphics have been omitted from Appendix D of this ENTRIX report, as well as erroneous reference to them within the text of the report; and (2) graphics depicting "Fish Flood Refugia" have been inserted into Appendix D of this ENTRIX report, and references have been added to the Refugia graphics within the text; a subset of the Fish Flood Refugia graphics was previously presented in **Section 4.5**, Biological Resources, of the Draft EIS/EIR. In sum, the erroneous graphics and text references were removed and replaced with the appropriate graphics and text references. All of the revisions are reflected in the Revised ENTRIX report in underline and strikeout format, including the Title Page and Table of Contents.

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ENTRIX

REVISED FOCUSED SPECIAL STATUS FISH SPECIES HABITAT ASSESSMENT AND IMPACT ANALYSIS SANTA CLARA RIVER AND TRIBUTARY DRAINAGES WITHIN NEWHALL RANCH

NEWHALL RANCH RESOURCE MANAGEMENT & DEVELOPMENT PLAN LOS ANGELES COUNTY, CALIFORNIA

Prepared for:
The Newhall Land & Farming Company
Valencia, CA

Prepared by:
ENTRIX, Inc.
Ventura, CA

June 2010

~~**February 23, 2009**~~

Revised
Focused Special Status Fish Species Habitat Assessment and Impact Analysis Santa Clara River and Tributary Drainages within Newhall Ranch

Newhall Ranch
Resource Management & Development Plan
Los Angeles County, California

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Project No. 3109006

JUNE 2010
~~**February 23, 2009**~~

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1. INTRODUCTION

This report summarizes the focused assessment of fish presence, aquatic habitat quality and quantity and of potential project effects on threatened or endangered fish species inhabiting the Newhall Ranch reach of the Santa Clara River as well as tributary drainages to the Santa Clara River. Specifically, this report focuses on potential impacts to special-status fish species including the unarmored threespine stickleback. This assessment covered the mainstem Santa Clara River from Salt Creek Canyon upstream to the Middle Canyon confluence and included the Salt Creek and Potrero Creek tributaries. Specifically, this report focused on potential impacts to the State and Federally-listed unarmored threespine stickleback and other fish species, including arroyo chub and Santa Ana sucker. A quantitative habitat inventory was also conducted to identify existing habitat composition including important habitat features utilized by unarmored threespine stickleback and other locally important species.

The primary focus of this assessment is to examine potential impacts to the target species, including impacts to habitat resulting from alterations to local hydrology and corresponding habitat areas through implementation of the Newhall Ranch Resource Management and Development Plan (RMDP). Another focus of the assessment is to characterize aquatic habitat conditions to establish a general environmental baseline for future studies. While sampling for the presence of fish species was performed during the assessment of habitat conditions, these surveys were not census driven and this report does not present an assessment of overall fish abundance or distribution. The unarmored threespine stickleback, arroyo chub, and Santa Ana sucker fish species have been documented to be locally abundant throughout the RMDP reach of the Santa Clara River in some years and their numbers are typically dependent on inter-annual hydrological conditions, such as the frequency and intensity of flood events. The assessment draws on numerous historical survey reports, as well as recent reconnaissance surveys conducted in 2004, 2005, and 2006.

1.1 THE RESOURCE MANAGEMENT AND DEVELOPMENT PLAN

Newhall Land (Newhall) is implementing the Resource Management and Development Plan (RMDP) concurrently with the phased development outlined by the approved Newhall Ranch Specific Plan (NRSP) on property west of Interstate 5 along the northern and southern terraces, and drainages tributary to the Santa Clara River. The Newhall Ranch property, within the approved NRSP area is currently used for agriculture and oil and gas production. Newhall retained ENTRIX to assess the potential effects of the RMDP and five other project alternatives on selected special-status fish species, including unarmored threespine stickleback and other sensitive fish species.

PROJECT SUMMARY

The proposed Project consists of two components. The first component is the RMDP, which is a conservation, mitigation, and permitting plan for sensitive biological resources within the previously approved Newhall Ranch Specific Plan (Specific Plan) area. The RMDP would be relied upon to obtain federal and state permits to implement infrastructure improvements necessary to facilitate build-out of the approved Specific Plan. The RMDP is intended to direct both resource management and development on the Specific Plan site.

The second component of the proposed Project is the SCP, which is a conservation and management plan to permanently protect and manage a system of preserves designed to maximize the long-term persistence of the San Fernando Valley spineflower (*Chorizanthe parryi ssp. fernandina*; spineflower), a federal candidate and a state-listed endangered plant species. The SCP would address known spineflower located within the Specific Plan area and two study areas, the Valencia Commerce Center (VCC) and Entrada planning areas.

RESOURCE MANAGEMENT DEVELOPMENT PLAN COMPONENT

The RMDP component of the proposed Project is a conservation, mitigation, and permitting plan for the long-term management of sensitive biological resources in conjunction with infrastructure improvements within the 11,999-acre Specific Plan area, located in unincorporated Los Angeles County, California. The Specific Plan was approved by Los Angeles County in May 2003 to guide development of a new community composed of a broad range of residential, mixed-use, and nonresidential land uses within villages on the Specific Plan site. Subsequent development plans, subdivision maps, and federal and state permitting, consultations, and agreements were anticipated to be required to facilitate build-out of the Specific Plan.

The resource management portion of the RMDP would guide the future resource conservation, mitigation, and permitting needed for the long-term management of sensitive biological resources within the Specific Plan. The development plan portion of the RMDP consists of physical infrastructure improvements located in or adjacent to the Santa Clara River and its tributaries that are required to facilitate development of the approved Specific Plan.

The RMDP infrastructure components are briefly summarized, as follows:

Bridges and Road Crossing Culverts. Three bridges and 15 new road crossing culverts would be installed to serve the Specific Plan, and to accommodate future traffic associated with development of the Specific Plan and the region. The three bridges would be located over the main stem of the Santa Clara River, including the Potrero Canyon Road and Long Canyon Road

bridges, and the previously-approved Commerce Center Drive bridge[1] at Middle Canyon. Fifteen new road crossing culverts would cross six drainages tributary to the Santa Clara River (Chiquito, San Martinez Grande, Lion, Long, Potrero, and Ayers Canyons).

Bank Stabilization. Bank stabilization/protection would be installed along portions of the Santa Clara River Corridor and its tributary drainages within the RMDP site. Bank protection would include buried soil cement, grouted and ungrouted rock riprap, turf reinforcement mats, and limited gunite slope lining in and around bridge abutments. In addition, all applicable development areas would be raised above the FEMA flood hazard elevation to protect land uses from flooding.

Drainage Facilities. Drainage facilities would be installed and include open and closed drainage systems, inlets, outlets, bank stabilization, and National Pollutant Discharge Elimination System (NPDES) water quality basins. The proposed drainage structures focus on minimizing the amount of debris and urban contaminants from entering into stormdrain systems and natural and modified drainages.

Water Quality Control Facilities. Pursuant to NPDES requirements, Best Management Practices (BMPs) would be implemented, including numerous water quality control facilities (*e.g.*, water quality basins, debris basins, detention basins, *etc*.).

Tributary Drainages

- **Modified Tributary Drainages -- Existing Channels Stabilized.** Due to existing degraded conditions, and in order to accommodate the Specific Plan development, portions of the existing major tributary drainages within the RMDP site (portions of Chiquito Canyon, San Martinez Grande Canyon, and Lion Canyon) would require stabilizing treatments to protect the channel and surrounding development from excessive vertical scour and lateral channel migration. The existing drainages would remain intact, but would sustain permanent and temporary impacts from construction of stabilization elements, including buried bank stabilization and grade stabilization structures.

- **Modified Tributary Drainages -- Regraded Channels**. Due to the existing degraded conditions within portions of some drainages in the RMDP site (Potrero Canyon, Long Canyon, and portions of Chiquito, San Martinez Grande, and Lion canyons), stabilization of the existing drainages is not feasible; and, therefore, in order to meet the County's flood protection objectives, these drainages would be graded, and a new drainage would be constructed in the same or similar location. The new drainages would be designed to incorporate buried bank stabilization and grade stabilization, and would have sufficient hydrologic capacity to pass the Los Angeles County Capital Flood without the need for clearing vegetation from the channels. The new channel banks would be planted with riparian vegetation following construction.

- **Unmodified (Preserved) Drainages.** Among the minor tributary drainages within the RMDP site, some are not in a degraded condition; others are located in areas where no

1 The Commerce Center Drive bridge was approved by the California Department of Fish and Game (Section 1603) and Army Corps of Engineers (CWA 404) and analyzed under CEQA and NEPA in the Valencia Natural River Management Plan Final EIS-EIR in 1998.

impacts are proposed; and others are distant enough from surrounding development that bank stabilization is not required. These drainages would remain in their existing condition; the RMDP does not propose to impact or enhance these drainages.

- **Drainages Converted to Buried Storm Drain.** Some of the drainages within the RMDP site, including many of the smaller drainages, would be graded to facilitate build-out of the Specific Plan. The wet-weather flows in these drainages meet the Los Angeles County flood criteria (less than 2,000 cfs) to be conveyed by storm drain, and would be discharged to the Santa Clara River *via* proposed storm drain outlets.

Grade Stabilization Structures. Grade stabilization structures will be installed in five major tributary drainages (Chiquito, San Martinez Grande, Lion, Long, and Potrero Canyons). The grade stabilization structures are designed an located to dissipate storm flow energy and prevent excessive scour and bed erosion and maintain slope equilibrium along the length of each drainage.

Utility Corridor and Crossings. The Corridor alignment generally extends parallel to the south side of SR-126 north of the Santa Clara River. Various electrical, sewer, water, gas, and communications lines would be installed across tributary drainages within an approximately 100-foot wide Corridor alignment right-of-way to serve the Specific Plan. Utility lines would be installed in rights-of-way adjacent to bridges where access for installation and maintenance can be easily accommodated. Utilities also would be extended across the Santa Clara River and its tributaries to serve the Specific Plan.

Temporary Haul Routes for Grading Equipment. Temporary haul routes across the Santa Clara River would be used during construction to move equipment and excavated soil to locations in the RMDP site where fill is needed for the Specific Plan.

WRP Outfall Construction Activities. An effluent outfall pipeline would be constructed from the Newhall Ranch Water Reclamation Plant (WRP) through the bank stabilization to the bed of the Santa Clara River. An earthen channel and adjacent walkway also would be constructed to reach the actual flow path of the river.

Roadway Improvements to SR-126. Various roadway improvements, including SR-126 widening and a grade-separated crossing at Long Canyon Road/SR-126, would be needed within the vicinity of the RMDP site.

Maintenance Activities. The Los Angeles County Department of Public Works (DPW) or other entity would conduct regular and ongoing maintenance of flood, drainage, and water quality protection facilities on the RMDP site.

Recreation Facilities. In addition to the comprehensive system of bicycle, pedestrian, and equestrian trails that would be implemented by the adopted Specific Plan Master Trails Plan, the RMDP proposes to construct up to eight nature viewing platforms that would be located in jurisdictional areas along the Santa Clara River.

Geotechnical Investigation Activities. To accommodate the Specific Plan development, geotechnical investigations and associated activities would be undertaken to ensure that the development would be safely constructed in accordance with all applicable geotechnical reports,

studies, and standards.

Habitat Enhancement and Restoration Activities. The RMDP incorporates a variety of habitat enhancement and restoration activities along and within the Santa Clara River and its tributary drainages.

The proposed RMDP infrastructure and maintenance activities require federal and state permits, consultations, and agreements from the Corps, U.S. Fish and Wildlife Service (USFWS), CDFG, and other agencies. The proposed improvements and activities require such permitting because the activities would affect waters, riverbeds, or banks within the jurisdictional limits of the Corps and CDFG, or would potentially affect listed or threatened species, thereby requiring USFWS and/or CDFG approvals. The RMDP also would include various measures necessary under CEQA to mitigate, to the extent feasible, significant environmental impacts resulting from the proposed Project, including impacts that fall within CDFG's charge as a trustee agency for fish and wildlife resources in California.

The RMDP would guide future resource conservation, mitigation, and permitting for the long-term management of sensitive biological resources in conjunction with the proposed infrastructure and facilities required to implement the approved Specific Plan.

SUMMARY OF PROJECT LOCATION

The proposed Project is located in a portion of the Santa Clara River Valley in northwestern Los Angeles County, between the city of Santa Clarita and the Los Angeles County/Ventura County jurisdictional boundary line. The RMDP and SCP study areas constitute the Project area for purposes of this report. On a regional level, the city of Santa Clarita is located to the east of the Project area. Both the Los Angeles County/Ventura County jurisdictional boundary line and the Salt Creek area located in Ventura County adjacent to this westerly boundary form the western edge of the Project area. The Los Padres National Forest is located to the north of the Project area, the Angeles National Forest lies to the north and east, and the Santa Susana Mountains are to the south.

SUMMARY OF PROJECT COMPONENTS

This EIS/EIR evaluates the direct, indirect, secondary, and cumulative impacts associated with the proposed Project, recommends feasible mitigation measures, and analyzes a range of reasonable Project alternatives. In summary, the components of the proposed Project are listed below. The proposed Project is comprised of the following:

- Bridges and road crossing culverts;

- Bank stabilization along the Santa Clara River and identified tributaries;
- Drainage facilities;
- Water quality control facilities;
- Modified, unmodified (preserved), and converted tributary drainages;
- Grade stabilization structures;
- Utility crossings;
- Temporary haul routes for grading and hauling equipment;
- WRP outfall construction;
- Roadway improvements to SR-126;
- Maintenance by DPW or other entity;
- Recreational facilities (including trails and nature observation platforms);
- Geotechnical investigation activities;
- Habitat enhancement and restoration activities; and
- Spineflower Conservation Plan and Candidate Conservation Agreement.

This assessment addresses both the loss of fish habitat due to the construction footprint of these bank protection as well as the anticipated hydrologic influences of the RMDP on in-stream habitat utilization.

OVERVIEW OF ALTERNATIVES ANALYZED

There are seven on-site alternatives described and analyzed in this assessment, including the No Action/No Project Alternative (Alternative 1), the applicant's proposed Project (Alternative 2), and five other "build" alternatives (Alternatives 3-7). Land use plans for six of the seven alternatives are shown graphically in the discussion of each alternative (there is no land use plan for the No Action/No Project Alternative).

In general, the No-Action/No Project Alternative (Alternative 1) is a description of what would occur should the lead agencies (*i.e.*, the Corps and CDFG) decide not to approve the permits and other approvals associated with the proposed Project. Thus, the No Action/No Project Alternative would result in the inability to develop any of the RMDP infrastructure or facilitated development, none of the proposed spineflower preserves would be established, and none of

the open space within the Project area would be dedicated and managed as contemplated by the proposed Project.

Alternative 2 (proposed Project) would implement the RMDP and SCP components of the proposed Project and facilitate development of the approved Specific Plan, the approved development in the VCC planning area, and the planned development in a portion of the Entrada planning area.

The five build alternatives (Alternatives 3-7) address a broad range of different configurations for the major RMDP infrastructure in or adjacent to waters of the U.S. (Santa Clara River and tributary drainages), which are necessary to facilitate development of the Specific Plan. These alternatives also focus on different configurations for the spineflower preserves, which, in turn, affects the conservation of sensitive biotic and aquatic resources within a managed open space/preserve system.

Combined, the five build alternatives focus on avoiding or minimizing impacts to jurisdictional waters and spineflower. As impacts to jurisdictional waters are primarily associated with construction of bridges, bank stabilization, the grading and realigning of tributary drainages to facilitate Specific Plan development, and the conversion of minor tributary drainages to buried storm drains, alternative configurations for the major RMDP infrastructure are reflected in each build alternative. Similarly, because the proposed Project could impact spineflower outside of designated preserves, a broad range of spineflower preserve design options and their connectivity to open space were evaluated. Each of the build alternatives (Alternatives 3-7) reduce the RMDP infrastructure and increase the size of spineflower preserves, resulting in reduced development facilitated in the Specific Plan and the VCC and Entrada planning areas, and, correspondingly, minimize or avoid jurisdictional waters and spineflower impacts. The build alternatives also have been designed so that the impact reduction characteristics of the preceding alternative are generally incorporated into the subsequent alternatives.

For example, Alternative 3 would modify the proposed RMDP and SCP, respectively, by eliminating the planned Potrero Canyon Road bridge and increasing spineflower preserve acreage in the Specific Plan's Airport Mesa preserve and on Entrada. Alternative 4 would eliminate Potrero Canyon Road bridge, but retain the preserve acreage added by Alternative 3, and increase further the preserve acreage in the Specific Plan's Airport Mesa, Potrero, and Grapevine Mesa preserves and on Entrada. Alternative 4 also would add a spineflower preserve in the VCC planning area. Alternative 5 would widen tributary drainages, add a spineflower preserve within the VCC planning area, and would include the same three bridge crossings over the Santa Clara River as the proposed Project Alternative 6 would eliminate the planned

Commerce Center Drive bridge and maximize spineflower preserve buffers and open space connectivity. Alternative 7 would incorporate a two-prong approach: (i) preservation of all spineflower occurrences along with 300-foot buffers; and (ii) elimination of two planned bridges (Commerce Center and Potrero Canyon Road bridges), and the avoidance of the 100-year floodplain along the Santa Clara River and nearly all of the tributary drainages.

Each of the alternatives is summarized further below.

ALTERNATIVE 1 (NO ACTION/NO PROJECT):

The proposed RMDP and SCP would not be approved, and the requested federal and state permits and authorizations would not be granted.

Existing land use practices, including oil and gas, grazing, and cultivated agriculture, would continue on the Specific Plan and Entrada sites.

No spineflower preserves or natural open space/conservation areas would be dedicated and managed without Specific Plan, VCC, and Entrada approvals.

The approved Specific Plan and remaining portion of the VCC would not be developed.

The planned development within a portion of the Entrada project area would not occur.

ALTERNATIVE 2 (PROPOSED PROJECT):

The RMDP and SCP would be approved as proposed by the applicant, and the requested federal and state permits and authorizations would be granted.

Three major bridges across the Santa Clara River and associated bank stabilization would be constructed, including the Commerce Center Driver bridge (already approved by the Corps and CDFG in 1999), the Potrero Canyon Road bridge, and the Long Canyon Road bridge.

Major tributary drainages would be regraded and realigned to facilitate and protect Specific Plan development.

Several minor tributary drainages would be graded and converted to buried storm drain systems.

Five spineflower preserves would be established within the Specific Plan site and the Entrada planning area, totaling 167.6 acres and preserving 68.6 percent of the cumulative area occupied by spineflower in the Project area; and no spineflower preserve would occur within the VCC planning area.

The alternative would facilitate Specific Plan, VCC, and Entrada development, including 22,610 residential units and 9.40 million square feet (msf) of commercial/industrial/business park floor area.

ALTERNATIVE 3 (ELIMINATION OF PLANNED POTRERO BRIDGE AND ADDITIONAL SPINEFLOWER PRESERVES):

The RMDP and SCP would be modified from the plans proposed by the applicant, and the requested federal and state permits and authorizations would be granted consistent with those modifications.

Two bridges across the Santa Clara River and the associated bank stabilization would be constructed, including the Commerce Center Driver bridge (already approved by the Corps and CDFG in 1999) and the Long Canyon Road bridge. The Potrero Canyon Road bridge would not be constructed under this alternative.

Major tributary drainages would be regraded and realigned under this alternative; however, the channels would be wider than those of the proposed Project. The cismontane alkali marsh in lower Potrero Canyon would be preserved.

Additional spineflower preserve acreage would be established in the Specific Plan's Airport Mesa area and on Entrada. This alternative would provide a total of 221.8 acres of spineflower preserves and protect 76.6 percent of the cumulative area occupied by spineflower in the Project area.

This alternative would facilitate development within the Specific Plan, VCC, and Entrada, including 21,558 residential units and 9.33 msf of commercial/industrial/ business park floor area.

ALTERNATIVE 4 (ELIMINATION OF PLANNED POTRERO BRIDGE AND ADDITION OF VCC SPINEFLOWER PRESERVE):

The RMDP and SCP would be modified from the plans proposed by the applicant, and the requested federal and state permits and authorizations would be granted consistent with those modifications.

Two bridges across the Santa Clara River and the associated bank stabilization would be constructed, including the Commerce Center Driver bridge (already approved by the Corps and CDFG in 1999) and the Long Canyon Road bridge. The Potrero Canyon Road bridge would not be constructed under this alternative.

Major tributary drainages would be regraded and realigned under this alternative, but cismontane alkali marsh in lower Potrero Canyon would be preserved.

Additional spineflower preserve acreage would be established in the Specific Plan's Airport Mesa, Potrero Canyon, and Grapevine Mesa areas and on Entrada. A preserve also would be established within the VCC planning area. Alternative 4 would provide a total of 259.9 acres of spineflower preserves, and protect 81.6 percent of the cumulative area occupied by spineflower in the Project area.

This alternative would facilitate development within the Specific Plan and the Entrada planning area, including 21,846 residential units and 5.93 msf of commercial/industrial/business park

floor area. No development would be facilitated within the VCC planning area.

ALTERNATIVE 5 (WIDEN TRIBUTARY DRAINAGES AND ADDITION OF VCC SPINEFLOWER PRESERVE):

The RMDP and SCP would be modified from the plans proposed by the applicant, and the requested federal and state permits and authorizations would be granted consistent with those modifications.

The three bridges across the Santa Clara River and the associated bank stabilization would be constructed as under the proposed Project (Alternative 2).

Major tributary drainages would be regraded and realigned under this alternative, but would result in impact reductions in the Chiquito Canyon, San Martinez Grande Canyon, and Potrero Canyon drainages compared to the proposed Project (Alternative 2).

Additional spineflower preserve acreage would be established in the Specific Plan's Airport Mesa, Potrero Canyon, and Grapevine Mesa areas and on Entrada. A preserve also would be established within the VCC planning area. Alternative 5 would provide a total of 338.6 acres of spineflower preserves, and protect 83.3 percent of the cumulative area occupied by spineflower in the Project area.

This alternative would facilitate development within the Specific Plan and the Entrada planning area, including 21,155 residential units and 5.87 msf of commercial/industrial/business park floor area. No development would be facilitated within the VCC planning area.

ALTERNATIVE 6 (ELIMINATION OF PLANNED COMMERCE CENTER DRIVE BRIDGE AND MAXIMUM SPINEFLOWER EXPANSION/CONNECTIVITY):

The RMDP and SCP would be modified from the plans proposed by the applicant, and the requested federal and state permits and authorizations would be granted consistent with those modifications.

Two bridges across the Santa Clara River and the associated bank stabilization would be constructed, including the Potrero Canyon Road bridge (extended span similar to the proposed Project (Alternative 2) and Alternative 5) and the Long Canyon Road bridge. The previously approved Commerce Center Drive bridge would not be constructed under this alternative.

Major tributary drainages would be regraded and realigned under this alternative. However, all realigned channels would be wider under this alternative than under the proposed Project (Alternative 2), and the majority of proposed road crossings along the channels would be bridges as opposed to culverts.

This alternative would designate spineflower preserves on the applicant's property with known spineflower populations (Specific Plan, four preserves; Entrada, one preserve; and VCC, one preserve). Alternative 6 would significantly increase preserve acreage, and provide a total of 891.2 acres of spineflower preserves, protecting 87.5 percent of the cumulative area occupied

by spineflower in the Project area.

This alternative would facilitate development within the Specific Plan and the Entrada planning area, including 20,212 residential units and 5.78 msf of commercial/industrial/business park floor area. No development would be facilitated within the VCC planning area.

ALTERNATIVE 7 (AVOIDANCE OF 100-YEAR FLOODPLAIN, ELIMINATION OF TWO PLANNED BRIDGES, AND AVOIDANCE OF SPINEFLOWER):

The RMDP and SCP would be modified from the plans proposed by the applicant, and the requested federal and state permits and authorizations would be granted consistent with those modifications

Only one bridge across the Santa Clara River would be constructed, located at Long Canyon Road. The Potrero Canyon Road bridge and the already approved Commerce Center Drive bridge would not be constructed under this alternative. Bank stabilization along the Santa Clara River would be constructed outside the 100-year floodplain.

Under this alternative, major tributary drainages would not be regraded or realigned. Bank stabilization would be constructed to protect development, but would be located outside the 100-year floodplain of these drainages. In addition, the Middle Canyon and Magic Mountain Canyon drainages, which are proposed for conversion to buried storm drains under the proposed Project (Alternative 2), would be preserved.

Alternative 7 was designed to achieve maximal avoidance of the cumulative area occupied by spineflower within the Project area. This alternative would designate spineflower preserves with 300 feet of expansion area surrounding the cumulative area occupied spineflower locations, and provide a total of 660.6 acres of spineflower preserves, protecting 96.9 percent of the cumulative area occupied by spineflower in the Project area.

This alternative would facilitate development within the Specific Plan and the Entrada planning area, including 17,323 residential units and 3.82 msf of commercial/industrial/business park floor area. No development would be facilitated within the VCC planning area.

1.2 SENSITIVE FISH SPECIES

This section summarizes sensitive fish species that are known or are expected to occur in the Newhall Ranch reach of the Santa Clara River and within tributary drainages. The only native sensitive fish that exists in this reach is the endangered unarmored threespine stickleback (UTS or stickleback). Other sensitive fish species that exist in the Santa Clara River such as the Santa Ana sucker and arroyo chub are native to many streams in southern California, but not the Santa Clara River system. However, these fish are considered introduced to the Santa Clara River from other regional watersheds, namely the Los Angeles River, San Gabriel River and Santa Ana River and are listed as federally-threatened (Santa Ana sucker) or California species of special concern (arroyo chub) in these neighboring watersheds.

1.2.1 Unarmored Threespine Stickleback

Populations of unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*) (UTS) are restricted to three sections of the upper Santa Clara River including the Newhall Ranch reach, which represents the downstream demarcation of the unarmored subspecies. The unarmored threespine stickleback was designated a federally endangered species in 1970 under the Endangered Species Conservation Act of 1969 (the precursor to the Endangered Species Act of 1973), and a state endangered species in 1971.In 2002, The United States Fish and Wildlife Service (USFWS) decided not to finalize the designation of critical habitat for UTS because the initial federal listing was in 1970 under the predecessor of the Endangered Species Act of 1973, The Endangered Species Conservation Act of 1969, which did not have a critical habitat designation requirement. Since this species was listed before the enactment of the ESA of 1973 when critical habitat designations were first mandated, the Ninth Circuit Court of Appeals upheld the USFWS decision to not designate critical habitat for UTS (CBD vs. USFWS 2006). The Recovery Plan for this species (U. S. Fish and Wildlife Service 1985) designated three areas as very important for the survival and recovery of the species. One of the initial proposed critical habitat designations was called the Del Valle Zone and was defined as the Santa Clara River floodplain from Interstate 5 downstream to the mouth of San Martinez Grande Canyon.

The UTS is a small; largely annual fish that requires shallow, slow marginal stream flows with abundant aquatic vegetation for cover. The male guards territories and builds a small nest of decaying vegetation where he guards the eggs until they hatch. Large numbers of stickleback can exist in the summer and fall with the long breeding season in southern California, and breeding can be almost all year in dry years when a stream is minimally disrupted by storm flows. Under optimum conditions, up to a few hundred stickleback can exist within approximately ten meters of stream. Strong storm flows can severely reduce localized populations until the streams stabilize in spring and the numbers can build up again. Backwater habitats within the Santa Clara River are utilized by UTS as refugia during storm events.

Two primary UTS populations occur upstream of RMDP site both in Soledad Canyon above Lang Station (about 8 miles upstream) and in San Francisquito Canyon up to from just below Drinkwater Reservoir upstream to the vicinity of the old St. Francis Dam location (about 7.5 miles upstream of the river). San Francisquito Creek flows into the Santa Clara River near the upper end of the downstream-most UTS population. Recently, a population was discovered in upper Bouquet Canyon (Jonathan Baskin, pers. comm.) about 11 miles above its mouth at the Santa Clara River. Perennial flows occur in the Santa Clara River downstream of the Saugus Water Reclamation Plant, which discharges tertiary treated effluent immediately downstream of the Bouquet Canyon Road Bridge over the Santa Clara River. Unarmored threespine

stickleback are also known to occur in the reach immediately upstream of the NRSP area, between Interstate 5 and Middle Canyon, where the Valencia Wastewater Treatment Plant (WTP) discharges to the Santa Clara River. These populations are located primarily upstream of the RMDP and the hydrology and habitat where these populations are situated are clearly not affected by the proposed RMDP improvements. Downstream of Newhall Ranch and the Blue Cut area, a reach of the Santa Clara River has been historically broad and dry, losing to groundwater in the Piru groundwater basin. This reach, commonly called the "Dry Gap" represents a hydrologic and geographic division between UTS in the upper Santa Clara River and partially-armored threespine stickleback in the lower river, including portions of Piru, Sespe, and Santa Paula creeks.

1.2.2 Santa Ana Sucker

Santa Ana suckers (*Catostomus santaanae*) are small fish usually <16 cm standard length (SL) that have distinct deep notches at the junctions of the upper and lower lips, with a shallow median notch in the lower lip. They live in small to medium-sized (<7 meters wide) permanent streams in water ranging in depth from a few centimeters to a meter or more. They require cool (<22°C), water with slight to swift water velocities (Moyle 2002). They prefer coarse substrates such as gravel, cobble and boulder but can be found in sandy habitats.

The Santa Ana sucker was designated a federally-threatened species in 2000 by the U. S. Fish and Wildlife Service. The Santa Ana sucker is considered introduced to the Santa Clara River but with populations declining within neighboring watersheds, the Santa Clara River population is recognized by biologists as one of the potential viable populations in southern California. Critical Habitat was designated for the Santa Ana sucker in 2005 within portions of the Santa Ana and San Gabriel Rivers and Big Tujunga Creek and did not include the Santa Clara River. The Santa Ana sucker has been observed throughout the Santa Clara River from Highway 101 in Oxnard, Ventura County, upstream to Interstate 5 in Valencia, Los Angeles County.

Owens suckers (*Catostomus fumieventris*) are endemic to the Owens River watershed in southeastern California. Owens suckers prefer slower water velocities and finer substrates and lack the deep notches at the junctions of the upper and lower lips compared to Santa Ana suckers (Moyle 2002).

The Owens sucker is a related sucker that has been introduced to the Santa Clara River. This fish was designated a CDFG species of special concern in 1995 and was most likely introduced via the Los Angeles aqueduct that was linked to the storage reservoir behind Saint Francis Dam in San Francisquito Canyon. Saint Francis Dam failed in 1928 and this is most likely one avenue that introduced Owens sucker to the Santa Clara River. The Santa Ana and Owens sucker have

hybridized in the Santa Clara River although suckers collected upstream of the Ventura/Los Angeles county line have been mostly pure Santa Ana sucker.

1.2.3 Arroyo Chub

Arroyo chubs (*Gila orcutti*) are small, chunky fish that reach lengths of up to 120-mm standard length (SL). Typical adults lengths range from 70-100 mm SL. Arroyo chubs are most abundant in slow-moving or backwater sections of warm to cool (10-24°C) streams with muddy or sandy bottoms, although they are also found in fairly fast moving sections of stream with coarse substrate (Moyle 2002).

The arroyo chub was designated a CDFG species of special concern in 1995 in its native range. The chubs' native range includes the Los Angeles, San Gabriel, San Luis Rey, Santa Ana and Santa Margarita Rivers and Malibu and San Juan Creeks. They have been introduced to many river systems in southern California including the Santa Clara River. Arroyo chubs are a dominant fish species in the Santa Clara River and can be found in most, if not all of its major tributaries when perennial aquatic habitat is present.

1.2.4 Southern California Steelhead

No historical records exist for southern steelhead in the Santa Clara River or tributaries upstream of the confluence of Piru Creek, (Titus 2000) and the Project area is not included in the federal critical habitat designation for southern ESU steelhead whereby the National Marine Fisheries Service (NMFS, now referred to as NOAA Fisheries) considers natural barriers and specific dams within the historical range of each ESU to be the upstream limit of a critical habitat designation (Federal Register 2000). A natural barrier to fish migration within the Santa Clara River exists downstream of the project area and upstream of the Piru Creek confluence in the form of an ephemeral reach of the river that is referred to as the "Dry Gap." The Dry Gap consists of an area downstream of the Los Angeles County/Ventura County line where surface flows in the river are lost to the Piru groundwater basin. Implementation of the Project would require the construction of bridges and bank stabilization within the river corridor upstream of the Dry Gap. However, due to the absence of southern steelhead upstream of the Dry Gap, Project implementation will not impact steelhead in the Project area. Additionally, Project implementation, including flows from the yet-built Newhall Ranch WRP will not change the seasonality of Dry Gap hydrology or water quality (GSI Water Solutions 2008). Therefore, southern steelhead are not considered further within this report.

1.3 ENVIRONMETAL SETTING

This section describes the general environmental setting observed within each reach during the September 2, 5 and 7, 2005 survey. Specific quantitative habitat results are summarized in section 3.2.3.

1.3.1 Overview of Recent Hydraulic and Geomorphic Events

The Santa Clara River is a dynamic, episodic system that experiences “re-set” flood events that can be expected every 5-15 years (Balance Hydrologics, Inc. 2005). A re-set flood event refers to the affect that large storm events have on the stability of local channel geomorphology, and riparian vegetation. The re-occurrence of these large storm events interrupts the bank-holding properties and riparian maturation within the channel resulting in a re-set of the channel. This re-set condition occurred in 2005 following the 2004-2005 flood events.

Extensive bank scour from the flood events in 2004-2005 has resulted in extensive fine sediment deposition within the existing Newhall Ranch reach of the Santa Clara River. Some of this bed material (fine sediments) is currently being transported through stream load downstream throughout the lower Santa Clara River. Hydraulic action from stream flow will eventually create various habitat structures (pools, riffles, backwater habitats) through this newly deposited substrate that will benefit aquatic species (instream cover, velocity refugia). Although channel “re-set” tends to occur every 5-15 years, in the interim new habitats will form including pool, riffle, run habitat arrangements that are important to fish species including unarmored threespine stickleback.

The environmental setting describes habitat quality observed during the September 2005 survey. As stated above, aquatic habitat was altered following the flood events in 2004 and 2005. As is typical of habitat succession within the Santa Clara River, habitat composition and quality will most likely change and improve as a new low flow channel and riparian vegetation become established.

1.3.2 Mainstem Santa Clara River

Salt Canyon to Potrero Canyon (Reach A)

This reach (Reach A) of the Santa Clara River consists of a broad, flat sandy floodplain with minimal riparian vegetation. The general mesohabitat structure primarily was composed of riffles and runs with no pools. Unarmored threespine stickleback habitat was minimally present in this reach due to a lack of pools, backwater habitats and the presence high velocity flow over newly

deposited substrate. Edgewater vegetation, preferred by stickleback, existed throughout this reach and will become increasingly lush over time. Arroyo chubs and suckers were the only fish collected and no unarmored threespine stickleback were observed or collected. Unarmored threespine stickleback were collected in this reach of the Santa Clara River by Impact Sciences, Inc. during surveys conducted in March and June 2002 (Impact Sciences 2003).

Potrero Canyon to Chiquito Canyon (Reach B)

The physical channel structure and habitat composition in this reach (Reach B) of the Santa Clara River is similar to Reach A. Minimal unarmored threespine stickleback habitat existed in the reach because of a lack of pools, backwater habitats and the presence high velocity flow over newly deposited substrate. Edgewater vegetation, preferred by stickleback, was present throughout this reach and will become increasingly lush over time not withstanding episodic flood and scour events. Arroyo chubs and suckers were the only fish collected and no unarmored threespine stickleback were observed or collected. Unarmored threespine stickleback were collected in this reach of the Santa Clara River by Impact Sciences, Inc. during surveys conducted in March and June 2002 (Impact Sciences 2003).

Chiquito Canyon to Middle Canyon (Reach C)

The physical channel structure and habitat composition in this reach (Reach C) of the Santa Clara River is similar to Reaches A and B. Minimal unarmored threespine stickleback habitat existed in this reach due to a lack of pools and backwater habitats, and the predominance of high velocity flow over newly deposited substrate. Edgewater vegetation, preferred by stickleback, was present throughout this reach and is expected become increasingly lush over time. Arroyo chubs, suckers, largemouth bass, and mosquitofish were collected in this reach and no unarmored threespine stickleback were observed or collected. Unarmored threespine stickleback were collected in this reach of the Santa Clara River by Impact Sciences, Inc. during surveys conducted in March and June 2002 (Impact Sciences 2003).

The remaining reaches surveyed exist outside of the focus project reach. They were surveyed for comparison and were also surveyed for unarmored threespine stickleback presence/absence.

Middle Canyon to Valencia WTP (Reach D)

This reach (Reach D) is different compared to the other reaches surveyed in habitat and substrate composition. This reach retained some vegetation as well as associated pool habitats following the flood events in 2004 and 2005. Although sand was the dominant substrate type,

gravel and cobble substrate were prominent. The channel bed was unstable from recent sediment deposition and even though there were a few pools and riffles, sandy run habitats were the dominant feature. Flow velocities were fast in the riffle and run habitats, which are not preferred by stickleback. Edgewater vegetation existed throughout this reach but there was a lack of backwater habitat preferred by stickleback. Arroyo chubs and suckers were the only fish species collected in this reach. No unarmored threespine stickleback were observed or collected in the main channel. Unarmored threespine sticklebacks were collected in the reach during a survey conducted in May 2000 by Aquatic Consulting Services, Inc. and during surveys conducted by Impact Sciences, Inc. in March and June 2002 (Impact Sciences 2003).

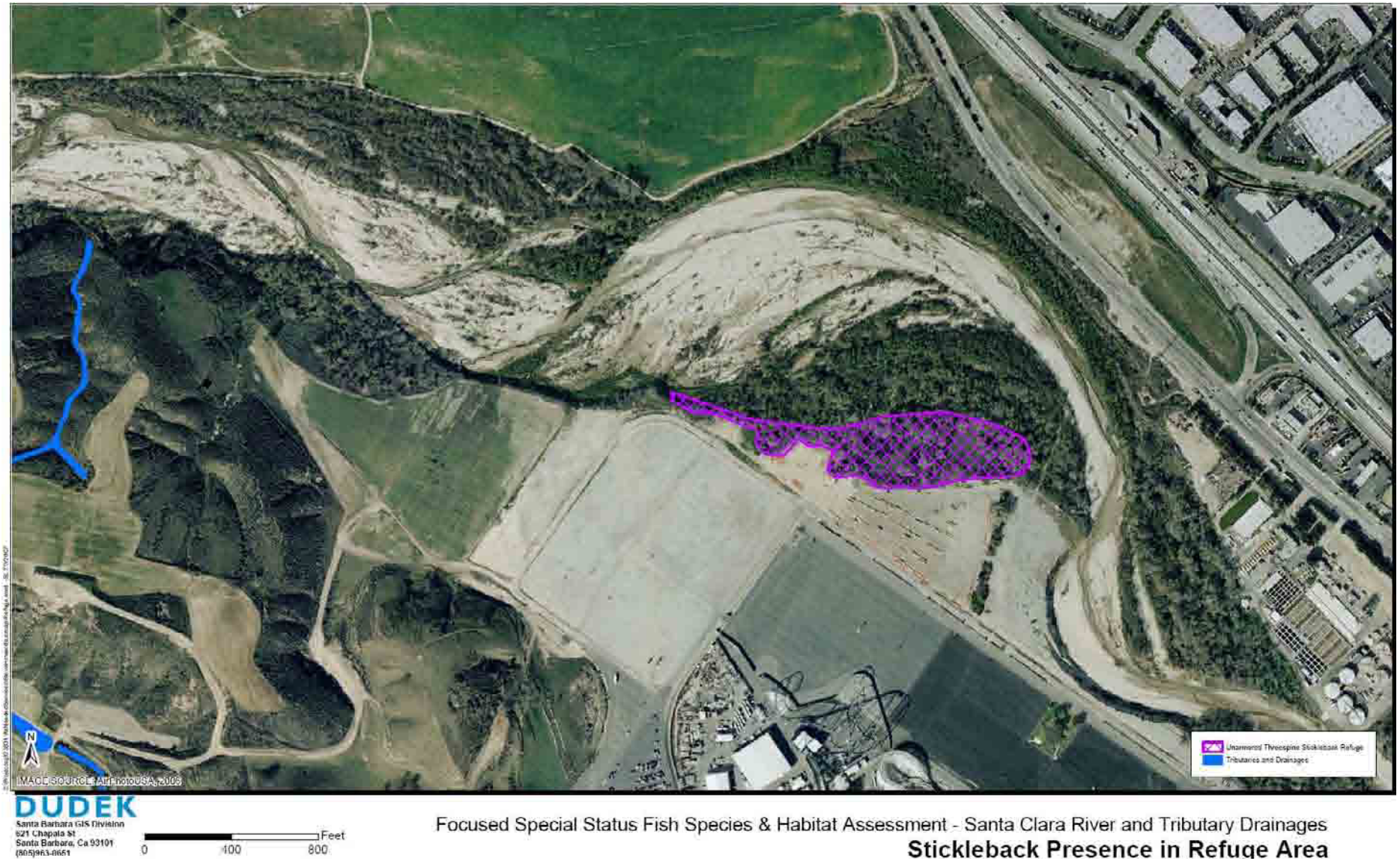
A spring-fed area commonly referred to as “the refuge” was surveyed adjacent to the south bank of the channel that was connected to the main river. Young of the year unarmored threespine stickleback were collected in this wetland area (Table 1 and Figure 1). This spring-fed wetland has historically provided stickleback refugia from high flow events and major pollution events related to oil and sewage spills.

Table 1: Fish survey results during an assessment conducted on the Santa Clara River on September 2, 5 and 7, 2005 from Salt Creek upstream to Old Road Bridge.

Hauls	Method	stickleback	arroyo chub	sucker	carp	mosquitofish	lgmth bass	prickly sculpin	clawed frog	tree frog	pond turtle	crayfish	TOTALS	Notes, water temperature
Reach A (Salt Creek to Potrere Canyon) September 1														Water 20 [Blue Cut] to 29º C. main river
30	1,2	0	300+		3		1	1	1000+				**1305**	Chubs larval to adult, clawed frogs 99% larvae in one pool
Reach B (Potrero Canyon to Chiquito Canyon) September 2														suckers juveniles and adults
40	1,2	0	30+	15			4				2		**51**	
Reach C (Chiquito Canyon to Castaic Creek) September 2 and 5*														
35	1,2	0	500+	30	3	25	5			2	1		**566**	
Reach D: From mouth of Castaic Creek upstream to Wastewater Plant Outfall, September 5														
20	1,2	0	300	45		50		6	7	15		15	**440**	Tree frogs one or two adults and rest larvae
Tributary (Lower Castaic Creek, upstream about 200 yards)														18-22º C.
6	1	0	300	15	2	20	6	2		3			**348**	
Refuge Stream (south side of floodplain between Castaic Creek and Wastewater Plant) September 5														Stickleback YOY to adult, water 18-20º C.
10	2	25											**25**	
Reach E (Wastewater Plant to Old Road Bridge, September 5, 7														
15	1,2		20			30		2		5		1	**58**	
Totals		**25**	**1450**	**105**	**8**	**125**	**16**	**11**	**1007**	**27**	**3**	**16**	**2793**	

Methods: 1) 3.2 X 1.2 meter, 3 millimeter mesh seine, 2) dip net. All potential UTS habitats sampled.
*On September 2, from Potrero to Walcott Crossing, and on September 5, Walcott to Castaic and beyond.

Figure 1 Santa Clara River Stickleback Refuge (Reach D)



Valencia WTP to Old Road Bridge (Reach E)

Flow in the reach (Reach E) was considerably less (2-3 cfs) than the downstream reaches due to its location upstream of the wastewater effluent channel. Riparian vegetation was infrequently present in this reach due to the 2004-2005 flood events. The general habitat structure consisted of riffles and runs with no pools. Aquatic habitat for unarmored threespine stickleback was fair in this reach due to the presence of low velocity flow and edgewater aquatic vegetation. A lack of pool and backwater habitats are most likely the limiting features resulting in a lack of unarmored threespine stickleback presence in this reach during the September 2005 survey. Unarmored threespine stickleback were collected in the reach by Aquatic Consulting Services in May 2000.

1.3.3 Tributary Drainages

Salt Canyon

The Salt Canyon channel is deeply incised, unstable and lacks adequate habitat for fish species. This is due to a lack of substantial perennial flow and a lack of pools, instream structure and riparian vegetation. Water temperatures in Salt Creek reach over 30 degrees Celsius, which is not conducive to the survival of unarmored threespine stickleback or other special-status fish species. No fish were collected or observed fish during the September 2005 survey. Aquatic habitat in Long Canyon is poor due to a lack of perennial flow.

Potrero Canyon

The lower reach of Potrero Canyon is relatively unstable and deeply incised with dense riparian including willows and cottonwoods. Flow observed was less than 1 cfs during the survey. Approximately 1,500 feet upstream of the Potrero Creek and Santa Clara River confluence, the channel becomes lower gradient, is less incised and lacks dense riparian vegetation compared to the lower reach. Overall, aquatic habitat is poor in middle and upper Potrero Canyon due to a lack of perennial flow and riparian vegetation within most of the channel. The lower reach contains the only potential habitat for but was unoccupied during the 2004-2005 surveys. African Clawed frogs were the only aquatic species observed in Potrero Creek.

San Martinez Grande Canyon

San Martinez Grande Canyon consists of an unstable, incised channel. The stream habitat is marginal for fish species due to a lack of available perennial flow, spawning habitat, and pool refuge habitat. The only aquatic species collected in this drainage were California toad tadpoles.

Long Canyon

Long Canyon is deeply incised, unstable and lacks adequate habitat for fish species. Aquatic habitat in Long Canyon is not present because the entire channel lacks perennial flow.

Chiquito Canyon

Aquatic habitat in Chiquito Canyon is poor due to a lack of perennial flow. The channel consists of an unstable sandy wash with scrub vegetation. No aquatic species were observed or collected during a survey conducted by ENTRIX in 2004.

Castaic Creek

Castaic Creek is dry during most of the year. When flow is released from Castaic Lake upstream or when rain events maintain surface flow for an extended period of time, adequate aquatic habitat exists to support various fish species found in the Santa Clara River watershed. Surface flow is intermittent and the creek eventually goes dry either stranding fish or receding at a slow rate where fish can migrate downstream to the Santa Clara River. Fish species collected during the September 2005 survey were arroyo chubs and Santa Ana suckers. Unarmored threespine sticklebacks have been collected in Castaic Creek in the past (pers. com Chris Dellith, USFWS) when persistent flows and aquatic habitat conditions are present there.

The remaining reaches surveyed exist outside of the focus project reach. They were surveyed for comparison and were also surveyed for unarmored threespine stickleback presence/absence.

Middle Canyon

Middle Canyon is relatively high gradient, incised canyon. Aquatic habitat in Middle Canyon is poor due to a lack of perennial flow. The only fish observed or collected were arroyo chubs that were collected at a spring-fed area along the southern bank of the Santa Clara River, downstream (west) of the mouth of Middle Canyon. The slope spring (Middle Canyon Spring) is located on the southern terrace of the Santa Clara River and flows west into a portion the Santa Clara River that is hydrologically disconnected from mainstem flows, except during major flood events. This area is potentially important in providing additional off-channel refugia in the floodplain of the Santa Clara River in major flood years.

1.4 STUDY SCOPE

The scope of this study is to assess the potential effects of the RMDP on the fish species described above and is based on a review of technical and regulatory documents provided by Newhall Land (Section 2.1) and applicable field surveys of the NRSP area. Although the RMDP could also potentially impact other aquatic species such as amphibians and reptiles, this assessment specifically evaluates potential impacts to sensitive fish species. During field survey conducted for this report, qualitative and quantitative habitat data was collected from meso- and macro-habitats utilized by unarmored threespine stickleback, Santa Ana sucker and arroyo chub. Additionally, a presence/absence and relative abundance survey for unarmored threespine stickleback and other sensitive fish species was conducted within RMDP reach. The preparers of this assessment have relied upon their extensive knowledge and experience regarding aquatic habitat, and local native and non-native fish species within the Santa Clara River. See Section 8, below, for a list of the preparers of this assessment. In addition, please refer to Appendix F for copies of the resumes of the preparers documenting their experience and expertise.

1.5 ORGANIZATION OF REPORT

The remainder of this report is organized as follows:

- **Section 2** describes the methods used during the habitat assessment.
- **Section 3** summarizes the results of this assessment.
- **Section 4** discusses the potential RMDP impacts to special-status fish species
- **Section 5** discusses potential RMDP alternatives impacts
- **Section 6** provides conclusions generated through the assessment
- **Section 7** cites literature and technical references used in the preparation of this assessment.
- **Section 8** is the list of preparers of this assessment.
- **Appendix A** Field photographs
- **Appendix B** Figures

- **Appendix C** PACE Velocity Distribution Graphics
- **Appendix D** PACE Analysis of Flood Refugia (0 to 2 FPS) ~~Riparian Velocity Comparison Graphics~~
- **Appendix E** Aquatic Habitat Survey of the Tributaries to the Santa Clara River in the RMDP Project Area
- **Appendix F** Resumes of Preparers

2. METHODS

The methods used to conduct this assessment are based on review of technical and regulatory documentation provided by Newhall, and field surveys of the RMDP area. The methods are described in greater detail below.

2.1 REVIEW OF EXISTING PROJECT REPORTS AND DOCUMENTATION

The following technical reports and supporting documentation were reviewed in assessing the potential effects of the RMDP improvements and/or related activities on sensitive fish species inhabiting the Santa Clara River and their habitat:

These documents are listed in chronological order.

- *Biota Report, Newhall Ranch Specific Plan, Los Angeles County Department of Regional Planning, Los Angeles, California, September 7, 1995, July 1996 revision.*
- *Final EIS/EIR: 404 Permit and 1603 Streambed Alteration Agreement for Portions of the Santa Clara River and its Tributaries, Los Angeles County. Valencia Company, August 1998.*
- *SEATAC Biota Report, Combined San Francisquito Canyon Projects (West Creek (VTTM 52455) and East Creek (VTTM 44831, 52667), Newhall Land and Farming Company, Significant Ecological Area 19, San Francisquito Canyon, Los Angeles County, California, Los Angeles County Department of Regional Planning, Frank Hovore & Associates, San Marino Environmental Associates, Planning Consultants Research, August 19, 1998.*
- *Natural River Management Plan: Permitted Projects and Activities. Santa Clara River and Tributaries. Valencia Company, November 1998.*
- *Biological Resources Assessment of the Proposed Santa Clara River Significant Ecological Area. Los Angeles County Department of Regional Planning. PCR Services Corporation, Frank Hovore and Associates, FORMA Systems, November 2000.*
- *Aquatic Surveys Along the Santa Clara River Part I: Castaic Junction Project Area, Los Angeles County, California. Aquatic Consulting Services, Inc., April 2002.*
- *Aquatic Surveys Along the Santa Clara River Part III: West of Commerce Center Bridge to the Ventura County Line, California. Aquatic Consulting Services, Inc., June 2002.*

- *Biological Opinion for the Natural River Management Plan, Santa Clarita, Los Angeles County, California (1-8-02-F-4R) (File No. 940050400-BAH). U.S. Fish and Wildlife Service, November 2002.*

- *Amended 404 Permit (No. 940050400-BAH) for Natural River Management Plan. U.S. Army Corps of Engineers, June 2003.*

- *Revised Additional Analysis to the Newhall Ranch Specific Plan and Water Reclamation Plant Final Program EIR, Volume VIII (May 2003), Section 2.3, Floodplain Modifications.*

- *Assessment of Potential Impacts Resulting From Cumulative Hyromodification Effects, selected Reaches of the Santa Clara River, Los Angeles County, California. Balance Hydrologics, Inc. 2005.*

- *Newhall Ranch Specific Plan, Sub-Regional Stormwater Mitigation Plan. GeoSyntec Consultants. 2008*

- *Santa Clara River and Tributary Drainages Flood Technical Reports (2008). Pacific Advanced Civil Engineering, Inc. (PACE)*

- *Assessment of Future Dry Gap Hydrologic Conditions related to Newhall Ranch Build-out (GSI Water Solutions. 2008)*

2.2 PAST ENTRIX FIELD SURVEY METHODS

Reconnaissance surveys were conducted by ENTRIX biologists within the Newhall Ranch reach of the Santa Clara River from Salt Canyon to Middle Canyon during 2004 and 2005. Tributary drainages surveyed include Salt Canyon, Potrero Canyon, Long Canyon, San Martinez Grande Canyon, Chiquito Canyon, Castaic Creek, Humble Canyon, Lion Canyon and Middle Canyon.

Surveys were conducted utilizing dip nets (4 feet long overall, opening 16 X 12 inches with one eighth inch mesh) and/or a small seine (10 X 4 foot, one eighth inch mesh). At certain locations, bank observation was utilized when other techniques were not feasible due to access issues. Habitat quality data was also collected for the associated special status aquatic species covered in this report.

2.3 ASSESSMENT SURVEY METHODS

This section described the methods utilized during surveys conducted on September 2, 5 and 7 2005. The purpose of the survey was primarily to assess aquatic habitat for fish species. While sampling for the presence of fish species was performed, the survey was not census driven and

was not intended to be an assessment of overall fish abundance or distribution.

2.3.1 Fish Survey Methods

Dr. Camm Swift and Steve Howard walked the active channel of the Santa Clara River on September 2 and 5, 2005 and sampled for the presence/absence of unarmored threespine stickleback. Swift and Howard surveyed lower Salt Creek Canyon and Potrero Canyon on September 7 via direct observation of habitat quality and sampling for the presence of unarmored threespine stickleback. The Santa Clara River was surveyed in an upstream direction from Salt Creek Canyon to the Old Road Bridge near Interstate 5. Numerous potential stickleback habitat locations were sampled throughout the study reach with dip nets (4 feet long overall, opening 16 X 12 inches with one eighth inch mesh) and/or small seine (10 X 4 foot with one eighth inch mesh). All fish collected during the survey were returned unharmed to the habitats where they were collected. Exotic fish species (by-catch) were sacrificed as directed by DFG in the biologists' scientific collecting permits.

2.3.2 Qualitative and Quantitative Habitat Survey Methods

The habitat survey was conducted utilizing a modified level two version of the DFG protocols presented in the California Salmonid Stream Habitat Restoration Manual (Flosi et al. 1998). The protocol was modified to capture habitat attributes related to the target fish species rather than salmonids exclusively. Habitats in the Santa Clara River were surveyed walking upstream from Salt Creek Canyon to Middle Canyon (RMDP Project Area). The habitat survey was extended upstream to the Old Road Bridge (near Interstate 5) to further evaluate unarmored threespine stickleback habitat within the Del Valle Zone.

Data collected included: habitat type, habitat length and mean width, mean and maximum depth, substrate composition, water and air temperature, and percent edgewater vegetation. Photographs were taken of representative habitat types. River reaches were delineated based on changes in channel morphology, substrate, slope and locale (tributary confluences).

3. RESULTS

This section discusses the results of the assessment and addresses potential impacts of RMDP on the target special-status aquatic species. Based on the review of hydraulic modeling documents provided, very little or no physical long-term adverse physical changes to the Santa Clara River will result from the RMDP aside from bridge piers at three locations. The tributary drainages on the whole are dry and void of sufficient perennial habitat to support fish species. Only two tributary areas, Middle Canyon Spring and Potrero Canyon, have adequate fish habitat supported by perennial high groundwater, spring-fed conditions in the Santa Clara River floodplain, disconnected from the mainstem. Natural barriers to upstream movement preclude fish from occupying reaches of these tributaries upstream of the river floodplain. The results of this assessment are described further below.

3.1 PAST ENTRIX FIELD SURVEY RESULTS

This section summarizes results from data collected during past surveys conducted in the Santa Clara River and tributaries in 2004 and 2005 as well as the fish survey conducted during the habitat evaluation on September 2, 5 and 7, 2005. An additional tributary survey was performed in May and June of 2007 to assess the seasonality of tributary hydrology and barriers and is included in Appendix E.

3.1.1 Tributary Surveys (2004-2005)

In general these tributaries are ephemeral or highly intermittent in nature and do not support adequate habitat for fish populations. The confluences of Middle Canyon and Potrero Canyon with the Santa Clara River appear to be spring fed and do have adequate fish habitat in the form of instream vegetation for cover and cool water. The northern tributaries (not including Castaic Creek) contain poor fish habitat when present and these tributary drainages were predominately dry during the surveys summarized below.

Salt, Potrero, Long, Humble, and Middle Canyons

On April 6, 2004 a reconnaissance survey was conducted at Salt, Potrero, Long, Humble, and Middle Canyons. Only marginal aquatic habitat was observed, which was located in Potrero and Salt Canyons. This habitat had only a small amount of flow during the April 6, 2004 survey and during a later visit on September 7, 2005. Two spring-fed tributary channels (middle Canyon Spring) existed in the riparian forest a short distance downstream of the mouth of Middle Canyon that flows along the edge of the southern bank of the Santa Clara River. In 2004 a few arroyo chubs were observed in spring-fed flows downstream of the Potrero Canyon - Santa

Clara River confluence in marshy areas in the river floodplain. No fish were found in Salt Canyon. Salt Canyon had abundant western toad and tree frog tadpoles on April 6, 2004 but lacked these on September 7, 2005. Dip netting within springs, runs and marsh habitats at the mouth of Middle Canyon contained a few arroyo chubs and abundant aquatic insects but no other fish species.

Chiquito and San Martinez Grande Canyons

On April 6, 2004 the area of Chiquito and San Martinez Grande Canyons that run south through the Newhall Ranch were also surveyed. San Martinez Grande Creek had a trickle flow from recent rains. Chiquito Canyon was moist or dry and lacked any surface water. San Martinez Grande Canyon was dry from the Santa Clara River up to Hwy 126. About a half mile upstream of the Hwy 126 Bridge, a reach of Chiquito Canyon approximately 300 yards long had a small amount of flow at less than half a cfs. The substrate consisted of silt and sand and the banks were unstable. The wetted habitats were on average shallower than 10 cm, though three larger pools were present. Each of the larger pools was approximately 1 X 6 meters and 30-40 cm deep. San Martinez Grande Creek had a few California toad tadpoles but no fish were observed or collected.

Lower Castaic Creek

On February 1, 2005 Dr. Camm Swift and Sean Barry conducted 19 large dip net sweeps in the scattered surface water of lower Castaic Creek that persisted from recent flood flow events. No fish were observed or collected on this date. On December 6, 2004 Dr. Swift visually surveyed Castaic Creek at the Interstate 5 Bridge. No fish were observed in the creek or in a small drainage entering from the west, downstream of the bridge.

3.1.2 Santa Clara River Surveys (2004)

March, April and November, 2004

ENTRIX biologists, Dr. Camm Swift and Steve Howard, conducted reconnaissance-level field surveys that focused on unarmored threespine stickleback in the months of March, April, and November, 2004. The purpose of these field surveys was to analyze the potential effects of the RMDP improvements and/or related activities on this species and its associated habitat. The reach of the Santa Clara River from the mouth of Salt Creek to the Castaic Junction was surveyed in its entirety on March 31 and April 1, 2004. An additional survey was conducted on November 8, 2004 up Castaic Creek and up the Santa Clara River from the Castaic Creek confluence to the State Route 126 (SR-126) bridge over Castaic Creek. The surveys focused

mainly on evaluating habitat conditions within these reaches and in establishing the relative proximity from the streamside Project boundary to in-stream habitats. Most of these efforts were visual habitat assessments documented by field photographs with special reference to unarmored threespine stickleback and other fishes. Some collecting was conducted with a small seine (1.8 X 1.2 m, 3 mm mesh/6 X 3 feet, one eighth inch mesh) and aquarium dip nets in habitats that could potentially contain sticklebacks. Further upstream, the Santa Clara River at the Commerce Center Drive Bridge area and Castaic Creek near the Interstate 5 Bridge were examined on December 16, 2004.

The March 31 and April 1, 2004 surveys were during relatively high spring season flows and the river had recently been scoured and fresh sediments were present. Additionally, virtually all marginal herbaceous vegetation and other cover were washed out along much of the river. Due to an unusual set of strong October rainstorms, the river was also scoured out during the visits in November and December 2004. Typically, the November and December collections would precede any high flows, marginal herbaceous vegetation would be well developed, and fishes would be abundant. However, due to the early storms, the habitat conditions noted during our surveys were comparable to those normally associated with early spring season conditions in non-drought years.

During the spring 2004 survey, the river was running a visually estimated 30 to 40 cubic feet per second (cfs) and was turbid with visibility to about 50 cm. Some small spring-fed tributaries and isolated pools were clear. The water temperature ranged from 22-26 degrees and at least four areas of upwelling with water at 18 to 20 degrees C. The substrate was variously sand, gravel, and cobble and 10-40% of the river margins had some vegetative cover such as herbaceous vegetation, debris, or overhanging trees or bushes. This marginal vegetation was just beginning to develop, as was green algae in the water. About 30-40% of the habitat was low to high gradient riffles with the remaining 60-70% being runs. Eight to ten standing or backwater pools more than 1 m deep were seen near large obstructions.

At the confluence of Castaic Creek and the Santa Clara River, a small flow entered the main river with a few associated pools and backwaters. This flow went subsurface a few hundred meters upstream. Castaic Creek remained dry upstream of this point. The flowing stretch of Castaic Creek was surveyed over two days utilizing about 30 seine hauls and 140 dips with aquarium dip nets. No stickleback were taken or seen. Arroyo chubs were abundant, and one Santa Ana sucker was taken. Larval arroyo chubs were commonly seen and up to 15 sucker larvae were observed. Some backwater areas had African clawed frogs and approximately 25 were taken. In addition, several African clawed frog larvae were seen in isolated floodplain pools.

The survey on November 8, 2004 was restricted specifically to the Landmark Village project area (portions of reaches B, C, D). The main channel was well scoured and was flowing at an estimated 25-30 cfs. Channel substrate consisted of approximately 75% sand and 25% gravel, cobble, and rock. Visibility was about 50 cm in the main river, though some isolated pools were clearer. Several of these isolated or spring fed ponds existed in the riparian areas on the north side of the floodplain and were choked with cattails, willows, and Arundo. The shores of the main river channel were almost entirely scoured off by the October storms. Ten seine hauls were conducted in backwater areas of the main river that serve as small refuges during scouring flows related to flood events. Six half grown to adult unarmored threespine stickleback were taken in these areas. Arroyo chubs were common in the river with over 150 taken, and in the oxbow ponds crayfish (about 20 taken) were common. One large arroyo chub was taken in the oxbow ponds, along with one small African clawed frog. A few mosquitofish were collected or observed in the adjacent oxbows. Though some fish were common or very locally abundant, these were in occasional oxbow and marginal areas, with most areas of faster flow devoid of fishes.

On the December 16, 2004 visit, Castaic Creek was dry all the way to the SR-126 Bridge and the only wetted areas were near storm drains that were surveyed earlier this year and found to be fishless. The Commerce Center Drive Bridge area was similar to the river downstream examined by Swift and Howard, but no fish were observed. The Commerce Center Drive Bridge is upstream of the Landmark Village Project in Reach D.

3.2 ASSESSMENT SURVEY RESULTS

This section summarizes the results of the Santa Clara River fish survey conducted on September 2, 5 and 7, 2005. Figures 1 through 18 that summarize these results can be found in Appendix B.

3.2.1 Fish Survey Results

Unarmored threespine sticklebacks were collected by ENTRIX during previous surveys within the focus project reach in 2004, before the flood events in 2005, by Aquatic Consulting Services, Inc. in 2002a and 2002b and by Impact Sciences in 2003. Although stickleback were present within this reach during the 2004 surveys, they were relatively uncommon. The unarmored threespine stickleback surveys conducted on September 2, 5 and 7, 2005 from Salt Creek Canyon upstream to Old Road Bridge found no unarmored threespine stickleback in the active channel of the Santa Clara River but did find them in a side channel area in Reach D between Castaic Creek and the Valencia WTP. This side channel is a known refuge area for unarmored threespine stickleback (Figure 2). Note that these were not census surveys and

were not intended to be an assessment of overall fish abundance or distribution within the RMDP. Based on historic surveys, it is assumed that stickleback, chubs, and suckers can be locally abundant in any given year. These fish and their requisite habitat conditions are subject to inter-annual hydrologic variability, such as scouring flows and successional stages of herbaceous and woody riparian vegetation. Most recently, in the fall of 2007, hundreds of unarmored threespine stickleback and arroyo chub were observed by ENTRIX biologists during construction monitoring activities near the Old Road Bridge upstream of the RMDP reaches of the Santa Clara River.

It was visually estimated that a few thousand arroyo chubs were present during the survey. Approximately one hundred Santa Ana suckers were also collected as well as a few largemouth bass and mosquitofish. Both of these exotic fish were collected in Reach C from Chiquito Canyon upstream to the mouth of Castaic Creek. The mosquitofish were relatively rare until we reached the downstream side of the Wolcott Crossing which is located downstream of Castaic Creek in Reach C where schools of this species were collected in watercress choked habitats. Mosquitofish were also collected in various areas from this point upstream to the Old Road Bridge. No largemouth bass were collected upstream of Castaic Creek. Species found are tabulated in Table 1, in subsection 1.3.2 above.

The following sections 3.2.2 and 3.2.3 summarize results from data collected during a qualitative and quantitative habitat survey on September 2, 5 and 7, 2005.

3.2.2 Qualitative Habitat Survey Results

This section summarizes the results of the Santa Clara River qualitative aquatic habitat survey conducted on September 2, 5 and 7, 2005.

The river floodplain consisted of an open 100-300 yard wide sandy channel with intermittent gravel and cobble in each reach. Bedrock was less than 1% of the substrate both in and outside the wetted channel. The gradient was low, about 1% or less and natural falls or other abrupt drops were absent. Some artificial drops at the lower end of culverts are discussed below. The past winter's storms left virtually no canopy on the stream. Less than 10% of the shores had canopy covering the margins of the wetted channel.

The flow during the survey was approximately 30 cfs and varied slightly throughout the study reach due mostly to groundwater upwelling or infiltration and agricultural runoff. Salt Creek has a very slight, muddy flow partly from agricultural fields. Upstream at Wolcott Crossing, a small amount of flow entered from the north side, apparently also from agricultural runoff.

Upstream of the mouth of Castaic Creek, flow entered the river from the south which extended upstream on the south side of the floodplain for approximately half a mile. It contributed minimal flow of less than a quarter of a cfs and only occasional places were deeper than 15 centimeters. It was largely choked with green filamentous algae, Chara, cattails, and sedges. The water temperature was 20-22 degrees C.

Upstream of Castaic Creek in the Santa Clara River floodplain, the Middle Canyon Spring a little less than 1 cfs form the southern terrace of the river. This flow enters into a wetland area on the south side of the river floodplain and extends about 2000 ft downstream, disconnected from mainstem flows. The upper one-third of the Middle Canyon Spring flows was completely within a willow forest and herbaceous vegetation was almost completely absent. In this upper area, the channel splits into two or three braids. The main stream was clear and cool with water temperature between 18-22 degrees C. The lower two thirds of the river floodplain flows and adjacent wetland was choked with cattails and watercress. The wetland water temperature was measured at 18 degrees C. whereas the main flow of the tributary that enters the wetland was 20-20.5 degrees C.

Further upstream, another spring-fed area is present adjacent to western edge of the Magic Mountain Theme Park parking lot within the Santa Clara River floodplain.. This wetland feature has been informally referred to as “the refuge” in previous studies of stickleback distribution in relation to floods and oil spills in this area of the Santa Clara River. The refuge area maintains low water temperatures, consistently contains sticklebacks, and exists approximately 100-300 yards south of the active channel within the floodplain. Although this spring seeps into the Santa Clara River floodplain, river flows do not appear to interact with the spring. It is this separation that has most likely maintained a population of unarmored threespine stickleback during past flood events and oil spills.

Upstream of the mouth of the “refuge” area, and approximately 475 yards downstream of the Old Road Bridge, wastewater effluent enters the active channel from the north side. The effluent discharge was about 20 to 25 cfs and contributed approximately 80% of the river flow downstream of the point of discharge near the Valencia WTP. Upstream of this point the river’s reduced flow was about 1-2 cfs. The effluent came out through a dense thicket of willows and Arundo and is probably less than 100 yards long. In the late afternoon the wastewater inflow was warmer than the river flow above its junction, which was 25.5º C., compared to 23º C. in the mainstem flows.

A small lateral linear seep of very slight flow existed about 15 yards south of and parallel to the main wetted river channel. This seep was just upstream of the wastewater inflow and was 20.5º C. at about 16:30. It was choked with green filamentous algae, Azolla, duckweed, and sedges.

A few hylid tadpoles were observed in this area. Another small inflow entered the main river 20-30 yards downstream of the Old Road Bridge from the south shore. This did not come from a natural canyon and may be local street runoff.

The depth of water in the mainstem river flows downstream of the Valencia WTP discharge point, showed signs of having varied over 15-20 cm on a daily or possibly more frequent basis. Indications of this were noted during the September 1-2 visit: 1) freshly exposed wetted sand bars, 2) exposed clumps of wet green, 3) very fresh vertical low cuts on bordering sand bars usually caused by short-term increases and decreases in flow.

Oxbow or lateral ponded areas existed above and below the five culverted temporary agricultural road crossings within the focus project reach. Water temperatures in these ponded areas varied from cool (low 20's° C.) to warm (high 20's° C.). These areas range in condition from being choked with green filamentous algae and herbaceous vegetation such as watercress and Veronica to relatively open and lacking much vegetation. One was full of green algae during the first visit and was almost devoid of such vegetation two days later. All of these ponds were lateral to the main river flow and occurred on both the upstream and downstream sides of the road crossings. The temporary crossings consist of raised sandy berms with several culverts to convey the water. The concentration of the flow in the culverts appeared to accelerate the flow velocity. At downstream end of the culverts this rapid flow usually caused formation of plunge pools with considerable turbulence and bubble curtain. These pools were often up to 60 or 70 cm deep.

3.2.3 Quantitative Habitat Survey Results

This section summarizes the results of the Santa Clara River quantitative aquatic habitat survey conducted on September 2, 5 and 7, 2005.

The general habitat structure within the Newhall Ranch reach or Del Valle Zone has become altered during the flood events that occurred in late 2004 and early 2005. Extensive bank scour and channel bed aggradation or deposition has contributed to a more homogeneous habitat composition that is made up of almost entirely runs and low gradient riffles with little turbulence. The low gradient riffles appear to be down cutting through newly deposited sandy substrate and will most likely become more distinct riffle habitats with gravel and cobble substrate over time. There were almost no pool habitats except within Reach D. This altered homogeneous habitat composition will most likely develop into a complex of riffles, runs, and pools as the channel responds to temporal hydraulic processes such as lateral active channel migration and streambed scour and deposition. The longitudinal habitat dimensions were long throughout RMDP reach. While this is not unusual for a wide sandy stream channel, they were most likely

longer than usual due to new deposition from the recent floods.

The survey reach was broken up into five separate reaches. The reach brakes were delineated based on changes in substrate and slope and tributary location. These reaches include: Reach A (Salt Creek to Potrero Canyon), Reach B (Potrero Canyon to Chiquito Canyon), Reach C (Chiquito Canyon to Castaic Creek), Reach D (Castaic Creek to Valencia WTP), Reach E (Valencia WTP to Old Road Bridge). The focus project reach starts at Salt Creek and ends upstream at Middle Canyon. Part of Reach D (Middle Canyon to Valencia WTP) and all of Reach E exists upstream of the RMDP project reach but were sampled during the fish surveys to identify habitat composition wherever stickleback were present.

Below are the survey results for each reach in the Santa Clara River from Salt Creek to the Old Road Bridge. These results compliment the unarmored threespine stickleback survey results by comparing presence/absence with individual mesohabitats. The results represent a “snapshot” of habitat composition that reflects that the stream channel is in a constant state of succession and varies in absolute composition from year to year. Future habitat mapping and fish surveys will continue to document the dynamic nature of this river channel as well as monitor fish recolonization in the main river following flood events.

Reach A (Salt Canyon to Potrero Canyon)

This reach was comprised of a flat broad floodplain that was dominated by sandy substrate and run and riffle habitats. The habitat type proportions in this reach were 50% runs, 50% riffles and no pools. The run habitats were on average 30 feet wide and 0.7 inches deep. The average substrate composition in the run habitats was 86% sand, 12% gravel and 10% cobble. The low gradient riffle habitats were on the borderline between riffle and run habitat meaning they had similar characteristics. The difference was a slight change in gradient, flow velocity, and substrate composition. The riffle habitats were on average 24 feet wide and 0.7 inches deep. The average substrate composition in the riffle habitats was 59% sand, 29% gravel and 18% cobble. The habitat length for each habitat type was on average: runs 1076 feet (272-2985 feet), riffles 424 feet (158-855 feet), and no there were no pools. The lack of pools in this reach is a product of an absence of roughness structures including bedrock, boulders, and mature riparian vegetation. Much of this structure that might have existed before the recent flood events was either transported downstream or inundated by sand. Edgewater vegetation is an important habitat feature utilized by stickleback. Stickleback in particular, utilize this vegetation for cover, feeding, spawning and velocity refuge. Although the recent floods wiped out most of the vegetation with the active channel, edgewater vegetation is slowly growing back and was present throughout this reach. The average percent of habitat that had edgewater vegetation of any kind was: runs 33%, riffles 21% with no pools. (See Appendix B Figures 1, 7 and 13).

Reach B (Potrero Canyon to Chiquito Canyon)

Similar to Reach A, this reach was comprised of a flat broad floodplain that was dominated by sandy substrate and run and riffle habitats. The habitat type proportions in this reach were 62% runs, 38% riffles and no pools. The run habitats were on average 40 feet wide and 0.3 inches deep. The average substrate composition in the run habitats was 90% sand, 10% gravel and 10% cobble. The low gradient riffle habitats in this reach were also on the borderline between riffle and run habitat. The difference was a slight change in gradient, flow velocity, and substrate composition. The riffle habitats were on average 30 feet wide and 0.5 inches deep. The average substrate composition in the riffle habitats was 73% sand, 10% gravel and 17% cobble. The habitat length for each habitat type was on average: runs 1442 feet (358-2930 feet), riffles 405 feet (203-555 feet), and no there were no pools. The lack of pools in this reach is a product of an absence of roughness structures including bedrock, boulders, and mature riparian vegetation. Much of this structure that might have existed before the recent flood events was either transported downstream or inundated by sand. The average percent of habitat that had edgewater vegetation of any kind was: runs 78%, riffles 20% with no pools. (See Appendix B Figures 2, 8 and 14).

Reach C (Chiquito Canyon to Castaic Creek)

Similar to Reaches A and B, Reach C was comprised of a flat broad floodplain that was dominated by sandy substrate and run and riffle habitats. The habitat type proportions in this reach were 56% runs, 44% riffles and no pools. The run habitats were on average 47 feet wide and 0.3 inches deep. The average substrate composition in the run habitats was 86% sand, 14% gravel and no cobble. The low gradient riffle habitats in this reach were also on the borderline between riffle and run habitat. The difference was a slight change in gradient, flow velocity, and substrate composition. The riffle habitats were on average 25 feet wide and 0.5 inches deep. The average substrate composition in the riffle habitats was 58% sand, 33% gravel and 13% cobble. The habitat length for each habitat type was on average: runs 1761 feet (197-3132 feet), riffles 1083 feet (170-3810 feet), and no there were no pools. The lack of pools in this reach is a product of an absence of roughness structures including bedrock, boulders, and mature riparian vegetation. Much of this structure that might have existed before the recent flood events was either transported downstream or inundated by sand. The average percent of habitat that had edgewater vegetation of any kind was: runs 70%, riffles 34% with no pools. (See Appendix B Figures 3, 9 and 15).

Reach D (Castaic Creek to Valencia WTP)

This reach differs from all other reaches surveyed in habitat composition, substrate composition,

and average habitat length and width. The reach was comprised of a flat broad floodplain that was dominated by sand and gravel substrate with run, riffle and pool habitats. The habitat type proportions in this reach were 50% runs, 27% riffles and 23% pools. The run habitats were on average 25 feet wide and 0.7 inches deep. The average substrate composition in the run habitats was 49% sand, 41% gravel and 12% cobble. The low gradient riffle habitats in this reach were more defined compared to the other reaches. The riffle habitats were on average 15 feet wide and 0.7 inches deep. The average substrate composition in the riffle habitats was 22% sand, 60% gravel and 20% cobble. The pool habitats were on average 18 feet wide and 2.1 feet deep. The maximum depth in the pools ranged form 3.0 to 4.5 feet. The average substrate composition in the pool habitats was 58% sand, 38% gravel and 10% cobble. The habitat length for each habitat type was on average: runs 810 feet (130-2750 feet), riffles 202 feet (81-425 feet), and pools 55 feet (27-85 feet). The presence of pools in this reach is a product remnant post flood roughness structure in the form of vegetative root wads. The average percent of habitat that had edgewater vegetation of any kind was: runs 65%, riffles 39% and pools 68%. (See Appendix B Figures 4, 10 and 16).

Reach E (Valencia WTP to Old Road Bridge)

This reach was comprised of a wide floodplain that transitions to a more incised upstream of the WTP channel and was dominated by sand and gravel substrate and run and riffle habitats. The habitat type proportions in this reach were 60% runs, 40% riffles and no pools. No width or depth dimension data was gathered in this reach due to time constraints. The average substrate composition in the run habitats was 60% sand, 50% gravel and no cobble. The average substrate composition in the riffle habitats was 45% sand, 55% gravel and 10% cobble. The habitat length for each habitat type was on average: runs 969 feet (245-2357 feet), riffles 261 feet (52-470 feet), and no there were no pools. The lack of pools in this reach is a product of an absence of roughness structures including bedrock, boulders, and mature riparian vegetation. Much of this structure that might have existed before the recent flood events was either transported downstream or inundated by sand. The average percent of habitat that had edgewater vegetation of any kind was: runs 50%, riffles 80% with no pools. (See Appendix B Figures 5, 11 and 17).

3.3 DISCUSSION

Unarmored threespine stickleback were rare or absent throughout the majority of the project reach in several moderate to intensive surveys conducted in 2004 and 2005. The only place this fish appeared to be common was in a marginal spring-fed area, which was about a half mile long and located along the south side of the river floodplain just north of Magic Mountain commonly referred to as the “refuge”. They are stable, spring fed flows, choked with vegetation

that was disconnected from mainstem river flows. It contained better habitat components for the species than the main river and other smaller, ephemeral wetted channels noted on the river floodplain. The stable and established vegetation and clear, cooler water indicated it was probably always independent of the short-term flow variations and water quality changes in the main river channel. This area is indicative of good to excellent stickleback habitat when compared to most of the Santa Clara's mainstem waters. The lower temperature and stability in the area are probably the main factors favoring stickleback. Furthermore, cooler waters are less preferred by largemouth bass, green sunfish, crayfish, and mosquitofish when more favorable warmer water exists nearby. Thus these exotics are much less common in the refuge stream and undoubtedly have lower impact there. Additionally, this area was identified as a place that was unaffected by oil spills that inundated much of the main river channel in 1991 and 1994. Fish within the refuge were less affected by the spill, and the area was able to be used as a location to relocate stickleback that were "rescued" from the main river. This area appears very important to the continuing survival of the Del Valle Zone population of unarmored threespine stickleback.

The level of disturbance from early 2005 floods may have flushed stickleback temporarily from the project reach, which might explain why stickleback were not observed in 2005. ENTRIX biologists observed hundreds of sticklebacks during fall 2007 construction monitoring activities upstream near the Old Road bridge, suggesting that areas of the Del Valle zone have probably been recolonized. During an educational event conducted with the United States Fish and Wildlife Service in June of 2008, unarmored threespine stickleback were observed although intensive surveys were conducted as part of that activity. Generally speaking, stickleback have been locally abundant in some years and are assumed, for the purposes of this analysis, to be present throughout the RMDP project reach in any given year.

Most of the exotic species collected were in the upstream segments of the river, from the mouth of Chiquito Canyon to the mouth of Castaic Creek. The largemouth bass were in a few deeper pools, including those just downstream of the culverts at road crossings. Bass were also found in lower Castaic Creek. Bass were absent in the river upstream of the Castaic Creek confluence indicating they may have originated in some part of Castaic Creek or come from Castaic Reservoir following the recent flood events. Mosquitofish were common in this same area and also farther upstream to the Old Road Bridge. Although Swift and Barry took two small bluegill in the main river below the mouth of Castaic Creek in an earlier survey, none were taken during other visits and these were probably strays. By the time of this visit, many of the deeper and larger backwater pools on the floodplain had been obliterated or filled in by sediment deposition. Many of these backwater pools along the north side of the floodplain were found to be full of crayfish and mosquitofish during the earlier visits of Swift and Howard. By September 2005 crayfish were very scarce, probably also particularly vulnerable to the very high, strong flows of

the previous winter.

Populations of arroyo chub and Santa Ana sucker were healthy in the spring and summer of 2005 and were common in our collections. These two species are considered introduced here, but are native just to the south in the Los Angeles and Santa Ana rivers where, ecological and habitat conditions are or were very similar to the Santa Clara River. Perhaps the upper Santa Clara population could a genetic buffer population since the native stocks are currently federally listed as threatened. Those in the lower Santa Clara, from the mouth of Piru Creek and downstream, hybridize with another introduced sucker, the Owens sucker.

4. IMPACTS ANALYSIS

This impact analysis focuses on the modeled, post-project hydrology and affects to fish relative to potential disturbance of instream habitat and the availability of suitable aquatic refugia during flood events. In addition, it evaluates construction-related impacts to mainstem Santa Clara River and floodplain aquatic habitat that support fish in the RMDP project reach.

Stickleback, chub, and sucker are known to inhabit the Del Valle Zone of the Santa Clara River running through Newhall Ranch and the RMDP area. The location of the proposed stabilization features is set back beyond the River and adjacent riparian areas and permanent features would not interface with the active stream channel. The hydrologic influence of the bank stabilization on fish will be substantially muted when viewed in conjunction with episodic flood flow conditions. Similarly, bridge-related features such as piers and abutments would result in localized velocity increases but not substantially reduce riparian refugia areas along the Newhall Ranch mainstem reach. The Newhall Ranch drainages tributary to the Santa Clara River do not represent viable fish habitat due their intermittent and/or ephemeral nature, as well as degraded aquatic habitat quality where perennial flows are present.

Threespine stickleback have been found to be able to withstand velocities of less or equal to 60 centimeters per second [cm/s] (2 feet per second [fps]) if a coarse substrate is present and less or equal to 34 cm/s (1.2 fps) if a coarse substrate is not present, without being washed downstream (Whoriskey and Wooton 1987). Whoriskey and Wooton determined that European threespine stickleback can swim and maintain themselves for several hours in current flows of 22 to 31 centimeters per second (cm/sec) (0.67 to 1.0 feet per second [fps]). Whoriskey and Wooton also found stickleback could move upstream for one meter or less in flows of 30.8-37.1 cm/sec (1.0-1.3 fps). Fish used in this study were from 4.4 to 5.2 cm (males) and 4.8 to 5.3 cm (females) in length (about 1.7-2.1 inches), similar in size to our local unarmored threespine stickleback.

From the threespine stickleback velocity studies above, it is inferred that unarmored threespine stickleback in the Santa Clara River require flood refugia velocities of 2 feet per second or less in order to avoid being washed downstream in flood events. During flood events, areas maintaining velocities less than or equal to two feet per second would act as the preferred refuge during storm events, and important to maintaining the Del Valle Zone population of unarmored threespine stickleback. Most of the Santa Clara River and its adjacent floodplain contains flows of greater than 2 fps in the existing condition and is part of stickleback natural history.

The Flood Technical Report (PACE 2008) presents modeling data indicating that there would be no significant impacts in water flows, velocities, depth, sedimentation, or floodplain and channel conditions downstream of the RMDP as a result of the proposed Project improvements. These hydraulic effects were also found to be insufficient to alter the amount, location and nature of aquatic and riparian habitats within the RMDP and downstream into Ventura County. The technical analysis further determined that the river would still retain sufficient width to allow natural fluvial processes to continue; and, as a result, the mosaic of habitats in the river that support various sensitive species would be maintained, and the population of the species within and immediately adjacent to the river corridor would not be significantly affected. See Appendix C for the PACE velocity distribution graphics that depict changes in Santa Clara River flood-logy, and Appendix D for PACE analysis of flood refugia (0 to 2 fps) available to unarmored threespine stickleback and other special status fish species during a range of flood events.

4.1 PROJECT RELATED IMPACTS TO AQUATIC HABITAT AND SPECIAL STATUS FISH SPECIES

This section analyses potential project-related impacts to aquatic habitat and special status fish species from a thorough review of hydraulic modeling results submitted by PACE, Inc. These modeling results present potential changes in floodplain width, backwater refuge habitat area, and water velocity. The hydraulic model output presents these potential changes during various theoretical flood frequency events including 2, 5, 10, 20, 50, and 100-year occurrences. Table 2 summarizes potential impacts to UTS rearing habitats and impacts from increased velocities resulting from the construction of various RMDP infrastructure improvements, such as bridges and bank stabilization. See Appendix D for the PACE analysis of flood refugia ~~riparian velocity comparison graphics~~ for each project alternative.

4.1.1 Mainstem Santa Clara River Impacts

Salt Creek to Potrero Canyon Impacts

RMDP improvements proposed in this reach include buried bank stabilization on the north bank to protect the Newhall Ranch Water Reclamation Plant (WRP) and Utility Corridor, and the Potrero Canyon Bridge (piers and abutments).

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization on the north bank. There will be no loss to back water habitats and no net increase in water velocities within riparian refugia. The bridge at Potrero Canyon will have less than significant impacts to unarmored threespine stickleback at the 10, 20, 50, and 100- year flood occurrences. These impacts are less than significant

because backwater habitat loss occurs within terraced agricultural land during the 20-year and greater flood occurrence and is unsuitable for stickleback. The modeling results suggest that no net loss of backwater habitat or riparian refugia will occur due hydrologic effects of the Potrero Canyon bridge. Additionally, modeled water velocities 7 and 20 fps at the pre-project baseline will increase slightly during the 10, 20, 50, and 100-year flood occurrences due to floodplain modifications. Stickleback do not utilize aquatic habitats in the thalweg portion of River when high water velocities from flood conditions are present.

Potrero Canyon to Chiquito Canyon Impacts

RMDP improvements proposed in this reach include buried bank stabilization on the south bank along the adjacent agricultural fields commonly referred to as the Onion Fields.

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization on the south bank during the 2, 5 and 10 flood occurrences. Less than significant impacts at the 20, 50, and 100-year flood occurrences. These impacts are less than significant because backwater habitat loss occurs within terraced agricultural land not suitable to stickleback and water velocity increases are negligible especially during these high velocity events. Modeling results also indicate that the bank stabilization structure could create additional backwater habitat on the north edge of the floodplain during the 10 and 20-year flood occurrences. The riparian habitat along the northern edge of the River between Potrero Canyon and Chiquito Canyon will provide new riparian refugia and floodplain connectivity available to stickleback under the 10-year and great flood events.

Chiquito Canyon to Middle Canyon Impacts

RMDP improvements proposed in this reach include buried soil cement and rip rap bank stabilization at the Chiquito Creek/Santa Clara River confluence, buried and rip rap bank stabilization at Long Canyon, buried bank stabilization on the north bank (along the former Indian Dunes and proposed Landmark Village site), the Long Canyon bridge, and buried bank stabilization along Castaic Creek at its confluence with the Santa Clara River to the SR-126 bridge over Castaic Creek.

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization at the Chiquito Creek confluence during the 2, 5, 10, 20 and 50-year flood occurrences. There will be a slight increase in water velocities at the 100-year flood occurrence in the thalweg but stickleback do not rear in thalweg habitat especially during high intensity flood events. There will be no impacts to unarmored threespine stickleback from the Long Canyon Bridge during the 2 and 5-year flood occurrences. Impacts to

stickleback during the 10, 20, 50 and 100-year flood occurrences will be less than significant because backwater habitat loss occurs within disturbed agricultural land not suitable for stickleback, and water velocity increases are negligible during these brief, high intensity events when water velocities within the main channel are too high for stickleback. Additionally, localized reductions in refuge habitat offset the gains in habitat in and around the Long Canyon bridge location.

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization structure on the north bank of the Santa Clara River (along the Indian Dunes/Landmark Village area) during the 2, 5 and 10-year flood occurrences. There will be less than significant impacts at the 20, 50 and 100-year flood occurrences. These impacts are less than significant because any loss in backwater habitat during these high intensity flood events will be in disturbed agricultural upland land that is not suitable for stickleback. Additionally, slight velocity increases will be negligible especially during these high velocity events when water velocities within the main channel are too high for stickleback. Under the proposed project, extensive restored floodplain areas along the north bank, in combination with undisturbed canyon mouth areas on the south bank, will provide a net gain in riparian refugia available to stickleback when compared to the existing condition.

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization structure on the north bank of the Santa Clara River during all flood occurrences except during a 100-year flood occurrence. These impacts are less than significant because any loss in backwater habitat during these short-duration, high intensity flood events will be in disturbed agricultural upland land that is not suitable for stickleback. Additionally, slight velocity increases will be negligible especially during these infrequent, high intensity events when water velocities within the main channel are too high for stickleback.

RMDP improvements proposed in this reach include buried bank stabilization on the south bank at San Jose Flats and Commerce Center Drive Bridge and rip rap bank stabilization at Middle Canyon. The Commerce Center Drive bridge will cross the Santa Clara River from its current alignment to the eastern slope below Airport Mesa, above the Middle Canyon confluence.

Hydraulic modeling results indicate that there will be no impacts to unarmored threespine stickleback from the buried bank stabilization structure on the south bank at San Jose Flats and the Commerce Center Drive Bridge during the 2 and 5-year flood occurrences. The modeling results indicate a gain in backwater habitat during the 10, 20, 50 and 100-year flood occurrences. There will be less than significant impacts to stickleback from slight localized increases in water velocities at the high intensity flood events when water velocities within the

main channel are too high for stickleback. Analysis of the velocity distribution modeling indicates that several new riparian refugia areas in and around the Middle Canyon and Commerce Center Drive bridge will be accessible to stickleback.

Middle Canyon to Old Road Bridge Impacts

There are no proposed RMDP improvements within this reach of the Santa Clara River, upstream of Middle Canyon to the Old Road Bridge near Interstate 5. Therefore, no impacts to stickleback or other fishes will occur.

The potential impacts to unarmored threespine stickleback, Santa Ana sucker or arroyo chub due to the construction and persistence of RMDP's bank stabilization features and the bridge construction are expected to be less than significant.

Downstream of Project Area Impacts

Included in the RMDP is a proposed Newhall Ranch Wastewater Reclamation Plant (WRP). The WRP will be a near-zero discharge facility and limited discharge from the WRP to the Santa Clara River will occur during the winter months. Currently the unarmored threespine stickleback is genetically and geographically isolated by the Dry Gap. If increased flow from the WRP were to substantially lengthen the duration of seasonal flow in the Dry Gap, the potential for invasion of partially armored threespine stickleback (*Gasterosteus aculeatus microcephalus*), a non-protected subspecies of stickleback known to occur downstream of the Dry Gap, would be considered a significant secondary impact of the Project. Increased connection through the Dry Gap would increase the potential for the partially unarmored stickleback to invade upstream and to hybridize with the unarmored form thereby compromising the genetic integrity of unarmored threespine stickleback.

As discussed in the Dry Gap technical report (GSI Water Solutions 2008), the potential impacts of the Newhall Ranch WRP to the Dry Gap are considered less than significant since they will not substantially lengthen the duration of seasonal flow in the Dry Gap. This finding is based on the fact that discharge from the Newhall Ranch WRP would only occur in the winter and would be small relative to the overall flow in the Santa Clara River, and the existing data shows that increases in base flow due to discharges from the Valencia WRP and the Saugus WRP since the 1960s have not led to a substantial change in the duration of seasonal flow in the Dry Gap.

Impacts of the Proposed Project

The Proposed Project is referred to as Alternative 2. Alternative 2 would involve the construction of buried bank stabilization in upland and riparian areas along approximately half of the north bank and one-third of the south bank of the portion of the Santa Clara River within Newhall Ranch. Santa Clara River Alternative 2 involves the construction of three bridges across the river, one at Commerce Center Drive, one at the mouth of Potrero Canyon, and one at the mouth of Long Canyon. In total, this alternative proposes that 32,334 linear feet of buried bank stabilization and three new bridges be constructed in the Santa Clara River corridor. In addition, a WRP outfall to the Santa Clara River would be constructed. No grade control structures are proposed on the river mainstem.

Implementation of Alternative2 is expected to result in a gain in natural refugia acreage under two, five, ten, and one hundred year flood conditions. A loss of 6.9 and 0.4 acres is expected under twenty and fifty year flood conditions, respectively. Disturbed refugia acreage is expected to increase during a five, ten or one hundred year flood event. Two, twenty, and fifty year flood events are predicted to result in a loss of small amounts of disturbed refugia acreage under the proposed alternative.

Table 2 – Alternative 2 velocity modeling results.

Flood Event (years)	Existing Conditions		Projected		Gain/Loss (acres)	
	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed
2	126.3	2.1	127.6	2	1.3	-0.1
5	115.9	2.6	116.7	2.7	0.8	0.1
10	128.3	4.7	138.3	4.8	10	0.1
20	182	27	175.1	10.3	-6.9	-16.7
50	199.7	31.1	199.3	21.4	-0.4	-9.7
100	144.5	26.8	164	28.7	19.5	1.9

4.1.2 Santa Clara River Tributary Impacts

The proposed RMDP improvements within Santa Clara River tributary drainages are expected to have no impact or will be less than significant based on the absence of fish, perennial flows and generally poor quality aquatic habitat conditions observed during past surveys. Previous surveys indicate that the tributary drainages also lack surface water connectivity with the Santa Clara River, except in two cases at the mouths of Middle and Potrero Canyons. The south side drainages have substantial fish passage barriers in the form of large headcuts or bedrock cascades that are impassable by fish. No fish were observed upstream of the mouths of these drainages.

The RMDP improvements will not substantially alter the existing drainage pattern of the Santa

Clara River at its tributaries in a manner that would cause substantial erosion, siltation, or channel instability; or substantially increase the rates, velocities, frequencies, duration and/or seasonality of flows in a manner that causes channel instability or in a manner that harms sensitive habitats or species in the river. Therefore, the impact of the RMDP projects on hydro-modification is considered less than significant (GeoSyntec 2006).

Salt Canyon

No RMDP improvements are proposed in Salt Canyon. Aquatic habitat in this canyon is poor and no special status fish species were collected in recent surveys. Therefore, the impact to Salt Creek will be no impact. Salt Canyon, in its lower reaches, could benefit substantially from restoration or other habitat enhancement measures to improve aquatic habitat conditions.

Potrero Canyon

Aquatic habitat in the very lower portion of Potrero Canyon is poor and no special status fish species were collected during this survey and past ENTRIX surveys. Upstream of the lower reach flows in Potrero are ephemeral or intermittent and does not represent viable aquatic habitat for fish. Therefore, the impact of the RMDP improvements is considered less than significant.

San Martinez Grande Canyon

Aquatic habitat in this canyon is generally absent and of poor quality when it is present, and no special status fish species were observed in past surveys or would be expected to be present in San Martinez Grande Canyon. Therefore, the impact of the RMDP improvements is considered less than significant.

Long Canyon

Aquatic habitat in Long Canyon is generally absent and of poor quality when it is present, and no special status fish species were observed in past surveys or would be expected to be present in Long Canyon. Therefore, the impact of the RMDP improvements is considered less than significant.

Chiquito Canyon

Aquatic habitat in Chiquito Canyon is generally absent and of poor quality when it is present,

and no special status fish species were observed in past surveys or would be expected to be present in Chiquito Canyon. Therefore, the impact of the RMDP improvements is considered less than significant.

Humble Canyon

No RMDP improvements are proposed in Humble Canyon. Aquatic habitat quality in this canyon is poor and no special status fish species were collected in past surveys. Therefore, there will be no impact to Humble Canyon Creek.

Castaic Creek

No instream improvements are proposed for Castaic Creek although a buried soil cement bank stabilization feature is proposed on the west bank downstream of the SR-126 bridge. This bank stabilization structure will have no impact at flood event occurrences up to the 50-year occurrence and will have a less than significant impact at the 100-year occurrence (see Table 2). Castaic Creek is and intermittent stream that does support seasonal aquatic habitat during the rainy season due to runoff and releases from Castaic Lake. Typically, however, Castaic Creek is dry and does not support fish habitat. Therefore, the potential impact to fish resources in Castaic Creek is less than significant.

Lion Canyon

Aquatic habitat in this canyon is generally absent and of poor quality when it is present, and no special status fish species were observed in past surveys or would be expected to be present in Lion Canyon. Therefore, the impact of the RMDP improvements is considered less than significant.

Middle Canyon

Aquatic habitat in this canyon is generally absent and of poor quality when it is present, and no special status fish species were observed in past surveys, except at the mouth where a spring confluences with the Santa Clara River. Structural improvements related to the Commerce Center Drive bridge will not interfere with the spring-fed area where chubs were observed in 2004. Since this area and its hydrology will not be affected, the impact of the RMDP improvements is considered less than significant.

5. ALTERNATIVES ANALYSIS

5.1 INTRODUCTION

Pursuant to NEPA and CEQA, several alternatives to the Proposed Project have been identified and evaluated. These alternatives (Alternatives 3, 4, 5, 6, and 7) reflect a wide range of actions designed to meet the applicant's basic objectives for the proposed Project, while avoiding or substantially minimizing the significant impacts of the proposed project. To assess what impact the implementation of each alternative would have on available stickleback refuge (areas with velocities less than or equal to two feet per second) during flood events, hydrologic modeling was used to compare existing versus projected post-project velocity conditions at two, five, ten, twenty, fifty, one hundred year flood events, and during a capital flood event, for each alternative. See Appendix D for the PACE ~~r~~analysis of flood refugia ~~riparian velocity comparison graphics~~ for each project alternative.

As previously discussed, areas of the Santa Clara River with velocities of 2 fps or less are very important for persistence of the Del Valle Zone population of UTS since they serve as areas of refuge or "refugia" habitat during high flow events. Accordingly, ENTRIX evaluated the pre- and post-Project hydraulic model results to determine the change in "refugia" habitat for each modeled flood event in each alternative. A brief description of each project alternative, and the amount of projected stickleback refuge acreage that would be gained or lost during major flood

5.2 ALTERNATIVES 3 AND 4

Alternatives 3 and 4 incorporate the same RMDP feature layout along the Santa Clara River. Alternatives 3 and 4 would involve the construction of buried bank stabilization in upland and riparian areas along approximately half of the north bank, and one-third of the south bank, of the Santa Clara River. These alternatives would involve the construction of two bridges across the river, one at Commerce Center Drive and one at the mouth of Long Canyon. No bridge is proposed at the mouth of Potrero Canyon under these alternatives. In total, Alternatives 3 and 4 would propose 31,857 linear feet of buried bank stabilization and two new bridges to be constructed within the Santa Clara River corridor. In addition, a WRP outfall to the Santa Clara River would be constructed. It would not be necessary to construct any grade control structures within the river.

Implementation of Alternatives 3 and 4 is expected to result in a gain in natural refugia acreage under two, five, fifty and one hundred year flood conditions. A loss of 4.3 and 7.2 acres is expected under ten and twenty year flood conditions, respectively. Disturbed refugia acreage is expected to increase only during a one hundred year flood event. All other flood events are

predicted to result in a loss of small amounts of disturbed refugia acreage under the proposed alternatives.

Table 3 – Alternatives 3 and 4 velocity modeling results.

Flood Event (years)	Existing Conditions		Projected		Gain/Loss (acres)	
	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed
2	126.3	2.1	126.6	2	0.3	-0.1
5	115.9	2.6	116.7	2.5	0.8	-0.1
10	128.3	4.7	124	3.9	-4.3	-0.8
20	182	27	174.8	10.6	-7.2	-16.4
50	199.7	31.1	205.8	25.6	6.1	-5.5
100	144.5	26.8	165.2	34.4	20.7	7.6

5.3 ALTERNATIVE 5

Alternative 5 would involve the construction of buried bank stabilization in upland and riparian areas along approximately half of the north bank and one-third of the south bank of the portion of the Santa Clara River within Newhall Ranch. Alternative 5 is nearly the same as Alternative 2 on the Santa Clara River, however, the northern Potrero Bridge abutment is significantly setback from the River (bridge span extended additional 500 feet). Alternative 5 involves the construction of three bridges across the river, one at Commerce Center Drive, one at the mouth of Potrero Canyon, and one at the mouth of Long Canyon. In total, this alternative proposes that 32,334 linear feet of buried bank stabilization and three new bridges be constructed in the Santa Clara River corridor. In addition, a WRP outfall to the Santa Clara River would be constructed. No grade control structures are proposed on the river mainstem.

Implementation of Alternatives 5 is expected to result in a gain in natural refugia acreage under two and fifty year flood conditions. No change is expected during a 5 year flood event. A loss of 2.8, 10.0, and 5.2 acres is expected under ten, twenty, and one hundred year flood conditions, respectively. Disturbed refugia acreage is expected to decrease or remain the same under all flood event conditions.

Table 4 – Alternative 5 velocity modeling results.

Flood Event (years)	Existing Conditions		Projected		Gain/Loss (acres)	
	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed
2	126.3	2.1	127	2	0.7	-0.1
5	115.9	2.6	115.9	2.5	0	-0.1
10	128.3	4.7	125.5	3.9	-2.8	-0.8
20	182	27	172	9.3	-10	-17.7
50	199.7	31.1	202.6	25.7	2.9	-5.4
100	144.5	26.8	139.3	26.8	-5.2	0

5.4 ALTERNATIVE 6

Alternative 6 would involve the construction of buried bank stabilization along approximately half of the north bank and one-third of the south bank of the Santa Clara River within the RMDP area, mostly in upland areas. This alternative would also involve the construction of two bridges across the river: one at the mouth of Potrero Canyon and one at the mouth of Long Canyon. The previously authorized bridge at Commerce Center Drive would not be constructed under this alternative. In total, Alternative 6 would require the placement of 29,293 linear feet of buried bank stabilization and two new bridges within the Santa Clara River corridor. In addition, a WRP outfall to the Santa Clara River would be constructed. It would not be necessary to construct any grade control structures within the river.

Implementation of Alternative 6 is expected to result in a gain in natural refugia acreage under two, five, and one hundred year flood conditions. A loss of 2.5, 9.1, and 0.9 acres is expected under ten, twenty, and fifty year flood conditions, respectively. Disturbed refugia acreage is expected to increase only during a one hundred year flood event. All other flood events are predicted to result in a loss of small amounts of disturbed refugia acreage under the proposed alternatives.

Table 5 – Alternative 6 velocity modeling results.

Flood Event (years)	Existing Conditions		Projected Conditions		Gain/Loss (acres)	
	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed
2	126.3	2.1	127.4	2	1.1	-0.1
5	115.9	2.6	117.2	2.5	1.3	-0.1
10	128.3	4.7	125.8	4	-2.5	-0.7
20	182	27	172.9	10.1	-9.1	-16.9
50	199.7	31.1	198.8	25.6	-0.9	-5.5
100	144.5	26.8	148.5	27.6	4	0.8

5.5 ALTERNATIVE 7

Alternative 7 (the Avoidance Alternative) would preserve or avoid impacts to jurisdictional streams and wetlands in the Santa Clara River, and the Potrero Canyon, Long Canyon, Chiquito Canyon, and San Martinez Grande Canyon drainages. Except for bridges to facilitate road crossings, no improvements would be constructed in jurisdictional areas within these canyons. Bank protection will be installed (constructed in upland areas) behind the 100 year flood limits to protect adjacent development from flooding and erosion. This alternative would involve the creation of pads for residential and commercial buildings, and would require 13,956 linear feet of ephemeral drainages within the RMDP area to be graded and converted to buried storm

drains. One bridge would be constructed across the Santa Clara River at the mouth of Long Canyon, but with a span that removes abutment impacts from the 100 year floodplain and jurisdictional waters. In addition, a WRP outfall to the Santa Clara River would be constructed.

Implementation of Alternative 7 is expected to result in a gain in natural refugia acreage under two and five year flood conditions. A loss of 1.3, 0.9, 0.8, and 1.5 acres is expected under ten, twenty, fifty, and one hundred year flood conditions, respectively. Disturbed refugia acreage is expected to increase slightly or stay the same during two, five, or ten year flood event. Twenty, fifty, and one hundred year flood events are predicted to result in a loss of small amounts of disturbed refugia acreage under the proposed alternative.

Table 6 – Alternative 7 velocity modeling results.

Flood Event (years)	Existing Conditions		Projected		Gain/Loss (acres)	
	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed	0-2 fps Natural	0-2 fps Disturbed
2	126.3	2.1	127.8	2.2	1.5	0.1
5	115.9	2.6	116.7	2.7	0.8	0.1
10	128.3	4.7	127	4.7	-1.3	0
20	182	27	181.1	24.4	-0.9	-2.6
50	199.7	31.1	198.9	29.7	-0.8	-1.4
100	144.5	26.8	143	26.7	-1.5	-0.1

6. CONCLUSIONS

Based on the analysis conducted to assess the potential RMDP-related impacts to special-status fish species, the following conclusions have been provided:

- No impacts to fish species will occur in the tributary drainages, including the larger tributaries such as Salt, Potrero, San Martinez Grande, Long, and Chiquito Canyons. Generally, tributary aquatic habitat is either absent or of very poor quality when present. The lack of perennial flows, coupled with poor habitat quality precludes fish from persisting in these tributary drainages.

- The proposed RMDP alternatives will not alter the general morphology of the Santa Clara River or adjacent rearing habitat or high flow riparian refugia. Under flood events there will not be any discernable difference in mainstem Santa Clara River marginal stickleback habitat and refugia, between the existing condition and the proposed alternatives.

- RMDP impacts to stickleback in riparian refugia areas due to floodplain modifications to facilitate RMDP improvements will be less than significant. The reductions in riparian refugia under the proposed RMDP (Alternative 2) are less than ten percent under the two, five, twenty and one hundred year flood events. Stickleback are expected to continue to redistribute and re-colonize appropriate habitat post flooding, as observed in years following the major floods of the 2005 wet season, which exceeded the 40 year flood event.

- The totality of RMDP-related improvements will not interfere with the persistence and overall survival of the Del Valle population of unarmored threespine stickleback. The effects of the improvements are typically very localized and occur only under extreme high flow flood events. The modeling data analyzed suggests that there will be little change between the existing condition and the proposed alternatives.

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8. LIST OF PREPARERS

ENTRIX, Inc.

Camm C. Swift, Ph.D., Senior Fisheries Scientist: conducted fish and qualitative habitat survey and background document review; prepared technical discussion of issues related to stickleback and fish.

Steve Howard, Senior Fisheries Scientist: conducted fish and quantitative habitat survey and background document review; supported technical discussion of issues related to stickleback and fish.

Joel Mulder, Fisheries Scientist: Supported analysis and reporting of flood refugia assessment, as well as alternatives analysis.

Resumes for these preparers are included in Appendix F.

APPENDIX A

FIELD PHOTOGRAPHS

Representative run habitat (Reach A).

Santa Clara River/Salt Creek confluence (Reach A)

Pond turtle captured during survey (Reach A)

Backwater habitat sampled (Reach A).

African clawed frog larvae captured (Reach B)

Isolated pool sampled at culverted crossing (Reach B)

Representative fast flowing braided run habitat (Reach C)

Culverted crossing with good sucker habitat (Reach C)

Representative shallow run/glide habitat (lower Reach D)

Representative gravel substrate (Reach D)

Spring-fed channel where stickleback were collected (Stickleback refuge Reach D)

Representative run habitat at Interstate 5 (Reach E)

APPENDIX B

FIGURES

Figure 1. Reach A (Salt Canyon to Potrero Canyon) Habitat Type Percentages

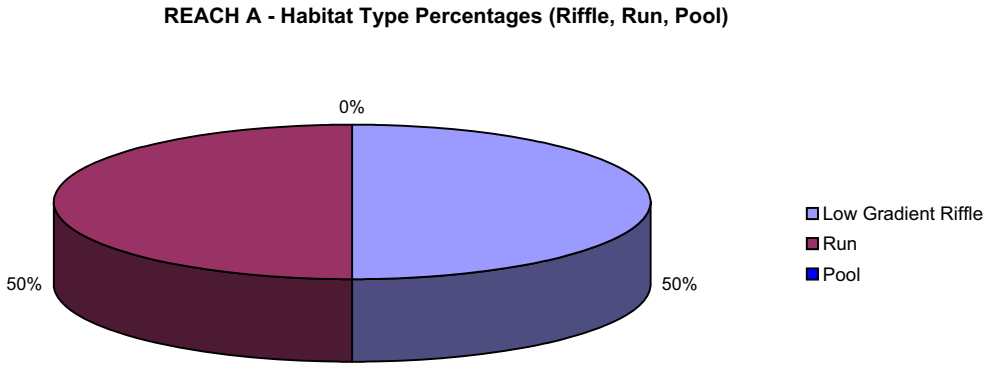


Figure 2. Reach B (Potrero Canyon to Chiquito Canyon) Habitat Type Percentages

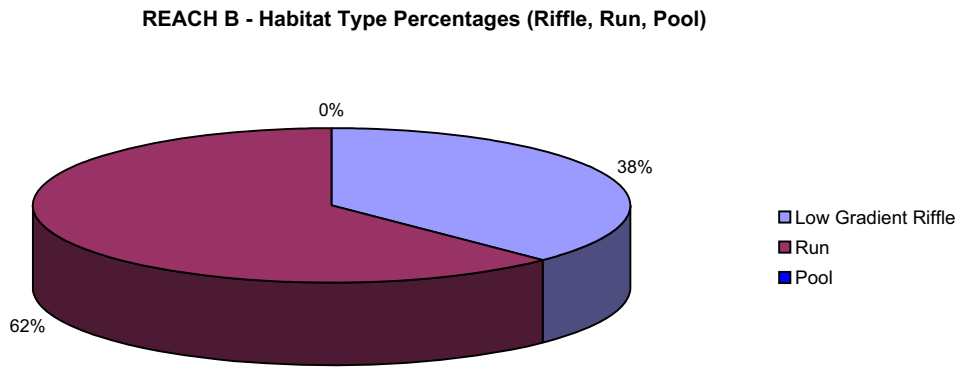


Figure 3. Reach C (Chiquito Canyon to Castaic Creek) Habitat Type Percentages

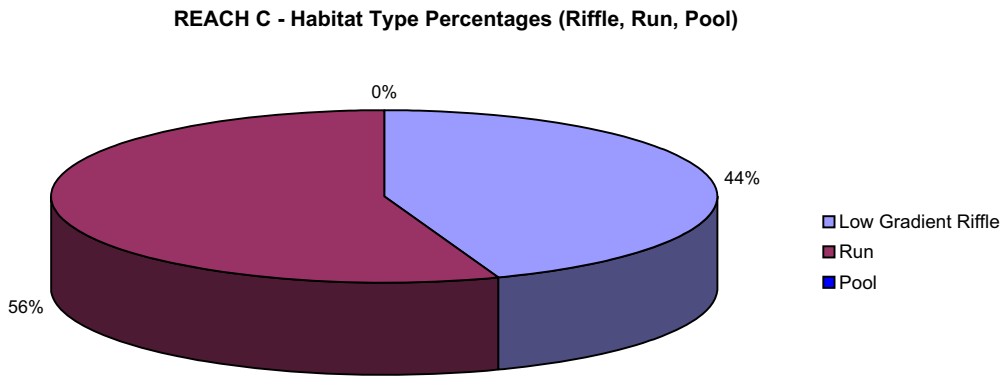


Figure 4. Reach D (Castaic Creek to Effluent Channel) Habitat Type Percentages

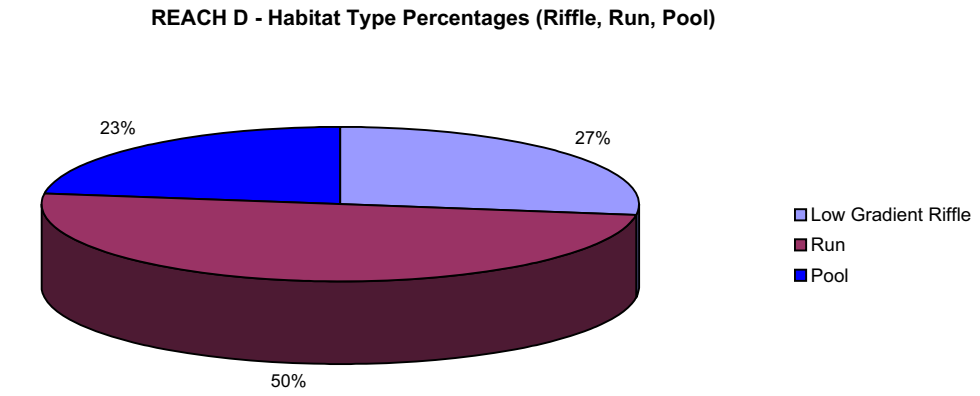


Figure 5. Reach E (Effluent Channel to Old Road) Habitat Type Percentages

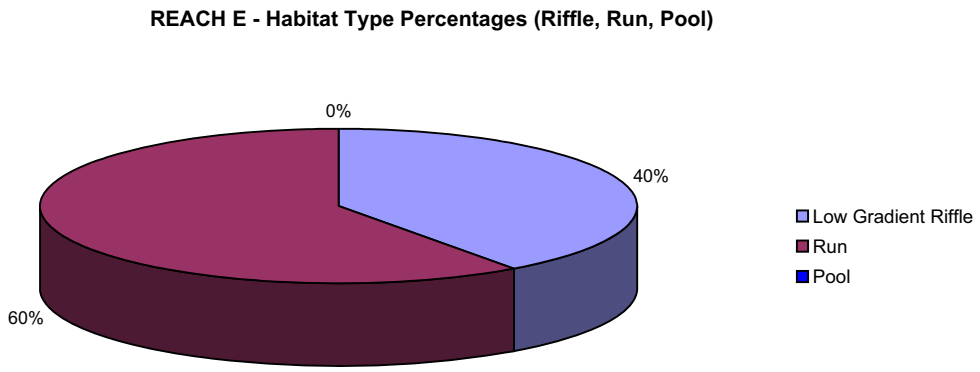


Figure 6. All Reaches (Salt Canyon to Old Road) Habitat Type Percentages

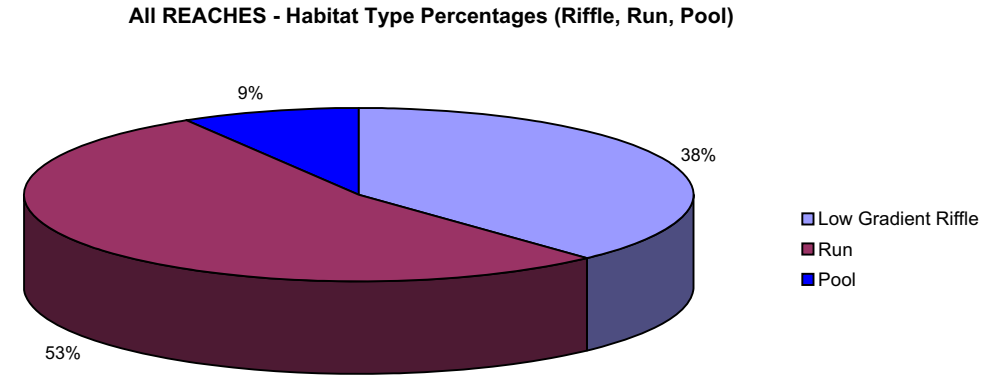


Figure 7. Reach A (Salt Canyon to Potrero Canyon) Average Sediment Composition per Habitat Type

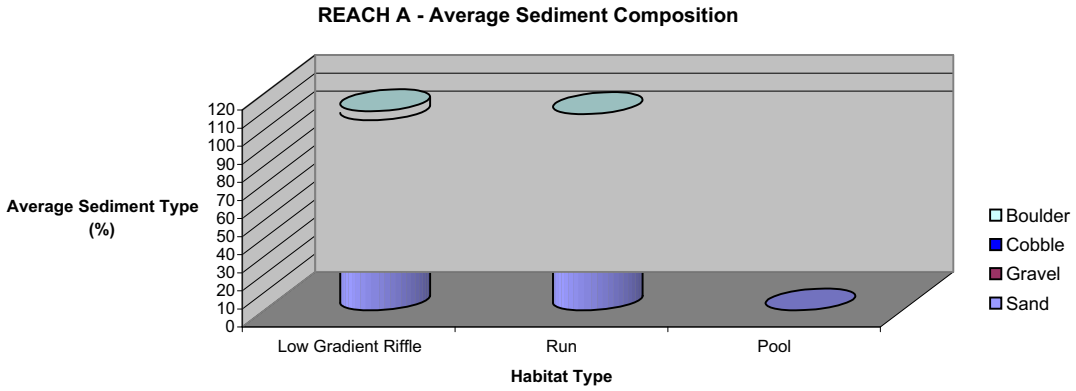


Figure 8. Reach B (Potrero Canyon to Chiquito Canyon) Average Sediment Composition per Habitat Type

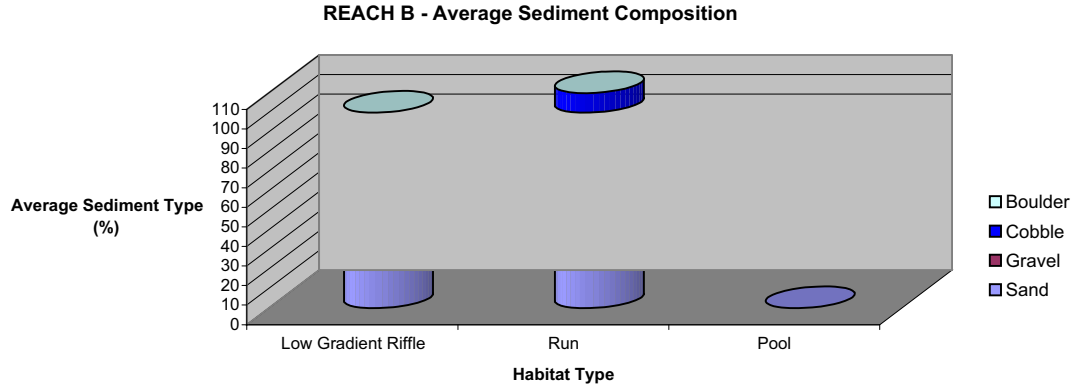


Figure 9. Reach C (Chiquito Canyon to Castaic Creek) Average Sediment Composition per Habitat Type

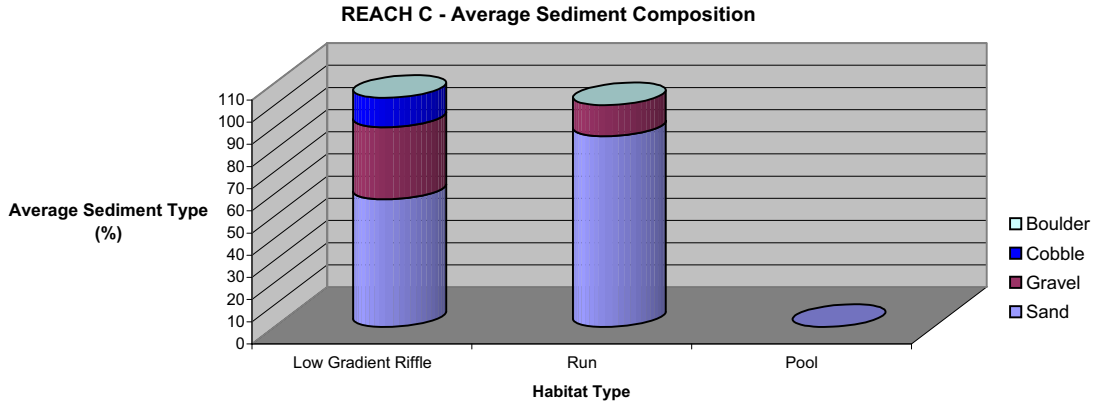


Figure 10. Reach D (Castaic Creek to Effluent Channel) Average Sediment Composition per Habitat Type

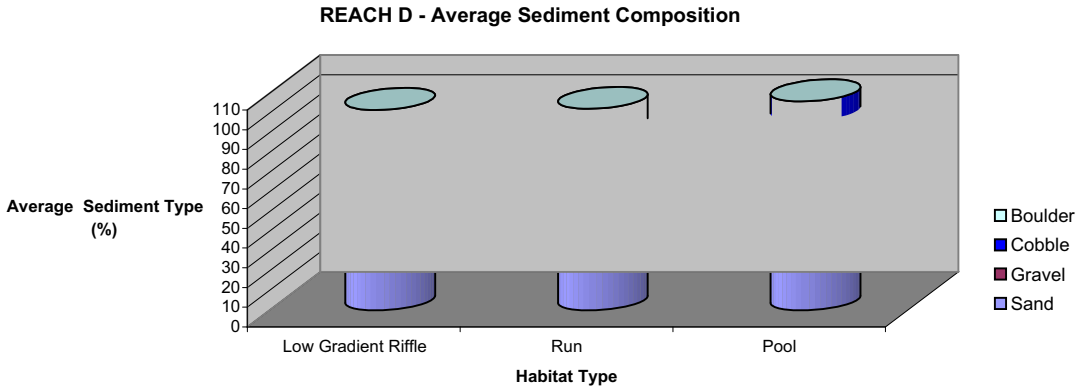


Figure 11. Reach E (Effluent Channel to Old Road) Average Sediment Composition per Habitat Type

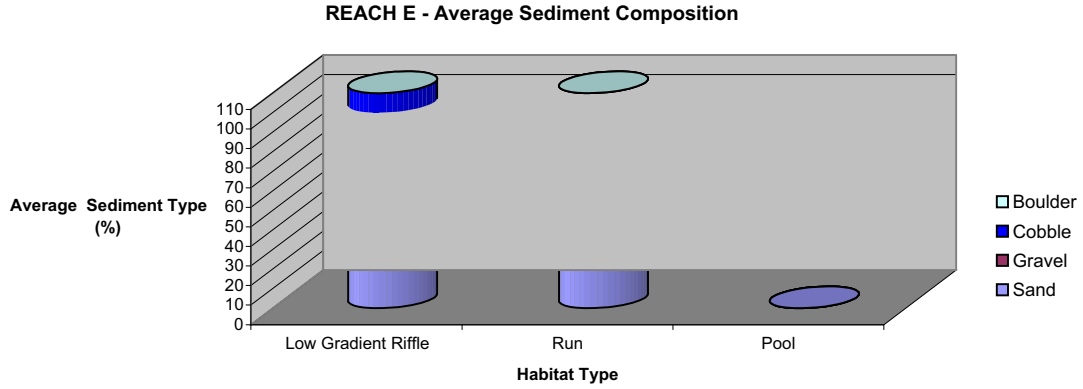


Figure 12. All Reaches (Salt Canyon to Old Road) Average Sediment Composition per Habitat Type

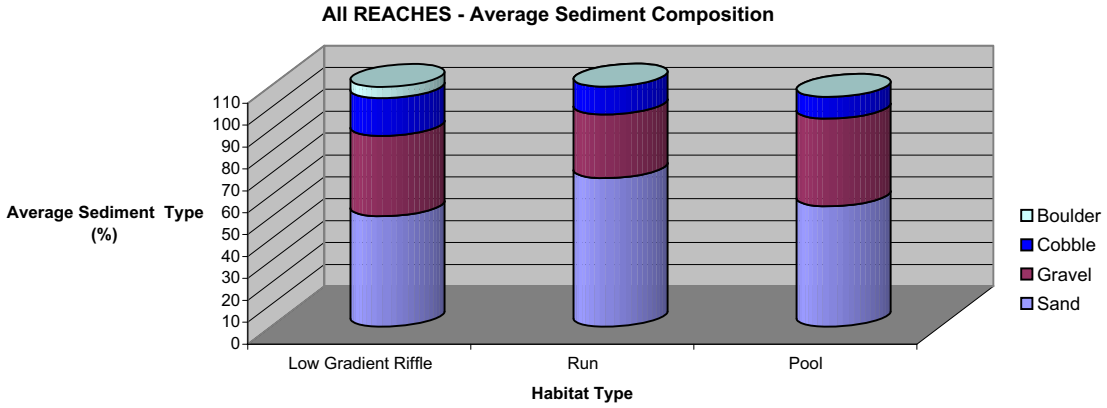


Figure 13. Reach A (Salt Canyon to Potrero Canyon) Average Percent Edgewater Vegetation per Habitat Type

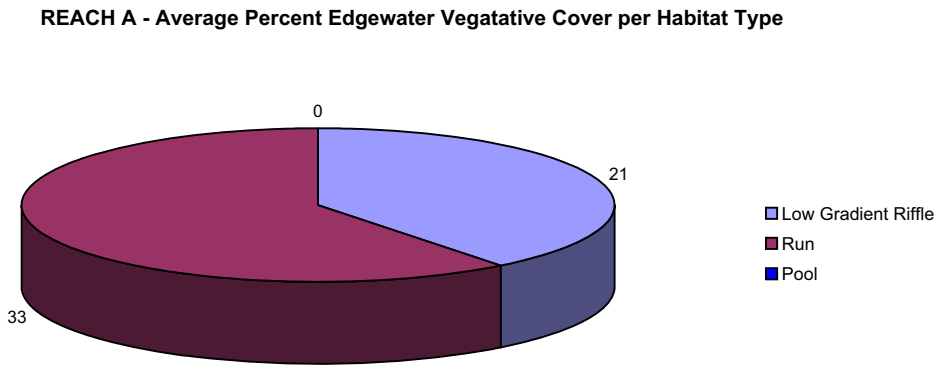


Figure 14. Reach B (Potrero Canyon to Chiquito Canyon) Average Percent Edgewater Vegetation per Habitat Type

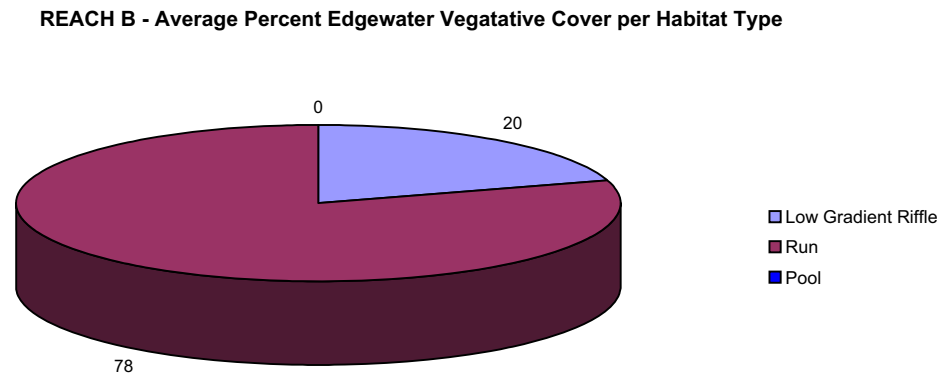


Figure 15. Reach C (Chiquito Canyon to Castaic Creek) Average Percent Edgewater Vegetation per Habitat Type

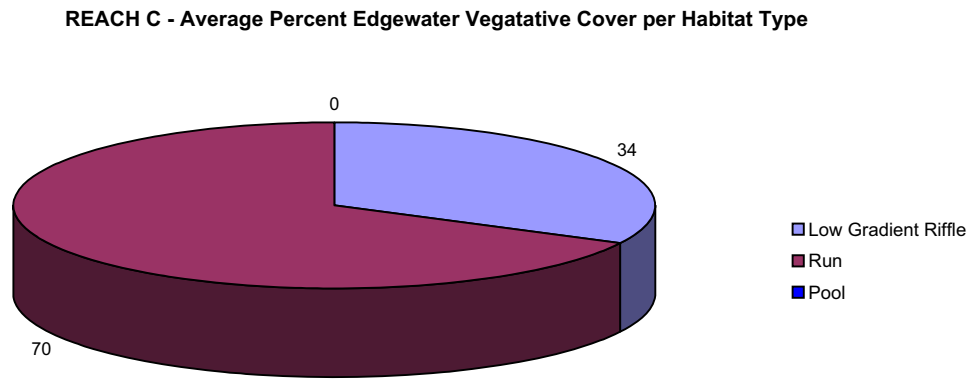


Figure 16. Reach D (Castaic Creek to Effluent Channel) Average Percent Edgewater Vegetation per Habitat Type

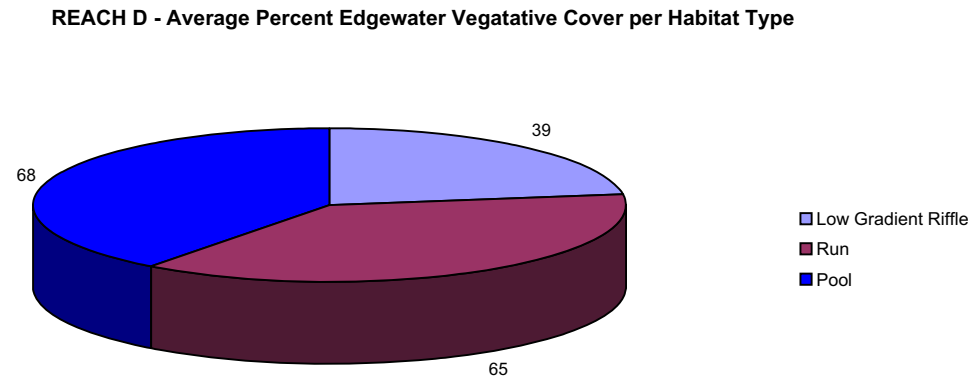


Figure 17. Reach E (Effluent Channel to Old Road) Average Percent Edgewater Vegetation per Habitat Type

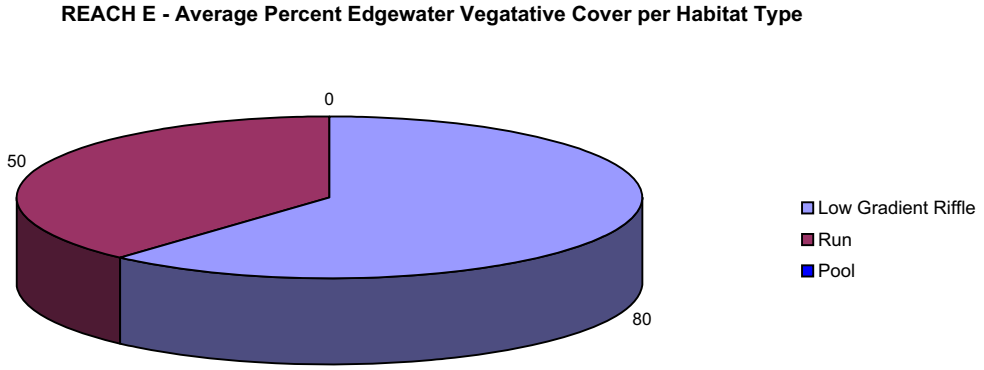
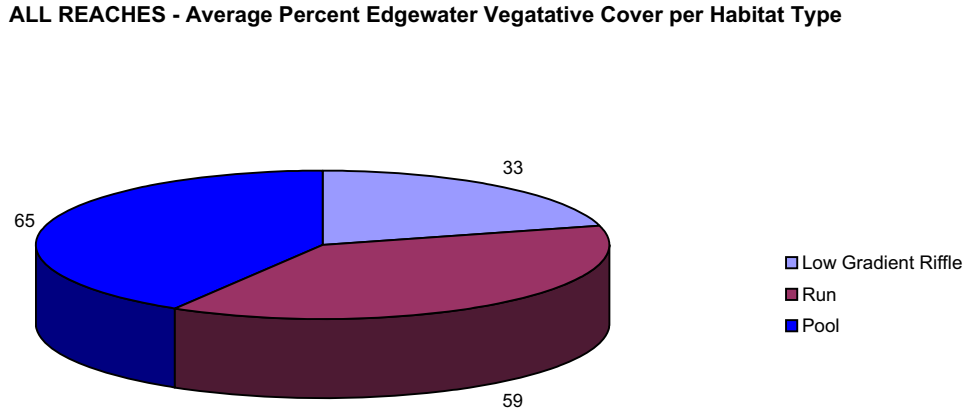


Figure 18. All Reaches (Salt Canyon to Old Road) Average Percent Edgewater Vegetation per Habitat Type



APPENDIX C

PACE VELOCITY DISTRIBUTION GRAPHICS

NEWHALL LAND
A LENNAR/LNR COMPANY

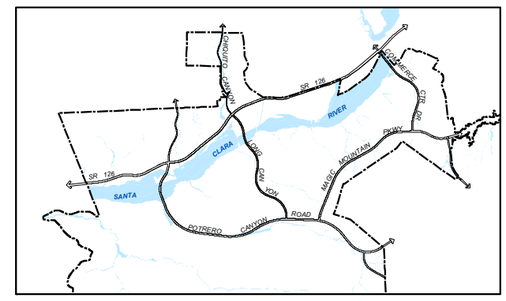
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 5.1b

EXISTING PRECONDITION
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1b_scr_ex_2Yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

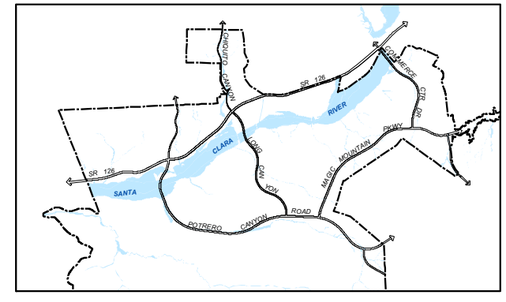
Chiquito Canyon

San Martinez Grande Canyon

Lion Canyon

Long Canyon

Potrero Canyon



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 5.1c

EXISTING PRECONDITION
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1c_scr_ex_5Yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

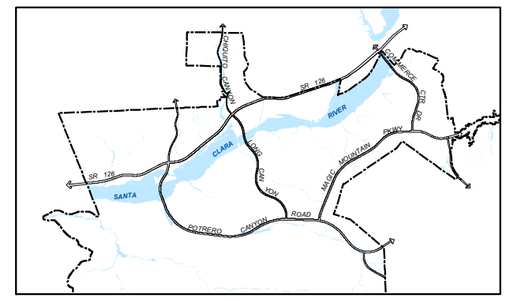
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet

500 250 0 500 Meters

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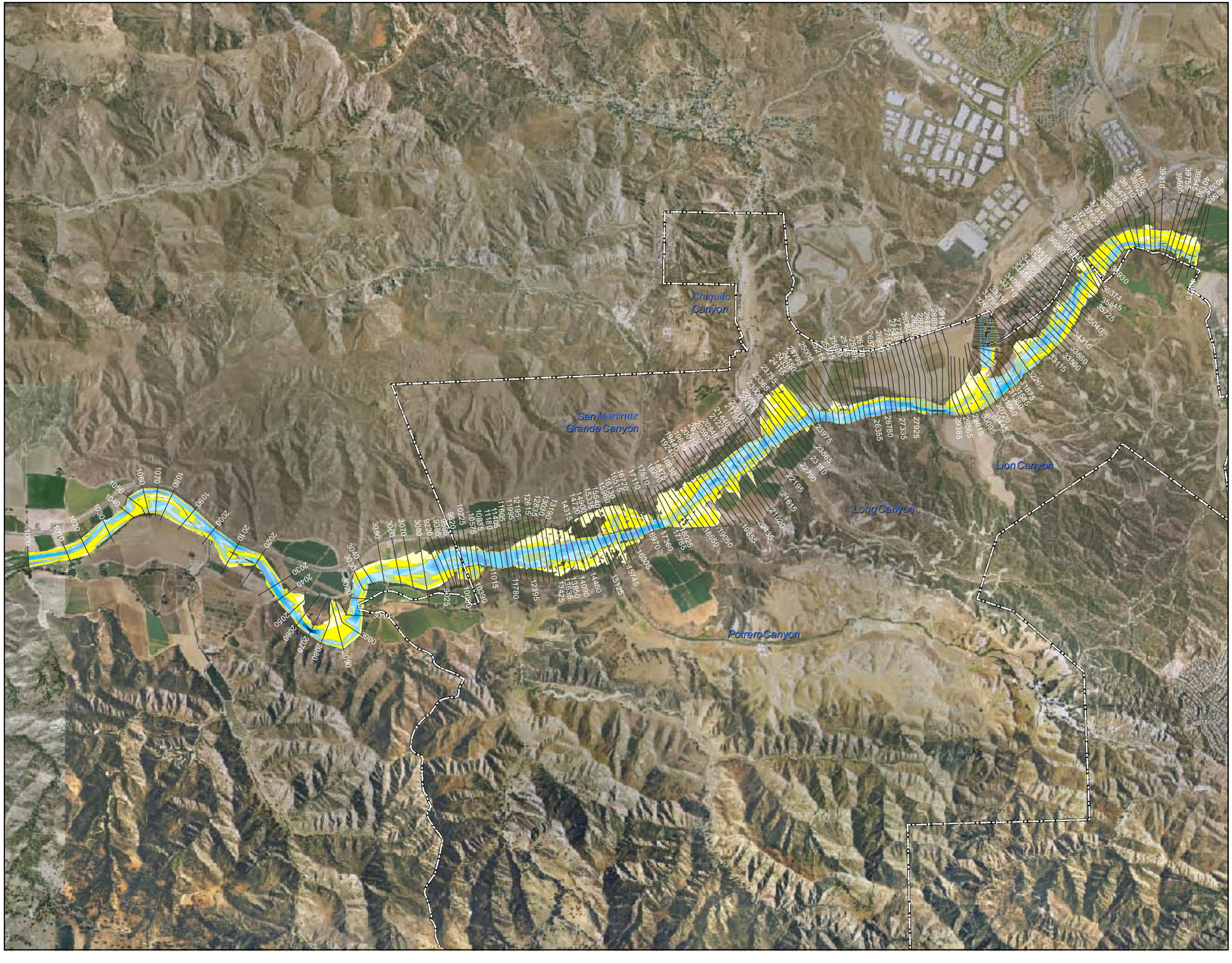
Figure 5.1d

EXISTING PRECONDITION
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1d_scr_ex_10Yr_112108.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

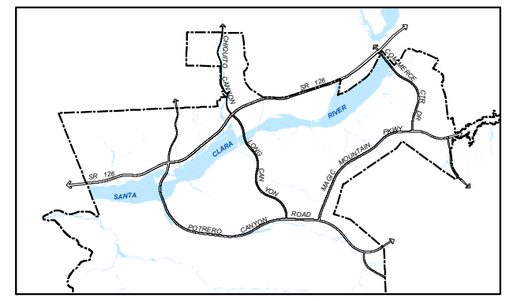
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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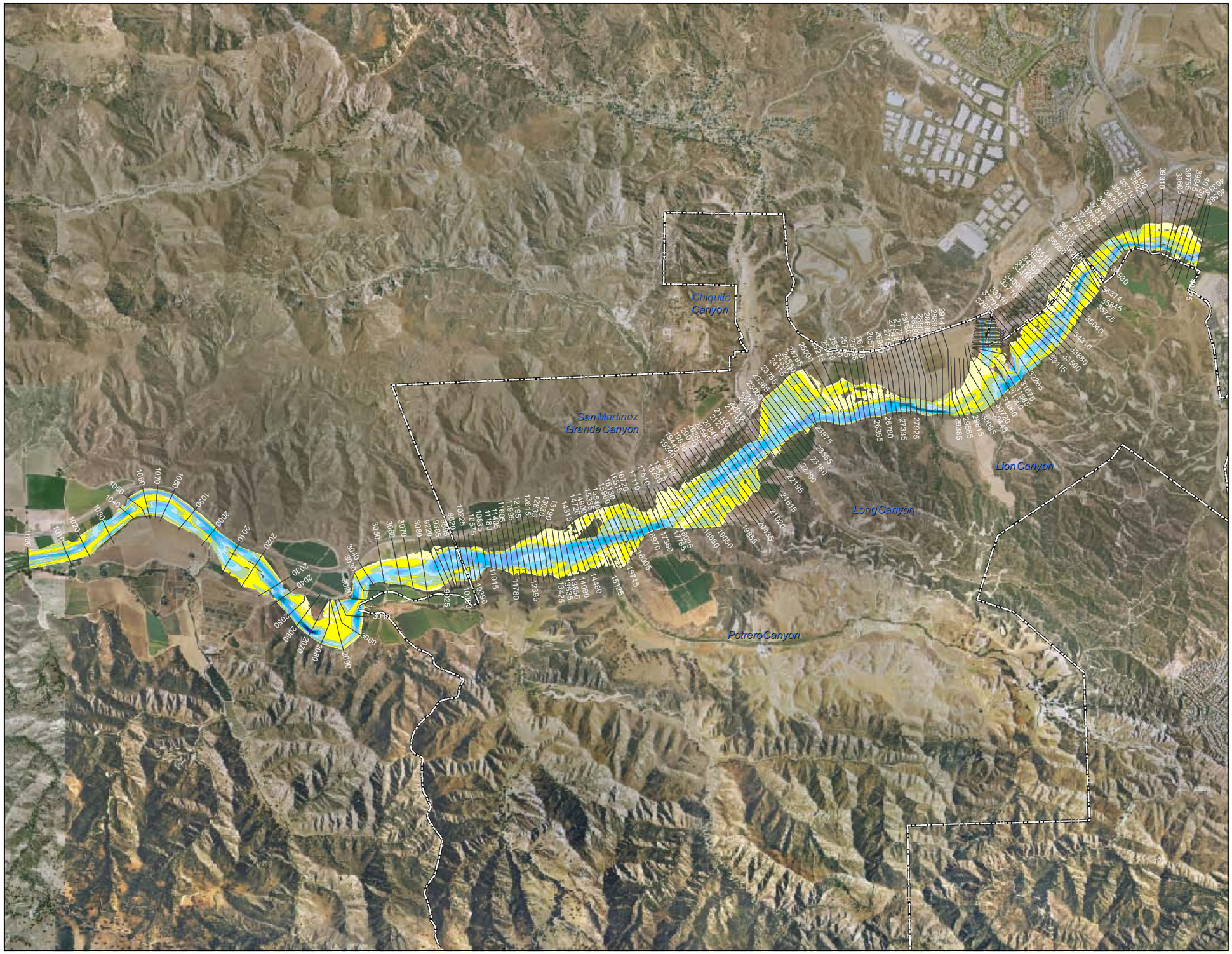
Figure 5.1e

EXISTING PRECONDITION\ 20 YEAR FLOOD EVENT VELOCITY SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1e_scr_ex_20Yr_112108.mxd



NEWHALL LAND
A LENNAR/LNR COMPANY

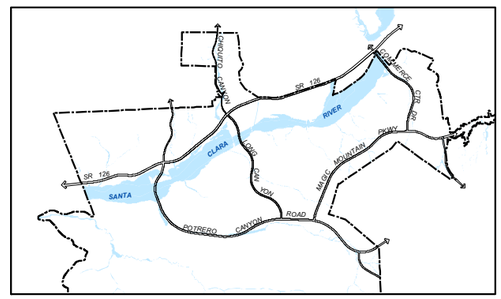
L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet

500 250 0 500 Meters

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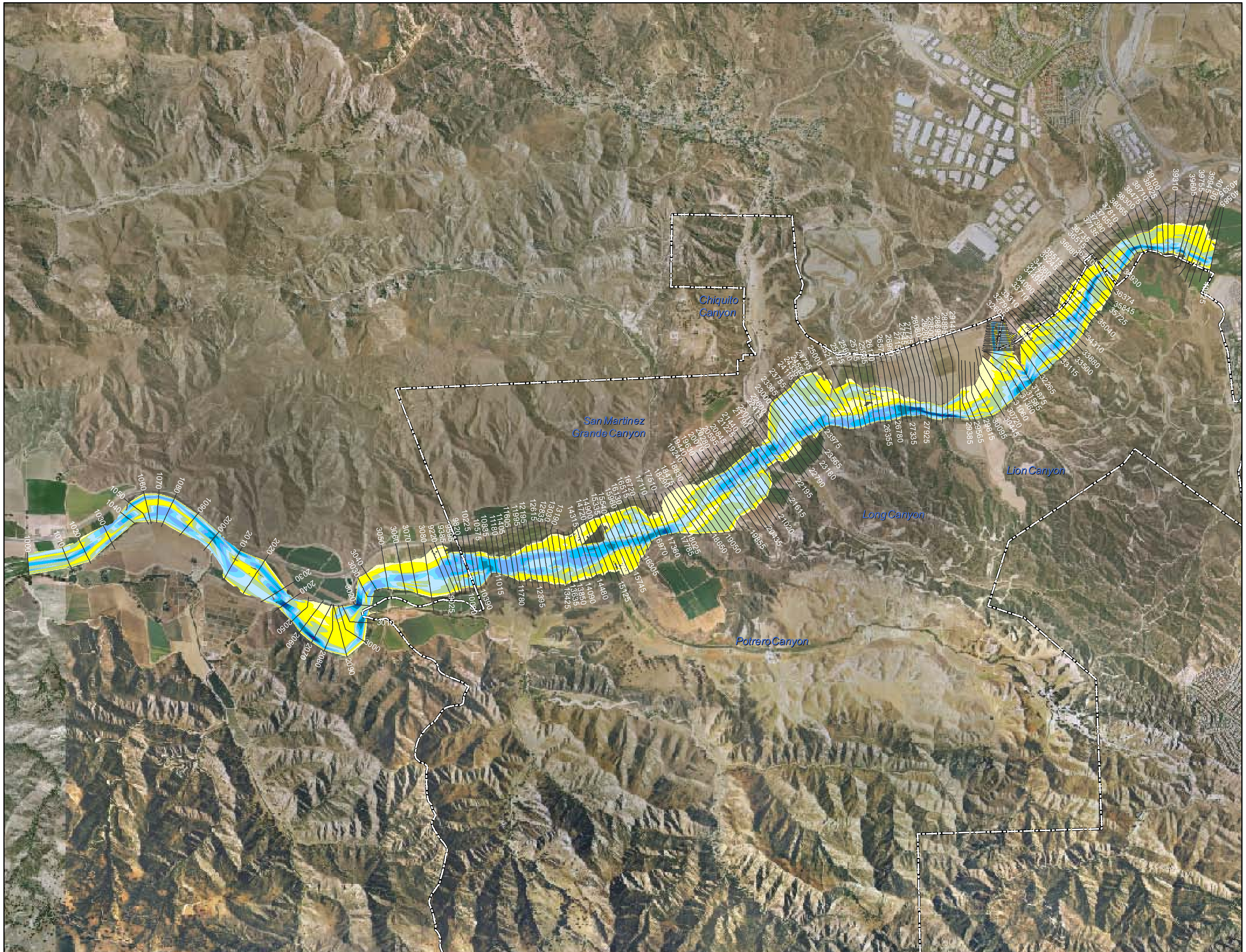
Figure 5.1f

EXISTING PRECONDITION\ 50 YEAR FLOOD EVENT VELOCITY SANTA CLARA RIVER

P:\17104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-1f_scr_ex_50Yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

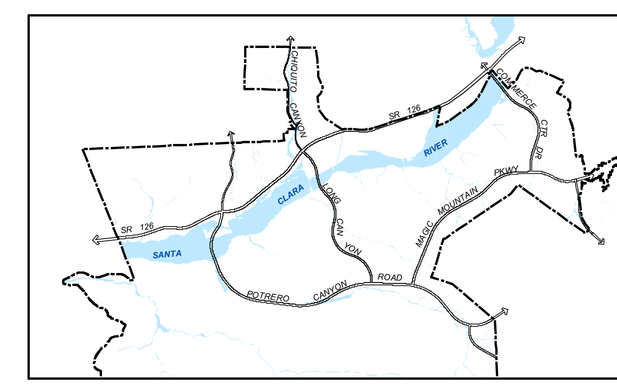


L E G E N D

- Newhall Ranch Specific Plan Boundary
- 10875 — Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.1g

EXISTING PRECONDITION\ 100 YEAR FLOOD EVENT VELOCITY SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-1g_scr_ex_100Yr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

Newhall Ranch Specific Plan Boundary

10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39

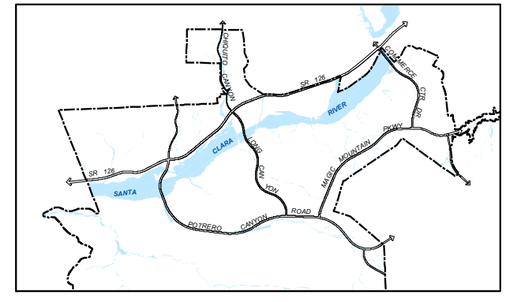
Chiquito Canyon

San Martinez Grande Canyon

Lion Canyon

Long Canyon

Potrero Canyon



Feet
1,750 875 0 1,750
Meters
500 250 0 500

PACE Advanced Water Engineering

Figure 5.1h

EXISTING PRECONDITION CAPITAL FLOOD EVENT VELOCITY SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-1h_scr_ex_CAPyr_112108.mxd

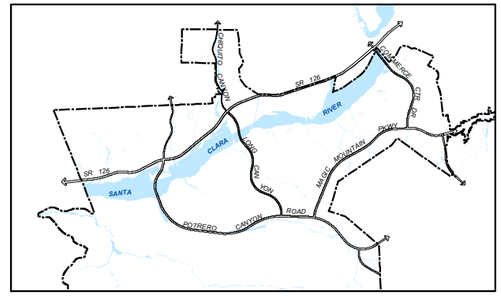
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.2b

ALTERNATIVE 2
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081\104E_Figure-5-2b_scr_Alt2_2yr_112108.mxd

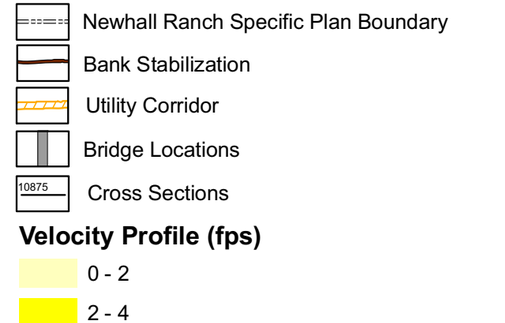
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.2c

ALTERNATIVE 2
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081\1704E_Figure-5-2c_scr_Alt2_5yr_112108.mxd

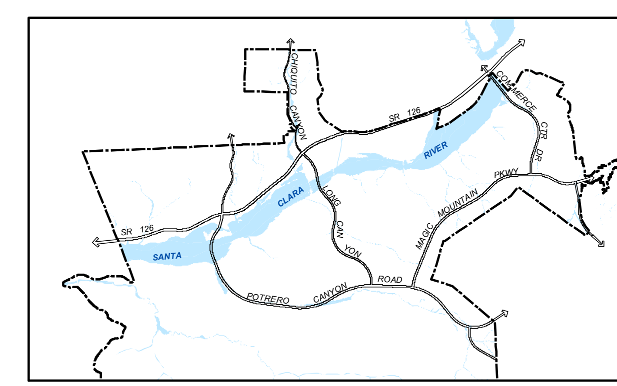
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.2d

ALTERNATIVE 2
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-2d_scr_Alt2_10yr_112108.mxd

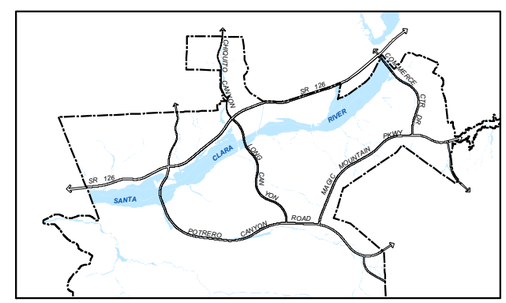
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.2e

ALTERNATIVE 2
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\17044E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081704E_Figure-5-2e_scr_Alt2_20yr_112108.mxd

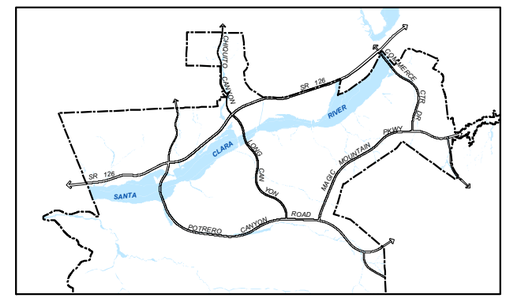
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



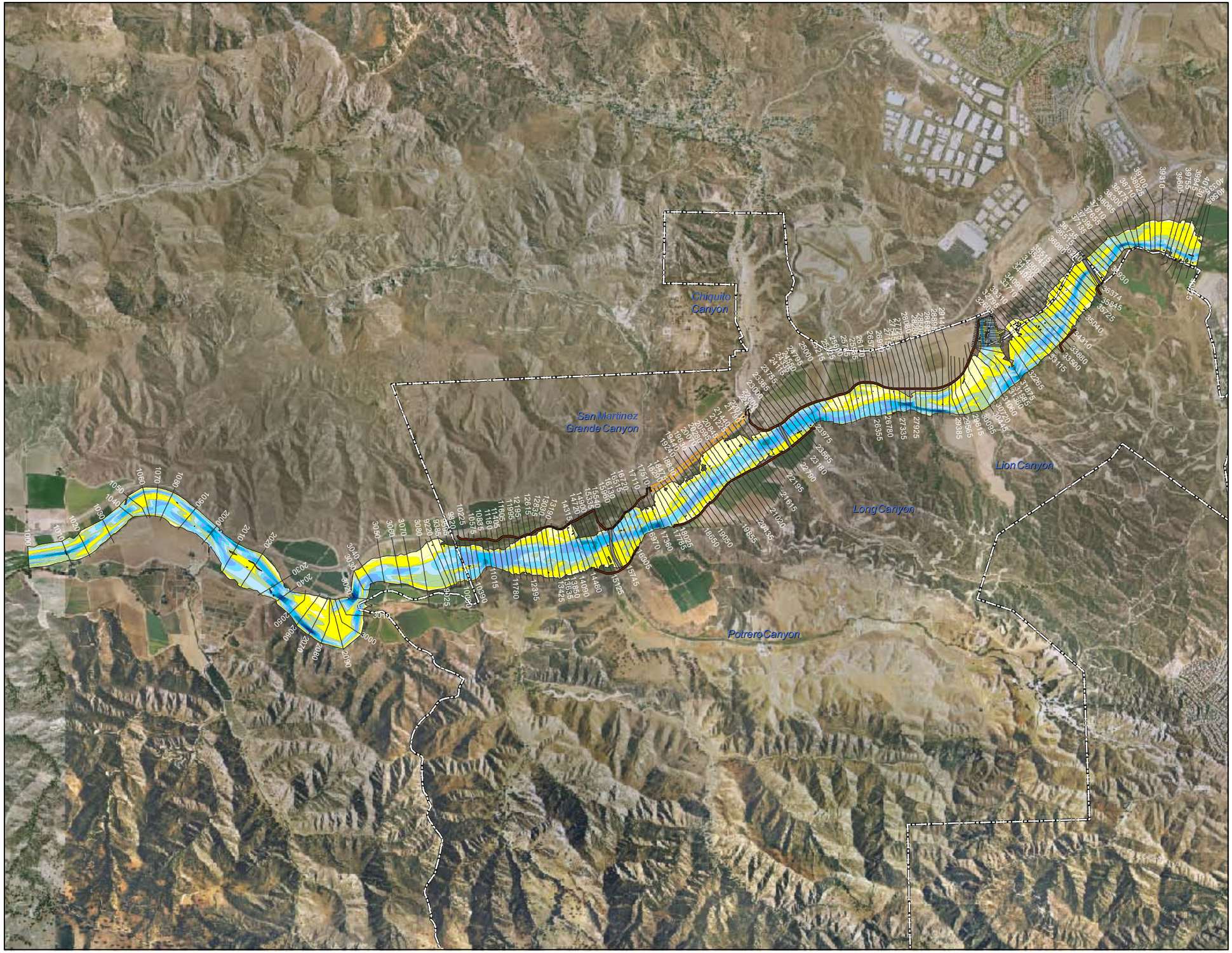
1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.2f

ALTERNATIVE 2
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-2f_scr_Alt2_50yr_112108.mxd



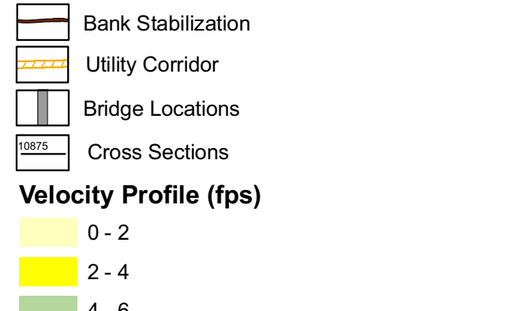
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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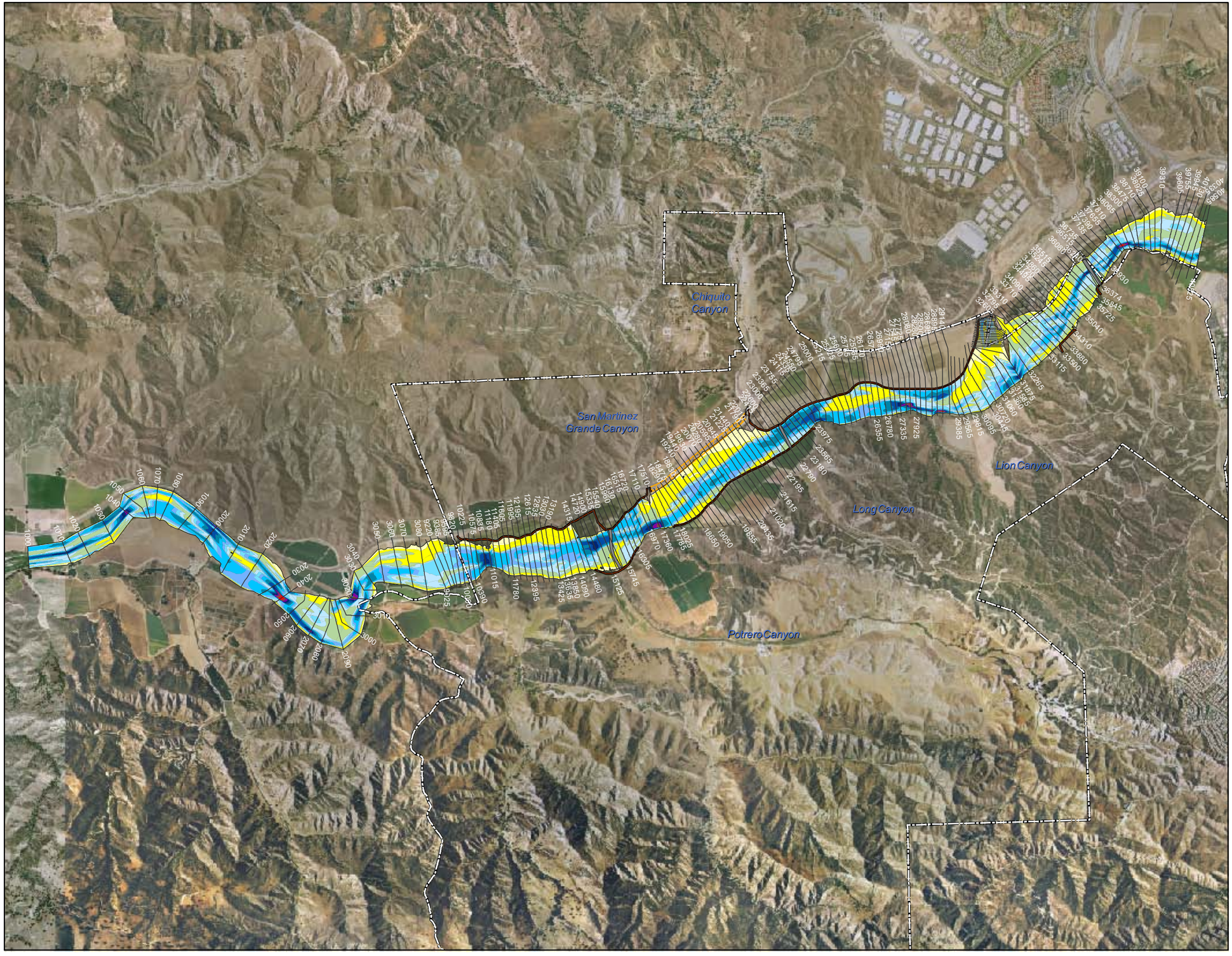
Figure 5.2g

ALTERNATIVE 2
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\1704E_Figure-5-2g_scr_Alt2_100yr_112108.mxd



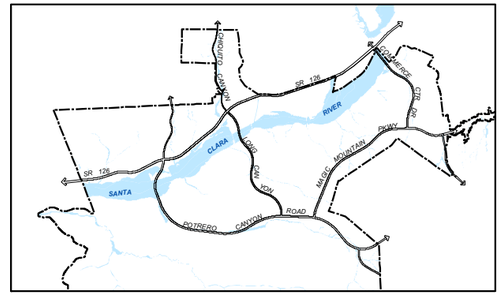
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Advanced Water Engineering

Figure 5.2h

ALTERNATIVE 2
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081704E_Figure-5-2h_scr_Alt2_CAPyr_112108.mxd

NEWHALL LAND
A LENNAR/LNR COMPANY

Chiquito Canyon

San Martinez Grande Canyon

Lion Canyon

Long Canyon

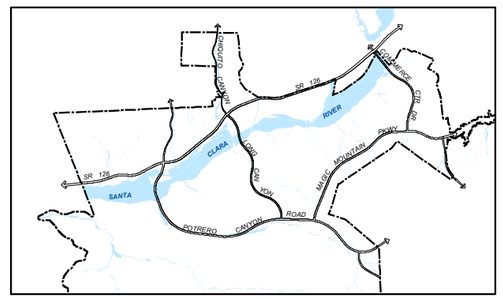
Potrero Canyon

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.3b

ALTERNATIVE 3 & 4
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081\104E_Figure-5-3b_scr_Alt3-4_2yr_112108.mxd

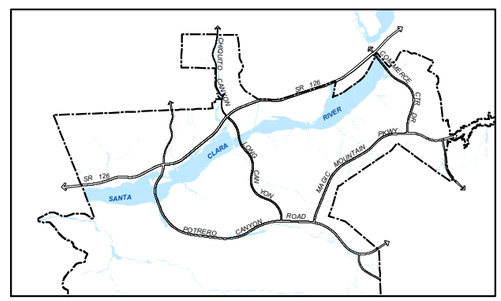
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet
1,750 875 0 1,750
Meters
500 250 0 500

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Figure 5.3c

ALTERNATIVE 3 & 4
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081\1704E_Figure-5-3c_scr_Alt3-4_5yr_112108.mxd

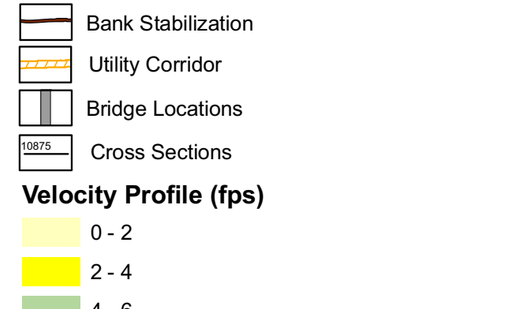
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.3d

ALTERNATIVE 3 & 4
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\17104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081\7104E_Figure-5-3d_scr_Alt3-4_10yr_112108.mxd

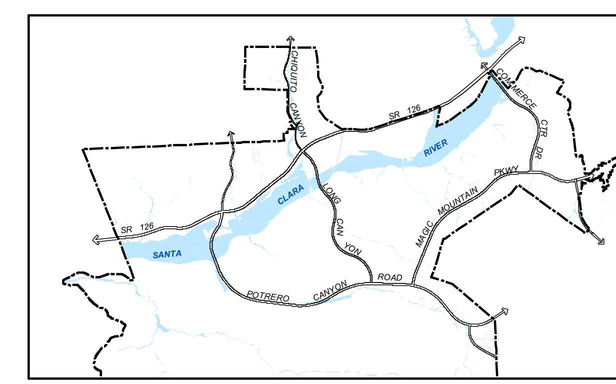
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.3e

ALTERNATIVE 3 & 4
20 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3e_scr_Alt3-4_20yr_112108.mxd

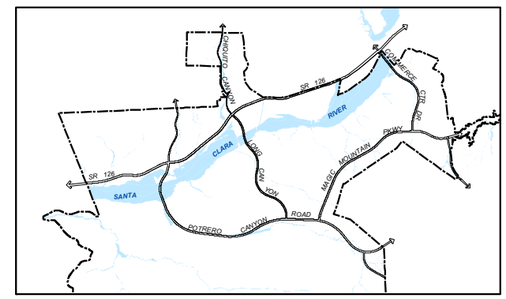
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

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Figure 5.3f

ALTERNATIVE 3 & 4
50 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\7104E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_2008\7104E_Figure-5-3f_scr_Alt3-4_50yr_112108.mxd

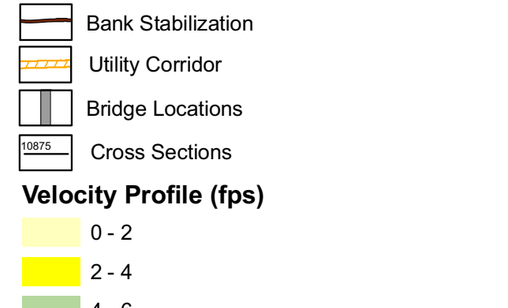
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.3g

ALTERNATIVE 3 & 4
100 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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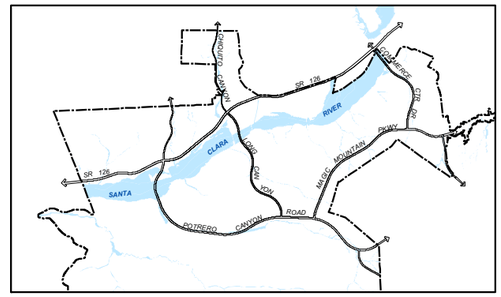
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



Feet: 1,750 875 0 1,750
Meters: 500 250 0 500

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Figure 5.3h

ALTERNATIVE 3 & 4
CAPITAL FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\1704E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081704E_Figure-5-3h_scr_Alt3-4_CAPyr_112108.mxd

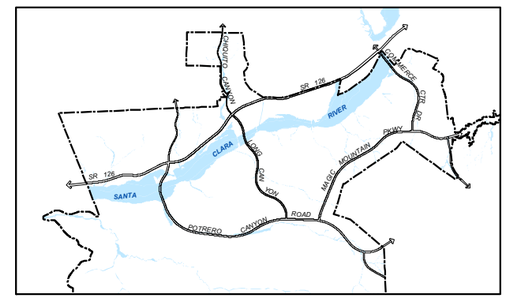
NEWHALL LAND
A LENNAR/LNR COMPANY

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.4b

ALTERNATIVE 5
2 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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NEWHALL LAND
A LENNAR/LNR COMPANY

Chiquito Canyon

San Martinez Grande Canyon

Lion Canyon

Long Canyon

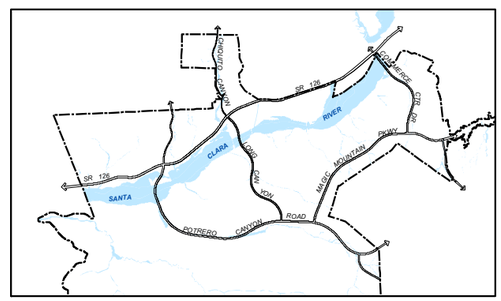
Potrero Canyon

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet
500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.4c

ALTERNATIVE 5
5 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

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NEWHALL LAND
A LENNAR/LNR COMPANY

Chiquito Canyon

San Martinez Grande Canyon

Lion Canyon

Long Canyon

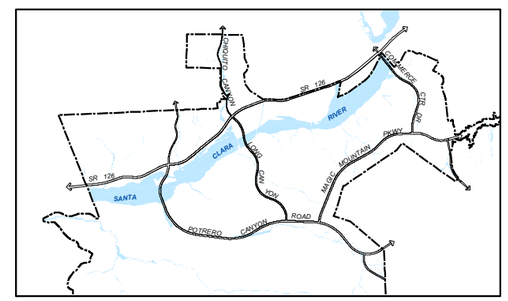
Potrero Canyon

L E G E N D

- Newhall Ranch Specific Plan Boundary
- Bank Stabilization
- Utility Corridor
- Bridge Locations
- 10875 Cross Sections

Velocity Profile (fps)

- 0 - 2
- 2 - 4
- 4 - 6
- 6 - 8
- 8 - 10
- 10 - 12
- 12 - 15
- 15 - 18
- 18 - 21
- 21 - 24
- 24 - 27
- 27 - 30
- 30 - 39



1,750 875 0 1,750 Feet

500 250 0 500 Meters

PACE Advanced Water Engineering

Figure 5.4d

ALTERNATIVE 5
10 YEAR FLOOD EVENT VELOCITY
SANTA CLARA RIVER

P:\17044E\6-GIS\mxds\RMDP_RiverDrainageAnalysis_20081704E_Figure-5-4d_scr_Alt5_10yr_112108.mxd