APPENDIX A

REFERENCES

LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	*Full Name*
ADA	Americans with Disabilities Act
BFE	Base flood elevation
CDFW	California Department of Fish and Wildlife
cfs	Cubic feet per second
CLOMR	Conditional Letter of Map Revision
CPIOZ	Community Plan Implementation Overlay Zone
du/ac	Dwelling unit per acre
FEMA	Flood Emergency Management Administration
FIS	Flood Insurance Study
Grantville Station	Grantville Trolley Station
HGLs	Hydraulic grade lines
I-8	Interstate 8
LOMR	Letter of Map Revision
Master Program	2013 Master Storm Water System Maintenance Program
MHPA	Multi-Habitat Planning Area
MSCP	San Diego Multiple Species Conservation Program
MTS	Metropolitan Transit System
RCB	Reinforced concrete box
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SDR	Supplemental development regulations
SFHA	Special Flood Hazard Area
SGIP	Smart Growth Incentive Program
T&SW	City of San Diego Transportation & Storm Water Department
TOD	Transit Oriented Development
USACE	U.S. Army Corps of Engineers

STUDY MATERIALS CITED

Biological Constraints Report

Prepared by RECON Environmental Inc. for the Grantville Trolley Station/Alvarado Creek Enhancement Study (Oct. 2016).

Available at the City of San Diego's Navajo Community Profile webpage: www.sandiego.gov/planning/community/profiles/navajo. The report may also be directly accessed here.

Existing Conditions Report

Prepared by Dyett & Bhatia, Rick Engineering Company, and RECON Environmental for the Grantville Trolley Station/Alvarado Creek Enhancement Study (Jan. 2017).

Available at the City of San Diego's Navajo Community Profile webpage: www.sandiego.gov/planning/community/profiles/navajo. The report may also be directly accessed here.

Feasibility Study

See Appendix C.

Hydrology Background Report

See Appendix D.

Also available at the City of San Diego's Navajo Community Profile webpage: www.sandiego.gov/planning/community/profiles/navajo.

APPENDIX B

DESIGN PALETTE

INTRODUCTION

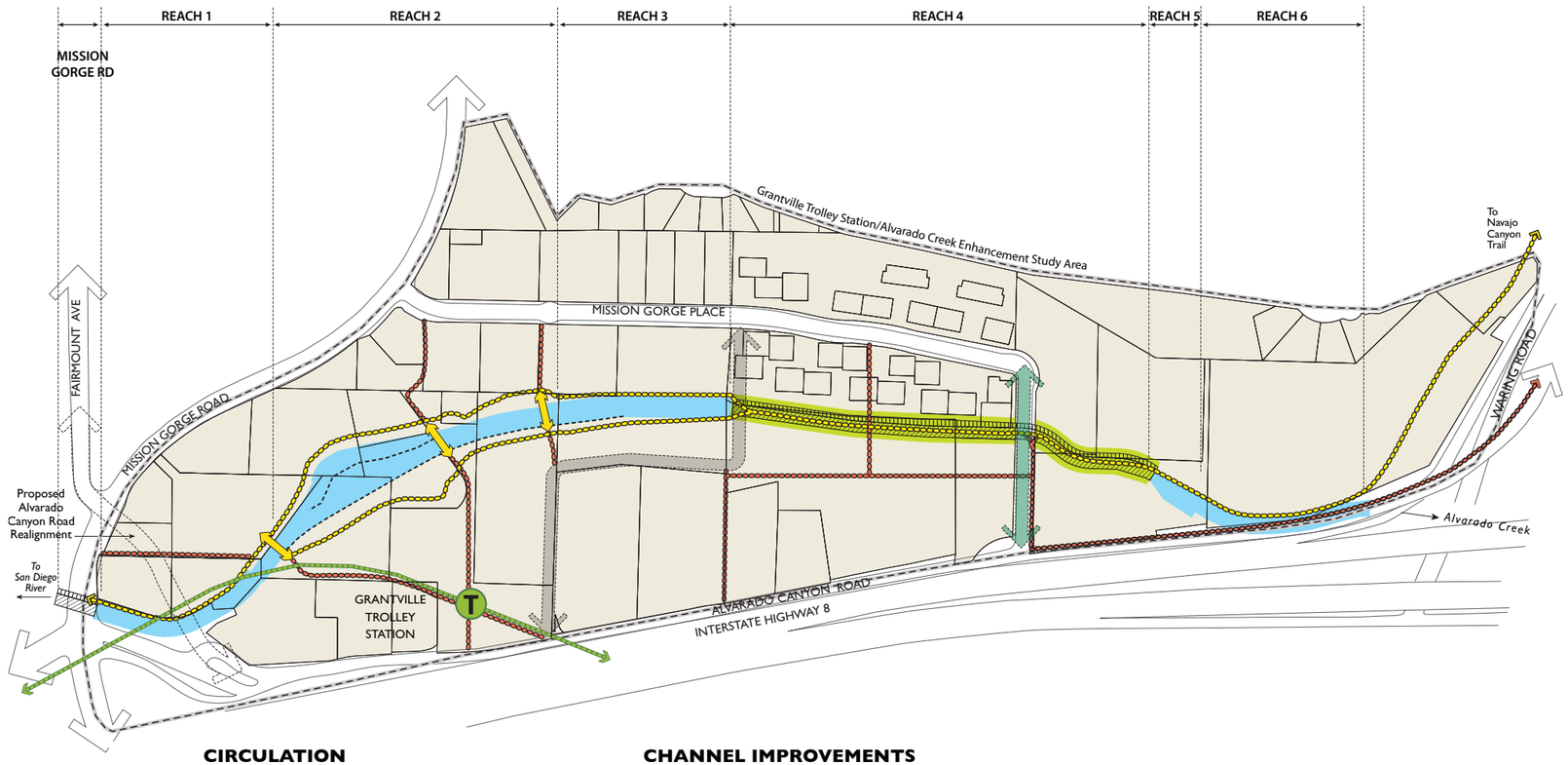
PURPOSE AND INTENT

The purpose of the following Design Palette is to provide non-binding recommendations and guidance to aid the design of the Multi-Use Trail, as well as lighting and educational signage along the Multi-Use Trail. The recommendations and guidance are intended to assist property owners in achieving the following goals:

- *Safe Environment*. Developing a Multi-Use Trail system that is safe for a wide variety of community members of all ages and abilities, in the daytime and in the evening, as well as during large storm events; and
- *Cohesive Appearance of the Multi-Use Trail System*. Developing a Multi-Use Trail system that has a cohesive look and feel throughout the Study Area.

APPLICABILITY

The Design Palette provides recommendations and guidance regarding the Multi-Use Trail system, the recommended alignment of which is shown in the adjacent figure. Specifically, the Design Palette provides non-binding guidance concerning the design of the Trail itself, lighting to illuminate the Trail, and educational signage along the Trail.



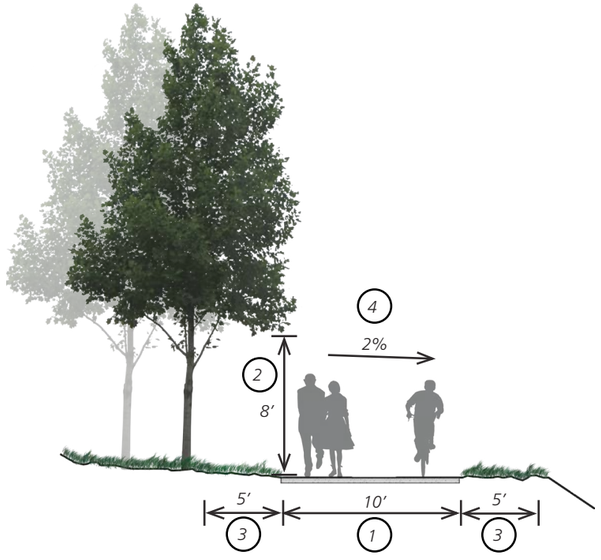
MULTI-USE TRAIL

The Multi-Use Trail should be designed to accommodate a variety of users, including walkers, joggers, and cyclists. Below are recommendations to aid the design and installation of a safe and cohesive Multi-Use Trail.

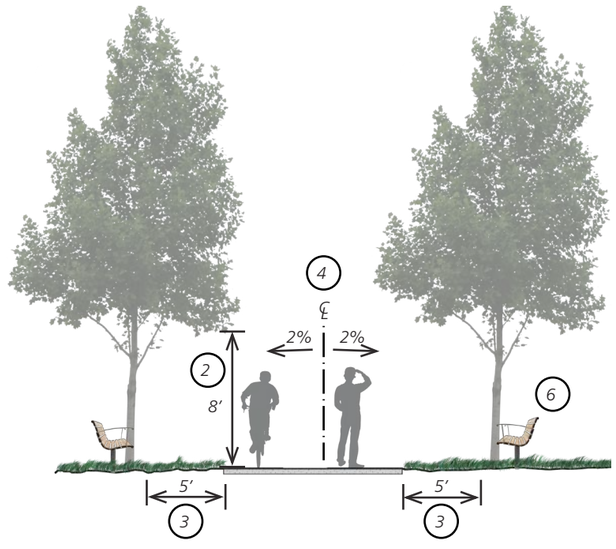
1. *Width:* The Trail should, at minimum, be 10 feet wide.
2. *Vertical Clearance:* Eight feet of vertical clearance from the finished grade of trail should be provided.
3. *Width Clearance:* In general, a minimum of five feet of clearance should be provided from the outside edge of the trail to any object, including fences, poles, signs, benches, and the top of slope at the creek channel's edge. Site constraints such as steep slopes and proximity to the channel edge may make a five-foot width clearance infeasible; in such situations, a safe and pleasant Trail segment for users of all ages and abilities should be provided.
4. *Cross-Slope:* Two percent cross-slope should be provided. If the Trail is to be crowned for grading and drainage purposes, such as on the Recreation Corridor, the maximum and minimum slope should be two percent from the centerline of the Trail.
5. *Surface Material:* As the Trail may be constructed, in part, in the floodplain, a hard-paved concrete surface should be used, so the Trail can withstand high velocity flows. Permeable concrete should be considered. Permeable concrete has the benefit of increasing filtration and reducing runoff of pollution into the creek; if selected, occasional sweeping and pressure washing may be required to keep the surface maintained and permeable. The selected concrete color should blend in with the Trail's surroundings and be relatively light, to minimize the urban heat island effect.
6. *Furnishings:* The installation of furnishings adjacent to the Multi-Use Trail should be carefully considered where the Trail is located in the floodplain. The installation of fencing, benches, signage, bike racks, and trash receptacles should be designed and installed in a manner that minimizes their effect on flood waters and protects the amenities from flood damage.
7. *Fences:* Limit fencing of the creek corridor except in those areas where safety presents a concern, or where fencing is required to protect sensitive habitat. Fencing should allow for wildlife movement. When needed, a unified fence type that is at least 75 percent open with appropriate access points can aid in making the creek a community asset.

ILLUSTRATIVE SECTIONS

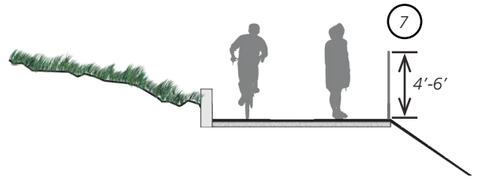
Typical Trail



Trail in Recreational Corridor

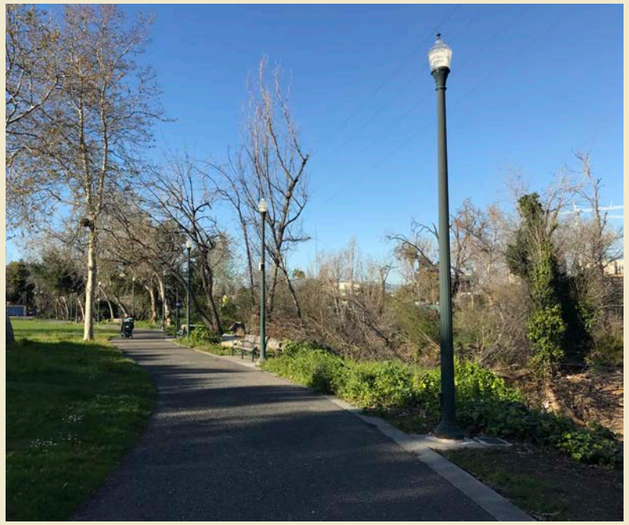


Trail with Site Constraints



EXAMPLES

Multi-Use Trails



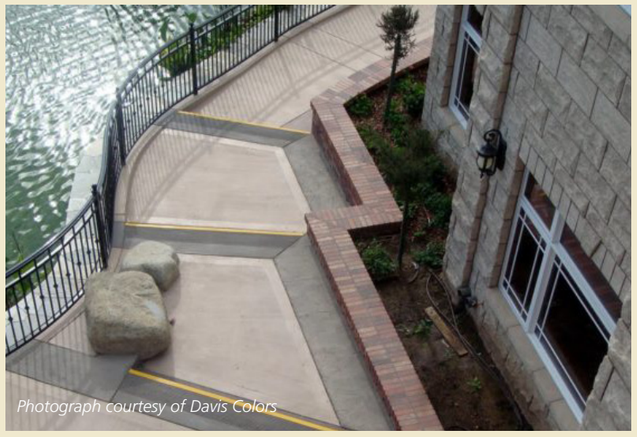
Trail adjacent to Guadalupe River, San Jose, CA

Floodable trail along Buffalo Bayou Park, Houston, Texas

Trail along the Los Angeles River, Studio City, CA

Concrete Colors

Photograph courtesy of Davis Colors



Photograph courtesy of Davis Colors

Photograph courtesy of Davis Colors

PEDESTRIAN-SCALED TRAIL LIGHTING

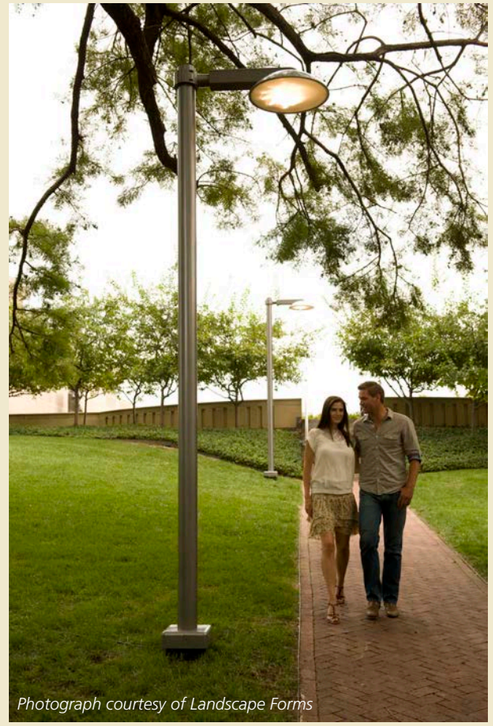
The overall conceptual approach to illuminating the Multi-Use Trail should balance safety and security with nighttime visibility and function through light color selection and reduction of glare. Below are recommendations to aid the design and implementation of a uniform Multi-Use Trail lighting plan.

- *Color of Light Source*: Light color should provide true color rendering.
- *Standards and Fixtures*: Fixtures should create an unobtrusive appearance that allows the focus to remain on the creek and trail, rather than the fixture. Where lighting is appropriate, it should be treated consistently throughout the Multi-Use Trail System, in terms of light source, fixture type, fixture finish, and color.
- *Energy Efficient*: Lighting should be energy efficient. Solar powered lighting should be considered as a sustainable alternative.
- *Illumination*: Illumination levels should meet the standards for Class I bike trails as defined by Caltrans Highway Design Manual.
- *Pedestrian-scaled*: Lighting should be pedestrian-scaled.

Pedestrian-scaled lighting example

EXAMPLES

One example of attractive and efficient solar-powered lighting is along D.C.'s Metropolitan Branch Trail.

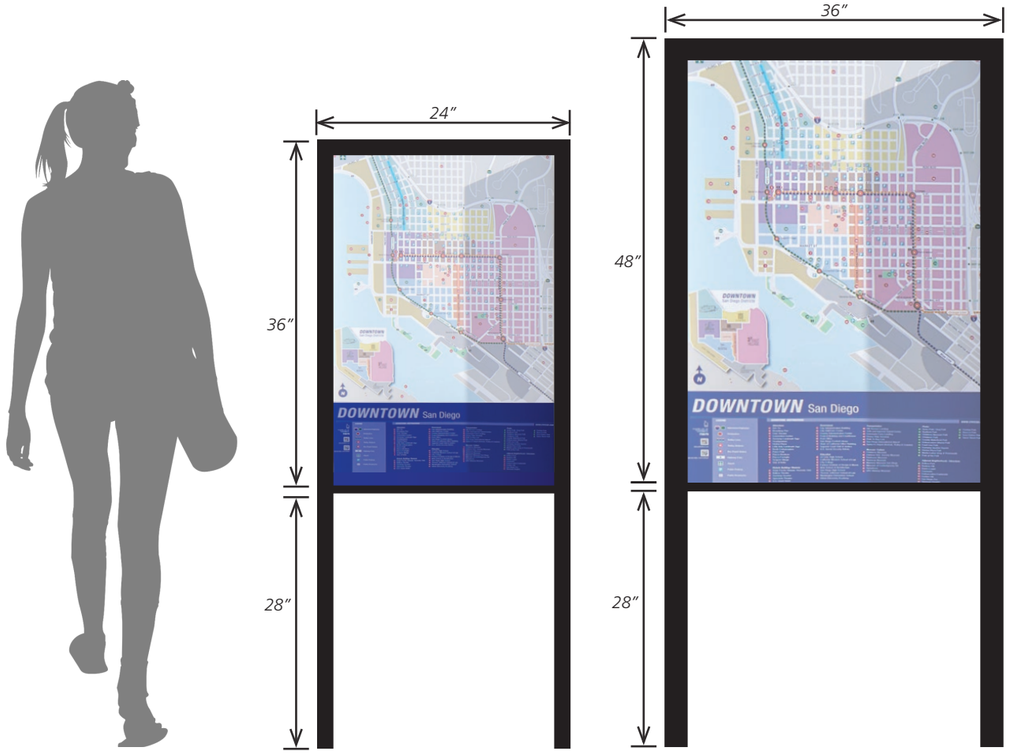


EDUCATIONAL SIGNAGE ALONG THE MULTI-USE TRAIL

The following provides guidance for implementation of a cohesive educational signage program along the Multi-Use Trail system. For further assistance, refer to the National Park Service's *Wayside Exhibits: A Guide to Developing Outdoor Interpretive Exhibits*.

FREESTANDING TRAILSIDE INFORMATION SIGNS

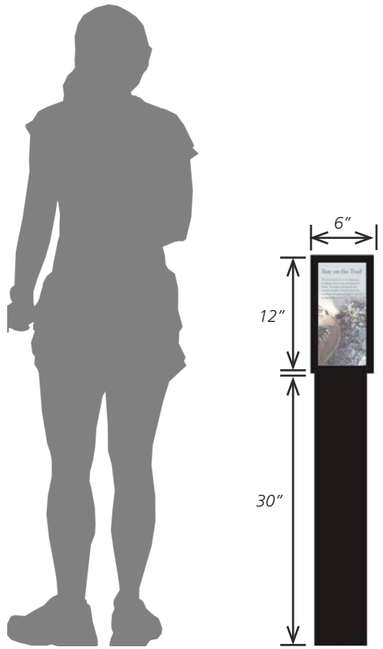
Generally, freestanding trailside information signs are placed at a visitor's decision point. They provide information to inform that decision, such as a map and particulars about what to expect along and what destinations can be accessed via the route. Maps, when used, should be simple, oriented in the direction of view, indicate where the visitor is, and help visitors get to a point B. Signs should be designed for an attention span of 30 to 45 seconds.



TRAILSIDE IDENTIFICATION SIGNS

Trailside identification signs are often used to identify a plant or provide a brief piece of helpful information. These signs generally include:

- (A) A short title
- (B) 25 words of text, or fewer
- (C) One, simple graphic

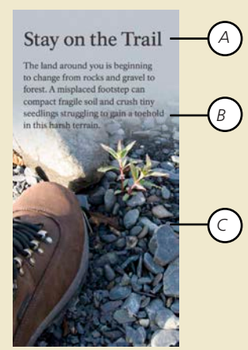


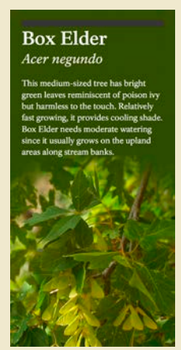
EXAMPLES

Freestanding Trailside Information Sign

Photo courtesy of Rick Engineering

Trailside Identification Signs





TABLETOP INTERPRETIVE SIGNS

Tabletop interpretive signs provide an interpretation of a significant landscape feature that visitors can readily see, and which is generally located in front of the sign. The sign should tell a simple story about what is unique about the landscape, and why visitors should care. A site-specific, bold graphic should be the primary tool for conveying the story. A 36 inch by 24 inch panel has room for the following elements:

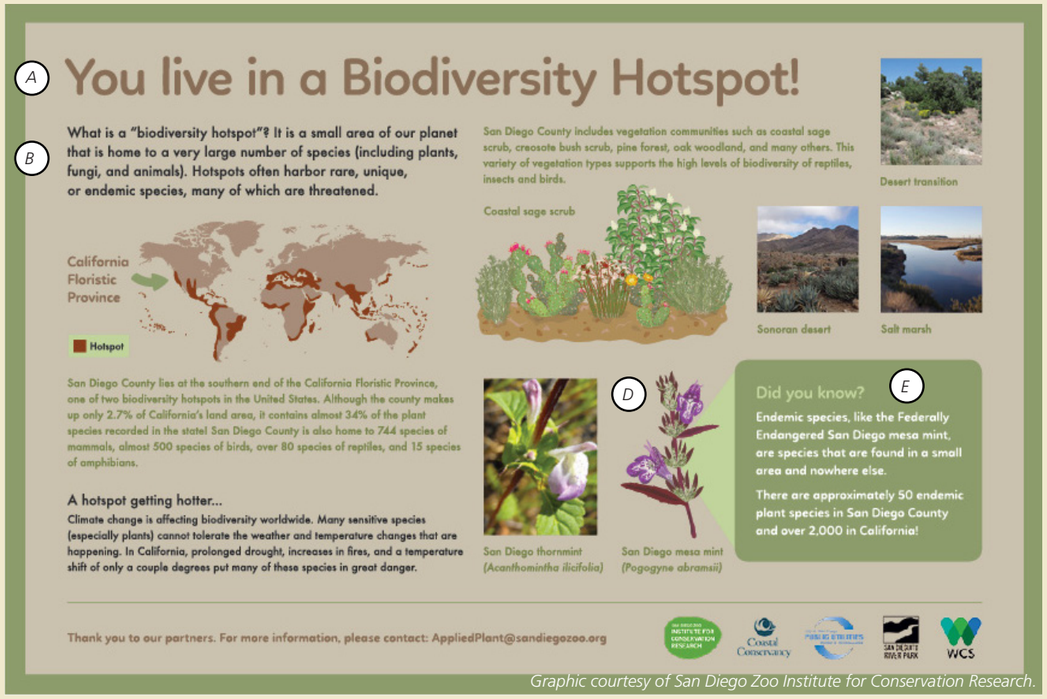
- (A) Compelling title, used to grab the visitor's attention and interest
- (B) 100 words of interpretive text, maximum
- (C) A large, bold interpretive graphic
- (D) Small inset graphics
- (E) Short captions or labels, which made be used to label the graphics

EXAMPLES

Tabletop Interpretive Signs

Bold graphics highlight the main features of the area, while also sharing additional information to engage and educate visitors.

This tabletop interpretive sign, located along the Los Angeles River, has a decorative, stone base.



Graphic courtesy of San Diego Zoo Institute for Conservation Research.

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APPENDIX C

FEASIBILITY REPORT

CONTENTS

LIST OF FIGURES AND TABLES

Figures

TABLES

1
Introduction and Study Area Location

1.1 INTRODUCTION

The purpose of this Feasibility Report for the Grantville Trolley Station/Alvarado Creek Enhancement Study is to describe and document the process and analysis undertaken to arrive at the preferred concepts for the alignment and geometry for an enhanced Alvarado Creek channel and flood management system, route for the Alvarado Creek Multi-Use Trail system, and locations of channel crossings for bicyclists and pedestrians.

This Feasibility Report is organized as follows:

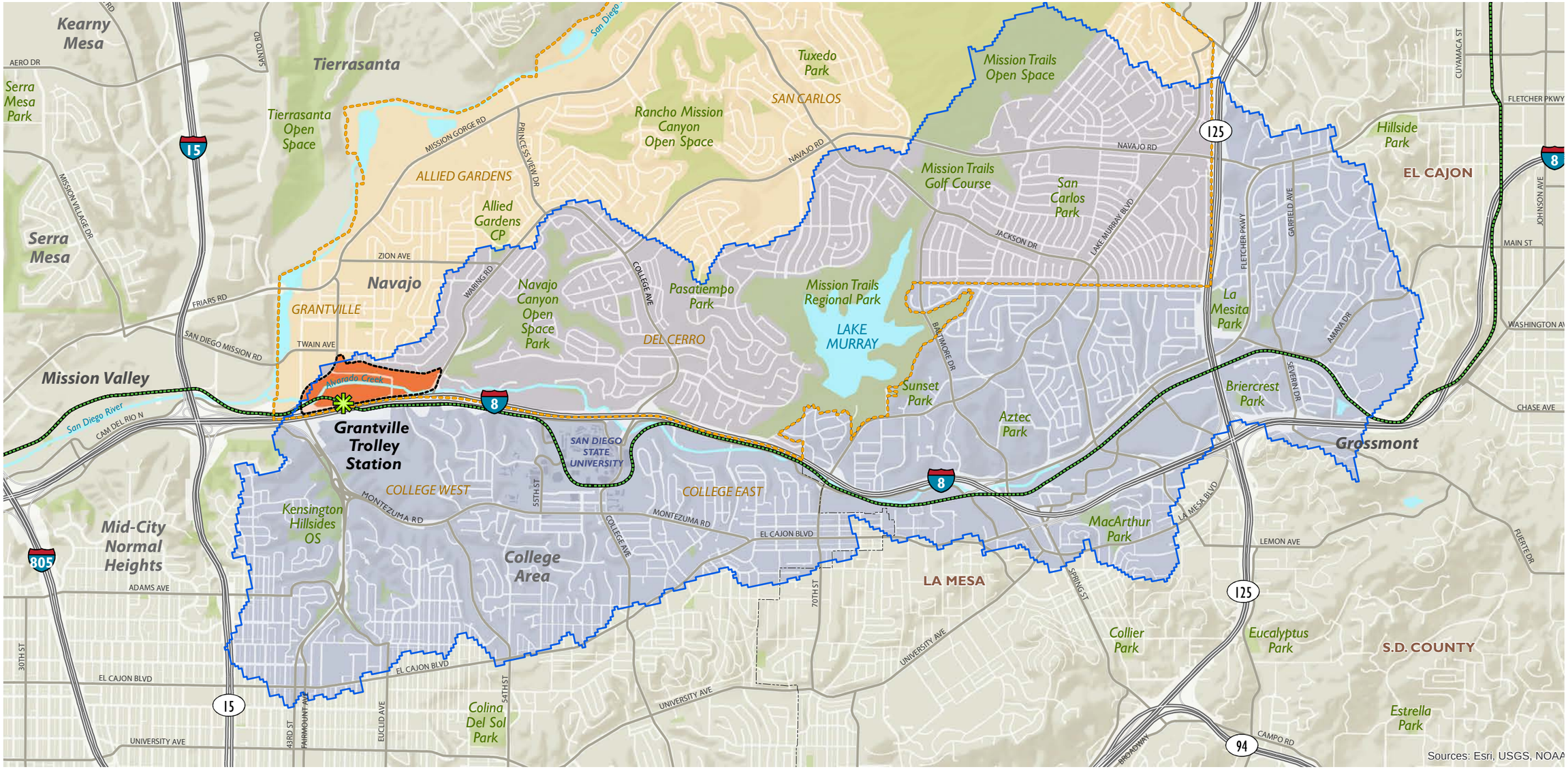
- **Chapter 1** provides an overview of the Study Area location.
- **Chapter 2** reviews the planning objectives and constraints. It also discusses the feasibility criteria used to evaluate the extent to which the preliminary, alternative revitalization strategies meet Study objectives.
- **Chapter 3** presents the preliminary, alternative revitalization strategies. Rejected alternatives are also presented.
- **Chapter 4** presents the preferred design strategy and how the channel improvements and trail and crossing system were refined.

1.2 STUDY AREA LOCATION

The Study Area is located in the easterly portion of the City of San Diego, within the Grantville community in the Navajo Community Planning Area, in close proximity to Mission Valley, Allied Gardens, and San Diego State University (Figure 1-1). The Study Area is encompassed by Twain Avenue to the north, Mission Gorge Road/Fairmount Avenue to the west, Alvarado Canyon Road to the south, and Waring Road to the east. The Grantville Station and Interstate 8 (I-8) are situated in the southern portion of the Study Area (Figure 1-2).

Alvarado Creek runs through the Study Area before its confluence with the San Diego River to the west. Alvarado Creek is a low-lying area of Grantville that gradually increases in elevation in the eastern and northern portions of the Study Area. Within the Study Area, water in Alvarado Creek is conveyed by a series of open channels and box culverts that extend approximately 4,400 feet upstream from directly east of Mission Gorge Road to the southbound Waring Road onramp to Westbound I-8. For the purposes of this Study, the creek is divided into several reaches, identified as reaches 1 through 6. The location and photographic description of the reaches are presented in Figure 1-3.

FIGURE 1-1 REGIONAL LOCATION



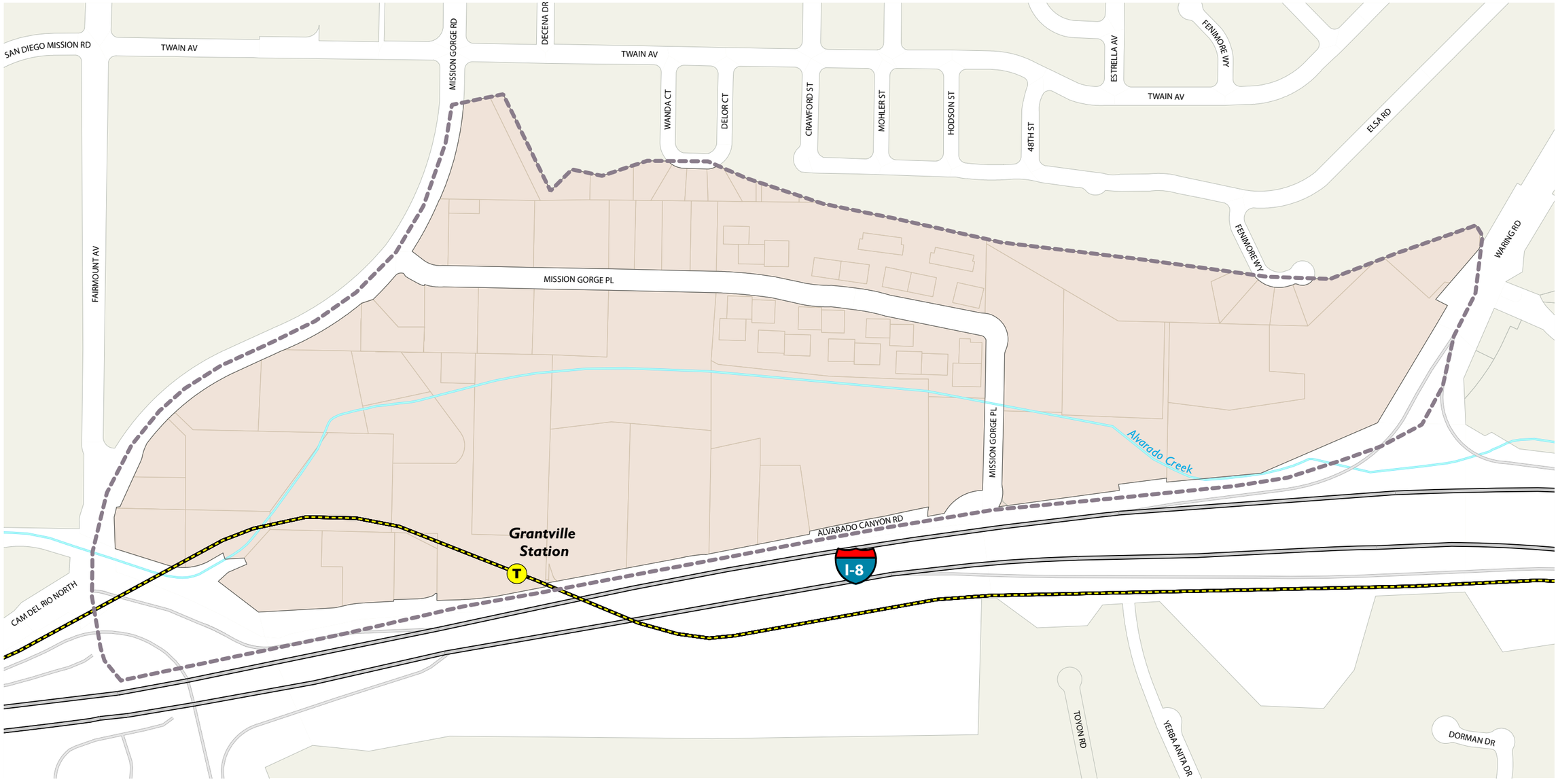
Grantville Trolley Station
Green Line
Freeways
Major Roads
Lake/Pond/Water

Study Area
Navajo Community Plan Area
Alvarado Creek Watershed
San Diego City Limits
Parks & Open Space

0 2,100 4,200 8,400 FEET

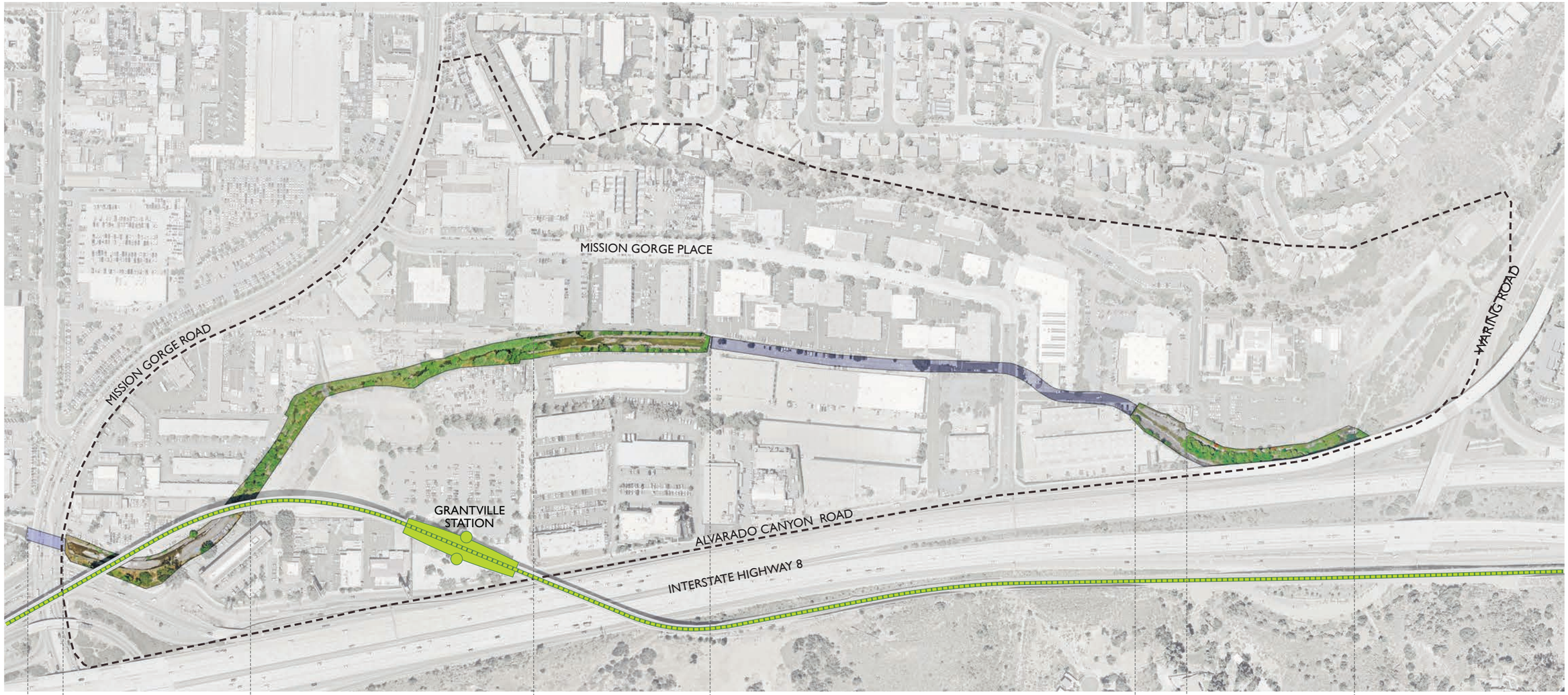
Data Source: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. (www.sangis.org) Dyett & Bhatia, 2016

FIGURE 1-2 STUDY AREA



Data Source: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. (www.sangis.org) Dyett & Bhatia, 2016

FIGURE 1-3 SUMMARY OF REACHES



Mission Gorge Rd	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6
Reinforced Concrete Box Culvert	Open Channel - Concrete	Open Channel - Vegetated	Open Channel - Concrete	Reinforced Concrete Box Culvert	Open Channel - Concrete	Open Channel - Vegetated Bottom, Concrete Sides

Green Line

Study Area

0 200 400 800

FEET

Sources: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016; Dyett& Bhatia, 2017

Flooding in the Study Area

Alvarado Creek's water quality is negatively impacted by adjacent parking and hardscape.

2
Planning Objectives

2.1 SPECIFIC OBJECTIVES

In 2015, the City of San Diego adopted a Focused Plan Amendment for the Navajo Community Plan, which envisions transformation of the primarily industrial area around the Grantville Trolley Station (Grantville Station) into a vibrant, mixed-use community. The Community Plan seeks to promote housing and a mix of other uses in a transit-oriented setting, as well as new bicycle and pedestrian trails along open spaces.

To facilitate this transformation, the City of San Diego applied for and was awarded a Smart Growth Incentive Program (SGIP) grant from San Diego Association of Governments (SANDAG). The purpose of this grant is to develop concepts and assess the feasibility of alternatives to transform Alvarado Creek into an amenity that catalyzes redevelopment and improves access and connections to Grantville Station for new residents, local businesses, and the community as a whole.

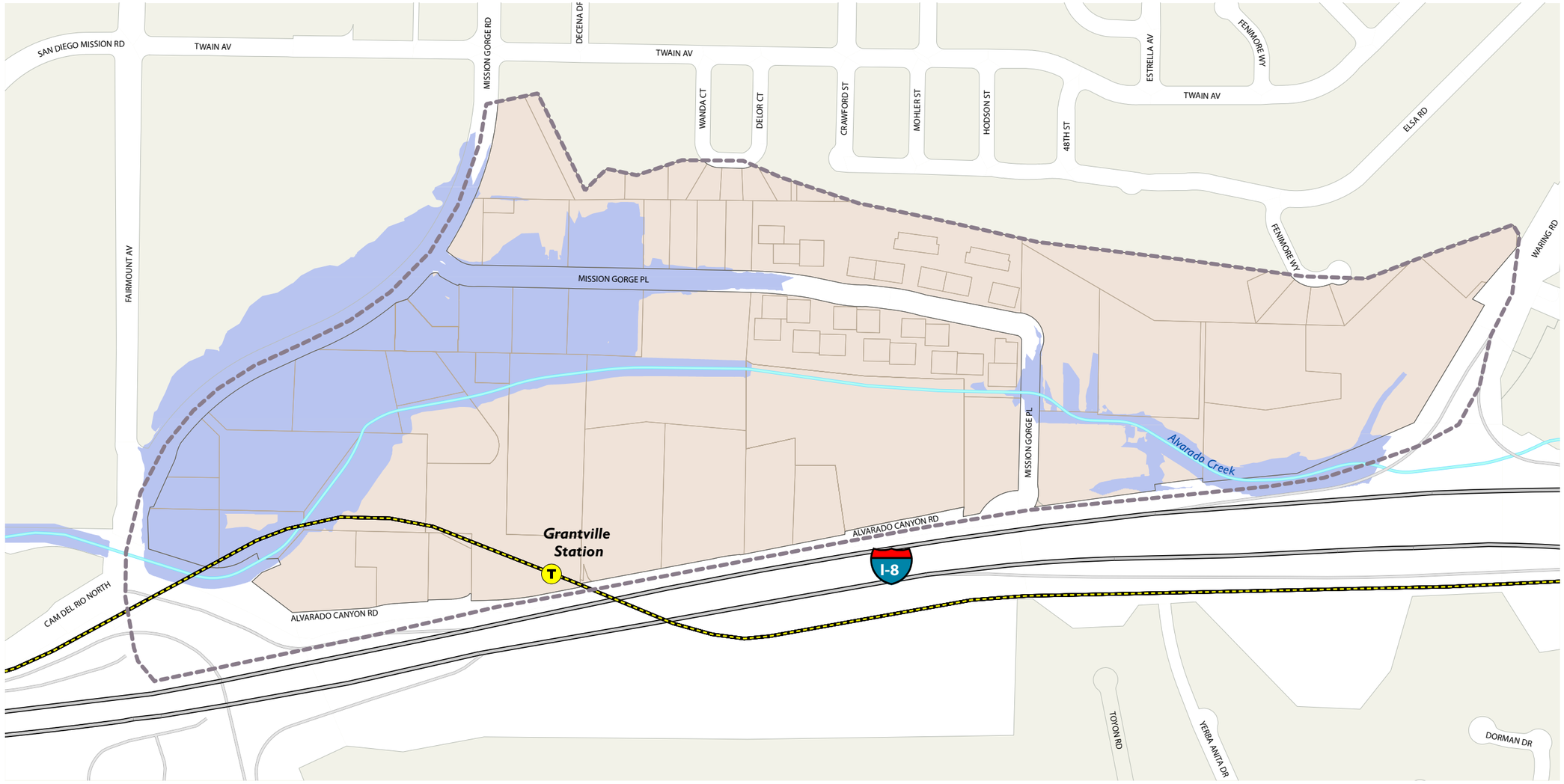
The specific planning objectives of the Grantville Trolley Station/Alvarado Creek Enhancement Study (Study) are discussed below.

IMPROVE FLOODING, STORMWATER, AND WATER QUALITY ISSUES

A primary planning objective is to develop strategies to manage the flooding that currently impacts surrounding properties and is an obstacle to transit-oriented development, particularly housing, in the Study Area. A significant portion of the Study Area is within a Special Flood Hazard Area (SFHA), the 100-year floodplain, as shown on Figure 2-1. The area north of Alvarado Creek along reaches 1 through 4, a limited area south of Alvarado Creek at Reach 2, and an area west of reaches 5 and 6 is shown within the 100-year floodplain. This is consistent with the hydraulic capacity analysis performed for this Study, which indicates that the majority of the channel reaches lack the hydraulic capacity to convey the 100-year storm event flow, as well as the flow from much smaller storm events.

Another planning objective is to improve Alvarado Creek's water quality, in part by minimizing stormwater runoff into the creek. Currently, Alvarado

FIGURE 2-1 EXISTING 100-YEAR FLOODPLAIN



Trolley Stop
Green Line
Freeway
Ramps
Major Roads
Existing Stream
Floodplain
Existing 100 Year Floodplain
Study Area Parcels
Study Area

0 250 500 1,000 FEET

Data Source: Rick Engineering Hydraulic Modeling, 2017; SANGIS/SANDAG Regional GIS Data Warehouse, 2016; Dyett & Bhatia, 2016

Barricades around Alvarado Creek

Fencing surrounding Alvarado Creek

Creek's water quality is negatively impacted by its location in a low-lying area and the presence of industrial uses, open storage, vehicular parking, and hardscape immediately adjacent to it.

INCREASE ACCESS TO GRANTVILLE STATION AND ALVARADO CREEK

Pedestrian access to Grantville Station is impeded due to the significant obstacle to north-south connectivity presented by Alvarado Creek and the fact that there is only one north-south street connection within the nearly one-mile long Study Area. Moreover, very little of the creek is itself publicly accessible. Within the Study Area, the creek is frequently surrounded by fencing or concrete barriers, as well as by surface parking lots and outdoor storage.

ENHANCE ALVARADO CREEK AS AN AMENITY THAT INCLUDES BICYCLE AND PEDESTRIAN TRAILS

The Navajo Community Plan, as amended in 2015 by the Grantville Focused Plan Amendment, designates the planned land uses for the Study Area (see Figure 2-2). This figure shows that approximately 75 percent of the Study Area is designated as either Urban Village or Business Park-Residential, permitting housing to be built at densities up to 109 and 73 dwelling units per acre, respectively. This indicates an intention for the Study Area to transform from largely an industrial and service-commercial district to a mixed-use and residential neighborhood that accommodates medium- and high-density housing. Indeed, the Focused Plan Amendment to the Navajo Community Plan Update is intended to facilitate approximately 8,280 new housing units in the planning area[1], approximately 6,260[2] of which are expected to be accommodated in the Study Area. Residents of these new housing units will benefit from areas to recreate outside their homes and pathways on which to travel, to access Grantville Station or stores to the north, for example. Although Alvarado Creek is currently an underutilized asset and an obstacle to mobility within the Study Area, it has the potential to operate as a natural linkage and a recreational resource for the community. In recognition of that, the Navajo Community Plan Update requires, among other things, that pedestrian and bicycle connectivity be enhanced and that a 10-foot wide multi-use pedestrian and bicycle trail directly adjacent to the Alvarado Creek be established.

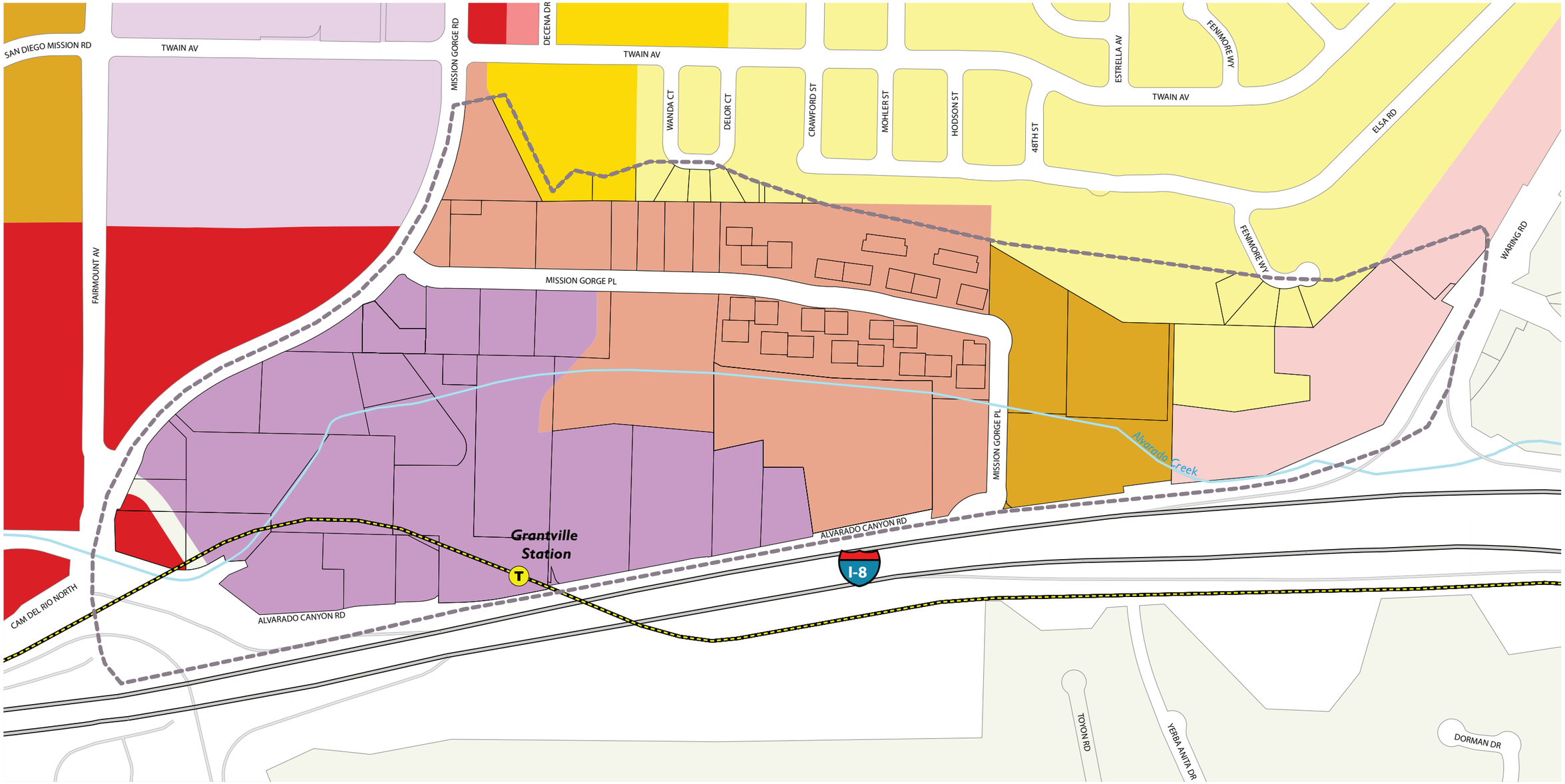
FOSTER TRANSIT-ORIENTED DEVELOPMENT ADJACENT TO THE GRANTVILLE STATION

Lastly, one of the primary Study objectives is to identify concepts to catalyze transit-oriented development in the Study Area. Essential to this objective is proposing strategies that ensure that homes built on the privately-owned parcels around Grantville Station are out of the 100-year floodplain, removing the flood insurance requirement there, while still leaving these parcels with sufficient developable space in which to construct medium- and high-density residential and mixed-use buildings.

[1]Grantville Focused Plan Amendment Final Environmental Impact Report, April 2015.

[2]Based on residential and mixed-use land use designations fully developing at the highest allowable densities, with Office, Urban Village, and Business Park designations developing with 75 percent residential uses and 25 percent commercial uses.

FIGURE 2-2 PLANNED LAND USE (NAVAJO COMMUNITY PLAN)



- Trolley Stop
- Green Line
- Freeway
- Ramps

Land Use Classifications

Residential

- Single Family Residential
- Multi Family Residential
- Residential - Medium High (30-43 du/ac)

Commercial Employment, Retail, and Services

- Office
- Commercial
- Community Commercial

Mixed Use

- Community Village (44-109 du/ac)
- Urban Village (44-109 du/ac)
- Business Park - Residential (44-73 du/ac)

- River/Streams/Creeks
- Study Area

0 250 500 1,000 FEET

Data Source: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. (www.sangis.org) Dyett & Bhatia, 2016

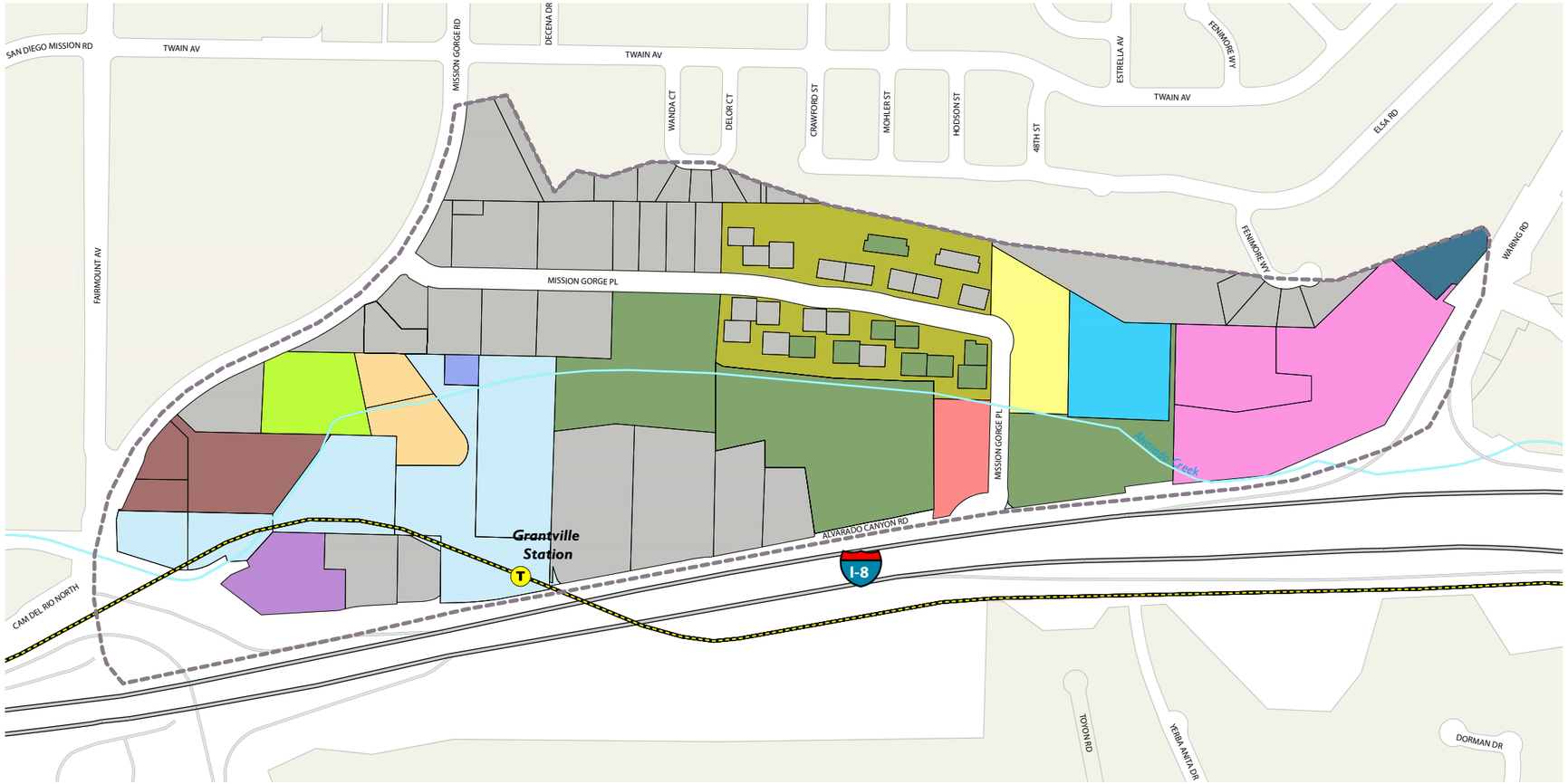
2.2 PLANNING CONSTRAINTS

Planning constraints are those that represent significant barriers that limit the physical or policy-related aspects of formulated plans. The location of the Study Area results in several constraints that required consideration during the development of alternatives for the revitalization of Alvarado Creek and the enhancement of the area surrounding Grantville Station. The following are key issues that were encountered and represent significant constraints that apply to the Study.

LAND OWNERSHIP

As shown in Figure 2-3, most of the parcels through which Alvarado Creek flows are owned by private parties. Indeed, of the approximately 48 acres of parcels that are located adjacent to the creek in the Study Area, 35 acres are privately owned. In addition, the San Diego Metropolitan Transit System (MTS), a non-City public agency, owns several parcels adjacent to the creek; MTS has plans to further develop these parcels as housing near Grantville Station.

FIGURE 2-3 PROPERTY OWNERSHIP ALONG THE CHANNEL

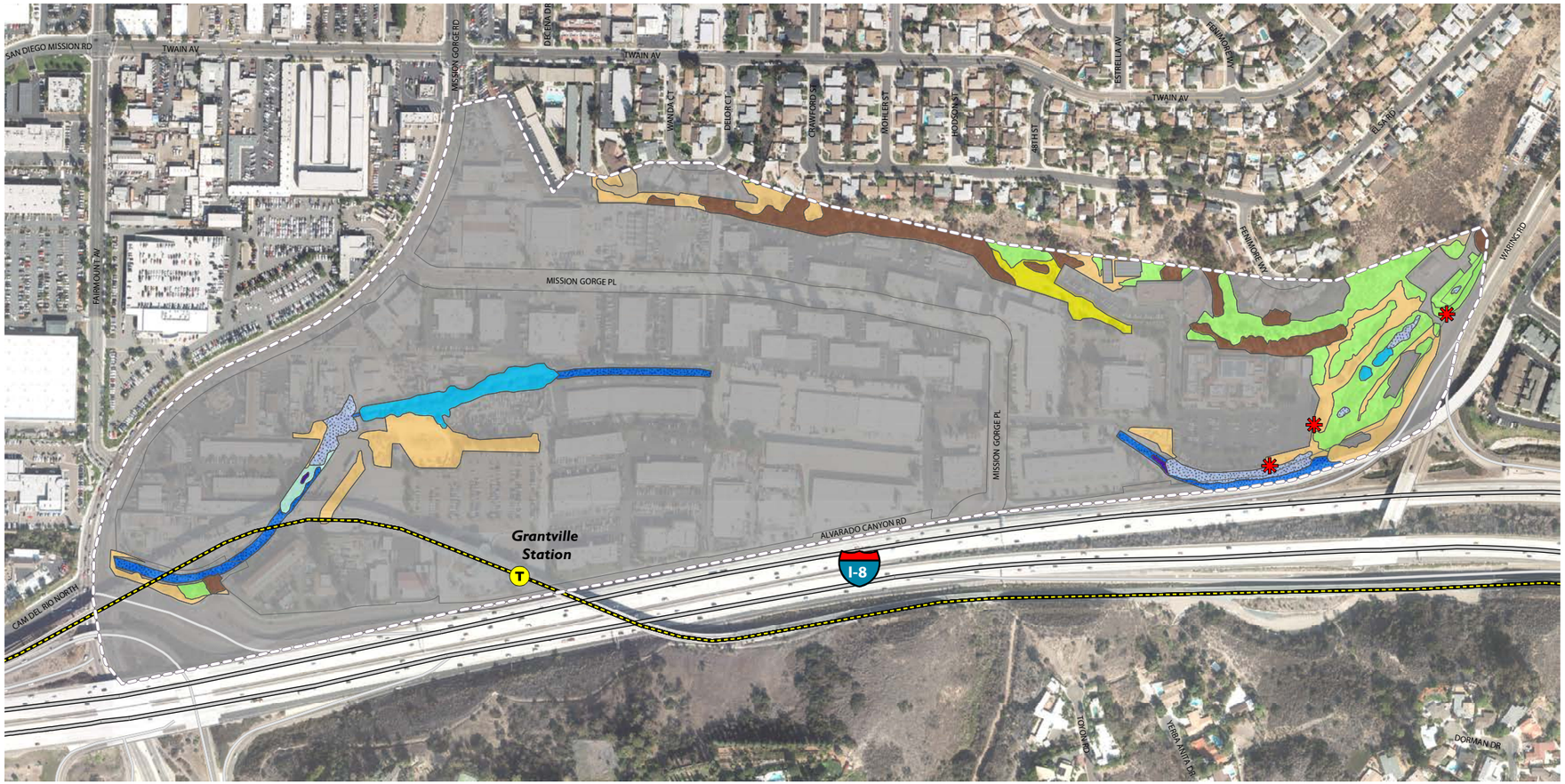


Data Source: City of San Diego, 2016; SANGIS/SANDAG Regional GIS Data Warehouse, 2016. (www.sangis.org) Dyett & Bhatia, 2016

BIOLOGICAL RESOURCES

There are approximately eight acres of sensitive vegetation communities[3] within the Study Area, approximately two acres of which are wetland communities within the Alvarado Creek channel in Reach 2 (Figure 2-4). Impacts to these wetlands should be avoided. To the extent that impacts to these communities cannot be avoided, they would require mitigation at a ratio of 1:1 up to 3:1 depending on the type and sensitivity of the community, based on negotiations with the resource agencies and in conformance with San Diego's Environmentally Sensitive Lands Regulations and Biology Guidelines, as well as in compliance with federal "no net loss" policies for wetlands. In addition, although there is currently development adjacent to the existing vegetation, a habitat buffer would likely be required to be maintained around existing, enhanced, and created wetlands, as needed to protect the functions and values of these wetlands.

FIGURE 2-4 VEGETATION COMMUNITIES AND SPECIAL STATUS SPECIES



[3]Sensitive vegetation communities are those identified by Holland (1986) or identified by the City of San Diego in its Biology Guidelines (2012). The Biology Guidelines were formulated to aid in the implementation and interpretation of the Environmentally Sensitive Lands Regulations (ESL), San Diego Land Development Code, Chapter 14, Division 1, Section 143.0101. Section III of the Guidelines (Biological Impact Analysis and Mitigation Procedures) also serve as standards for the determination of impacts and mitigation under California Environmental Quality Act (CEQA). The ESL defines sensitive biological resources as those lands included within the Multi-Habitat Planning Area (MHPA) as identified in the City of San Diego's Multiple Species Conservation Program (MSCP) Subarea Plan (City of San Diego 1997) and other lands outside the MHPA that contain wetlands; vegetation communities classifiable as Tier I, II, IIIA or IIIB; habitat for rare, endangered or threatened species; or narrow endemic species.

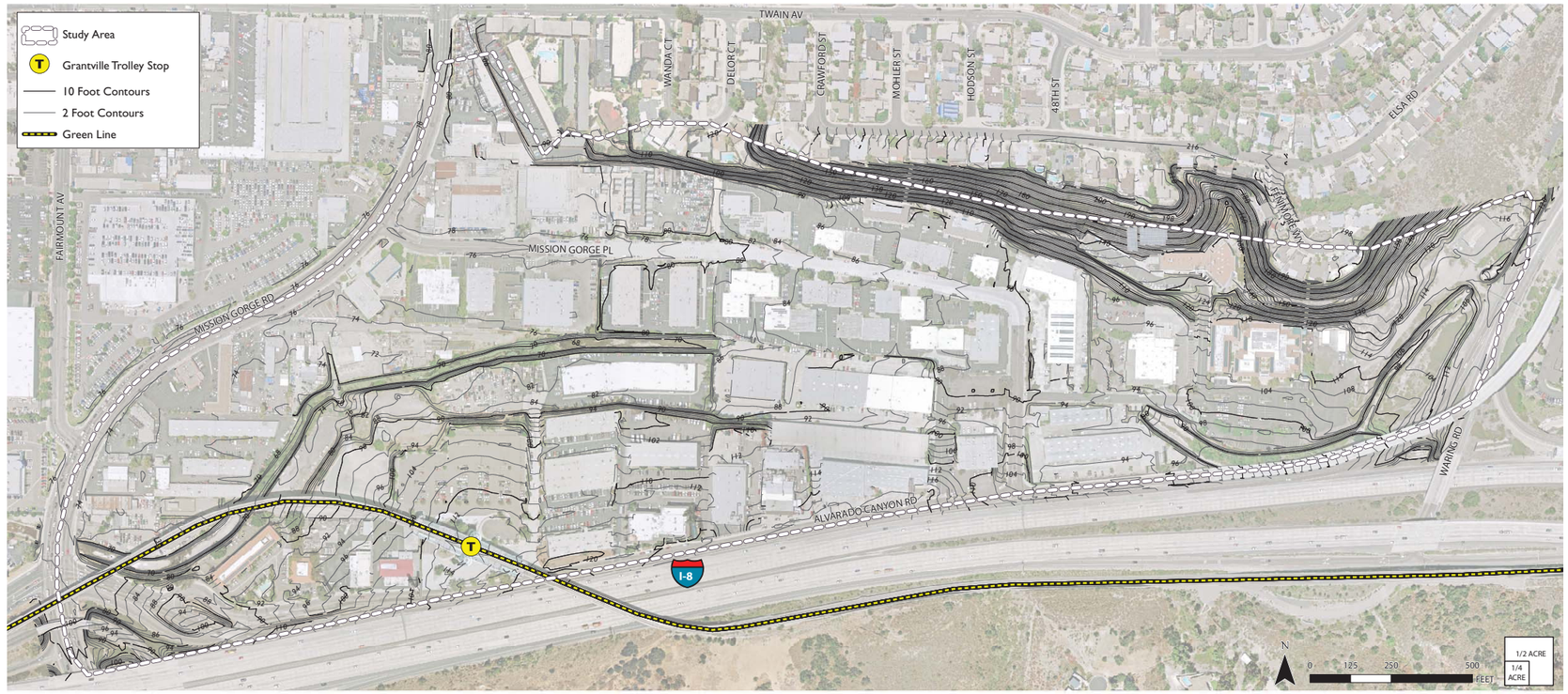
TOPOGRAPHY

Alvarado Creek is located in a low-lying area of Grantville that gradually increases in elevation in the western and northern portions of the Study Area. In addition, Alvarado Creek's confluence with the San Diego River is located nearby and to the west of the Study Area. This limited elevation range and close proximity to the San Diego River limit the options to achieve additional channel capacity by deepening the channel.

UTILITIES AND STRUCTURES

There are a number of existing utilities and structures within the Study Area (see Figure 2-6). These include support columns associated with the above-grade Grantville Station near reaches 1 and 2, a low-water crossing approximately 500 feet northwest of Grantville Station, a triple box culvert located in Reach 4, a triple box culvert under Mission Gorge Road, and various utilities.

FIGURE 2-5 EXISTING TOPOGRAPHY



2.3 FEASIBILITY CRITERIA

In light of the project objectives and constraints, project alternatives are analyzed and evaluated based on the following feasibility criteria.

The flooding is managed

- 100-year storm is accommodated (via channel geometry, floodable green space, fill north of the channel, building design, etc.)
- At minimum, properties that are designated for residential use are raised out of the 100-year frequency base flood elevation

Water quality is improved and stormwater is managed

- The amount of stormwater that flows into the creek is reduced and quality of water is improved (via green infrastructure, biofiltration areas, etc.)

Impacts to private property are minimized

- Proposed creek alignment minimizes, to the extent feasible, impacts on adjacent private property
- To the extent the proposed creek alignment impacts private property, owners maintain the ability to meaningfully develop their property
- Opportunities for partnerships are maximized
- Concerns of property owners and the surrounding community are taken into account

Biological impacts are avoided to the extent possible

- Impacts to the sensitive vegetative and wetland communities in the Study Area are minimized or mitigated
- There is no net loss to wetland communities and a wetland buffer is provided
- The ability to secure needed permits based on existing regulations

Connections within the study area are increased

- Access to the Grantville Trolley Station, particularly from north of the creek, is increased
- Bicycle/pedestrian bridge(s) are provided over the creek to increase north-south connections
- A 10-foot-wide continuous Multi-Use Trail is incorporated into creek corridor concepts for a consistent approach to the Grantville Supplemental Development Regulations
- Connections are accessible per the Americans with Disabilities Act (ADA), and ADA accessibility in the Study Area is improved
- Connections to Navajo Canyon and the San Diego River are provided

Alvarado Creek is transformed into an amenity

- Connections to Alvarado Creek are increased
- Open spaces are provided for the new residents planned for the area
- Trail design integrates opportunities for environmental education
- Views to the creek are opened up

The proposed design is context-sensitive

- Design provides safe and well-lit trails and crossings
- Porous material is given priority over impermeable materials
- Materials in the channel have a natural appearance (e.g., gabion, stones, blockcrete, berms) or use existing infrastructure
- To the extent the existing channel is substantially altered, such alteration is limited as necessary to either improving habitat functioning or controlling flooding, where no other feasible method of protecting existing public or private development exists and where such protection is necessary for public safety[4]
- Estimated cost of improvements (soft and hard costs) are minimized
- The location of existing utilities and structures are considered

[4]See San Diego Municipal Code Section §143.0145(e)(3).

Existing culvert under Mission Gorge Road

3 Preliminary Alternatives

3.1 VIABLE ALTERNATIVES

Three viable, preliminary alternatives were developed and analyzed to assess which alternative, or combination of interventions depicted in the alternatives, was the best potential strategy for achieving the Study objectives. Below, the common elements of all three viable, preliminary alternatives are described, and then each alternative is described, in turn. Then, the alternatives are evaluated and compared based on the feasibility criteria.

COMMON ELEMENTS

All three preliminary, viable alternatives shared certain elements, as described below.

NEW CULVERT UNDER MISSION GORGE ROAD

Preliminary hydraulic analysis indicated that events in excess of a 10-year storm event would exceed the current capacity of the existing triple reinforced-concrete box (triple RCB) culvert underneath Mission Gorge Road, located at the western edge of the Study Area. In other words, this is a water flow choke point. As a result, all three preliminary alternatives propose that the existing culvert be supplemented with an additional 15-foot-wide by 8-foot-tall box, to increase capacity in that location and decrease the likelihood of upstream flooding.

CHANNEL WIDENING IN REACHES 1, 2, AND 3

Preliminary hydraulic modeling indicated that, for the channel to accommodate the 100-year flood in the Study Area's urban environment, the channel bottom needed to be widened to approximately 50 feet, with 1.5 horizontal to 1 vertical side slopes, in reaches 1, 2, and 3. Thus, all preliminary alternatives propose widening of the channel bottom, with natural materials, by approximately 15 feet in reaches 1 and 3. The existing concrete infrastructure is not proposed to be removed from those reaches. In Reach 2, the channel bottom is proposed to be widened by approximately 35 feet, using approximately half concrete and half natural materials.

MULTI-USE TRAILS ALONG THE CREEK CORRIDOR

The Grantville Community Plan Implementation Overlay Zone (CPIOZ) includes supplemental development regulations (SDR). One such SDR requires that "…development along Alvarado Creek shall provide a 10-foot wide multi-use pedestrian and bicycle trail directly adjacent to the Alvarado Creek."[5] In accordance with this requirement, all preliminary alternatives propose a Multi-Use Trail system along the Alvarado Creek channel. The exact trail alignment varies depending on the alternative. In all alternatives, the Multi-Use Trail system provides for connections to the Navajo Canyon Trail via Alvarado Canyon Road as well as to the San Diego River, potentially, at Mission Gorge/Fairmount Avenue. This proposed intervention follows the recommendations of the San Diego River Park Master Plan.[6]

BIKE/PEDESTRIAN BRIDGES OVER THE CHANNEL

All preliminary, viable alternatives specify conceptual locations for pedestrian/bicycle bridges over the Alvarado Creek channel, in order to increase connections, particularly north-south connections, within the Study Area.

GREEN STREET AT MISSION GORGE PLACE

All three preliminary alternatives also propose to enhance connectivity within the Study Area and to the creek by recommending that Mission Gorge Place, where the street is aligned roughly north-south and crosses the creek, would be improved with green infrastructure, such as tree plantings, pervious surfaces, bio-retention areas, and treatment planters.

MINIMAL INTERVENTION IN REACHES 5 AND 6

All three preliminary alternatives show minimal interventions in reaches 5 and 6, based on the results of preliminary hydraulic modeling. These reaches are wider than the others, with approximately 45-feet-wide channel bottoms, and have the existing capacity to manage a 25-year storm event. The hydraulic capacity of Reach 5 would likely be improved if the triple RCB culvert in Reach 4 were improved.

Another planning objective is to improve Alvarado Creek's water quality, in part by minimizing stormwater runoff into the creek. Currently, Alvarado Creek's water quality is negatively impacted by its location in a low-lying area and the presence of industrial uses, open storage, vehicular parking, and hardscape immediately adjacent to it.

Current conditions of Mission Gorge Place

Green Infrastructure improvements, such as those pictured above, would help implement Study objectives for Mission Gorge Place in all three preliminary viable alternatives.

[5]Navajo Community Plan on page 44.

[6]*See* San Diego River Park Master Plan, pages 73-74.

ALTERNATIVE 1

Alternative 1 proposes a linear green space north of the Alvarado Creek channel to both manage flooding and provide a recreational corridor, as well as to emphasize the connection to the San Diego River. A conceptual plan and cross-sections are provided (Figures 3-1 through 3-6). They show the following conceptual improvements.

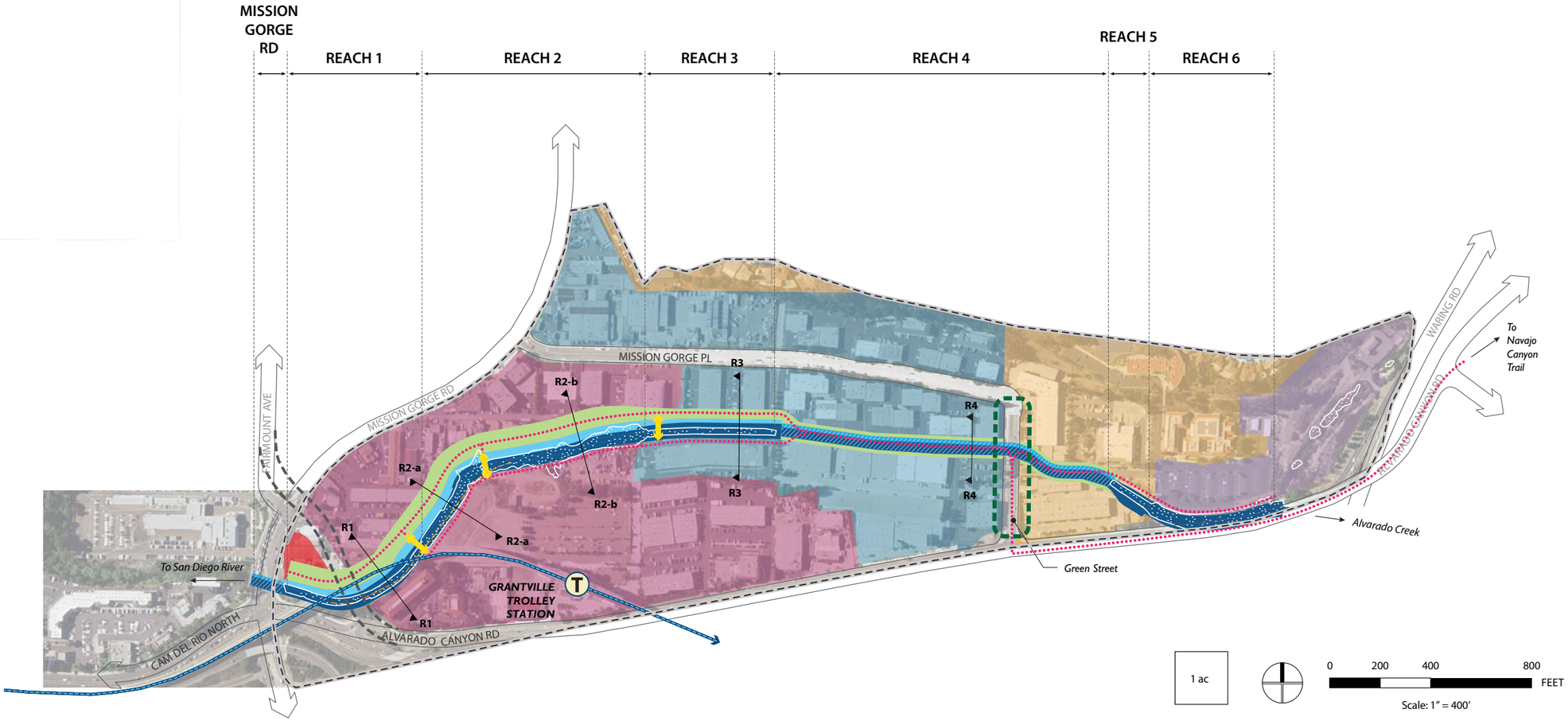
REACHES 1, 2, 3

1. Widening the creek channel to the north in reaches 1, 2, and 3
2. Floodable Green Space, approximately 80 feet wide, north of the creek in reaches 1, 2, and 3
3. Three pedestrian/bicycle bridges over Alvarado Creek

REACH 4

4. The addition of a new underground culvert adjacent and to the north of the existing triple RCB culvert in Reach 4
5. A Recreational Corridor, approximately 80 feet wide, over the existing and proposed culvert system in Reach 4

FIGURE 3-1 ALTERNATIVE 1



CREEK IMPROVEMENT

- Existing Open Channel
- Existing Underground Culvert
- Existing Sensitive Wetland/Riparian Vegetation Community *(white)*
- Proposed Open Channel
- Proposed Underground Culvert
- Proposed Creek Center Line Realignment

CONNECTIVITY/OPEN SPACE IMPROVEMENT

- Proposed Park/Flood Control Area
- Proposed Multi-Use Trail
- Proposed Pedestrian/Bicycle Bridge
- Proposed Alvarado Canyon Road Realignment

PROPOSED COMMUNITY PLAN LAND USE (SIMPLIFIED)

- Urban Village
- Business Park/Residential
- Residential
- Office
- Community Commercial

- Trolley Line
- Grantville Trolley Station/ Alvarado Creek Enhancement Study Area

FIGURE 3-2 ALTERNATIVE 1, REACH 1 SECTION

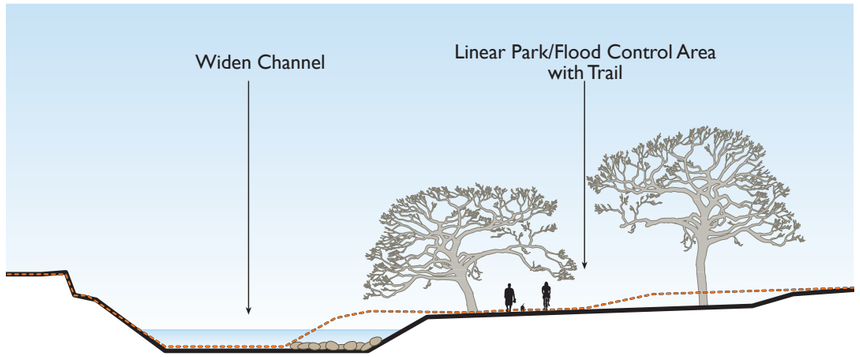


FIGURE 3-3 ALTERNATIVE 1, REACH 2-A SECTION

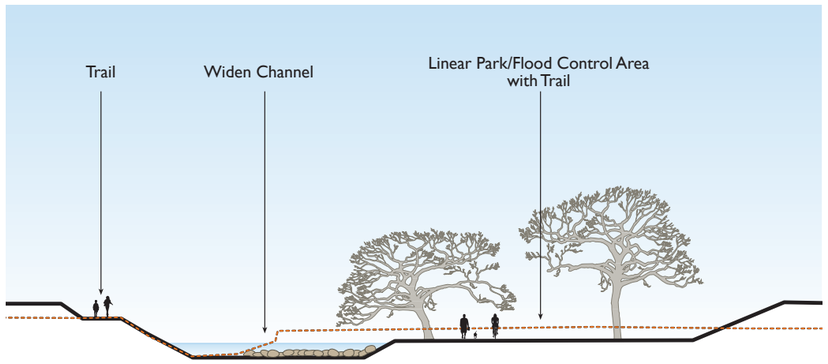


FIGURE 3-4 ALTERNATIVE 1, REACH 2-B SECTION

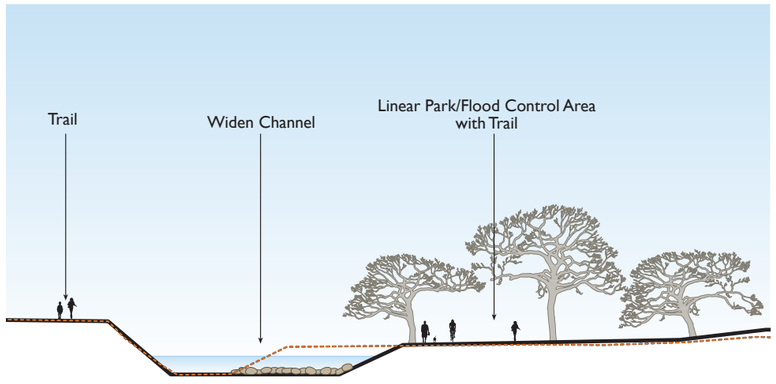


FIGURE 3-5 ALTERNATIVE 1, REACH 3 SECTION

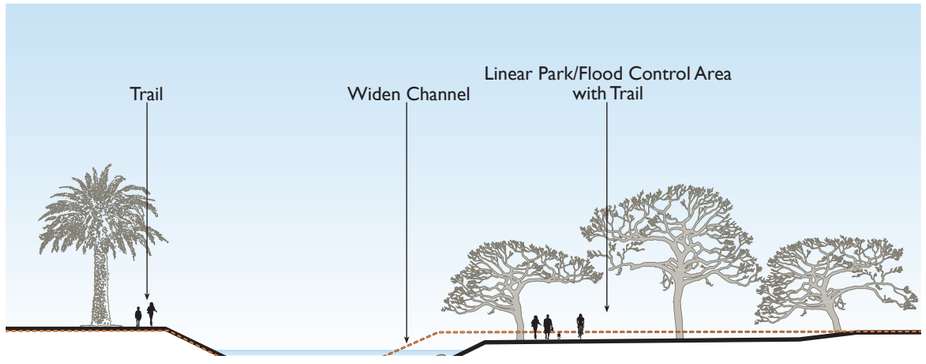
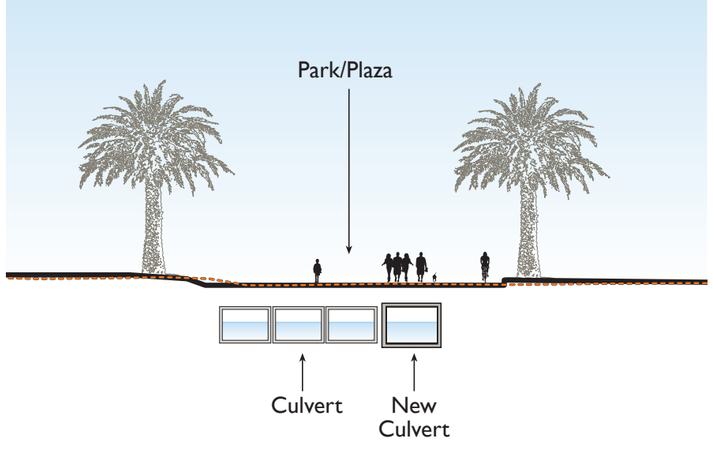


FIGURE 3-6 ALTERNATIVE 1, REACH 4 SECTION



ALTERNATIVE 2

Alternative 2 proposes pockets of green space in strategic locations as a means to manage flooding, provide recreational opportunities, and transform the creek into an amenity. A conceptual plan and cross-sections are provided (Figures 3-7 through 3-12). They show the following conceptual improvements.

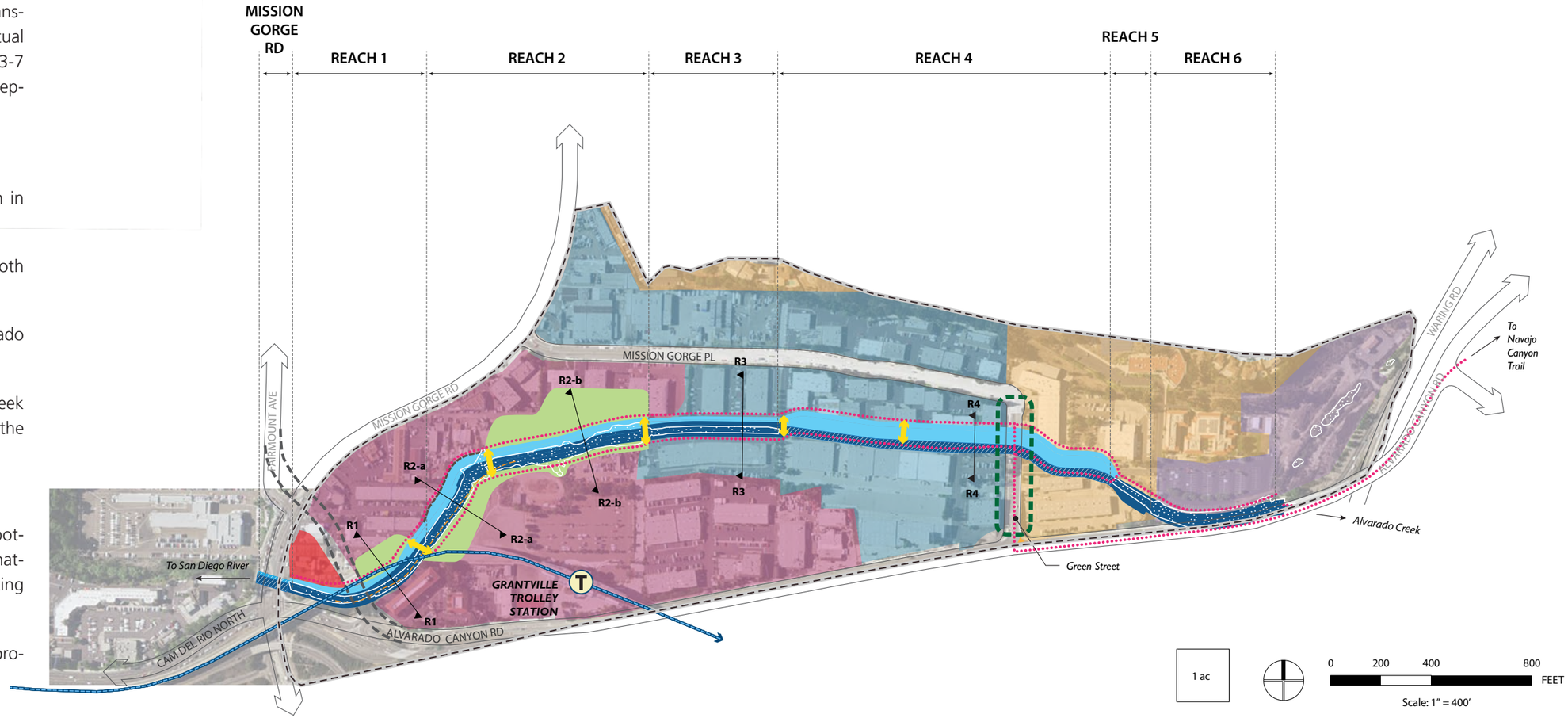
REACHES 1, 2, 3

1. Widening the creek channel to the north in reaches 1, 2, and 3
2. Floodable pockets of green space on both sides of the creek in reaches 1, 2, and 3
3. Four pedestrian/bicycle bridges over Alvarado Creek
4. The addition of fill in between the creek channel and Mission Gorge Place in the western portion of Reach 2

REACH 4

5. The addition of an open channel (with a bottom composed of concrete in part, and natural materials in part) north of the existing triple RCB culvert
6. Two pedestrian/bicycle bridges over the proposed open channel

FIGURE 3-7 ALTERNATIVE 2



CREEK IMPROVEMENT

- Existing Open Channel
- Existing Underground Culvert
- Existing Sensitive Wetland/Riparian Vegetation Community *(white)*
- Proposed Open Channel
- Proposed Underground Culvert
- Proposed Creek Center Line Realignment

CONNECTIVITY/OPEN SPACE IMPROVEMENT

- Proposed Park/Flood Control Area
- Proposed Multi-Use Trail
- Proposed Pedestrian/Bicycle Bridge
- Proposed Alvarado Canyon Road Realignment

PROPOSED COMMUNITY PLAN LAND USE (SIMPLIFIED)

- Urban Village
- Business Park/Residential
- Residential
- Office
- Community Commercial

- Trolley Line
- Grantville Trolley Station/ Alvarado Creek Enhancement Study Area

FIGURE 3-8 ALTERNATIVE 2, REACH 1 SECTION

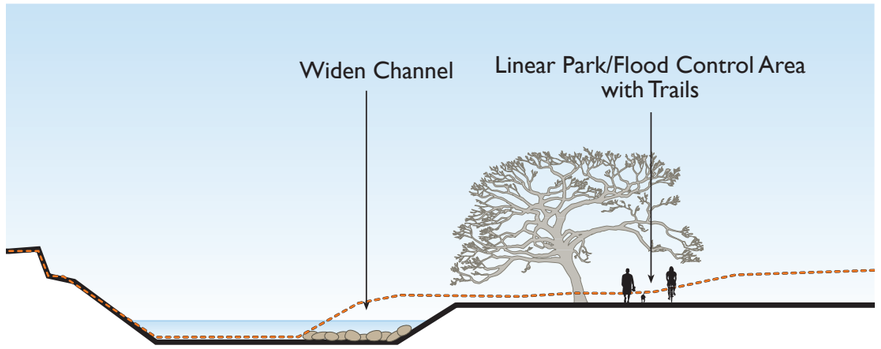


FIGURE 3-9 ALTERNATIVE 2, REACH 2-A SECTION

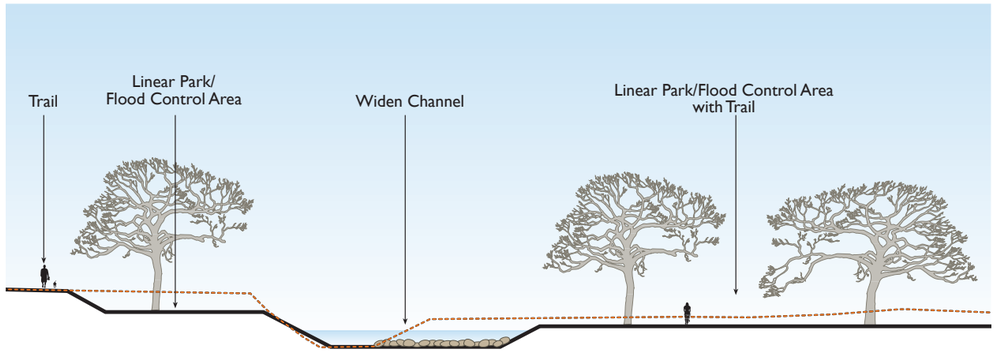


FIGURE 3-10 ALTERNATIVE 2, REACH 2-B SECTION

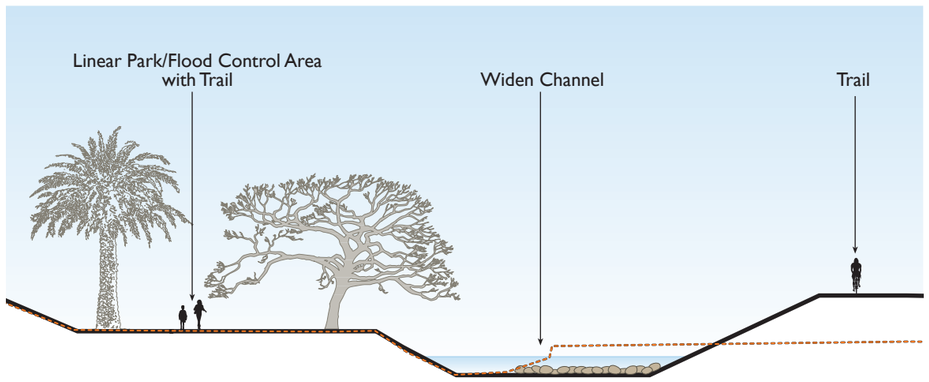


FIGURE 3-11 ALTERNATIVE 2, REACH 3 SECTION

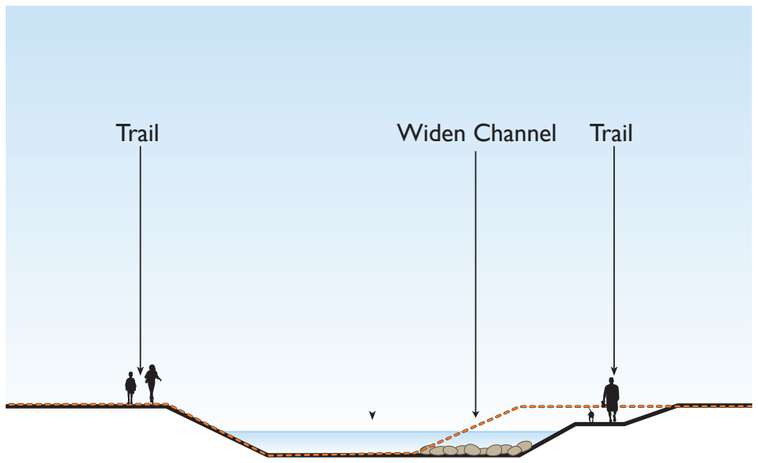
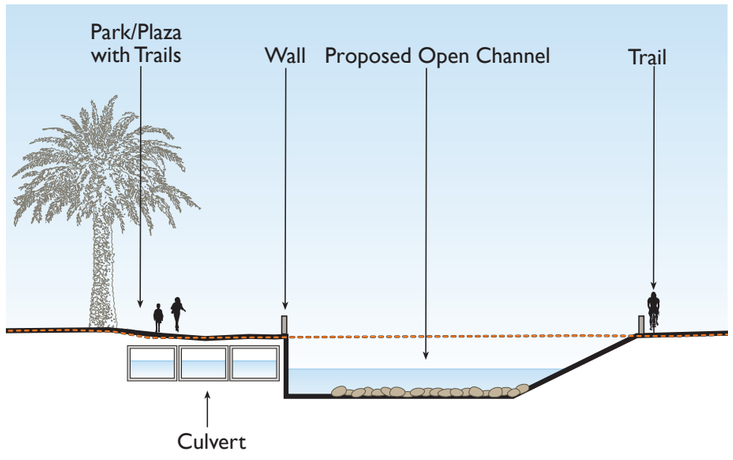


FIGURE 3-12 ALTERNATIVE 2, REACH 4 SECTION



ALTERNATIVE 3

Alternative 3 proposes a larger swath of green space, mostly south of the creek and adjacent to Grantville Station, to manage flooding, provide recreational opportunities, and enhance the creek and its surroundings. A conceptual plan and cross-sections are provided (Figures 3-13 through 3-18). They show the following conceptual improvements.

REACHES 1, 2, 3

1. Widening the creek channel to the north in reaches 1, 2, and 3
2. Floodable pockets of green space to the north of the creek in Reach 1 and to the south of the creek in reaches 2 and 3
3. Three pedestrian/bicycle bridges over Alvarado Creek
4. The addition of fill in the area between the creek channel and Mission Gorge Place in Reach 2

REACH 4

5. The addition of a new underground culvert adjacent and to the north of the existing triple RCB culvert in Reach 4
6. A Recreational Corridor directly over the existing and proposed underground culvert in Reach 4

FIGURE 3-13 ALTERNATIVE 3

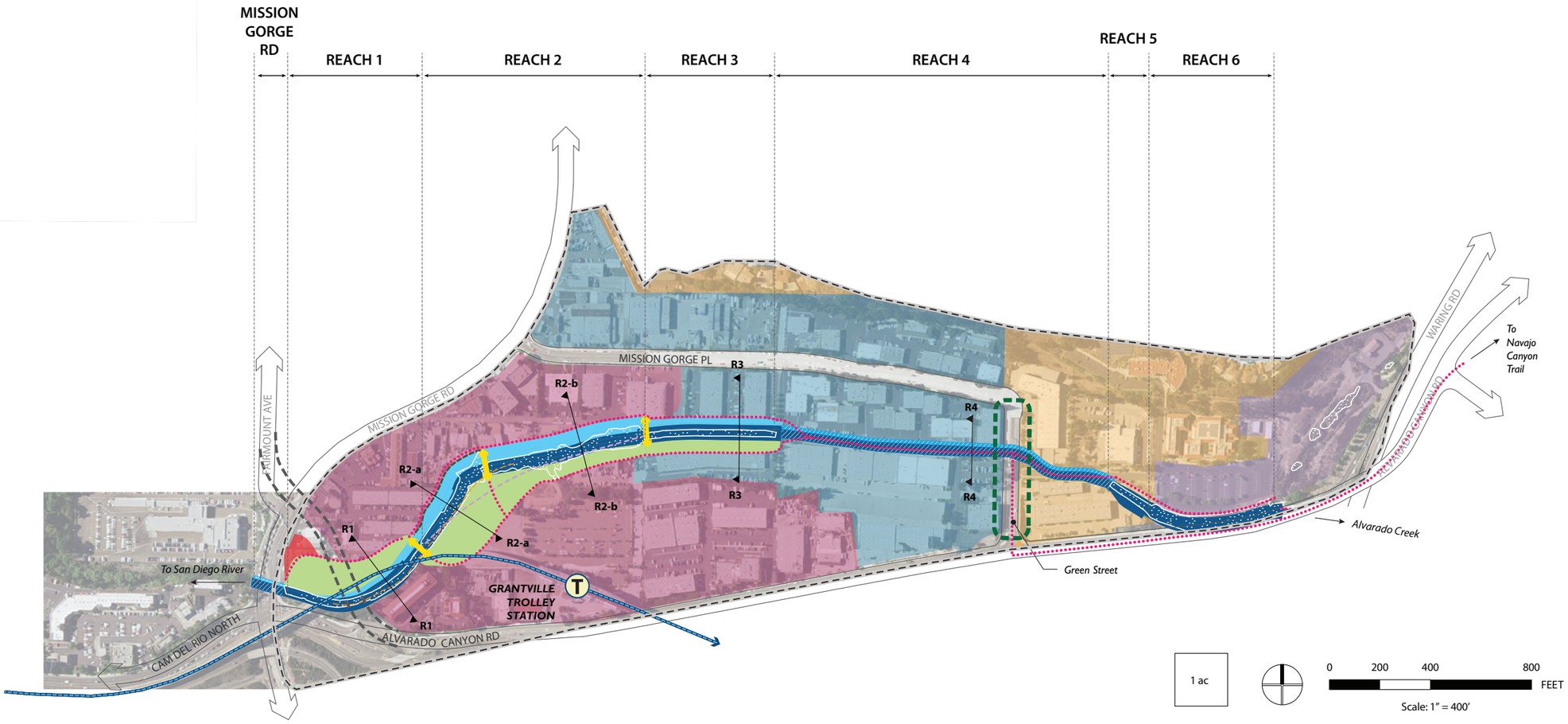


FIGURE 3-14 ALTERNATIVE 3, REACH 1 SECTION

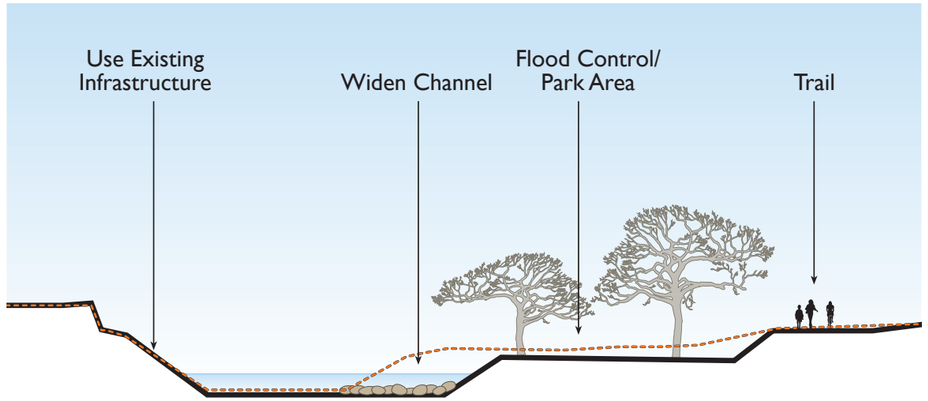


FIGURE 3-15 ALTERNATIVE 3, REACH 2-A SECTION

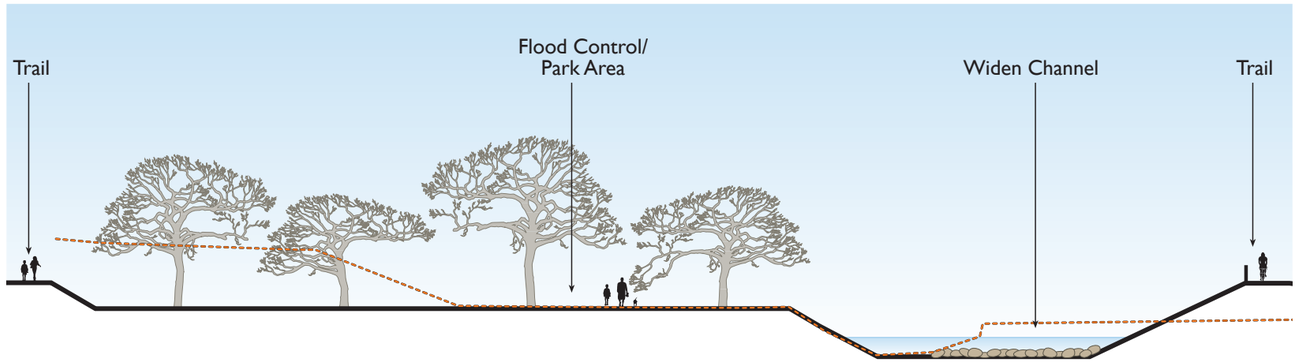


FIGURE 3-16 ALTERNATIVE 3, REACH 2-B SECTION

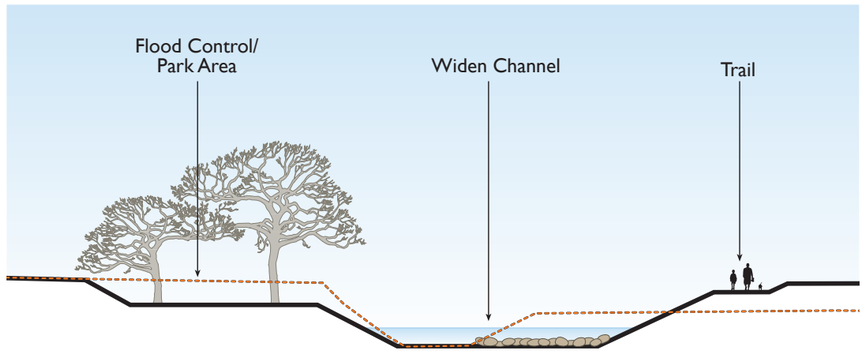


FIGURE 3-17 ALTERNATIVE 3, REACH 3 SECTION

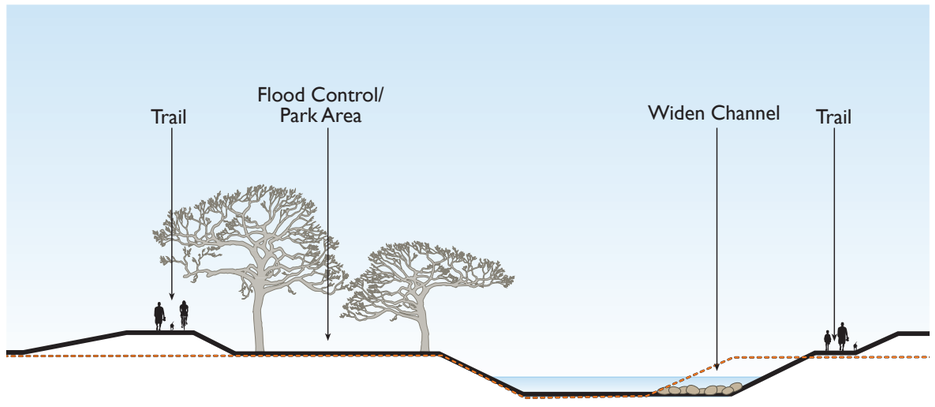
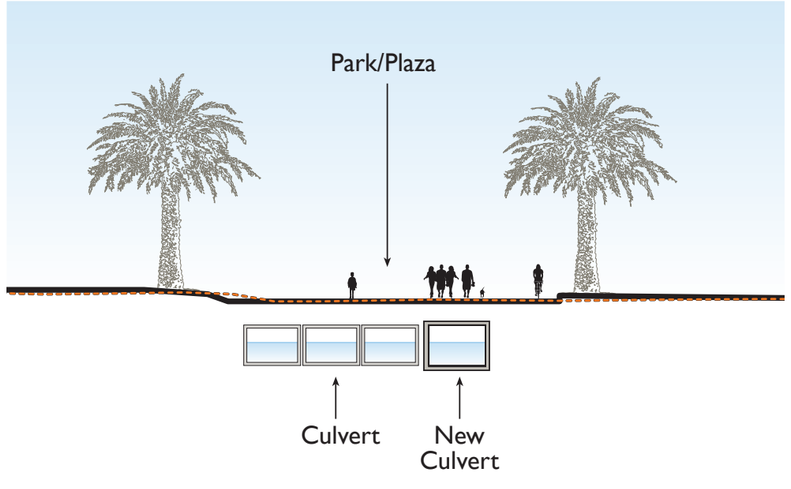
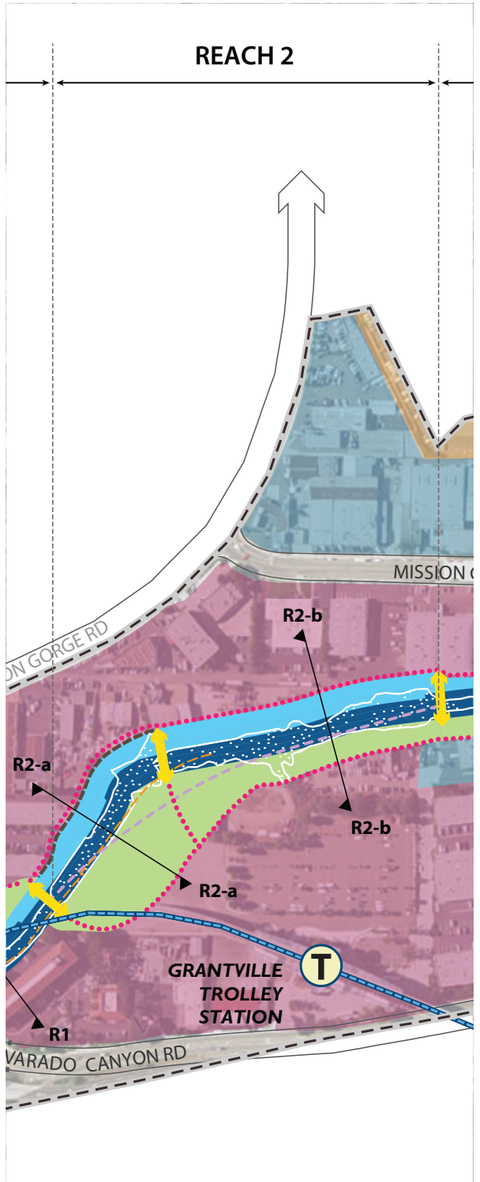


FIGURE 3-18 ALTERNATIVE 3, REACH 4 SECTION





The dashed purple line above indicates the centerline for the potential realignment considered in Alternative 3.

3.2 ADDITIONAL CONSIDERATIONS

CHANNEL RE-ALIGNMENT

As shown in Alternative 3, the realignment of the creek channel was examined as a potential way to avoid impacts to the sensitive vegetation communities in Reach 2, provide space for on-site wetland restoration, if any unavoidable, temporary losses to these communities occurred, and create room for habitat buffers.[7] Realigning the creek in this fashion would provide the additional benefit of removing the pinch point present in Reach 2, thus improving hydraulic functioning.

ALVARADO CANYON ROAD ALIGNMENT

An additional consideration, shown on all viable preliminary alternatives, is the proposed realignment of Alvarado Canyon Road through the Study Area, which would connect Alvarado Canyon Road to Mission Gorge Road at the existing Fairmount Avenue intersection.

3.3 REJECTED ALTERNATIVES

NATURALIZATION OF REACHES 1,2, AND 3

Naturalization of the channel in reaches 1, 2, and 3 was considered and determined to not be feasible. Preliminary hydraulic modeling analyzed the channel width required to accommodate the 100-year flood, removed all concrete from the channel bottom and sides in reaches 1 and 3, and maintained a vegetated bottom and sides in Reach 2. This modeling revealed that an unmaintained channel with riparian vegetation would require approximately 200 feet of width to accommodate a 100-year storm event without flooding. This substantial widening of the existing channel would foreclose development opportunities on adjacent properties, and likely require acquisition of many properties. This intervention would also fail to meet several Study objectives.

CONSISTENT CHANNEL GEOMETRY

Early on, the question was asked about whether the channel could be equally distributed on all privately-owned areas. The preliminary hydraulic modeling indicated that some consistency in channel components would improve conditions (i.e., consistent channel bottom width). However, the creek channel currently varies in geometry through the Study Area; the channel's width is inconsistent, as are the materials used in it. A portion of the channel has already been directed into underground box culverts; however, full channelization would fail to meet the Study objectives. Additionally, due to the presence of sensitive vegetation and potential mitigation requirements, it was deemed infeasible to construct and permit a full culvert.

DIVERSION OF WATER UNDERGROUND VIA PIPE

Diverting water from large storm events into an underground pipe was considered and determined to be infeasible. First, such a pipe would, most likely, need to be aligned underneath the right-of-way or an easement. This would likely require moving utilities and/or new easements, which could be cost prohibitive. Second, such a pipe would likely need to be quite large; to provide a rudimentary estimate, a 20 foot by six foot pipe could be needed. A project of this size would also, very likely, be cost prohibitive.

DAYLIGHTING OF REACH 4

Removal of the triple RCB culvert and daylighting of the channel in Reach 4 was also considered and determined to not be feasible. There were several factors that contributed to this decision. First, daylighting would raise the water surface elevation in Reach 4, requiring significant channel widening there. Second, daylighting would reduce connectivity in the Study Area, as the culvert enables uninterrupted connections between the northern and southern portions of the Study Area. Third, the expense to replace a functioning culvert that has been constructed over is an avoidable one, the area would require re-parcelization, and at least one additional pedestrian/bicycle bridge would need to be constructed. As shown in Alternative 2, the addition of an open channel adjacent to the existing culvert was explored as a means to allow access to the creek channel in Reach 4 while leaving more developable land north of the channel. That too was determined to not be the preferred solution in Reach 4. Indeed, feedback from the community and stakeholders did not support this Alternative.

[7] *See* San Diego Municipal Code §143.0141 (Development Regulations for Sensitive Biological Resources)

4 Evaluation of Preliminary Alternatives

Evaluation of the viable, preliminary alternatives was based on the Study Team's assessment of how well each alternative satisfied the feasibility criteria and responded to the feedback and concerns expressed by stakeholders throughout the planning process, and in particular during a series of community workshops held in February 2017 and in discussions with City staff. Table 4-1 is a matrix that was prepared to compare the preliminary, viable alternatives and how they satisfied the feasibility criteria.

Based on the evaluation of the preliminary, viable alternatives and stakeholders' feedback, the Study Team further refined elements from Alternative 1 and 3. The key considerations were whether impacts on adjacent property owners could be further minimized, allow property owners to meaningfully develop their property, and be equitably distributed, while managing flooding and providing some passive recreation space for new residents.

In addition, the Study Team further explored realigning the channel in Reach 2, to evaluate if impacts to the sensitive vegetation and wetlands could be avoided completely, and if not, then minimized. Widening Reach 2 in its existing alignment, as contemplated in all of the viable, preliminary alternatives, would unavoidably impact the vegetation communities located within that reach. If the existing alignment of Reach 2—the narrowest reach—was maintained without alteration, there would be no feasible manner to protect adjacent public and private development from flooding conditions, as necessary for public safety. The Study Team decided to further explore realigning Reach 2 due to the intervention's potential both to improve flooding conditions with minimal impacts to the sensitive vegetation communities and to improve the wetland and riparian habitat of Reach 2 by providing space on-site to create and enhance wetlands and buffer new and existing wetlands.

TABLE 4-1: EVALUATION OF PRELIMINARY VIABLE ALTERNATIVES

	Preliminary Viable Alternative		
Feasibility Criteria	**1**	**2**	**3**
Flooding is managed			
Water quality and stormwater is improved			
Impacts to property are minimized			
Biological impacts are avoided			
Connections are increased			
Alvarado Creek is transformed into an amenity			
The proposed design is context-sensitive			

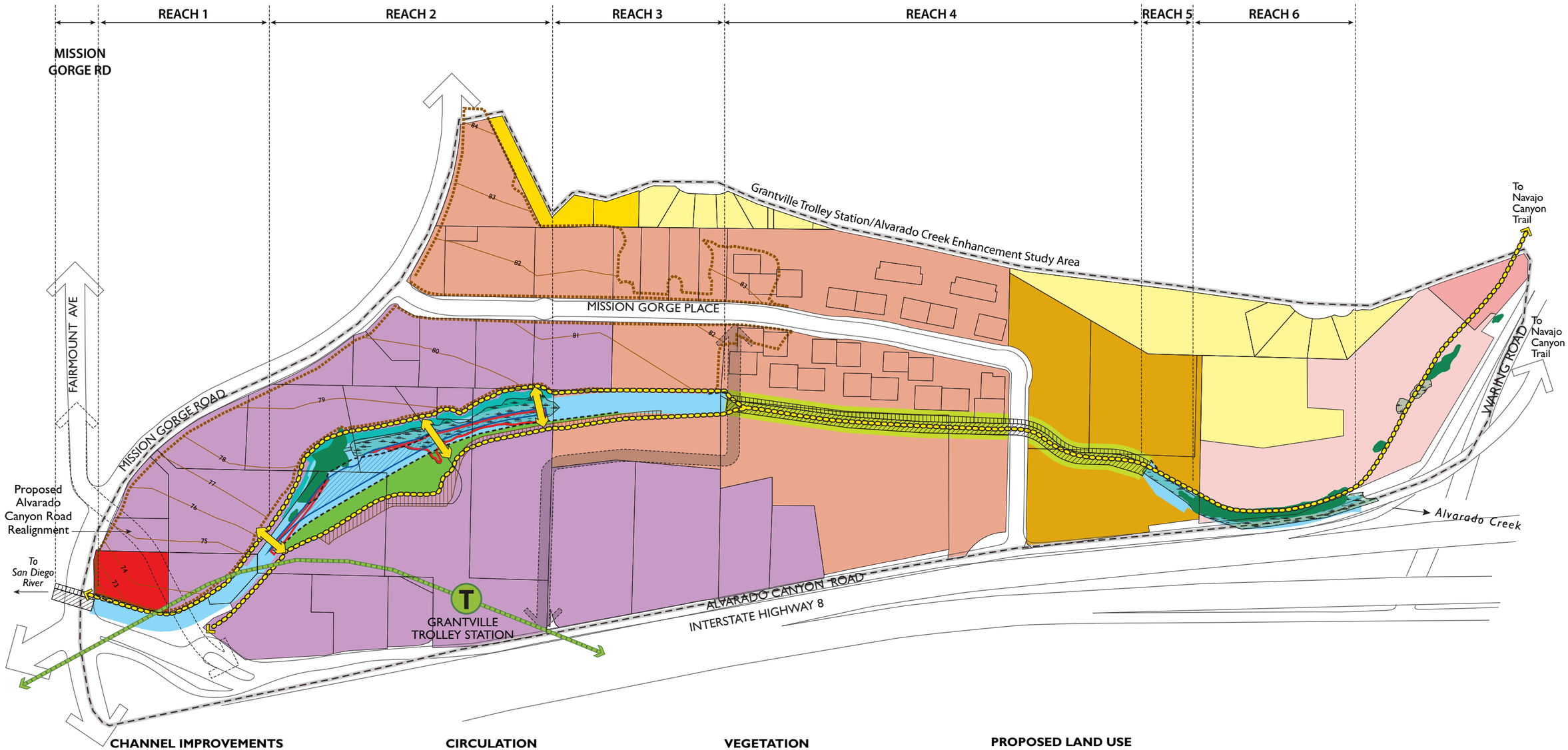
Legend

- Alternative's satisfaction of feasibility criteria is high.
- Alternative's satisfaction of feasibility criteria is medium.
- Alternative's satisfaction of feasibility criteria is low.

5 Preferred Alternative/Design

As stated previously, the Preferred Design was arrived at by refining elements of preliminary, viable Alternatives 1 and 3, and realigning the channel in Reach 2. Below is a discussion of the analysis and iteration preformed on each reach, which helped the Study Team arrive at the Preferred Design. Detailed discussion of the hydraulic analysis performed may be found in the Hydrology Background Report (Appendix D). A full discussion of the proposed Revitalization Strategy, including conceptual solutions for each reach, may be found in the Revitalization Study (Chapter 3).

FIGURE 5-1 PREFERRED ALTERNATIVE/DESIGN



CHANNEL IMPROVEMENTS

Existing
- To Remain - Open Channel (and walls)
- To Remain - Underground Culvert

Proposed
- Realigned/Widened Channel
- Underground Culvert
- Fill required for Floodplain Management
- 77 New Contours in Fill Area
- Limits of Grading for Flood Control Green Space

CIRCULATION

Proposed
- Pedestrian/Bicycle Bridge
- Promenade
- Multi-Use Trail
- Recreational Corridor

VEGETATION

Existing
- Higher Quality Vegetation
- Lower Quality Vegetation

Proposed
- Impacted Vegetation Area
- Created/Enhanced Wetland Area
- Wetland Buffer

PROPOSED LAND USE
- Single Family Residential
- Multi-Family Residential
- Residential Medium High (30-43 du/ac)
- Urban Village
- Business Park - Residential (44-73 du/ac)
- Office
- Community Commercial

- T Trolley Line
- 1 ac
- 0 200 400 800 FEET

5.1 PREFERRED CHANNEL IMPROVEMENTS

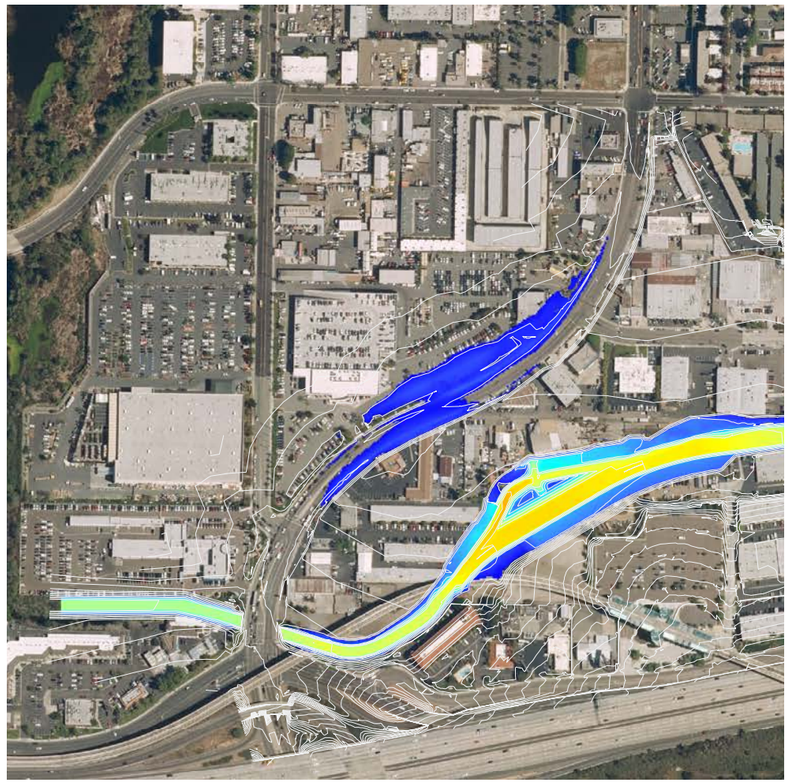
MISSION GORGE ROAD

Hydraulic modeling analyzed whether an additional box, adjacent to the existing triple RCB culvert under Mission Gorge Road, was required to alleviate the flooding conditions seen along Mission Gorge Road. This modeling indicated that an additional 15-foot-wide by 8-foot-high box alleviates the flooding condition; if such a box is not installed, the flooding along Mission Gorge Road would continue during 100-year storm events (Figure 5-2). As a result, the Preferred Design proposed a new box under Mission Gorge Road, parallel to the existing culvert.

REACH 1

Hydraulic modeling also analyzed to what extent channel widening was required in Reach 1. All preliminary, viable alternatives showed the channel bottom of Reach 1 being widened by approximately 15 feet to the north. Modeling indicated that the only widening required was as needed to connect to the new box under Mission Gorge Road. As a result, the Preferred Design proposes only this amount of widening in Reach 1, lessening the impacts to adjacent properties, in comparison to the preliminary viable alternatives.

FIGURE 5-2 MISSION GORGE ROAD CULVERT EXPANSION EVALUATION



100-year floodplain with Mission Gorge Road culvert expansion

100-year floodplain without Mission Gorge Road culvert expansion

REACH 2

All preliminary, viable alternatives showed the potential to impact sensitive vegetative communities and wetlands in Reach 2. Moreover, they did not provide space on-site for restoration or for a sufficient buffer for the existing and/or created wetlands. Thus, the Study Team evaluated whether impacts could be avoided by altering the flow of the creek in Reach 2, in support of the Study objective to avoid biological impacts to the extent possible (Figure 5-3).

It was determined that given the need to widen the creek for hydraulic capacity and flood control, impacts to wetlands could not be fully avoided. Thus, the question became how impacts could be minimized. It was determined that directing some of the flow into a newly constructed, realigned channel south of the existing channel in Reach 2 is a potential solution that could achieve the greatest number of Study objectives. In this solution, the original channel would be graded only in key areas, minimizing the impacts to wetlands and sensitive vegetation that are found along the existing vegetated bottom and sides there. In comparison, widening the existing channel to manage flooding would cause much greater impacts. In addition, constructing a new channel would allow for greater flood management. Further, the space in between the existing and new channels, as well as within the new channel, could provide space and the conditions for creating and enhancing wetlands, thus improving the habitat functioning on-site. This alignment potentially provides space to account for temporary losses to approximately 0.02 acres of higher quality sensitive vegetation communities (i.e. southern willow scrub) to be created at a ratio of approximately 2:1; temporary losses to approximately 0.55 acres of low-quality vegetation (i.e., arundo-dominated riparian, non-native riparian, and disturbed wetland) to be enhanced at a ratio of approximately 1:1.

The Study Team also iterated on the size and alignment of floodable green space south of the channel in Reach 2. As shown in Figure 5-4, several iterations were explored to satisfy two key Study objectives of creating an amenity and managing flooding.

FIGURE 5-3 REACH 2 REALIGNMENT EVALUATION

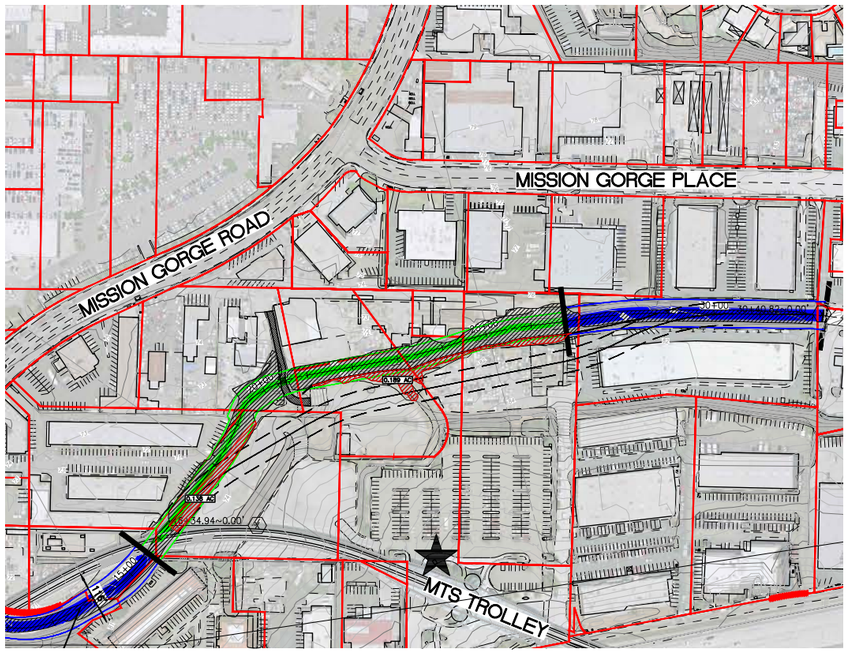
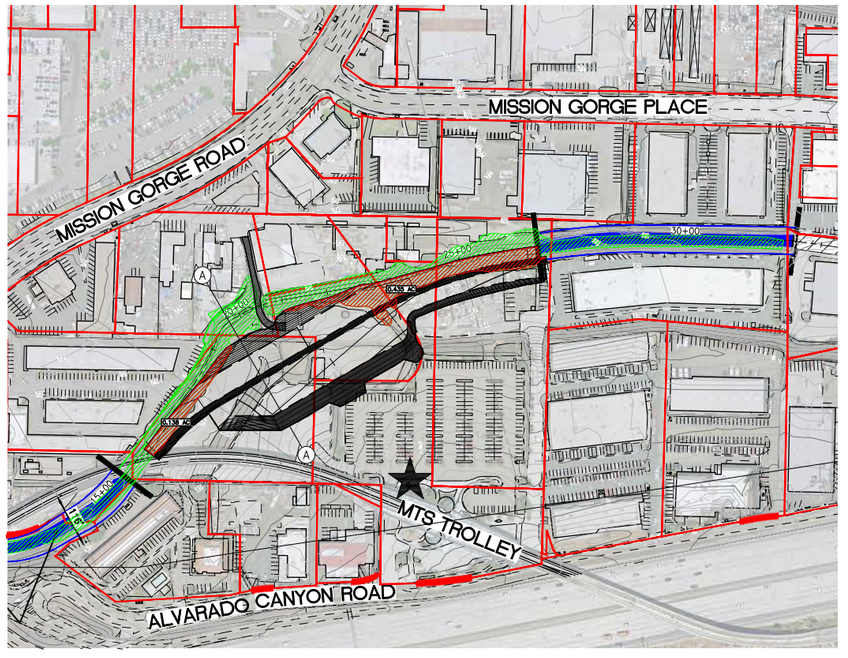
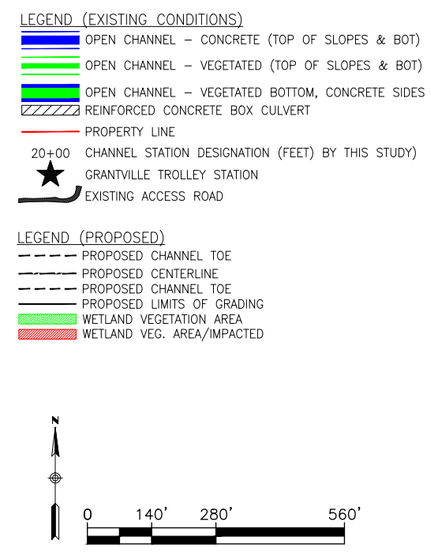


FIGURE 5-4 REACH 2 FLOODABLE GREEN SPACE SIZE AND ALIGNMENT EVALUATION





Reaches 3 and 4

REACH 3

All preliminary, viable alternatives showed the channel bottom of Reach 3 being widened by approximately 15 feet to the north, across the entire reach, as this was needed to connect reaches 2 and 4 with sufficient conveyance capacity. Hydraulic modeling analyzed to what extent channel widening was required in Reach 3. With the additional capacity upstream and downstream, Reach 3 only needed to be widened to connect to Reach 2 and to the new box in Reach 4, impacting the southwestern and northeastern portions of the reach, respectively. As a result, the Preferred Design proposes only this extent of widening in Reach 3, lessening the impacts to adjacent property in comparison to the preliminary viable alternatives.

REACH 4

Hydraulic modeling indicated that in the absence of any improvements to Reach 4, flooding on adjacent properties ensued. An open culvert would need greater right-of-way and to create new barriers to north-south movement, compared to a boxed culvert. Modeling indicated the appropriate box culvert size to be 15 feet by eight feet, which is reflected in the Preliminary Draft Preferred Alternative. A Recreational Corridor for passive recreation is proposed over the existing and proposed culvert to provide an amenity and also provide a continuous path indicated in the supplemental development regulations; the corridor extends 15 feet on either side of the culvert system, over the area where an easement would be required to preserve access to repair and maintain the culverts.

5.2 REJECTED CHANNEL IMPROVEMENTS

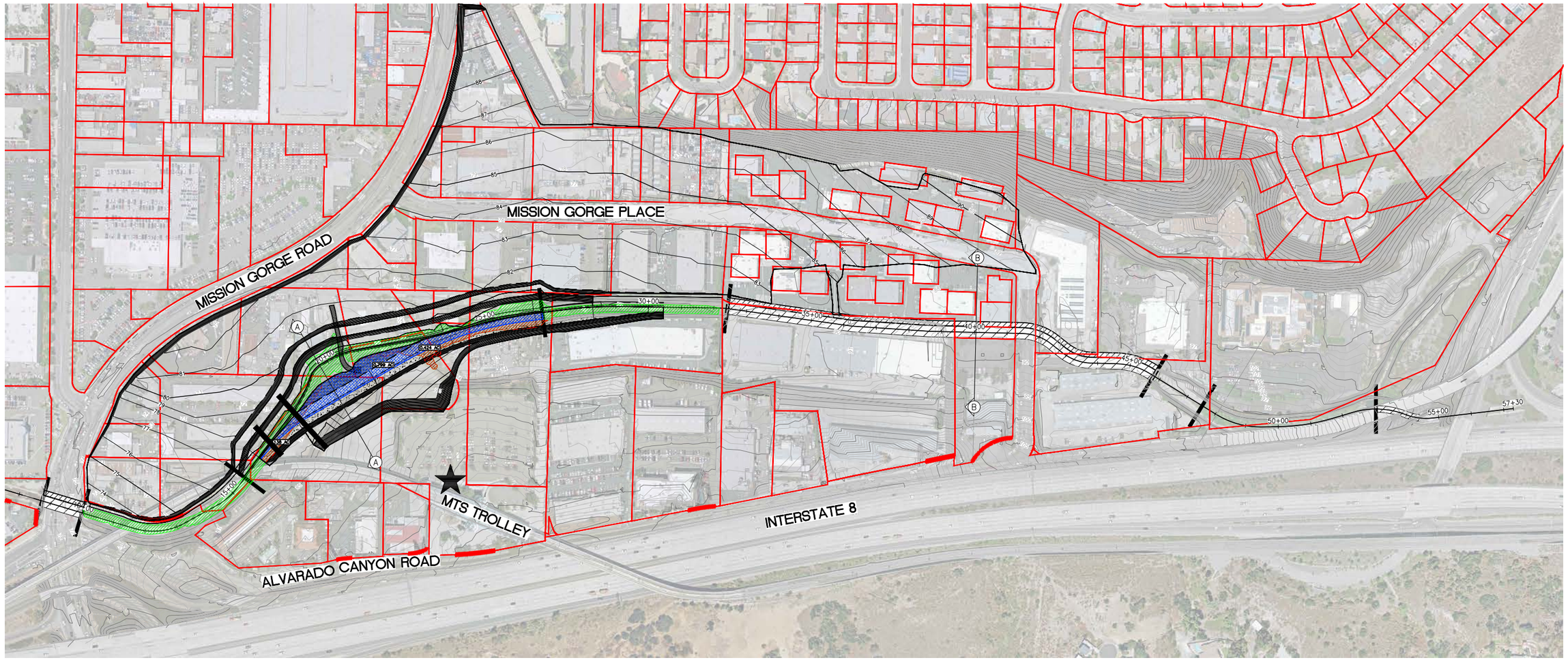
WIDENED CHANNEL TO DECREASE FILL

In response to inquiries by the Flooding Subcommittee of the Navajo Community Planning Group, the Study Team evaluated whether widening the creek channel in reaches 2 and 3 would lessen the amount of fill required north of the channel while still managing the flooding. The Study Team found that widening the channel by 30 feet would reduce the required fill by, on average, one-half of a foot (Figure 5-5). This option was determined infeasible, as widening the channel did not meaningfully lessen the fill required north of the channel and would have negative impacts on adjacent property owners' ability to develop their properties. This analysis was discussed at the meeting of the Flooding Subcommittee on June 9, 2017.

FLOODABLE GREEN SPACE IN REACH 4

The Study Team also evaluated whether the addition of floodable green space in Reach 4 could manage the flooding in that location and achieve Study objectives of transforming Alvarado Creek into an amenity, in part by providing open space for new residents planned for the area. Hydraulic modeling indicated that the addition of such a green space would not manage the flooding that is seen in Reach 4, absent the addition of a new box adjacent to the existing RCB culvert. Thus, this option was rejected.

FIGURE 5-5 REACH 2 CHANNEL WIDENING/REQUISITE FILL ANALYSIS

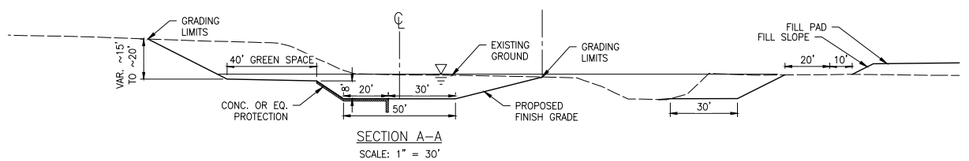


LEGEND (EXISTING CONDITIONS)

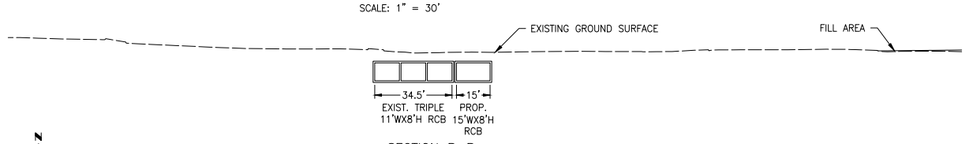
- OPEN CHANNEL – CONCRETE (TOP OF SLOPES & BOT)
- OPEN CHANNEL – VEGETATED (TOP OF SLOPES & BOT)
- OPEN CHANNEL – VEGETATED BOTTOM, CONCRETE SIDES
- REINFORCED CONCRETE BOX CULVERT
- PROPERTY LINE
- 20+00 CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY)
- GRANTVILLE TROLLEY STATION
- EXISTING ACCESS ROAD

LEGEND (PROPOSED)

- PROPOSED CENTERLINE
- PROPOSED CHANNEL TOE
- PROPOSED CHANNEL TOP
- PROPOSED LIMITS OF GRADING



SECTION A–A
SCALE: 1" = 30'



SECTION B–B
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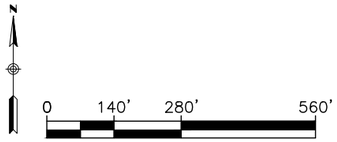

GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
REACH 2 WIDENING ANALYSIS

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PROJECT NO. 17571AW, 03/2017

5.3 PREFERRED TRAIL ALIGNMENT

Upon refinement of the channel improvements, the trail alignment was evaluated and refined. The preferred trail and circulation system consists of three proposed, interconnected components:

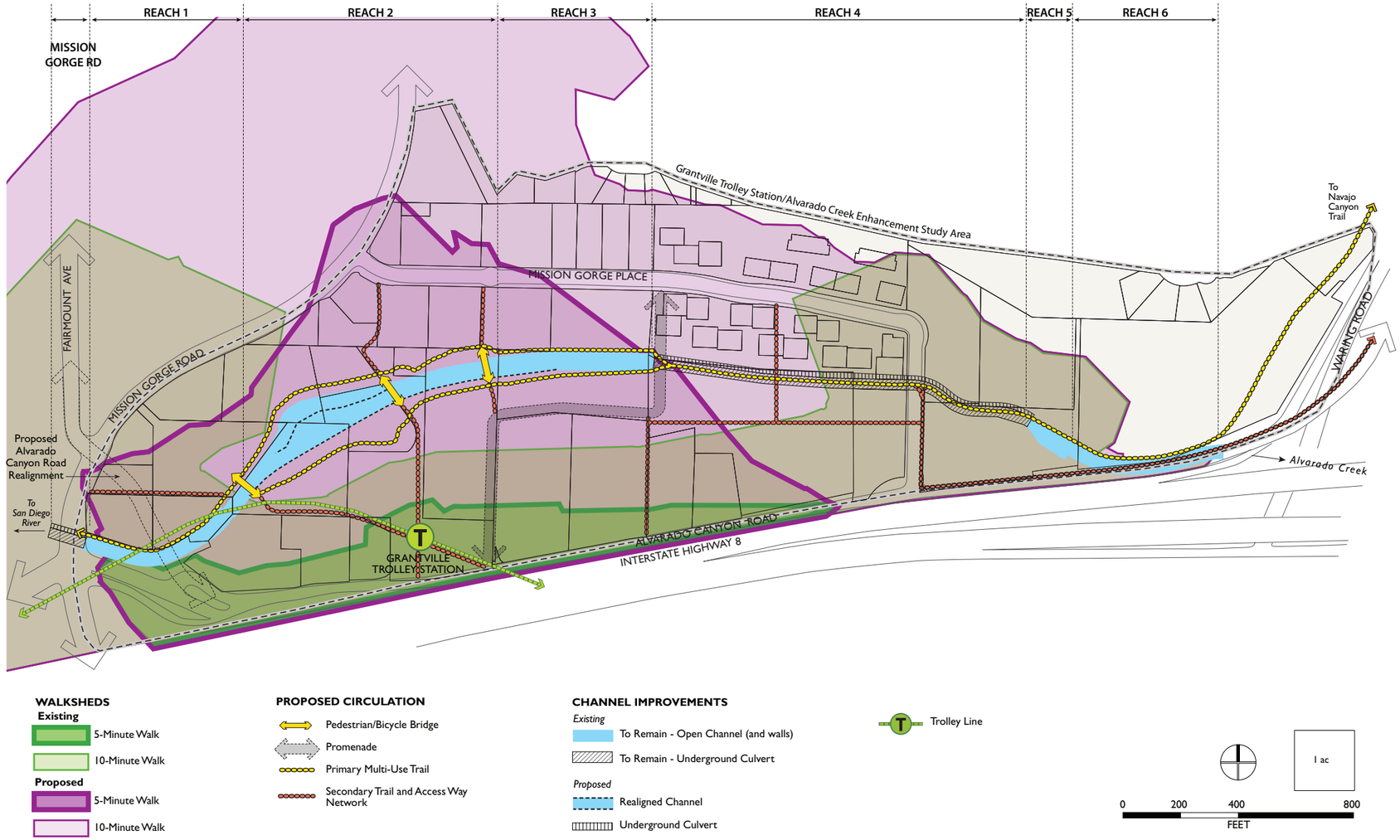
1. **The Promenade,** which extends private vehicular roadways into a public, neighborhood, multimodal connector.

2. **The Primary Trail System,** consisting of the two elements – three pedestrian/bicycle bridges over the creek, and a Multi-Use Trail system along the creek corridor.

3. **The Secondary Access Way and Trail Network,** which provides additional north-south and east-west connections for pedestrians and bicyclists in the Study Area, increases access to Grantville Station, and provides pathways from surrounding transit stops and land uses to key points within the Study Area.

These are elaborated upon below and mapped in Figure 5-6. A visualization of walksheds from Grantville Station, taking into account the proposed trail alignment and circulation system, is also shown. The process undertaken to assess the range of alignment alternatives and arrive at the preferred routes is discussed below.

FIGURE 5-6 PROPOSED TRAIL AND CONNECTIVITY IMPROVEMENTS WITH WALKSHEDS FROM GRANTVILLE STATION



PROMENADE

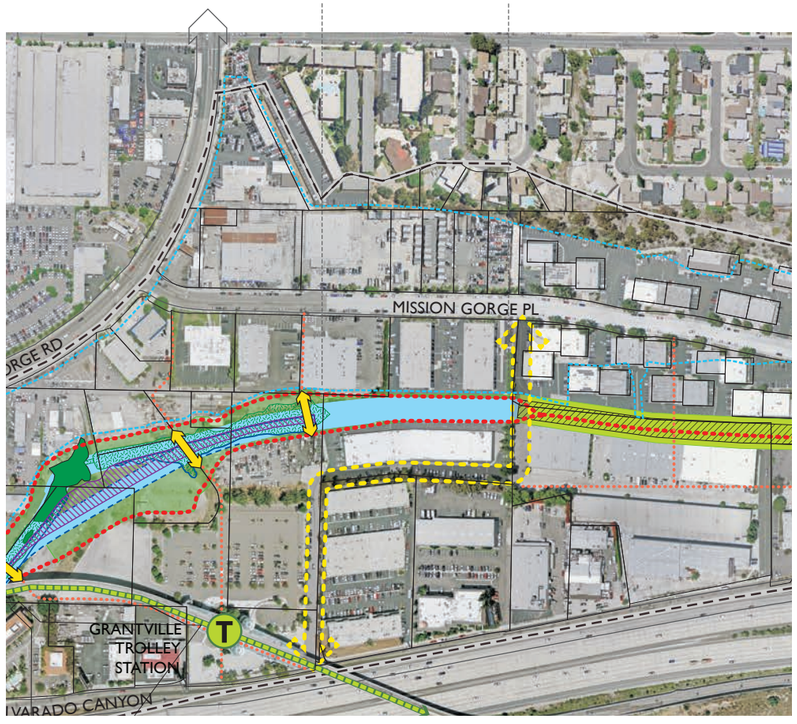
The Promenade provides a public, multi-modal, neighborhood connection aligned with existing (private) vehicular pathways, currently within a single ownership. As a condition of development of the site with higher intensity uses and in accordance with the Community Plan, the Promenade could be developed as a vehicular/pedestrian/bikeway connection, potentially remaining in private ownership, but with a public easement. This connection would be vital given the extensive number of new housing units planned at the site where the Promenade is located, as well as the Study Area in general. This would enable residents of these units greater ability to connect to existing roadways and move within the Study Area, and access Grantville Station and Alvarado Creek. The connection would also be necessary for emergency vehicles to easily access all parts of the Study Area from the north or the south.

The southern portion of the Promenade is situated on an already-existing private roadway (Figure 5-7). Where the roadway ends, the Promenade would turn eastbound along what now is an existing surface parking lot. The Promenade would then turn northward, onto an existing private road, which extends over the underground triple RCB culvert in Reach 4, and connects to Mission Gorge Place.

REJECTED ALIGNMENT

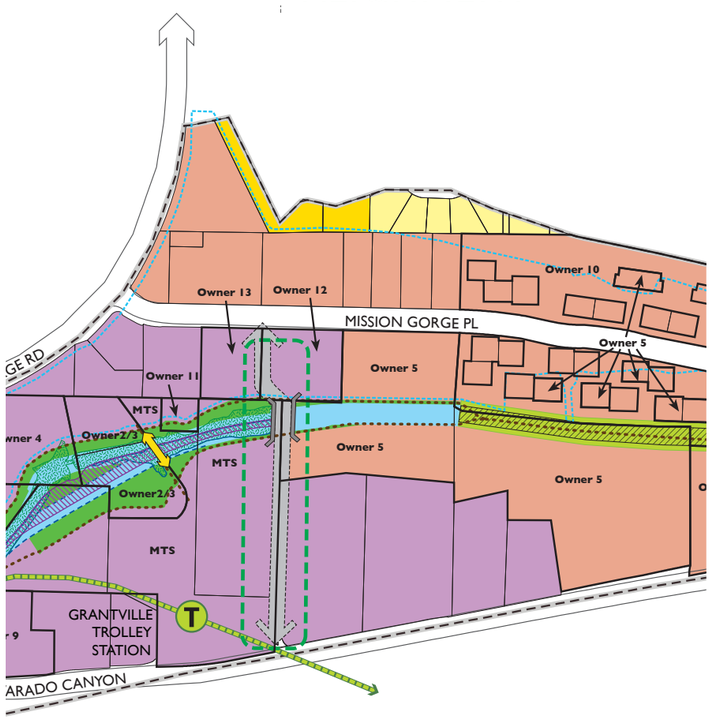
Initially, the Promenade was contemplated as extending in a straight north-south direction over the creek, approximately where Reach 2 meets Reach 3 (Figure 5-7). However, the construction of a vehicular bridge over the creek was determined to not be feasible for several reasons, and thus did not meet the Study's feasibility criteria. As a result, a Promenade that provided a north-south connection without requiring a creek crossing was explored and chosen.

FIGURE 5-7 PROMENADE ALIGNMENT ON AERIAL



The Promenade alignment is depicted with the yellow arrow.

FIGURE 5-8 REJECTED PROMENADE ALIGNMENT



The rejected Promenade alignment is depicted with the gray arrow.

PRIMARY TRAIL SYSTEM

The feasible Primary Trail System through the Study Area is described, by reach. Its purpose is to provide a multi-use path within the creek corridor, as specified in the Navajo Community Plan. This Multi-Use Trail system can transform Alvarado Creek into a linkage for the Study Area and provide the possibility for future connections to the San Diego River pathway and the Navajo Canyon Trail, as recommended in the San Diego Park Master Plan. In addition, three pedestrian/bicycle bridges would enhance north-south connectivity within the Study Area, increasing connections to Grantville Station, particularly from points north of the creek. This has the potential to be particularly important to the new residents planned for the area.

CREEK CROSSINGS

Three pedestrian/bicycle creek crossings are proposed in the preferred trail design, per the Grantville supplemental development regulations.[8] These are located with the following principles in mind:

- Provide creek crossings every 800 feet or less
- Locate the crossings to enhance connections to Grantville Station and other transit stops, strengthen connections to surrounding land uses, and to generally improve north-south connectivity in the Study Area
- Minimize the required bridge length, and thus, cost
- Avoid impacting higher quality, sensitive vegetation communities and wetlands
- Locate crossings along property lines
- Avoid interfering with existing utilities and structures

The length of the pedestrian/bicycle bridges will depend on their design. To provide an approximate sense of their length, the westernmost pedestrian and bicycle bridge, located where Reach 1 intersects with Reach 2, could extend between approximately 50 and 100 feet in length, with intermediate structural supports. A range is provided with the minimum distance having the landing right at the existing top of bank on the north side, which would be inundated during larger storms. Importantly, this bridge is located where the channel narrows substantially. In addition, this crossing location provides pedestrian and cyclists from Mission Gorge Road/Fairmount Avenue and other points to the north of the Study Area a way to cross the creek and access Grantville Station.

The central pedestrian/bicycle bridge, located squarely in Reach 2, could extend between 70 and 110 feet, with intermediate structural supports provided. Like the bridge to the west, this bridge is also located where the channel narrows, and where higher quality vegetation is not present. It is also located to provide direct access to Grantville Station from points north, including Mission Gorge Place.

The easternmost pedestrian/bicycle bridge, also located within Reach 2, could extend approximately 120 feet or greater. This proposed crossing location is located along parcel lines, away from higher quality vegetation. It also provides access to Grantville Station from the northern portion of the Study Area, and provides a direct connection to the Promenade from the northwest portion of the Study Area.

MULTI-USE TRAIL SYSTEM

Mission Gorge Road

The San Diego River Park Master Plan recommends providing a pedestrian connection under or over the bridge at Mission Gorge Road, to provide access to the San Diego River Pathway from Alvarado Creek. It is not feasible to route pedestrians below-grade, to provide access to the San Diego River. There are numerous concerns with this approach, including cost, safety, and ADA accessibility.

It also does not appear feasible to provide a pedestrian crossing on Mission Gorge Road/Fairmount Avenue where it crosses Camino Del Rio North. Currently, there is no pedestrian crossing on this heavily-trafficked, seven-lane road, which provides access to I-8. The addition of an at-grade pedestrian facility at this location has not previously been studied, and this roadway operates at the lowest level of service (F).[9]

The realignment of Alvarado Canyon Road presents an opportunity for a pedestrian connection to the San Diego River Pathway, at-grade, across Mission Gorge Road/Fairmount Avenue. The Preferred Design contemplates that the eventual connection to the San Diego River Pathway could be made as a part of this Capital Improvement Project.

Reach 1

The Primary Trail System in Reach 1 is composed of two elements: The Multi-Use Trail serving pedestrians and bicyclists and a pedestrian/bicycle bridge. The Multi-Use Trail is shown directly adjacent to and north of the existing channel. Although the supplemental development regulations of the Navajo Community Plan indicate that the Multi-Use Trail is to be provided along both sides of the creek corridor, the Multi-Use is shown only adjacent to a portion of the area south of Reach 1, due to site constraints.

Reach 2

To the north of the channel in Reach 2, the Preferred Design shows the Multi-Use Trail aligned on the periphery of the Floodable Green Space and Wetland Buffer (see Revitalization Study, Figure 3-4). This serves two purposes. First, it expands the hydraulic capacity of the channel. Second, it furthers the goal of transforming the creek into an amenity by aligning the trail in a way that allows community members to interact with the natural environment in their day-to-day lives, while navigating through the city. There is also a second option for the trail alignment north of the channel; this alignment locates the Multi-Use Trail adjacent to the channel, in the middle of the fill pad. In this option, the Multi-Use Trail would remain usable during large storm-events.

To the south of the channel, the Multi-Use Trail is aligned at outer edges of the Floodable Green Space, in the western portions of the reach. In the eastern portion of Reach 2, where there is no Floodable Green Space, the Multi-Use Trail is shown directly adjacent to the channel (see Revitalization Study, Figure 3-5). The Multi-Use Trail will need to climb many feet within this reach; the precise trail alignment would need to be further refined to meet ADA requirements.

[8]The Navajo Community Plan states, "Provide the opportunity for a pedestrian/bicycle bridge over Alvarado Creek, which will allow any development projects adjacent to Alvarado the creek a critical linkage to the Grantville Trolley Station." (UD-10)

[9]Grantville Focused Plan Amendment Final Environmental Impact Report, April 2015.

Reach 3

In Reach 3, the Multi-Use Trail to the north of the creek is located within the channel; the trail would experience flooding during larger storm events (see Revitalization Study, Figure 3-7). To the south of the channel, the Multi-Use Trail is located outside of and adjacent to the channel. This is a result of the site topography.

Reach 4

In Reach 4, the northern and southern branches of Reach 3's Multi-Use Trail converge into one within the proposed Recreational Corridor, sited on top of the culvert system (see Revitalization Study, Figure 3-9) .

Reaches 5 and 6

In reaches 5 and 6, the Multi-Use Trail extends immediately north of the creek. Due to the freeway, there is insufficient space south of the channel to provide a 10-foot-wide trail there.

The Study Team determined that the Multi-Use Trail could extend, in Reach 6 and beyond, along a San Diego Gas & Electric easement, in order to create a potential future connection to Navajo Canyon Trail. In the alternative, a connection can be made to Navajo Canyon Trail via Mission Gorge Place to Alvarado Canyon Road (Figure 5-9). In order for the Multi-Use Trail to connect from the easement to Navajo Canyon Trail, further study would be needed regarding how to make the connection from where the trail terminates in the Study Area to where the protected crossing is located at Waring Road and Adobe Falls Road (Figure 5-10).

SECONDARY ACCESS WAY AND TRAIL NETWORK

The secondary trail system provides an additional north-south and east-west pedestrian and bicycle network in the Study Area. It proposes connections from the primary trail network to Grantville Station, existing roadways, and land uses within and outside of the Study Area. The mapped alignment of these pathways is conceptual, and would likely need to be reassessed as development is proposed. It is envisioned that as development occurs, a more robust network of vehicular and pedestrian and bicycle access ways would be constructed, in conformance with the Navajo Community Plan, which provides as follows:

> *SDR 4. All new development shall provide a minimum of one vehicular access way through the project site. The layout of a private street or private drive should be in a grid pattern or modified grid pattern, emphasizing interconnected streets and the ability to reach local destinations through multiple routes. It is desirable to have streets with block faces of 400 feet in length or less. Private streets or private drives shall be coordinated and connected to the public street system. Fencing, walls, or gates that limit access are prohibited. Where possible, streets shall frame vistas of the mixed-use core, Grantville Trolley Station, San Diego River, and Alvarado Creek.*
>
> *SDR 5. All new development shall provide a minimum of one pedestrian and bicycle access-way through the project site. Pedestrian and bicycle access-ways shall be coordinated and connected to public streets. Fencing, walls, and gates that limit access are prohibited. Sidewalks shall be separated from the street by landscaped parkways and shall be provided as follows:*
>
> *a. Provide a minimum 5-foot landscaped parkway and minimum 5-foot non-contiguous sidewalk on at least one side of any private drive.*
>
> *b. Provide a minimum 5-foot landscaped parkway and minimum 10-foot non-contiguous sidewalk along any public or private street.*

FIGURE 5-9 MULTI-USE TRAIL, NAVAJO CANYON TRAIL CONNECTION VIA ALVARADO CANYON RD.

FIGURE 5-10 MULTI-USE TRAIL, EASEMENT CONNECTION TO NAVAJO CANYON

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APPENDIX D

HYDROLOGY BACKGROUND REPORT

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LIST OF FIGURES AND TABLES

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1 Introduction

1.1 HYDROLOGY BACKGROUND REPORT SCOPE

The City of San Diego (City) is preparing a planning study to develop and evaluate scenarios for the portion of Alvarado Creek channel in the Grantville area, which is located north of the Grantville Trolley Station. This Hydrology Background Report was developed as part of the overall planning study and included hydrology and hydraulic analyses that were specifically performed in support of the key planning objective of formulating and presenting a design option that will increase the hydraulic capacity of Alvarado Creek to improve flooding.

The general approach to prepare this Hydrology Background Report was to first gain an understanding of the existing drainage systems and potential issues. Next, the acquired understanding of the drainage systems was used to formulate channel geometries that may improve hydraulic conveyance. These alternative geometries were then analyzed to quantify the increase in the hydraulic capacity that each option may provide. The final step of this approach included the preparation of this report that describes the methodology and results of the data collected, hydrologic, and hydraulic analyses. The Hydrology Background Report does not address detention, hydromodification management, or water quality.

The preparation of this report included the following scope:

1. Review City provided topographic data, historical aerial photographs, stream flow data, flood history, habitat data, water quality data, groundwater reports, geology reports, and relevant monitoring reports.

2. Conduct a LIDAR topographic survey and identify creek centerlines and culvert locations and prepare a topographic survey map including 1 foot contour data and an orthorectified aerial photograph.

3. Review survey data and identify different channel reaches based on geometry and material.

4. Utilize existing data to identify design storm flow rates.

5. Perform a hydraulic analysis to identify existing channel deficiencies.

6. Perform hydraulic analyses to determine the performance of proposed design alternatives.

7. Preparation of this Hydrology Background Report, which includes hydrologic and hydraulic methodologies, parameters, results, a description of existing channel deficiencies, an assessment of the performance of the proposed design alternatives, and a description of grading or other improvements required for each channel reach.

1.2 STUDY AREA DESCRIPTION

The Study Area consists of approximately 102 acres that encompasses the Grantville Trolley Station and several nearby properties. The Study Area is bound by Mission Gorge Road to the west, Waring Road to the east, Alvarado Creek Road to the south, and single-family residences to the north. Alvarado Creek transects the southern portion of the Study Area. A vicinity map that includes the planning Study Area boundary is shown on Figure 1-1. Enhancements to Alvarado Creek have the potential to reduce the risk of flooding, improve natural habitat, and provide various multiple benefits including additional green space and improvement to pedestrian connectivity (i.e., transform Alvarado Creek into an amenity). Thus, enhancements to Alvarado Creek may facilitate redevelopment of the properties along the creek and are consistent with the Navajo Community Plan, which was most recently amended in 2015 and seeks to promote housing and mixed-use development in a transit-oriented setting. The Navajo Community Plan also encourages the implementation of new bicycle and pedestrian trails along open spaces. A revitalization of the Alvarado Creek is consistent with the San Diego River Park Master Plan, adopted May 20, 2013.

1.3 ALVARADO CREEK EXISTING CONDITIONS

Alvarado Creek flows east to west through the Study Area. The portion of Alvarado Creek within the Study Area is located between Waring Road and Mission Gorge Road. At the upstream end of the Study Area, Alvarado Creek is conveyed underneath the southbound Waring Road onramp to Westbound I-8 in a triple 11-foot wide by 8-foot high Reinforced Concrete Box (RCB) culvert. The downstream end of this culvert is the upstream end of Alvarado Creek within the Study Area. From this point, Alvarado Creek flows west for approximately 4,400 feet before passing underneath Mission Gorge Road. Here, flows are conveyed underneath Mission Gorge Road through a triple RCB culvert, with each cell measuring 11-foot wide by 8-foot high. The upstream end of this culvert is the downstream end of Alvarado Creek, within the Study Area. The Alvarado Creek confluence with the San Diego River is approximately 1,200 feet downstream of Mission Gorge Road.

Within the Study Area, Alvarado Creek has three different types of channel lining. Near the downstream limits of the Study Area, Alvarado Creek alternates between a concrete lined, trapezoidal channel and an earthen, trapezoidal channel. In the central portion of the Study Area, Alvarado Creek is conveyed underground through a triple 11-foot wide by 8-foot high RCB culvert that is approximately 1,340 feet long. A concrete lined, trapezoidal channel extends for approximately 175 feet east of the long RCB culvert. Alvarado Creek, near the upstream limits of the Study Area, consists of an earthen bottom with concrete lined sides, trapezoidal channel.

The unlined (earthen) sections of Alvarado Creek have established native riparian vegetation as well as non-native wetland vegetation (e.g., Arundo). Seven sensitive vegetation communities have been identified within Alvarado Creek as part of the overall Study. These areas are protected by the California Department of Fish and Wildlife (CDFW), the San Diego Regional Water Quality Control Board (SDRWQCB), and the United States Army Corps of Engineers (USACE).

Densely developed, low-lying areas are located along either side of Alvarado Creek. Along the north bank, the existing grade is approximately 7 to 8 feet above the flow line of the channel. Throughout the western half of the Study Area, low lying areas extend approximately 400 feet north of the channel. Land use within this low lying area consists of commercial and industrial buildings, parking lots, and a portion of Mission Gorge Place. A large portion of the western half of the Study Area is located within a Flood Emergency Management Administration (FEMA) mapped Special Flood Hazard Area (SFHA). That is, north of the open channel portion of Alvarado Creek and west of the long RCB culvert located near the center of the Study Area, the mapped SFHA, or 100-year floodplain, generally extends north of the channel approximately 400 feet. In the central portion of the Study Area, Alvarado Creek is conveyed underground, many properties between Alvarado Creek and Mission Gorge Place are located within the 100-year SFHA. Along the south bank, the existing grade is approximately 11 to 15 feet above the flow line of the channel. Due to the higher elevation, the majority of properties along the southern bank of Alvarado Creek are located outside of the FEMA mapped floodplain. South of the channel, only a low-lying area near the Grantville Trolley Station is included in the SFHA. Applicable Flood Insurance Rate Maps (FIRMs) showing the Study Area are included in Attachment 1.

FIGURE 1-1 VICINITY MAP

2
Data Collection

The data collection for this Study included performing a topographic survey of the Study Area, reviewing as-built drawings, and conducting a site visit. In the context of the Hydrology Background Report, the purpose of the data collection was to acquire, filter, and organize information related to the Study Area in support of preparing hydraulic modeling of the existing condition. The results of these modeling efforts were evaluated to determine areas where hydraulic capacity is restricted and where improvements will provide increased capacity. The collected data was also used to create base geometry in which proposed channel geometries were overlaid.

2.1 TOPOGRAPHIC SURVEY

Topographic aerial imagery and survey data were collected by Rick Engineering Company (RICK) on June 29, 2016 and July 14, 2016, respectively. The horizontal basis of coordinates for this survey is referenced to the California Coordinate System of 1983 (CCS83) Zone 6, North American Datum of 1983 (NAD83), and elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD 29). Data from the surveys were compiled into computer aided drafting and design (CADD) files that included ground elevation data as well as key features, such as storm water conveyances (e.g., channels flowlines, culverts, etc.).

2.2 CITY OF SAN DIEGO REVIEW OF AS-BUILT PLANS

As-built plans for the Study were obtained from the City of San Diego Development Services Department (DSD). These plans were used to obtain data related to the horizontal and vertical alignment of Alvarado Creek. As-built plans were also used to determine constraints impacting proposed alternative designs. A summary of the as-built plans reviewed is provided in Table 2-1.

TABLE 2-1: SUMMARY OF CITY OF SAN DIEGO AS-BUILT DRAWINGS REVIEWED

As-Built Drawing	*Construction Completion Date*	*Relevant Data Obtained*	*Datum*[1]
18412-D	6/1/1980	Downstream portion of triple RCB culvert in Reach 4	MSL, City of San Diego
19862-D	11/10/1988	Upstream portion of triple RCB culvert in Reach 4, Reach 5, Reach 6	MSL, City of San Diego
10116-D	4/28/61	Right Bank, Reach 2	MSL, City of San Diego
21647-D	7/2/1984	Reach 1	MSL, City of San Diego
16540-D	3/17/1976	Reach 3	MSL, City of San Diego
10569-AD	9/1/1973	Sewer Line	MSL, City of San Diego

Notes:
[1]MSL is mean sea level, and this datum is synonymous with the NGVD 29 datum.

TABLE 2-2: FEMA SUMMARY OF BASE FLOOD ELEVATIONS FOR ALVARADO CREEK WITHIN THE GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY AREA

Cross Section	*Return Period Storm Event*	*Base Flood Elevations (Feet NGVD 29)[1]*	*Base Flood Elevations (Feet NAVD 88)[1]*
B	10-Year	70.5	72.6
	50-Year	75.4	77.5
	100-Year	75.6	77.7
C	10-Year	74.1	76.2
	50-Year	75.8	77.9
	100-Year	76.0	78.1
D	10-Year	77.9	80.0
	50-Year	78.4	80.5
	100-Year	78.5	80.6
E	10-Year	89.6	91.7
	50-Year	93.8	95.9
	100-Year	94.6	96.7
F	10-Year	93.6	95.7
	50-Year	95.7	97.8
	100-Year	96.4	98.5

Notes:
1. Add 2.1 feet to NGVD 29 elevations to obtain NAVD 88 elevations.

2.3 FLOOD INSURANCE RATE MAP REVIEW

The Flood Emergency Management Administration (FEMA) Flood Insurance Rate Maps (FIRMs) for Alvarado Creek were reviewed (2016 FIS, Panels 06073C1636H, 06073C1637H, 06073C1638H and 06073C1639H; Cross Sections B-F). These documents describe the Base Flood Elevations (BFEs) for Alvarado Creek in the Study Area. Table 2-2 provides a summary of the BFEs for the return periods listed in the FIRM. The cross section locations are shown on the applicable pages from the FIRM for Alvarado Creek, which are included in Attachment 1.

Topographic survey data was reviewed in order to determine the relevance of the FIRM data to the Study Area. It should be noted that the topographic survey obtained as part of this Study is reference to the NGVD 29, whereas the FIRM is referenced to the North American Vertical Datum of 1988 (NAVD 88). Per Table 12 of the Flood Insurance Study, San Diego County, California and Incorporated Areas, Volume 2 of 11, dated April 5, 2016, the conversion between the two datums is +2.1 feet. The elevations discussion throughout this report are referenced to the NGVD 29 datum, unless specific to FEMA BFE data (e.g., Column 4 in Table 2-2).

Based on the topographic survey data obtained as part of this Study, facilities adjacent to the north side of Alvarado Creek range in elevations between approximately 70.5 feet NGVD 29 at the downstream end (near FEMA Cross Section B), approximately 81 feet NGVD 29 near the middle of the Study Area (near FEMA Cross Section D), and 105.0 feet NGVD 29 the upstream end (near FEMA Cross Section F). Facilities adjacent to the south side of Alvarado Creek range in elevations between 76.0 feet, 81.0 feet, and 98.0 feet NGVD 29 for the similar downstream, central, and upstream locations, respectively. This is consistent with the FEMA FIRMs, which show the 100-year floodplain extending 250 to 400 feet north of Alvarado Creek for the majority of the Study Area.

2.4 SITE VISIT

A field site visit was performed on May 20, 2016 to determine the Manning's Roughness Coefficients, channel conditions, and channel properties. Alvarado Creek photos from the May 20, 2016 site visit are included in Attachment 2. Manning's Roughness Coefficients for the creek were determined based on field observations and to be consistent with Table 1-104.14A of the City of San Diego Drainage Design Manual, dated April 1984. Manning's Roughness Coefficients for urban areas were determined based on typical values using the FEMA model for the region. A Manning's Roughness Coefficient of 0.018 was used to represent concrete channel bottoms and side slopes. A Manning's Roughness Coefficient of 0.1 was used to represent dense vegetation along earthen bottomed sections of the channel. Parking lots and other areas of asphalt pavement were represented using a Manning's Roughness Coefficient of 0.045.

3 Hydrology

3.1 HYDROLOGIC ANALYSIS METHODOLOGY

Hydrologic data relevant to Alvarado Creek and the Study Area was obtained from the *Flood Insurance Study, San Diego County, California and Incorporated Areas, Volume 1 of 11* (FIS), prepared by FEMA, dated April 5, 2016. The referenced FIS provided 10-, 50- and 100-year frequency peak flow rates, which were then plotted on log-probability paper in order to determine the flow rate distribution. From this distribution, peak flow rates were determined for the 2-, 5- and 25-year design storm events.

In order to gain a better understanding of the watershed associated with the Study Area, the watershed was delineated. The overall watershed tributary to Alvarado Creek at Mission Gorge Road was delineated using the U.S. Geological Survey's (USGS) StreamStats 3.0 Program. This program delineated watersheds to a user specified location using USGS survey data. A simplifying and conservative assumption was made that the total peak flow enters the Study Area at the upstream end of the Study Area. Therefore, contributing flows from local watersheds within the Study Area were not quantified separately and the local watersheds were not delineated.

3.2 HYDROLOGIC ANALYSIS RESULTS

According to the FEMA FIS, the Alvarado Creek watershed at the confluence with the San Diego River is 14 square miles (8,960 acres). The peak design storm flow rates obtained from the FEMA FIS are shown in Table 3-1.

According to the USGS StreamStats 3.0 program, the Alvarado Creek watershed at Mission Gorge Road is approximately 13.7 square miles (8,737 acres). This location is approximately 1,200 feet upstream from the confluence of the San Diego River. The StreamStats generated watershed is consistent with the watershed listed in the FEMA FIS referenced in Section 2.0. The Alvarado Creek watershed extends from the Grantville Area approximately seven miles east to the Grossmont Area and generally consists of developed urban land uses. The majority of the uses within the watershed are residential, including multi-family and single-family housing. Residential uses combined with road rights-of-way account for more than half of the uses in the watershed. The watershed also includes a variety of other land uses including commercial, industrial, and open space. Lake Murray is located near the center of the watershed.

3.3 LOCAL DRAINAGE

Runoff from the Study Area is conveyed directly into Alvarado Creek. Typically, sheet flows from parking lots and rooftops is conveyed via trench drains into existing catch basins located at the corners of parking lots. These catch basins discharge directly to Alvarado Creek via existing underground storm drains. Based on a review of the available as-built drawings, underground storm drain pipes that discharge directly to Alvarado Creek within the Study Area range in size from 18 to 36 inches in diameter. This Hydrology Background Report is focused on identifying and correcting deficiencies with the existing design of Alvarado Creek, not the local storm drain network. Therefore, an in-depth analysis of the storm drain network within the Study Area was not performed as part of this Study.

TABLE 3-1: SUMMARY OF PEAK FLOW RATES

Storm Event	*Flow Rate (cfs)*	*Source*
2-Year	1,180	Interpolated
5-Year	2,050	Interpolated
10-Year	2,700	2016 San Diego FIS
25-Year	3,800	Interpolated
50-Year	4,500	2016 San Diego FIS
100-Year	5,100	2016 San Diego FIS

4
Hydraulic Analysis Existing Conditions

4.1 METHODOLOGY

Hydraulic analyses were performed for existing conditions to determine the capacity of the channel and culverts. The U.S. Army Corps of Engineers' Hydrologic Engineering Center's River Analysis System (HEC-RAS) v 4.10 software was used to perform the analyses. The HEC-RAS software is designed to perform one-dimensional hydraulic calculations for steady or gradually-varied flow in natural and constructed channels. The HEC-RAS software was used to calculate the water surface elevation (WSE). Hydraulic modeling using HEC-RAS was performed to quantify WSEs and the limits of flooding for the exiting conditions for Alvarado Creek. The HEC-RAS modeling was performed using a subcritical flow regime for the existing conditions using the 100-year frequency design storm (5,100 cubic feet per second). In addition to the 100-year frequency, the peak flow rates for various other storm event frequencies were analyzed in order to estimate the maximum hydraulic capacity of culverts and reaches (i.e., performed to determine the storm event frequency that results in overtopping of channel banks).

Channel Reaches

For the purposes of this Report, the Alvarado Creek was divided into seven reaches (referred to as six reaches and Mission Gorge Road in the Revitalization Study). The culvert at Mission Gorge Road is identified as Reach 0, and the portion of Alvarado Creek within the Study Area is identified as Reaches 1 through 6 moving from downstream to upstream. Reaches were determined by sections of the creek having consistent geometries and compositions. A summary of the reaches and associated channel types is shown in Table 4-1, and the extent of each channel reach is shown on Figure 4-1. The HEC-RAS model extended approximately 600 feet downstream from the triple RCB culvert underneath Mission Gorge Road. The downstream boundary condition for the HEC-RAS model was based on normal depth calculations.

Cross sections data were obtained using a HEC-GeoRAS, which is a utility for processing geospatial data. The location of each cross section was selected to appropriately capture changes in the channel geometry. Essentially a cross section was selected near upstream and downstream limits of each reach. The HEC-GeoRAS tool was then used to extract topographic data for each cross section for use in the HEC-RAS hydraulic modeling software. A hydraulic map showing the locations of the cross sections that were incorporated into the hydraulic modeling is provided in Attachment 4.

Below is a summary of the existing conditions at each reach:

REACH 0 (MISSION GORGE ROAD) – TRIPLE RCB CULVERT:

This reach consists of 11 feet wide by 8 feet high RCB culvert and a concrete lined trapezoidal channel. This reach extends approximately 600 feet downstream of the triple 11 feet wide by 8 feet high RCB underneath Mission Gorge Road. The channel has a bottom width of 29.5 feet and has a depth of 15 feet with 1.5 to 1 (horizontal to vertical) side slopes.

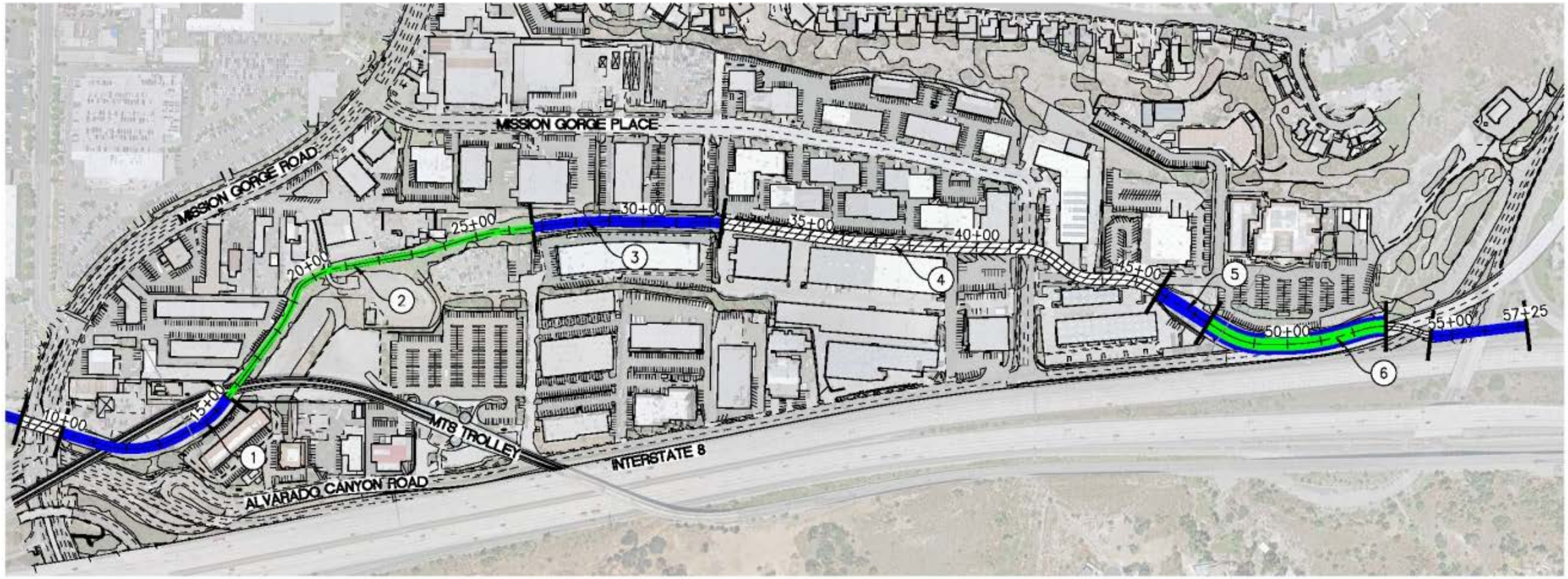
REACH 1 – CONCRETE LINED CHANNEL:

A concrete lined, trapezoidal channel extends approximately 550 feet from the upstream end of the triple 11-foot wide by 8-foot tall RCB underneath Mission Gorge Road to a point underneath the MTS Trolley Line where Alvarado Creek transitions to an earthen bottomed channel. Per As-Built Sheet 21647-D prepared by Simpson Engineering, dated July 2, 1984, and as verified with topography survey data the channel has a bottom width of approximately 29.5 feet. The banks are concrete with a slope of approximately 1.5 to 1 (horizontal to vertical). The north bank is approximately 8 feet in height. The south bank height varies but is generally approximately 12 feet.

TABLE 4-1: SUMMARY OF REACH DESIGNATIONS

Reach	*Channel Type*	*Bottom Width (feet)*	*Approximate Length (feet)*
0	Triple RCB	3 X 11 = 33	128
1	Concrete Trapezoidal	29.5	550
2	Vegetated	13 to 16	1,100
3	Concrete Trapezoidal	29.5	550
4	Triple RCB	3 X 11 = 33	1,340
5	Concrete Trapezoidal	45	175
6	Concrete & Vegetated Trapezoidal	44.5	550

FIGURE 4-1 ALVARADO CREEK REACHES



LEGEND

- OPEN CHANNEL – CONCRETE
- OPEN CHANNEL – VEGETATED
- OPEN CHANNEL – VEGETATED BOTTOM, CONCRETE SIDES
- REINFORCED CONCRETE BOX CULVERT
- (1) CHANNEL REACH DESIGNATION BY THIS STUDY
- 20+00 CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY)

N

0 300' 600'

REACH 2 – EARTHEN CHANNEL:

This reach is an earthen, trapezoidal channel with a length of approximately 1,100 feet. The bottom width varies between approximately 13 and 17 feet. Similar to Reach 1, the north bank is approximately 8 feet in height, and the south bank height varies but is generally approximately 12 feet. The bank slopes are generally approximately 2 to 1 (horizontal to vertical). Near the middle of this reach, a small paved access road crosses the channel, functioning as a grade control structure. Downstream of the access road, there is a rapid drop in elevation of approximately 0.5 feet over approximately 20 feet. The vegetation downstream of the access road is mature and consists of palm trees intermixed with riparian woody vegetation. The vegetation upstream of the access road consists primarily of tulles vegetation with some riparian vegetation. At the upstream limits of this vegetated reach, the channel becomes wider as it transitions to a concrete channel.

REACH 3 – CONCRETE LINED CHANNEL:

This reach is a concrete lined trapezoidal channel. This reach extends approximately 550 feet from the upstream end of Reach 2 to the start of the triple 11-foot wide by 8-foot tall RCB culvert underneath the central part of the Study Area. Pursuant to As-Built Sheet 16540-D, prepared by Rick Engineering Company, dated March 17, 1976, and as verified with topographic survey data the channel has a bottom width of approximately 29.5 feet. The side slopes have a height of approximately 11 feet and a slope of approximately 1.5 to 1 (horizontal to vertical).

REACH 4 – TRIPLE RCB CULVERT:

This reach consists of a triple 11-foot wide by 8-foot high RCB culvert. This culvert extends approximately 1,340 feet underneath the central part of the Study Area. Based on a review of the as-built drawings, this culvert was constructed as part of two separate projects. As Built Plan 18412-D, prepared by the City of San Diego and dated April 19, 1979, shows that the downstream or western-most 900 feet of the culvert was constructed first. This portion of the culvert is nearly straight with only minor angles. As Built Plan 19862-D, prepared by Deacon Associates and prepared March 9, 1981, shows that the upstream 440 feet of culvert was constructed later. This section of the culvert includes three approximately 45-degree angles in order to align the culvert underneath an existing access road.

REACH 5 – CONCRETE LINED CHANNEL:

A concrete lined trapezoidal channel extends approximately 175 feet upstream from the triple 11-foot wide by 8-foot tall RCB culvert to a point where Alvarado Creek changes to an earthen bottomed channel. Per As Built Sheet 19862-D, prepared by Deacon Associates, dated March 9, 1981, and as verified by topographic data, this reach has bottom width of approximately 44.5 feet and approximately 1.5 to 1 (horizontal to vertical) side slopes with heights of approximately 7 feet. A 60-foot long warped wingwall with an approximately 5 degree taper transitions the open channel into the triple RCB culvert at the downstream end of the reach.

REACH 6 – EARTHEN BOTTOM, CONCRETE SIDE SLOPE CHANNEL:

This reach consists of an earthen bottomed and concrete lined side slopes, trapezoidal channel. This reach extends approximately 480 feet upstream to a triple 11-foot wide by 8-foot tall RCB culvert located underneath the southbound Waring Road onramp to Westbound I-8. Per As Built Plan 19862-D, prepared by Deacon Associates, dated March 9, 1981, and as verified by topographic data, this reach has a base width of approximately 44 feet and 1.5 to 1 (horizontal to vertical) concrete side slopes with heights of approximately 9 feet.

4.2 EXISTING CONDITION RESULTS

The results of the hydraulic modeling indicate that the Alvarado Creek, in the existing condition, does not have adequate capacity to convey the 100-year frequency design storm event through the Study Area without significant flooding. Reach 2 due to having a narrow cross section and dense vegetation is the most restrictive reach within the Study Area and does not have adequate capacity to convey the 2-year frequency design storm. In general, the concrete lined reaches, without the effects of downstream restrictions, have the capacity to convey approximately the 10-year frequency design storm event, and the culverts have the capacity to convey approximately the 25-year frequency design storm event. For ease of discussion, the existing hydraulic capacity conditions of Reaches 0 through 6, as identified by this Study, are discussed individually below:

REACH 0 (MISSION GORGE ROAD) – TRIPLE RCB CULVERT:

Events in excess of the 25-year frequency storm event will exceed the capacity of the Mission Gorge Road culvert and cause a backwater condition immediately upstream (potential flooding). The backwater condition caused by the Mission Gorge Road triple RCB geometry during the 50-year frequency storm event will result in a water surface elevation above the northbound Mission Gorge Road sidewalk and pavement surface, but not the southbound pavement surface. The 100-year frequency storm event will result in an additional approximately 1.5 feet of water depth in comparison to the 50-year storm event and thus will result in the complete inundation of Mission Gorge Road, adjacent Alvarado Canyon Road, as well as extensive flooding of the area north of Alvarado Creek and east of Mission Gorge Road.

REACH 1 – CONCRETE LINED CHANNEL:

The backwater effects from the Mission Gorge Road culvert result in water depths significantly in excess of the north channel bank along Reach 1 during the 25-, 50-, and 100-year frequency design storm events. The hydraulic modeling shows that the 10-year frequency design storm event results in a channel depth of approximately 8.5 feet, which would overtop the north bank in some areas (bank is as low as 7.5 feet above the channel bottom) but flooding from the channel would be limited to the upland areas along bank (i.e., only extend approximately 10 to 20 feet outside of the channel bank). Without the backwater effect caused by the Mission Gorge Culvert (i.e., if the culvert was improved to have adequate capacity), the adjacent concrete trapezoidal channel (Reach 1) would flow at a depth of about 10 feet for the 100-year event. As previously stated, some of the top of bank elevations along the north side of this reach have a height of approximately 7.5 feet, and thus there would still be flooding along this reach for the 100-year event if the downstream culvert was improved without also implementing improvements to Reach 1, albeit significantly less flooding compared to the same event without improving the capacity of the Mission Gorge Road culvert.

REACH 2 – EARTHEN CHANNEL:

The 1,100 feet of vegetated channel (Reach 2) has by far the least hydraulic capacity of the entire channel system within the Study Area. The 2-year return period storm event flow will cause some flooding through this area. The degree of flooding during smaller storms, such as the 2-year event, is related to the resistance to flow imposed by the vegetation. Or in other words, heavy vegetation will result in slightly more flooding compared to the maintained condition. Assuming regularly maintained vegetation, the reach will have minor flooding along the north side of the channel for small events. The 5 year and greater flows will cause flooding along the north side of the channel regardless of the maintenance condition of this reach. Flows in excess of about the 25-year event will result in flooding along the south side of the channel along the reach in areas where elevations are relatively low. The main factors contributing the low hydraulic capacity of this reach include the narrow bottom width, low bank height (north side), and fairly flat topography along the channel (north side).

REACH 3 – CONCRETE LINED CHANNEL:

Reach 3 has a similar channel bottom width and composition as Reach 1. If the downstream channel reaches were to be improved to eliminate the backwater condition during the 100-year flow, Reach 3 would flow at a depth of approximately 10 feet, which means the flow would be contained in the channel in the upper approximately 350 feet and over top the north bank of the lower 200 feet of the reach. Under the current conditions, the elevated flow depths caused by the Reach 2 backwater condition will result in elevated water depths along Reach 3 and flooding north of the channel during 25-, 50-, and 100-year flows.

REACH 4 – TRIPLE RCB CULVERT:

The approximately 1,340 feet long triple RCB culvert located near the middle of the Study Area has adequate capacity to convey up to the 25-year return period storm event flow. The 50- and 100-year flows will result in water overtopping the upstream culvert inlet. During these larger storm events, flows not conveyed within the culvert will travel west down the access road, onto Mission Gorge Place, and continue down Mission Gorge Place before finding the downstream open channel before Mission Gorge Road. There is a sump along Mission Gorge Place, located approximately 600 feet east of Mission Gorge Road, and water will remain within the sump area of Mission Gorge Place until the water in the channel subsides allowing the sump to drain. Hence, the 50- and 100-year return period event flows that over top the culvert inlet will cause much flooding of the immediate access road and a significant portion of Mission Gorge Place; essentially Mission Gorge Place between the alignment of the culvert and above-descripted sump.

REACH 5 – CONCRETE LINED CHANNEL:

The concrete channel directly upstream of the Reach 3 triple RCB culvert would have adequate capacity to convey 100-year flow if the triple RCB culvert did not create a backflow condition during the larger events (i.e., if the triple RCP culvert was improved). In the existing configuration (with backwater) the 50- and 100-year flows will cause flooding along this channel reach upstream of the long triple RCB culvert.

REACH 6 – EARTHEN BOTTOM, CONCRETE SIDE SLOPE CHANNEL:

Assuming no backwater condition (downstream reaches improvement), the vegetated bottom, concrete side slope Reach 6 channel near the east Study Area boundary would have a hydraulic capacity adequate to convey between the 5-year and 25-year event depending on the condition of the vegetation (maintained verses unmaintained, respectively). For the no backwater condition, the 50- and 100-year flow will result in some flooding along each side of Reach 6 with the severity of flooding dependent on the vegetation condition at the time of the storm event. For the existing geometry scenario, the elevated 50- and 100-year flow depths at the inlet of the Reach 4 triple RCB culvert will result in flooding along both side of Reach 6; however, the steep topography (parking lot) on north side of the channel limits the extents of the flooding to approximately 80 feet outside the channel banks. On the south side of the channel, the slopes and walls associated with Highway 8 limit the extents of the flooding.

A hydraulic map showing the locations of the cross sections that were incorporated into the hydraulic modeling along with table of model output data are provided in Attachment 4.

5 Hydraulic Analyses Proposed Conditions

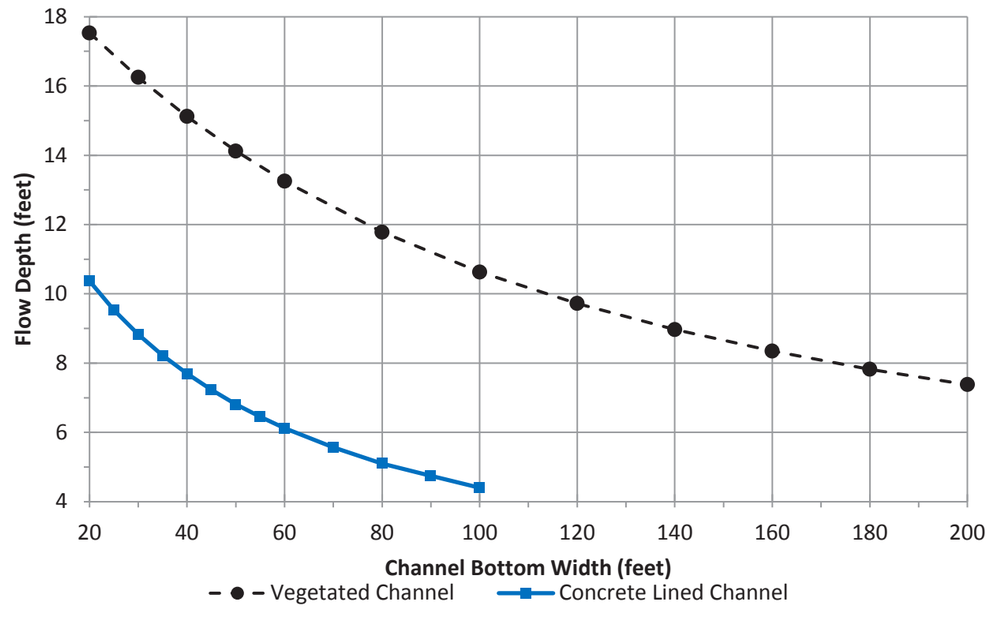
5.1 GENERAL APPROACH AND METHODOLOGY

The hydraulic analyses of the proposed condition included first formulating alternative designs, evaluating the alternative designs, and then preparing and analyzing a preferred alternative design. The existing condition hydraulic modeling results identified several locations with deficient hydraulic capacity. Alternative designs were formulated by proposing improvements that may enhance the hydraulic capacity at the locations where existing conditions deficiencies were identified. In order to estimate the open channel geometry that will be required to achieve the desired water surface elevations, normal depth calculations were performed. As feasible, the results of the normal depth calculations were incorporated into the proposed alternatives. Hydraulic modeling of each alternative was performed using the same approach as described for the existing conditions (see Section 4.1).

5.2 PRELIMINARY GEOMETRY DESIGN CALCULATIONS

Preliminary design calculations were performed to estimate the minimum channel widths associated with various channels. The results of these calculations were used, in combination with other data, such as site area constraints, to formulate proposed geometry for the alternative designs. Manning's Equation calculations, also referred to as normal depth calculations, were performed to determine the water depth necessary to convey the 100-year frequency design storm event flow rate of 5,100 cubic feet per second for various channel widths. Two channel linings were considered that included a fully concrete-lined channel and a fully vegetated channel. Manning Roughness Coefficient values of 0.018 and 0.1 were assumed for the concrete lined and vegetated channels, respectively. A side of 1.5 to 1 (horizontal to vertical) was assumed for the concrete and 3 to 1 (horizontal to vertical) for the vegetated. A longitudinal slope of 0.35 percent was assumed based on the approximate average longitudinal slope for Reaches 1, 2, and 3. Figure 5-1 shows the results of these preliminary calculations for the concrete lined and vegetated channels.

FIGURE 5-1 DEPTH VERSUS WIDTH, TRAPEZOIDAL CHANNEL



The results of the preliminary design calculations were used, in combination with other factors (explained below), to determine the appropriate channel width for the alternative designs. The concreted lined Reaches 1 and 3 have bottom width of approximately 30 feet each in the existing. Based on the stated assumptions, a concrete lined channel with a bottom width of 30 feet results in a channel depth of approximately 9 feet. In contrast, in order to achieve a depth of approximately 9 feet, a vegetated channel requires a bottom width of approximately 140 feet. This assumed vegetated channel geometry, 140-foot bottom width and a 30-foot side slope on each side, would result in total channel width, bank top of slope to bank top of slope, of approximately 200 feet. Due to limited area available within the Study Area, a 200-foot wide vegetated channel would not be feasible, because there would not be adequate remaining area for other improvements, such as infrastructure, green space areas, and buildings. Therefore, based on the preliminary results, the proposed channel should consist of either fully concrete lined channel or a reasonable combination of concrete and vegetation (i.e., concrete on one side and vegetation on the other). The existing conditions along Reach 2 includes sensitive wetland vegetation communities, and thus proposing a fully lined concrete channel through Reach 2 would pose great challenges re-

lated to environmental permitting. When considering these other factors of site area constraints and environmental permitting in combination with the preliminary design calculations, channel improvements, particularly for Reach 2, must include a concrete lined portion to provide much of needed hydraulic conveyance and a vegetated portion to protect and enhance the existing wetland vegetation.

5.3 FORMULATION OF ALTERNATIVES DESIGNS

Specific alternatives were formulated based on the channel deficiencies, identified as part of the existing condition hydraulic modeling, and the results of the preliminary design calculation. Initially, three alternatives were formulated that included enhancements to Reaches 1, 2, and 3 as well as improvements to the RCB culverts at Mission Gorge Road and near the center of the Study Area. Hydraulic modeling of these alternatives were performed to verify that, in comparison to the existing conditions, the alternative designs will provide improved hydraulic capacity and reduced water surface elevations. The three alternative designs were presented to the public through a number of outreach workshops. The three alternative designs were also presented to various City departments. Based on a combination of feedback from the public outreach and coordination with City departments, a preferred alternative design was formulated. Hydraulic modeling was performed for the preferred alternative design and is presented in this Study.

Initial Alternative Designs

The Alternative Designs 1, 2, and 3 included proposing channel widening, a tiered floodable control green space within the creek corridor (approximately four feet above the channel bottom), and a multi-use trail that includes pedestrian and bicycle bridges along the creek corridor. A description of each alternative is detailed below.

ALTERNATIVE DESIGN 1

This alternative design includes the widening of channel bottoms in Reaches 1 through 3 and the addition of an underground culvert adjacent to the existing culvert in Reach 4. A floodable linear park with multi-use trails is proposed adjacent to the creek and pedestrian/bicycle bridges over the creek are proposed in Reaches 1 through 3. A recreational corridor is incorporated into the alternative design over the existing and proposed culverts along Reach 4. No changes are proposed to Reaches 5 and 6 in this alternative design.

ALTERNATIVE DESIGN 2

This alternative design consists of the widening of channel bottoms in Reaches 1 through 3 and the addition of an underground culvert adjacent to the existing culvert in Reach 4. Floodable pocket parks are included to the north and south of the Creek in Reaches 1 and 2. Multi-use trails are incorporated adjacent the creek, and pedestrian/bicycle bridges over the creek are proposed in Reaches 1, 2, and 3.

ALTERNATIVE DESIGN 3

This alternative design includes the widening of channel bottoms in Reaches 1 through 3 and the addition of a new open channel adjacent to the existing underground culvert in Reach 4. A large floodable park is included north of Reach 1, and a large floodable park is incorporated south of Reach 2 and 3. Multi-use trails are proposed adjacent to the creek, and pedestrian/bicycle bridges over the creek are proposed along Reaches 1 through 4.

Initial Alternative Designs Results

Alternative Designs 1, 2, and 3 propose widening to the channel bottoms in Reaches 1, 2, and 3 as well as enhancements to Reach 4, and thus hydraulic modeling indicates that each of these alternatives provides increased hydraulic capacity. However, the hydraulic modeling also indicates very little decrease to the water surface elevations along Reach 1 and approximately mid-span along Reach 2. The elevated water surface along these reaches is caused by the lack of capacity of the Mission Gorge Road culvert. As such, a significant result of the preparing and analyzing the initial three initial alternative designs is identifying that, without improvement to Mission Gorge Road, little benefit in terms of reduced water surface elevations will be achieved in Reach 1 and east to about mid-span of Reach 2.

Preferred Alternative Design

The Preferred Alternative Design for Alvarado Creek was formulated based on the combination of the results of the initial alternative design modeling, public outreach feedback, and coordination with various City departments. Based on the coordination efforts, assumptions were incorporated into the Preferred Alternative. One assumption is that a 10-foot wide pedestrian trail shall be aligned above the top of slope of the north channel bank. A second assumption is that in areas of existing or proposed wetland vegetation, a 20-foot buffer must be incorporated along the wetland habitat. This assumption is primarily relevant to the north side of Reach 2. The Preferred Alternative Design is shown in Attachment 3. Below is a summary of the proposed Alvarado Creek improvements for each reach through the Study Area:

REACH 0 (MISSION GORGE ROAD) – EXISTING TRIPLE RCB CULVERT

The Preferred Alternative Design includes adding a 15 feet wide by 8 feet high RCB culvert adjacent to and north of the existing triple 11 feet wide by 8 feet high RCB culverts through Mission Gorge Road in order to improve the hydraulic capacity of the existing structure. The geometry of this additional culvert was determined through hydraulic modeling. The assumed hydraulic modeling did not consider a geometry reduction as result of potential debris loading, and doing so would result in a larger geometry being required. The area immediately downstream and upstream of the proposed culvert will require modifications, such as a warped wingwall in order to transition to the proposed wider geometry.

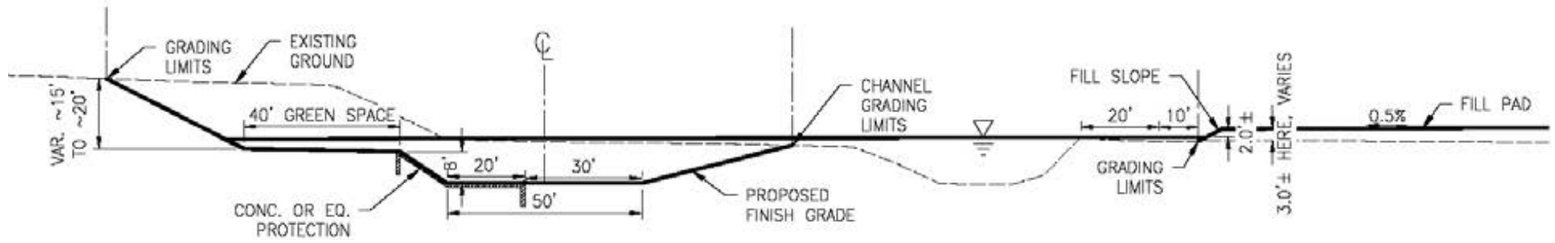
REACH 1 – CONCRETE LINED CHANNEL

The existing Reach 1 geometry, approximately 29.5 feet bottom wide concrete channel, has a fairly good hydraulic capacity, and thus only slight modifications were incorporated into Reach 1 as part of the Preferred Alternative Design. Development within the properties on the north side of Alvarado Creek will require fill in order to meet the City's requirement that the first floor elevation of proposed buildings be at least 2 feet above Base Flood Elevations. As such, the Preferred Alternative Design assumed a 10-foot wide pedestrian trail adjacent to the north bank top of slope followed by 2 to 1 (horizontal to vertical) slope up to a fill pad. The elevations of the fill pad were determined based on water surface elevations, which were determined through hydraulic modeling of the Preferred Alternative Design. The fill pad was assumed to be two feet above the 100-year frequency storm event water surface elevation and projected upward at a slope of 0.5 percent. When the depth of flow is above the north channel bank top of slope, the pedestrian path and fill slope and pad geometries become part of the overall channel (i.e., essentially act like an extension of the north channel bank). As such, these geometries were incorporated into the hydraulic modeling. Modifications to the channel width are required at the downstream and upstream limits of the Reach 1 in order to transition to the wider geometries proposed within Reach 0 and Reach 2, respectively.

REACH 2 – EARTHEN CHANNEL

The Preferred Alternative Design included the widening of Reach 2. The hydraulic modeling of the existing conditions indicates that Reach 2 has limited hydraulic capacity relevant to the other reaches and thus significantly restricts flow and results in elevated water surface elevations. Reach 2 also contains sensitive wetland vegetation that should be protected wherever possible (i.e., not impacted by proposed improvements). In order to accomplish the objectives of adding hydraulic capacity while minimizing impacts to the exiting sensitive wetland vegetation, The Preferred Alternative Design for Reach 2 consists of extending the channel geometry south of the existing channel to improve flood control. That is, a channel with a bottom width of 50 feet is proposed in an alignment slightly south of the existing Reach 2 alignment. The longitudinal slope along this shifted alignment is approximately 0.35 percent. The northern 30 feet of this channel is proposed as an earthen with riparian vegetation and 4 to 1 (horizontal to vertical) side slopes that daylight in the vicinity of the existing channel southern limits. The southern 20 feet of the channel is proposed as concrete lined with 1.5 to 1 (horizontal to vertical) side slopes. South of the concrete lined channel, at an elevation of approximately 8 feet above the channel bottom, a floodable green space is proposed. North of the existing channel, a 20-foot buffer zone and 10-foot pedestrian path was assumed. North of pedestrian path a fill slope and fill pad was incorporated into the hydraulic modeling as described in Reach 1. Figure 5-2 shows a typical cross section for Reach 2 of the Preferred Alternative Design.

FIGURE 5-2 REACH 2 PREFERRED ALTERNATIVE DESIGN TYPICAL CROSS SECTION



REACH 3 – CONCRETE LINED CHANNEL

Similar to Reach 1, no changes were proposed to the typical cross section of Reach 3 as part of the Preferred Alternative Design. A 10-foot pedestrian path, fill slope, and fill pad were incorporated into hydraulic modeling north of the existing north channel bank top of slope (same assumptions as described in Reach 1). Modifications, including a wider bottom width, at the upstream and downstream limits of Reach 3 were included to transition to the wider Reach 2 and Reach 4 geometries, respectively.

REACH 4 – TRIPLE RCB CULVERT

The Preferred Alternative Design for Reach 4 including adding a 15 feet wide by 8 feet high RCB culvert adjacent to and north of the existing triple 11 feet wide by 8 feet high RCB culvert in order to increase culvert capacity. The geometry of this additional culvert was determined through hydraulic modeling. The assumed hydraulic modeling did not consider a geometry reduction as result of potential debris loading, and doing so would result in a larger geometry being required.

REACH 5 – CONCRETE LINED CHANNEL

With the exception of the widening the downstream connection with Reach 4 to create a transition, no improvements are proposed to Reach 5. This reach is fairly steep, and hydraulic modeling indicates that Reach 5 will have adequate hydraulic capacity to convey the 100-year frequency storm event if the hydraulic capacity of Reach 4 is adequately improved.

REACH 6 – EARTHEN BOTTOM, CONCRETE SIDE SLOPE CHANNEL

Hydraulic modeling indicated that Reach 6 does not have adequate capacity to convey the 100-year frequency design storm event within the channel banks; however, this modeling also shows that the resulting flooding does not inundate existing structures (i.e., within the Study Area, the flooding is limited to a parking lot). As such no improvements were proposed to Reach 6 as part of the Preferred Alternative Design.

Preferred Alternative Design Results

The hydraulic modeling of the Preferred Alternative Design indicates reduced water surface elevations, at varying magnitudes in comparison to the existing conditions, for Reaches 0 through 5. The most significant improvements are observed for Reach 1 where, on average, water surface elevations are reduced by approximately five feet for the 100-year frequency design storm event. Along Reach 2 water surface elevations are reduced between approximately one to two feet. Water surface elevations along Reach 3 are also reduced by, on average, approximately one foot. Along Reach 4, the hydraulic modeling indicates that the 100-year flow will be entirely conveyed within underground culverts. The Reach 4 improvements result in a significant decrease in the water surface elevations along Reach 5. No improvements are proposed in Reach 6; however, the proposed improvements to Reach 4 result in reduction of the water surface elevations at the downstream limits of Reach 6. The results of the hydraulic modeling of the Preferred Alternative Design are provided in Attachment 4.

The hydraulic modeling results were used to prepare inundation maps. Geographic Information Software (GIS) was used to prepare the inundation maps. The software compared the HEC-RAS generated water surface elevations to the existing and assumed topography for the existing condition and Preferred Alternative Design, respectively, in order to generate geospatial depths and limits of flooding. The inundations maps are provided in Attachment 5.

6 Summary

The City is preparing a Study to develop and evaluate scenarios for the portion of the Alvarado Creek channel in the Grantville area, which is located near the Grantville Trolley Station. Enhancements to Alvarado Creek have the potential to reduce the risk of flooding, improve natural habitat, and provide various multiple benefits including additional green space and pedestrian connectivity (i.e., transform Alvarado Creek into an amenity). Thus, enhancements to Alvarado Creek may facilitate redevelopment of the properties along the creek and are consistent with the Navajo Community Plan. This Hydrology Background Report was prepared as part of the overall planning in order to evaluate specific development scenarios and provide general recommendations to improve the hydraulic conveyance and reduce water surface elevations of Alvarado Creek through the Study Area.

Data collection was performed in order to get a better understanding of the Study Area and to facilitate the preparation for the hydraulic models. The data collection included performing a topographic survey of the Study Area, reviewing as-built drawings, review FEMA data, and conducting a site visit. In the context of the Hydrology Background Report, the purpose of the data collection was to acquire, filter, and organize information related to the Study Area in support of preparing hydraulic modeling of the existing condition.

The determination of peak flow rates for this Study was based on data obtained from FEMA FIS. Additionally, the USGS StreamStats 3.0 Program was utilized to gain watershed related data. The FEMA FIS data is consistent with the data obtained from the StreamStats Program. The Alvarado Creek watershed at Mission Gorge Road is approximately 13.7 square miles (8,737 acres). The 100-year frequency peak design storm flow obtained from the FEMA FIS and utilized in the Study is 5,100 cubic feet per second (see Table 3-1 for addition design storm events).

For the purposes of this Study, the Alvarado Creek was divided into seven reaches. The culvert at Mission Gorge Road is identified as Reach 0, and the portion of Alvarado Creek within the Study Area is identified as Reaches 1 through 6 moving from downstream to upstream. Reaches were determined by sections of the creek having consistent geometries and compositions (see Table 4-1).

Hydraulic modeling of the existing condition indicated that in general the system does not have adequate capacity to convey the 100-year frequency storm. In particular, Reach 2 has the least hydraulic capacity. The area of Reach 2 includes sensitive wetland habitat, which results in potential limitations on what may be proposed to improve hydraulic conveyance through this reach. In general, impacts to sensitive wetland habitat should be avoided as much as possible. The hydraulic modeling of the existing condition also indicates that the Mission Gorge Road culvert and the culvert located within the Study do not have the capacity to convey the 100-year frequency storm event (each has the capacity to convey approximately the 25-year frequency storm event). Both of these culverts will result in backwater during large storm events (e.g., 50- and 100-year frequency storm events) with the Mission Gorge Road culvert contributing to the inundation of Mission Gorge Road as well as several properties located along Reaches 1 and 2 north of Alvarado Creek.

The identified existing condition deficiencies, preliminary hydraulic design calculations results, the constraint of having limited property (area), and the potential location multi-use features were considered as part of the process to formulate three initial alternative designs. The three alternative designs were presented to the public through a number of outreach workshops and also to various City departments in order to solicit feedback. Based on a combination of feedback from the public outreach and coordination with City departments, a preferred alternative design was formulated that included improvements to the Mission Gorge Road and on-site culverts and widening Reach 2 (see Figure 5-2). Hydraulic modeling was performed for the Preferred Alternative Design, and the results indicate that the water surface elevations will be reduced, at various magnitudes, across the Study Area. The most significant reductions in water surface elevations will be along Reach 1 and Reach 2 with reductions, on average, of approximately 5 and 1.5 feet, respectively. The hydraulic modeling workmap and results are provided in Attachment 4, and inundation mapping of the existing and proposed conditions is provided in Attachment 5.

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Attachments

Attachments are provided on the following pages in the order listed below.

Attachment 1: Applicable Flood Insurance Rate Maps for Alvarado Creek

Attachment 2: Site Photos

Attachment 3: Existing Conditions and Preferred Alternative Design Exhibits

Attachment 4: Model Workmaps and Output Tables

Attachment 5: Inundation Maps

Attachment 6: 30% Design Drawings

Attachment 7: Fill Depth Map

ATTACHMENT 1 - APPLICABLE FLOOD INSURANCE RATE MAPS FOR ALVARADO CREEK

NOTES TO USERS

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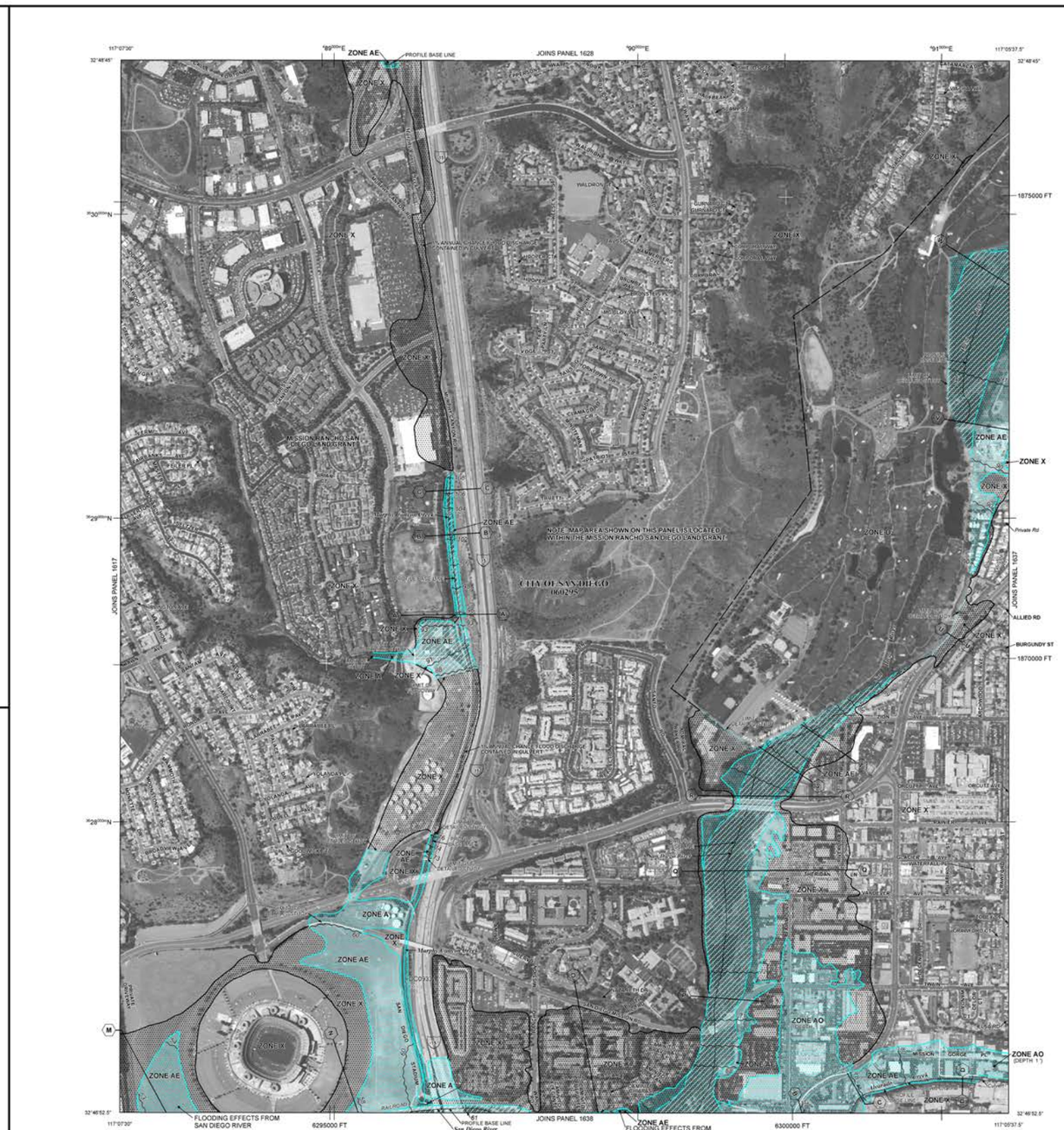

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
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- ZONE A99 — Areas to be protected from 1% annual chance flood event by a federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 (EL 987) — Base Flood Elevation line and value; elevation in feet* / Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988
- A — A — Cross section line
- 23 — 23 — Transect line
- 87°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 16, 1999

May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

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MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1636H

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA

AND INCORPORATED AREAS

PANEL 1636 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1636	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1636H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

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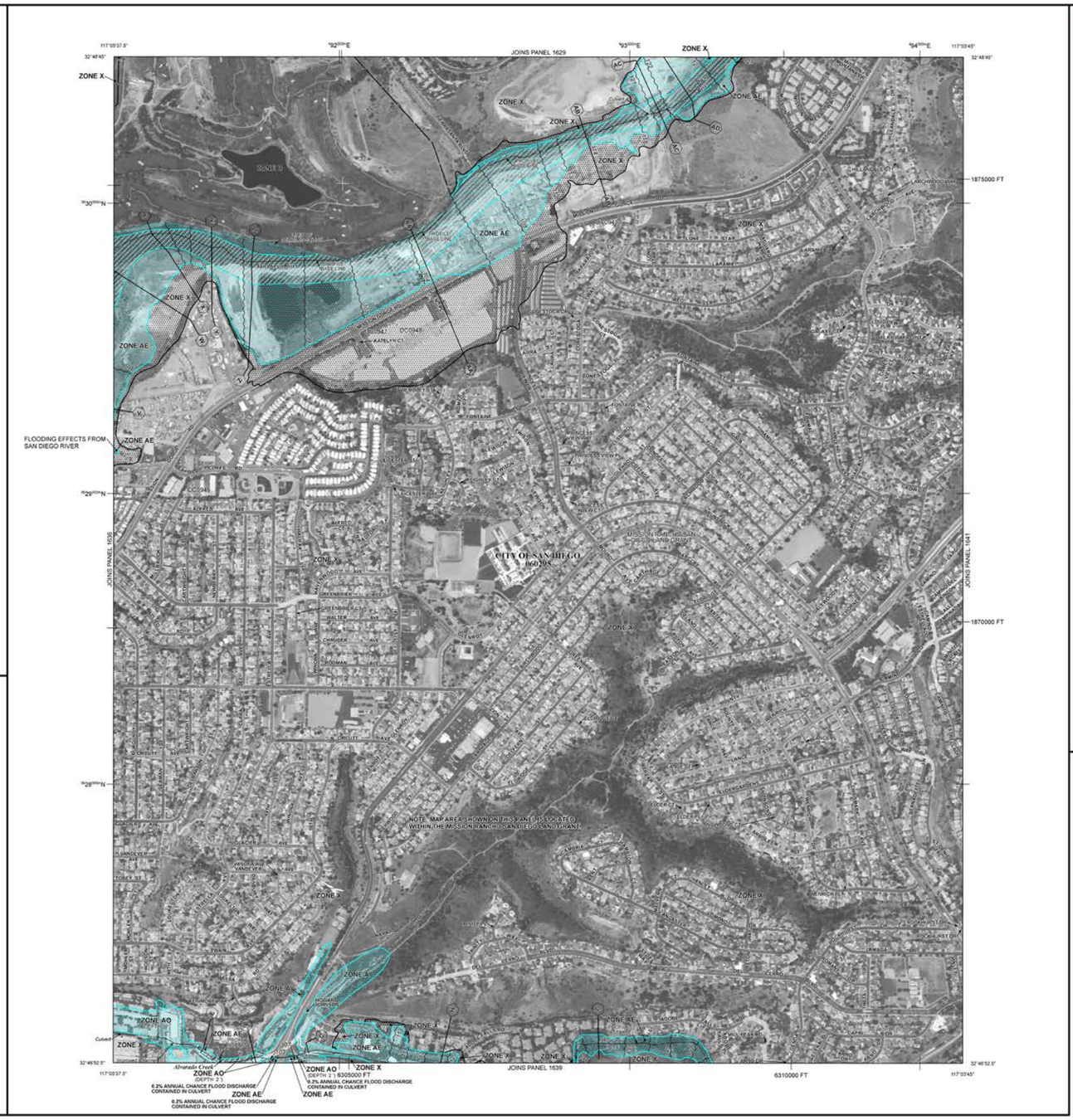

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NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1637H

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 1637 OF 2375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1637	H

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MAY 16, 2012

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If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip/.

The **"profile base lines"** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the "profile base line", in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** No Base Flood Elevations determined.
- **ZONE AE** Base Flood Elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** Areas to be protected from 1% annual chance flood event by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 4275000mE — 1000-meter Universal Transverse Mercator grid ticks, zone 11
- 6000000 FT — 5000-foot grid values: California State Plane coordinate system, Zone VI (FIPSZONE = 406), Lambert projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 19, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 16, 1999

May 16, 2012 – to update corporate limits, to add roads and road names, to incorporate previously issued Letters of Map Revision, and to update map elevations to North American Vertical Datum of 1988.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
150 0 150 300 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1638H

FIRM

FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1638 OF 2375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1638	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1638H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 11. The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242** or visit its website at http://www.ngs.noaa.gov/.

Base map information shown on this FIRM was provided in digital format by the USDA National Agriculture Imagery Program (NAIP). this information was photogrammetrically compiled at a scale of 1:24,000 from aerial photography dated 2009.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the *Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988
- A — A — Cross section line
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MAP SCALE 1" = 500'

250 0 250 500 750 1,000 FEET
100 0 100 200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1639H

FIRM

FLOOD INSURANCE RATE MAP
SAN DIEGO COUNTY, CALIFORNIA
AND INCORPORATED AREAS

PANEL 1639 OF 2375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

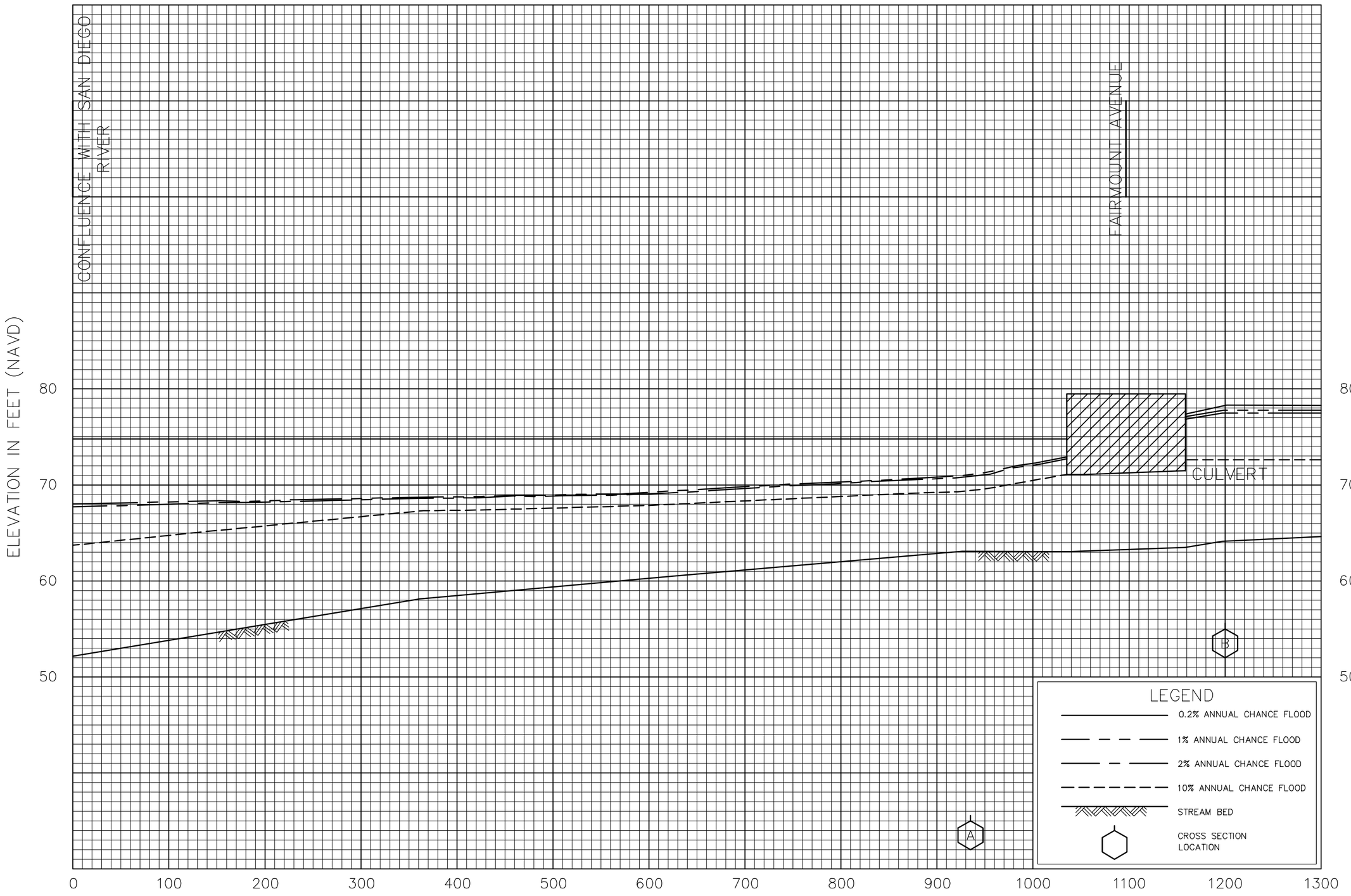
COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO, CITY OF	060295	1639	H

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
06073C1639H

MAP REVISED
MAY 16, 2012

Federal Emergency Management Agency



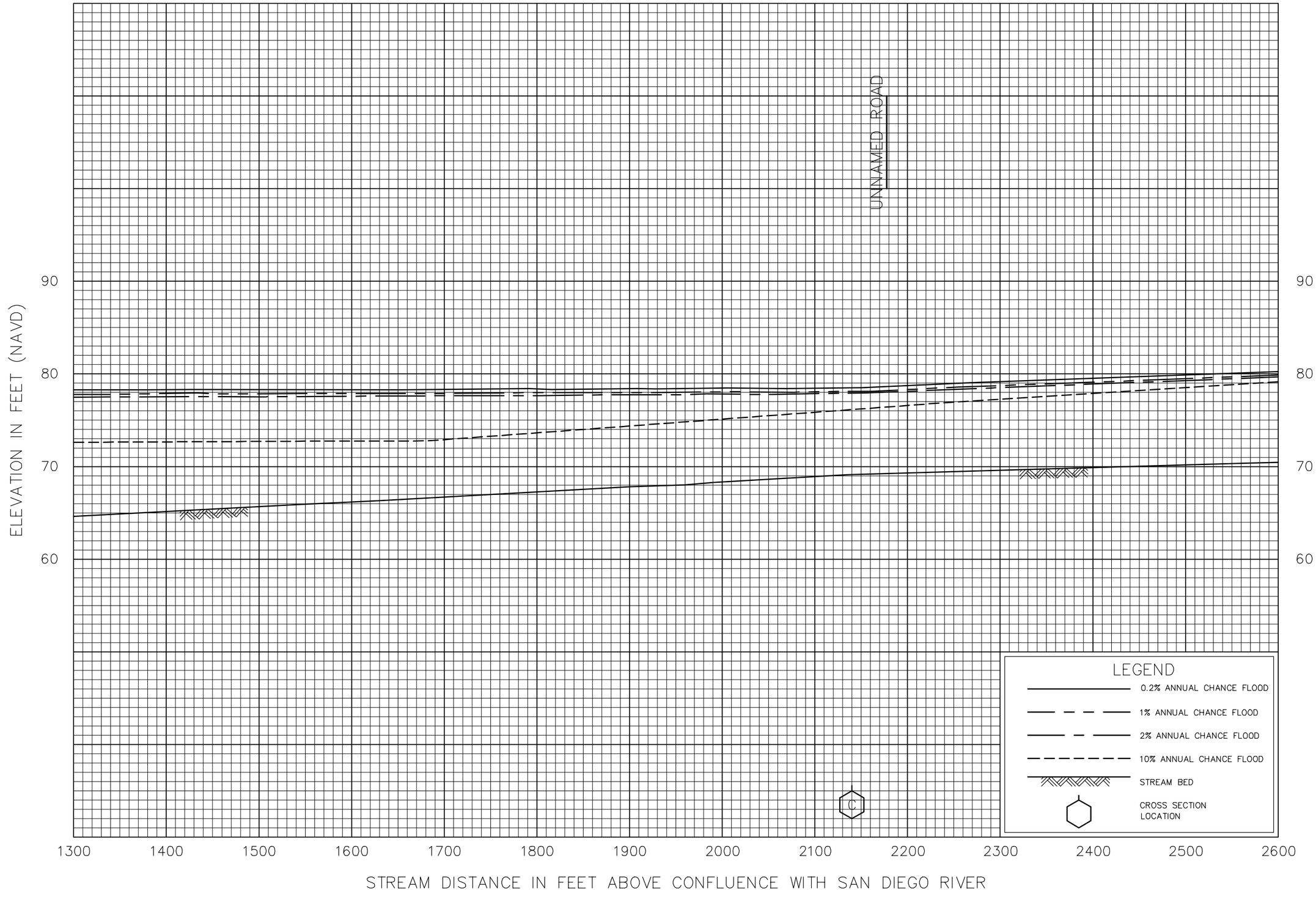
FLOOD PROFILES

ALVARADO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)

12P



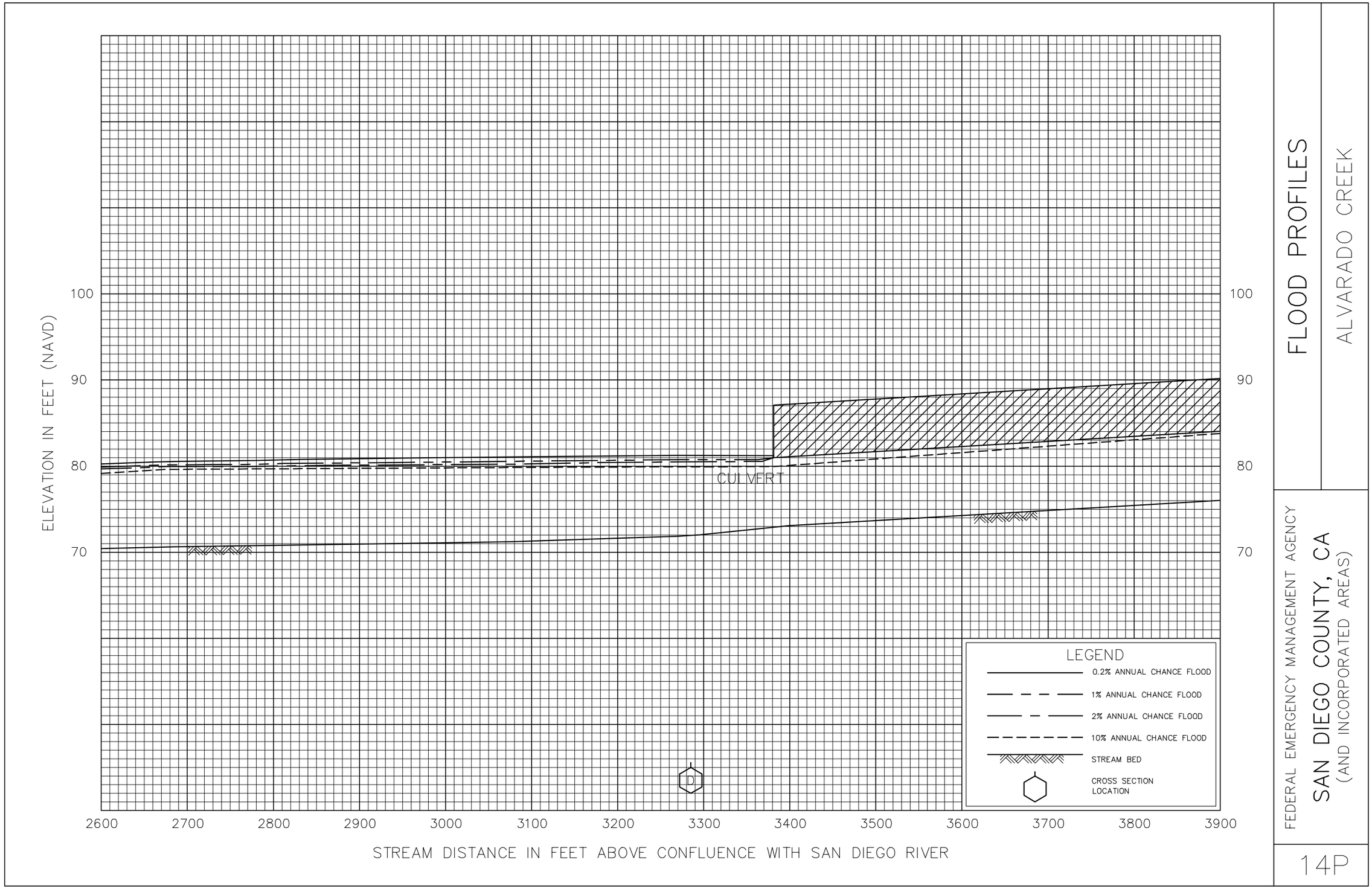
FLOOD PROFILES

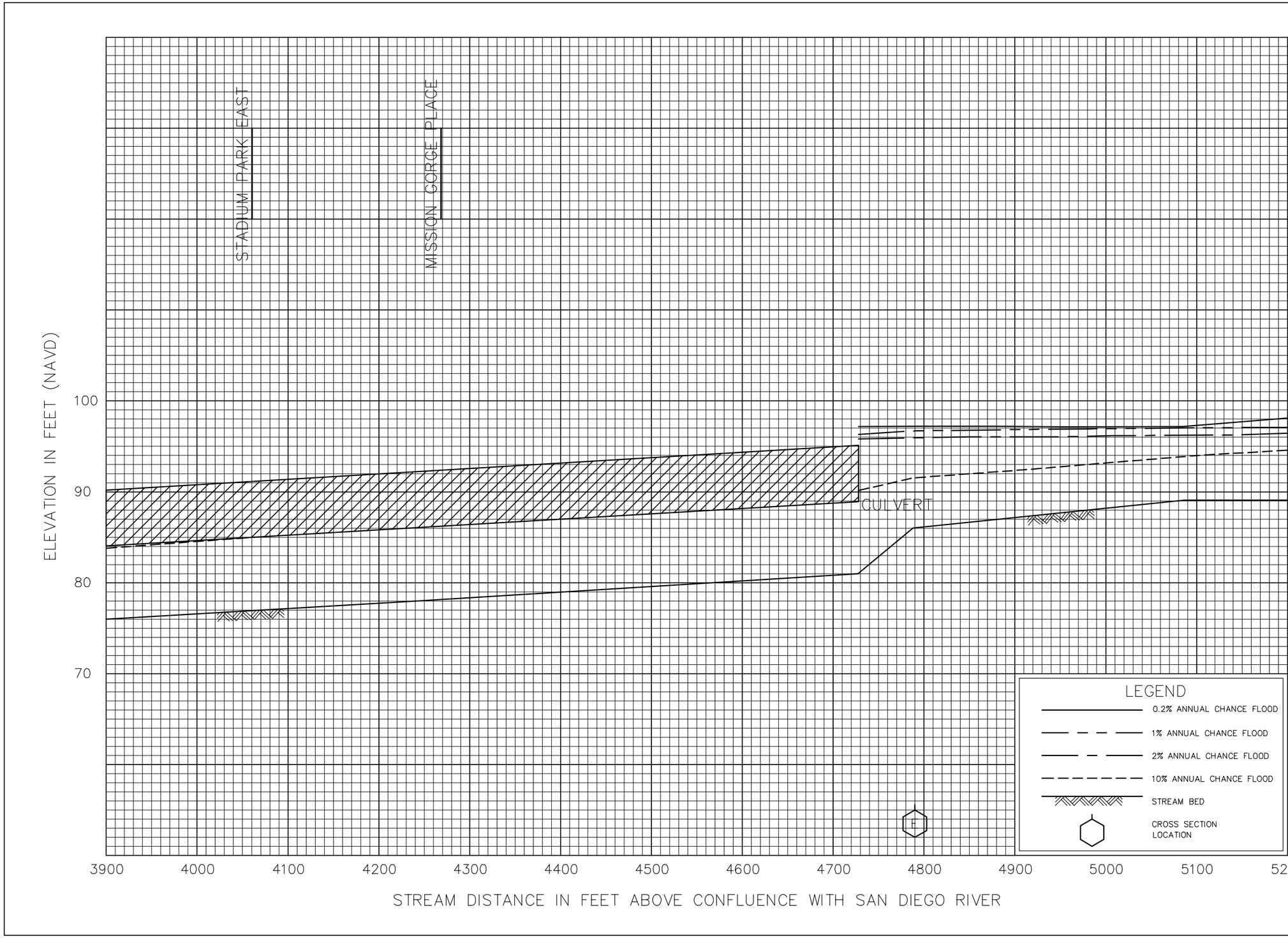
ALVARADO CREEK

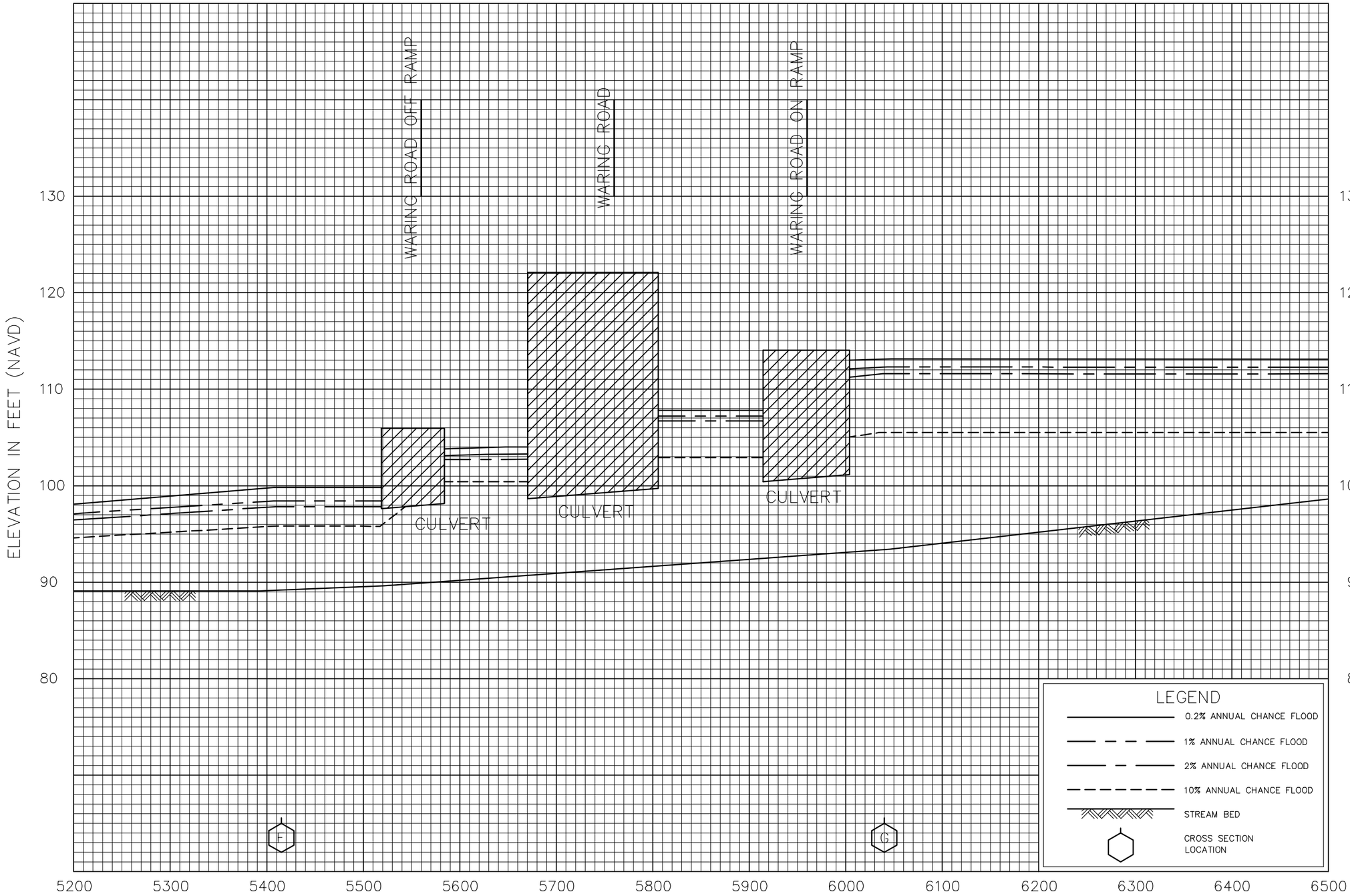
FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)

13P


ELEVATION IN FEET (NAVD)
100
90
80
70
CULVERT
D
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SAN DIEGO RIVER
FLOOD PROFILES
ALVARADO CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)
14P


STADIUM PARK EAST
MISSION GORGE PLACE
CULVERT
ELEVATION IN FEET (NAVD)
100
90
80
70
3900
4000
4100
4200
4300
4400
4500
4600
4700
4800
4900
5000
5100
5200
STREAM DISTANCE IN FEET ABOVE CONFLUENCE WITH SAN DIEGO RIVER
LEGEND
0.2% ANNUAL CHANCE FLOOD
1% ANNUAL CHANCE FLOOD
2% ANNUAL CHANCE FLOOD
10% ANNUAL CHANCE FLOOD
STREAM BED
CROSS SECTION LOCATION
FLOOD PROFILES
ALVARADO CREEK
FEDERAL EMERGENCY MANAGEMENT AGENCY
SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)
15P



FLOOD PROFILES

ALVARADO CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

SAN DIEGO COUNTY, CA
(AND INCORPORATED AREAS)

16P

3.3 Vertical Datum

All FIS reports and FIRMs are referenced to a specific vertical datum. The vertical datum provides a starting point against which flood, ground, and structure elevations can be referenced and compared. Until recently, the standard vertical datum in use for newly created or revised FIS reports and FIRMs was the National Geodetic Vertical Datum of 1929 (NGVD). With the finalization of the North American Vertical Datum of 1988 (NAVD), many FIS reports and FIRMs are being prepared using NAVD as the referenced vertical datum.

All flood elevations shown in this FIS report and on the FIRM are referenced to NAVD, with exception of two panels: 06073C2151F and 06073C2152F. These panels were not updated with this revision and are referenced to NGVD. Flooding sources on the non-updated FIRMs include Nestor Creek, Otay River, San Diego Bay, Telegraph Canyon Creek, and Tijuana River. The profile panels and floodway data tables that contain information corresponding with the non-updated panels have been included in NGVD, in addition to all of the data being presented in NAVD. Structure and ground elevations in the community must, therefore, be referenced to NAVD. It is important to note that adjacent communities may be referenced to NGVD. This may result in differences in Base (1-percent-annual-chance) Flood Elevations (BFEs) across the corporate limits between the communities. The conversion factor for each flooding source studied by detailed methods is shown below in Table 12 “Flooding Source Conversion Factor.”

TABLE 12: FLOODING SOURCE DATUM SHIFT VALUES

Stream Name	Elevation (feet NAVD above NGVD)
Adobe Creek	+2.2
Agua Hedionda Creek	+2.2
Agua Hedionda Creek (At City of Carlsbad)	+2.2
Agua Hedionda Creek (At City of Vista)	+2.3
Alvarado Creek	+2.1
Beaver Hollow Creek	+2.2
Beeler Creek	+2.1
Broadway Creek	+2.1
Buena Creek	+2.3
Buena Vista Creek	+2.3
Buena Vista Creek Tributary 1	+2.3
Buena Vista Creek Tributary 3	+2.3
Calavera Creek	+2.2
Carmel Valley Creek	+2.1
Carroll Canyon Creek	+2.1
Coleman Creek	+2.5
County Ditch Creek	+2.1

ATTACHMENT 2 - SITE PHOTOS

Photo 1: Looking downstream (W) from 11'x8' triple box culvert underneath Mission Gorge Road in Reach 1

Photo 2: Looking downstream (W) towards 11'x8' triple box culvert underneath Mission Gorge Road in Reach 1

Photo 3: Looking downstream (SW) near MTS trolley line upstream of Mission Gorge Road in Reach 1

Photo 4: Looking downstream towards Reach 1 (SW) at transition between vegetated and concrete lined channel underneath MTS trolley line

Photo 5: Looking upstream towards Reach 2 (NE) at transition between vegetated and concrete lined channel underneath MTS trolley line

Photo 6: Looking downstream (E) along vegetated channel in Reach 2

Photo 7: Reach 3 looking upstream (E) towards 11'x8' triple box culvert underneath Grantville Business District

Photo 8: Close up of downstream end of 11'x8' trple box culvert underneath Grantville Business District (Reach 4)

Photo 9: Looking west towards upstream end of triple box culvert from the downstream end of Reach 5

Photo 10: Bottom of Reach 5 looking upstream (W) from upstream end of triple box culvert

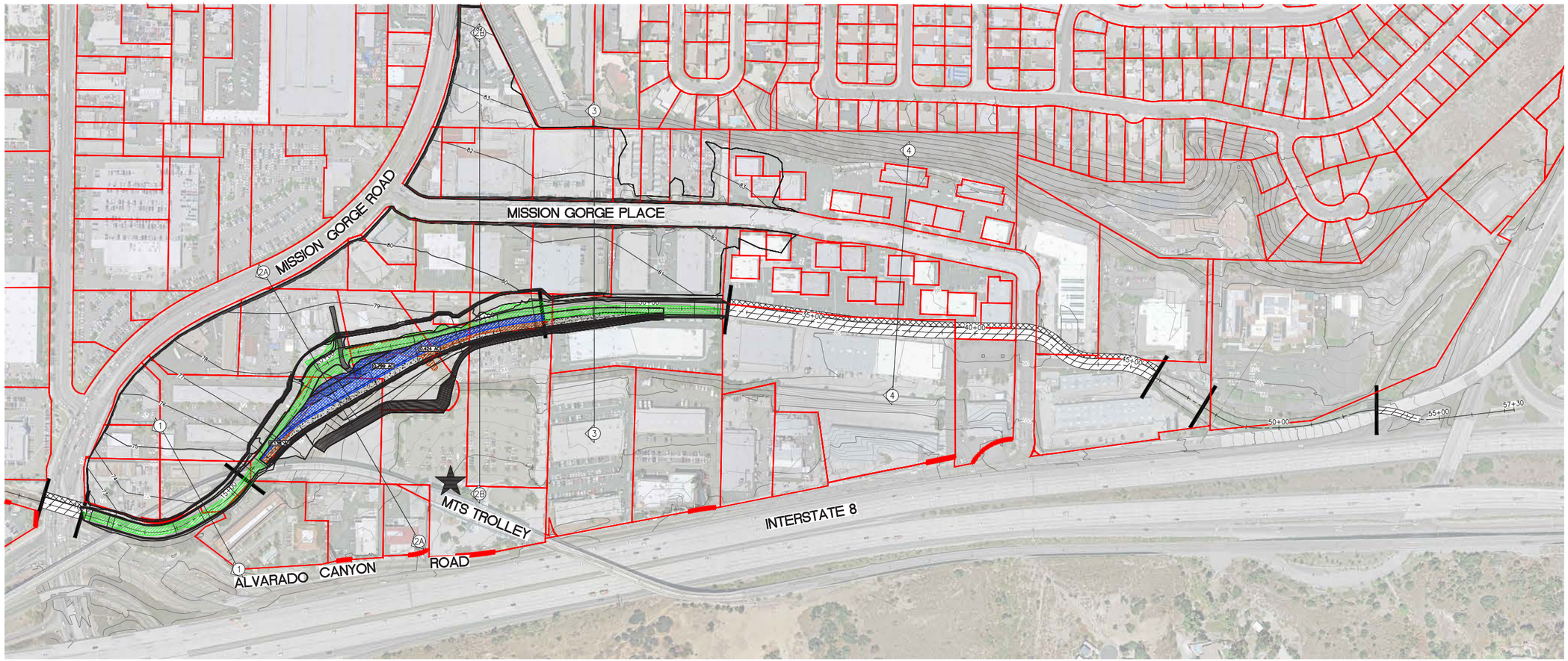
Photo 11: Looking upstream from towards Reach 6 (E) at transition earthen bottomed channel

Photo 12: Reach 6 looking upstream (E) under trolley line near Waring Road

Photo 13: Downstream end of 11'x8' triple box culvert underneath Interstate 8 onramp from Waring Road

Photo 14: Upstream end of triple box culvert underneath Interstate 8 onramp from Waring Road

ATTACHMENT 3 - EXISTING CONDITIONS AND PREFERRED ALTERNATIVE DESIGN EXHIBITS



LEGEND (EXISTING CONDITIONS)

PROPERTY LINE

20+00 CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY)

GRANTVILLE TROLLEY STATION

EXISTING ACCESS ROAD

LEGEND (PROPOSED)

PROPOSED CENTERLINE

PROPOSED CHANNEL TOE

PROPOSED CHANNEL TOP

PROPOSED LIMITS OF GRADING

REINFORCED CONCRETE BOX CULVERT

WETLAND VEGETATION AREA

0.138 AC WETLAND AREA–IMPACTED (RIPARIAN)

0.424 AC WETLAND AREA–IMPACTED (ARUNDO)

0.799 AC WETLAND AREA–CREATED/ENHANCED

PROFILES SHOWN ON SEPARATE SHEET

N

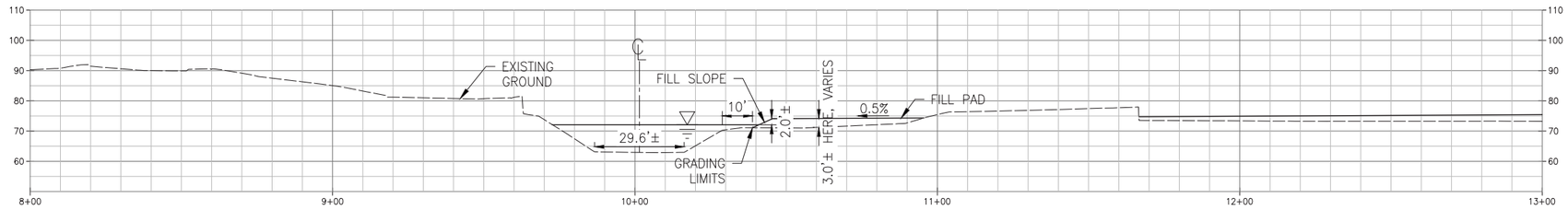
0 140' 280' 560'

GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
PRELIMINARY DRAFT PREFERRED PLAN

RICK ENGINEERING COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
San Diego Riverside Sacramento Orange Phoenix Tucson

PROJECT NO. 17571AW, 06/2017

X–Section_R1 PROFILE
SCALE: HORIZ. 1"=20', VERT. 1"=20'



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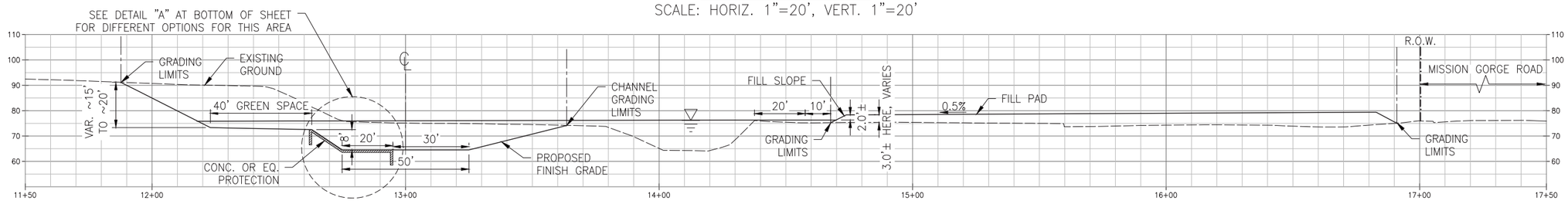

X–Section_R2B PROFILE
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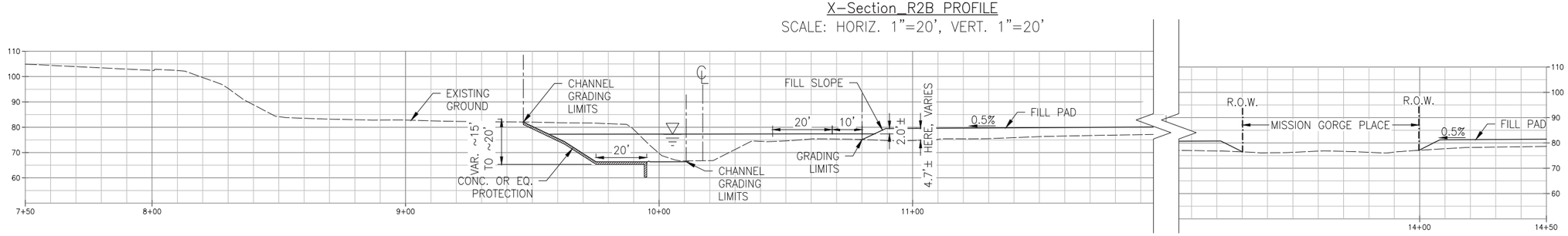

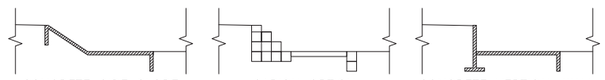

DETAIL "A"
SCALE: 1" = 20'

GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
PRELIMINARY DRAFT PREFERRED PLAN PROFILES
SHEET 1 OF 2

RICK ENGINEERING COMPANY
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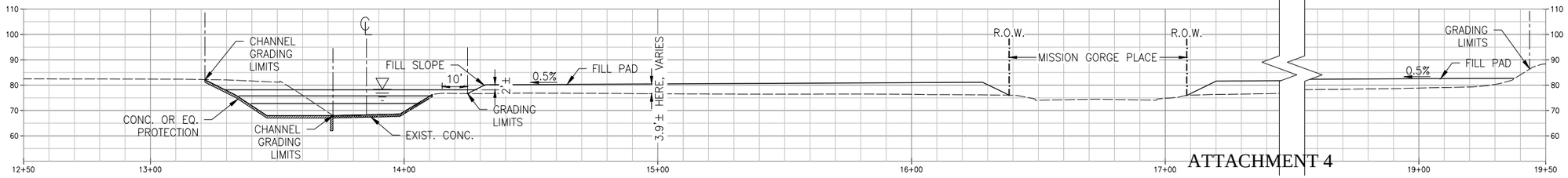
619.291.0707
(FAX)619.291.4165
rickengineering.com

PROJECT NO. 17571AW, 03/2017

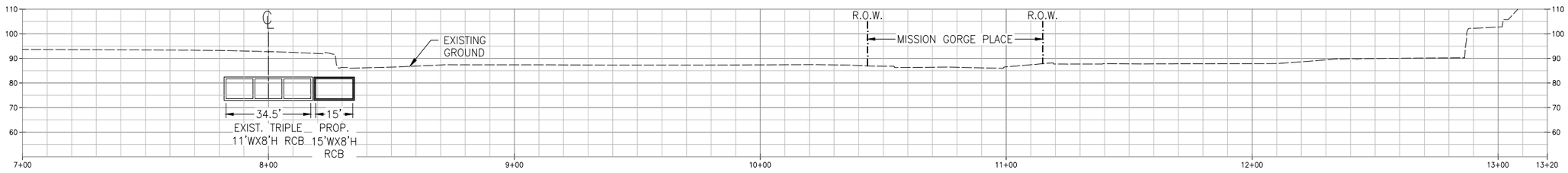
X–Section_R3 PROFILE
SCALE: HORIZ. 1"=20', VERT. 1"=20'



ATTACHMENT 4

MODEL WORKMAPS AND OUTPUT TABLES

X–Section_R4 PROFILE
SCALE: HORIZ. 1"=20', VERT. 1"=20'



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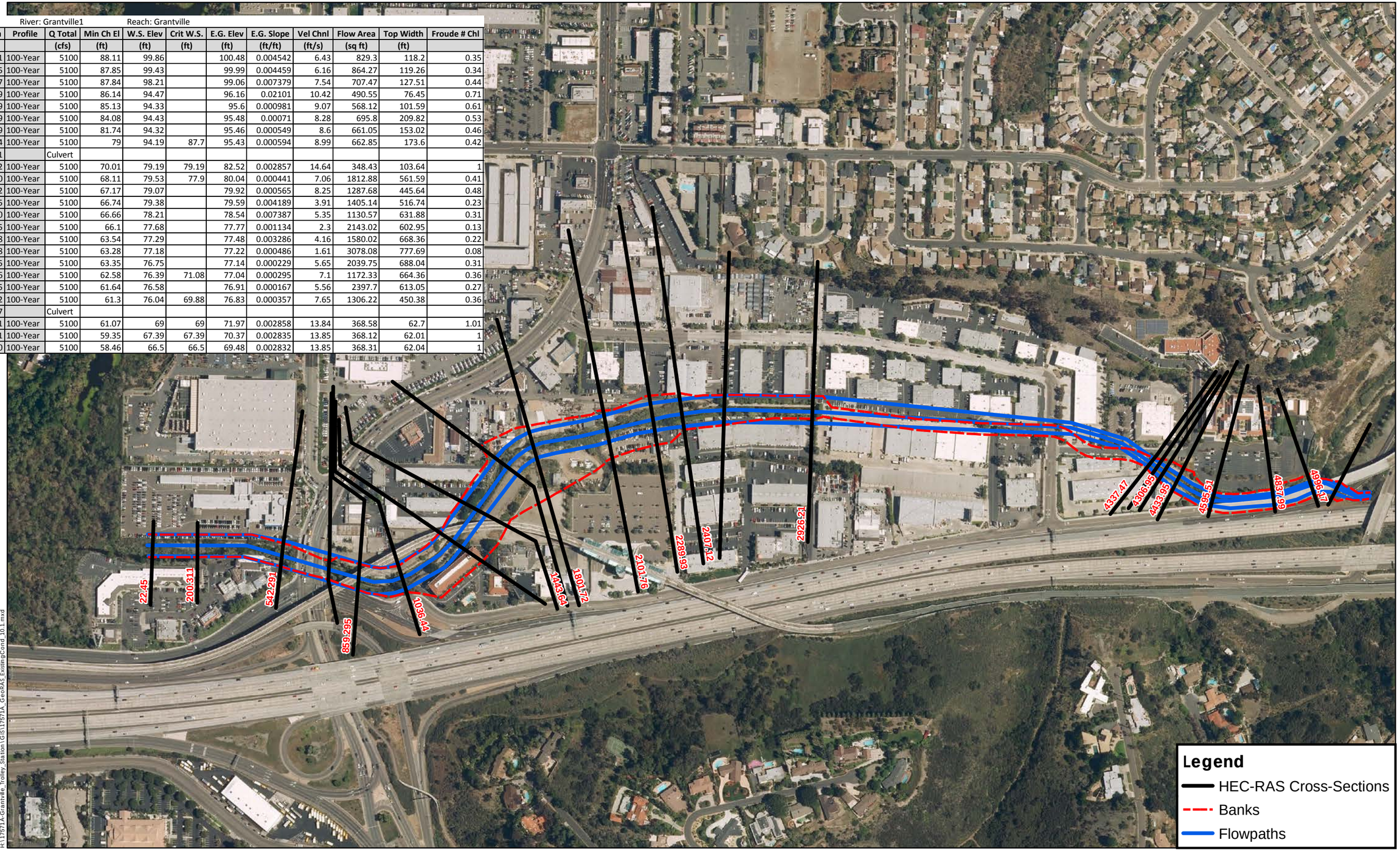
rickengineering.com
Riverside Sacramento Orange Phoenix Tucson

PROJECT NO. 17571AW, 06/2017

GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
PRELIMINARY DRAFT PREFERRED PLAN PROFILES
SHEET 2 OF 2

HEC-RAS Plan: Existing River: Grantville1 Reach: Grantville

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Grantville	5103.121	100-Year	5100	88.11	99.86		100.48	0.004542	6.43	829.3	118.2	0.35
Grantville	4996.165	100-Year	5100	87.85	99.43		99.99	0.004459	6.16	864.27	119.26	0.34
Grantville	4837.987	100-Year	5100	87.84	98.21		99.06	0.007379	7.54	707.47	127.51	0.44
Grantville	4595.509	100-Year	5100	86.14	94.47		96.16	0.02101	10.42	490.55	76.45	0.71
Grantville	4433.949	100-Year	5100	85.13	94.33		95.6	0.000981	9.07	568.12	101.59	0.61
Grantville	4370.469	100-Year	5100	84.08	94.43		95.48	0.00071	8.28	695.8	209.82	0.53
Grantville	4337.469	100-Year	5100	81.74	94.32		95.46	0.000549	8.6	661.05	153.02	0.46
Grantville	4306.954	100-Year	5100	79	94.19	87.7	95.43	0.000594	8.99	662.85	173.6	0.42
Grantville	4274.251		Culvert									
Grantville	2926.212	100-Year	5100	70.01	79.19	79.19	82.52	0.002857	14.64	348.43	103.64	1
Grantville	2575.770	100-Year	5100	68.11	79.53	77.9	80.04	0.000441	7.06	1812.88	561.59	0.41
Grantville	2407.122	100-Year	5100	67.17	79.07		79.92	0.000565	8.25	1287.68	445.64	0.48
Grantville	2289.925	100-Year	5100	66.74	79.38		79.59	0.004189	3.91	1405.14	516.74	0.23
Grantville	2101.760	100-Year	5100	66.66	78.21		78.54	0.007387	5.35	1130.57	631.88	0.31
Grantville	1801.725	100-Year	5100	66.1	77.68		77.77	0.001134	2.3	2143.02	602.95	0.13
Grantville	1654.028	100-Year	5100	63.54	77.29		77.48	0.003286	4.16	1580.02	668.36	0.22
Grantville	1443.638	100-Year	5100	63.28	77.18		77.22	0.000486	1.61	3078.08	777.69	0.08
Grantville	1286.405	100-Year	5100	63.35	76.75		77.14	0.000229	5.65	2039.75	688.04	0.31
Grantville	1036.436	100-Year	5100	62.58	76.39	71.08	77.04	0.000295	7.1	1172.33	664.36	0.36
Grantville	859.295	100-Year	5100	61.64	76.58		76.91	0.000167	5.56	2397.7	613.05	0.27
Grantville	736.072	100-Year	5100	61.3	76.04	69.88	76.83	0.000357	7.65	1306.22	450.38	0.36
Grantville	696.727		Culvert									
Grantville	542.291	100-Year	5100	61.07	69	69	71.97	0.002858	13.84	368.58	62.7	1.01
Grantville	200.311	100-Year	5100	59.35	67.39	67.39	70.37	0.002835	13.85	368.12	62.01	1
Grantville	22.450	100-Year	5100	58.46	66.5	66.5	69.48	0.002832	13.85	368.31	62.04	1



H:\17571A-Grantville_Trolley_Station\GIS\17571A_GeoRAS_ExistingCond_10.1.mxd

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Scale in Feet
0 500 1,000
North

Date of Exhibit: 7/6/2017
DigitalGlobe Aerial Image: 04.2013

Existing Conditions Workmap

Grantville Trolley Station/Alvarado Creek Enhancement Project

J-17571-A Grantville

HEC-RAS Plan: Alternative 4b_0428 River: River Reach: River

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
River	5028.648	100-Year	5100	88.11	99.84		100.45	0.004259	6.31	826.24	116.73	0.38
River	4935.467	100-Year	5100	87.85	99.49		100.04	0.004355	6.11	870.74	119.38	0.34
River	4774.998	100-Year	5100	87.84	98.27		99.11	0.007418	7.46	717.58	130.96	0.44
River	4531.455	100-Year	5100	86.14	94.32	93	96.08	0.02266	10.65	479.15	75.27	0.73
River	4371.136	100-Year	5100	85.13	92.22	92.22	95.03	0.002674	13.5	393.45	77.53	0.98
River	4308.15	100-Year	5100	84.08	91.44	91.35	94.21	0.002703	13.36	381.9	67.32	0.98
River	4275.147	100-Year	5100	81.74	91.98		93.89	0.001215	11.1	462.3	56.74	0.66
River	4244.437	100-Year	5100	79.00	92.02	87.73	93.83	0.001069	10.79	475.13	41.7	0.54
River	4230.878		Culvert									
River	2864.54	100-Year	5100	70.01	79.24	79.24	82.52	0.002866	14.55	350.58	53.45	1
River	2513.004	100-Year	5100	68.11	78.16		79.1	0.000592	7.83	671.88	100.67	0.48
River	2346.72	100-Year	5100	67.14	78.19		78.79	0.004051	6.36	846.07	130.69	0.38
River	2229.908	100-Year	5100	66.68	77.7		78.27	0.004786	6.25	861.96	136.25	0.37
River	2041.34	100-Year	5100	65.96	76.93	72.59	77.4	0.004133	5.79	959.13	189.26	0.33
River	1737.55	100-Year	5100	64.81	76.37	70.19	76.52	0.001789	2.89	1681.92	371.63	0.18
River	1665.505	100-Year	5100	63.54	76.23	69.06	76.37	0.001766	3	1719.54	402.01	0.18
River	1443.924	100-Year	5100	63.28	75.18	70.56	75.78	0.003788	6.42	866.19	220.08	0.36
River	1284.573	100-Year	5100	63.35	72.69	72.05	75.16	0.001964	12.71	422.72	69.75	0.85
River	1034.658	100-Year	5100	62.58	71.83	71.15	74.59	0.00203	13.36	391.87	63.75	0.86
River	857.2057	100-Year	5100	61.64	71.6	70.65	74.2	0.001832	12.97	409.64	65.25	0.81
River	733.5538	100-Year	5100	61.30	69.89	69.89	73.78	0.003318	15.82	322.46	41.71	1
River	705.7896		Culvert									
River	539.5847	100-Year	5100	61.07	69	69	71.97	0.002858	13.84	368.58	62.7	1.01
River	198.1097	100-Year	5100	59.35	67.39	67.39	70.37	0.002837	13.86	368.03	62	1
River	20.15875	100-Year	5100	58.46	66.5	66.5	69.48	0.002835	13.85	368.17	62.03	1

H:\17571A-Grantville_Trolley_Station\GIS\17571A_PreferredAlternativeWorkmap.mxd

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Scale in Feet
0 400 800
North

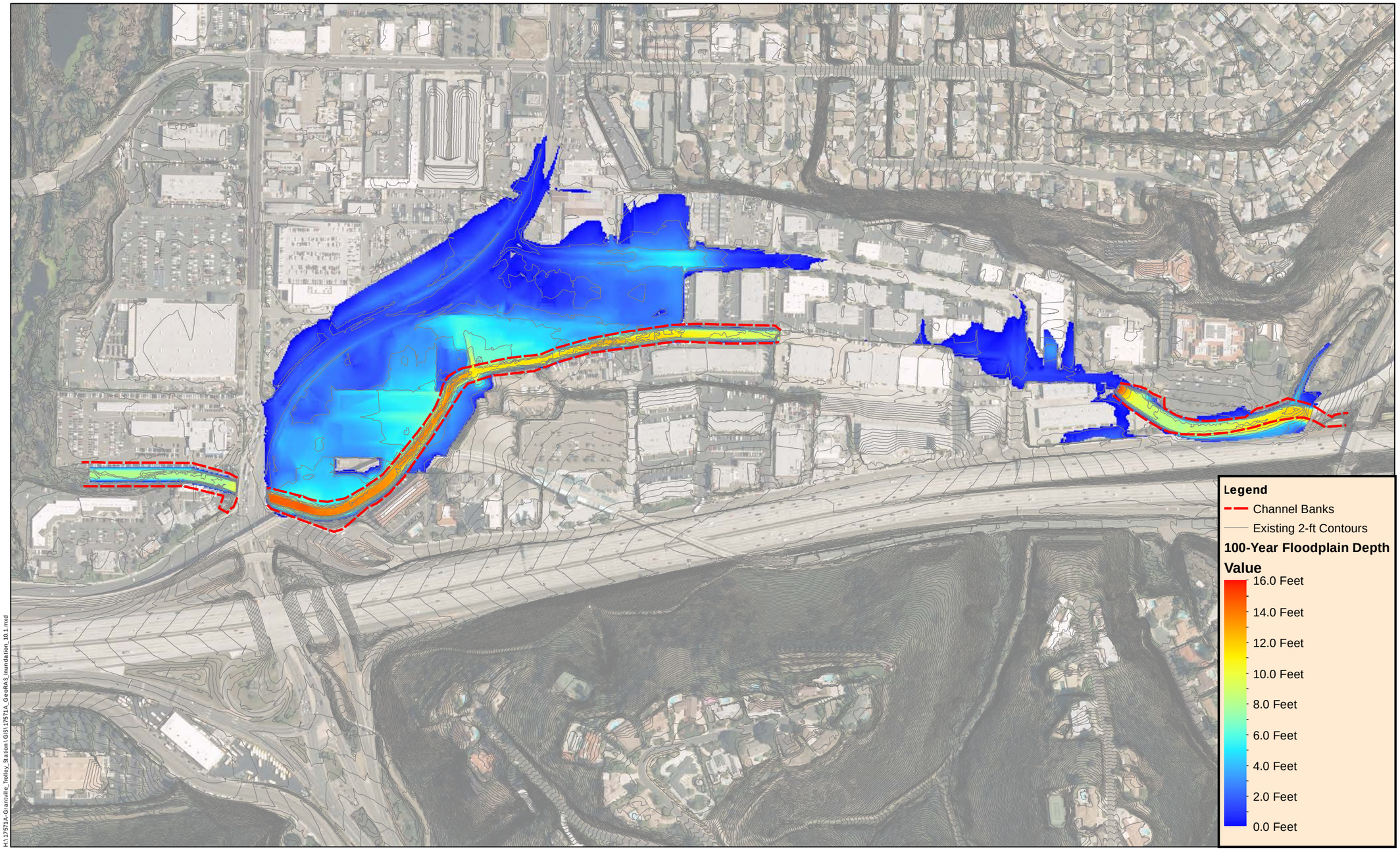
Date of Exhibit: 6/27/2017
DigitalGlobe Aerial Image: 04.2013

Preferred Alternative Workmap

Grantville Trolley Station/Alvarado Creek Enhancement Project

J-17571-A Grantville

ATTACHMENT 5 - INUNDATION MAPS



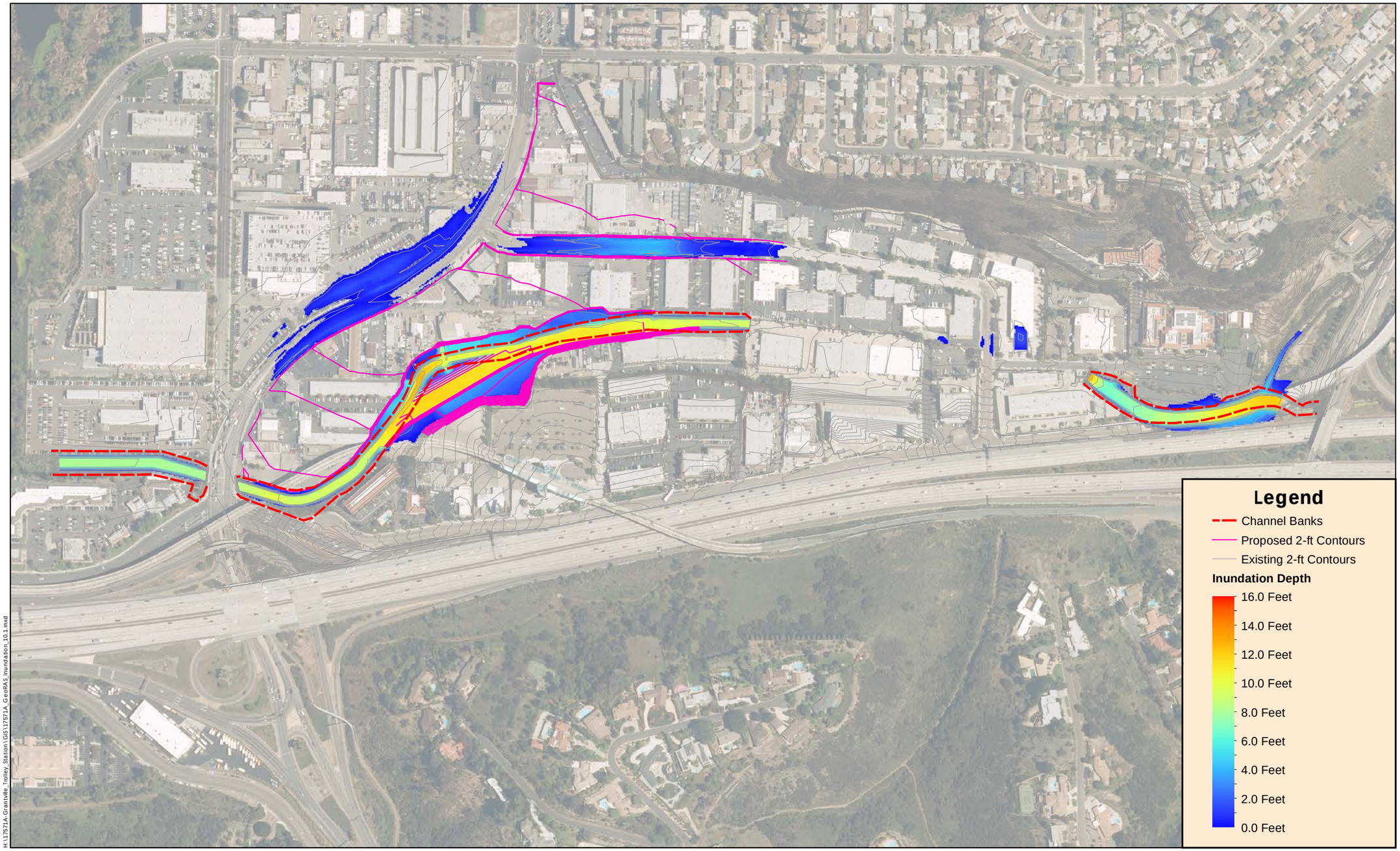
RICK ENGINEERING COMPANY

Scale in Feet
0 300 600
North

Date of Exhibit: 4/12/2017
DigitalGlobe Aerial Image: 04.2013

Existing Conditions 100-Year Floodplain
Grantville Trolley Station /Alvarado Creek Enhancement Project

J-17571-A



RICK ENGINEERING COMPANY

Scale in Feet
0 300 600
North

Date of Exhibit: 6/21/2017
DigitalGlobe Aerial Image: 04.2013

Preferred Alternative 100-Year Floodplain
Grantville Trolley Station / Alvarado Creek Enhancement Project

J-17571-A

ATTACHMENT 6 - 30% DESIGN DRAWINGS

ALVARADO CREEK ENHANCEMENT STUDY

CONTRACTOR'S RESPONSIBILITIES

1. CONTRACTOR SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT INCLUDING: SAFETY OF ALL PERSONS AND PROPERTY, AND THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS.
2. PURSUANT TO SECTION 4216 OF THE CALIFORNIA GOVERNMENT CODE, AT LEAST 2 WORKING DAYS PRIOR TO EXCAVATION, YOU MUST CONTACT THE REGIONAL NOTIFICATION CENTER (E.G., UNDERGROUND SERVICE ALERT OF SOUTHERN CALIFORNIA 1-800-422-4133) AND OBTAIN AN INQUIRY IDENTIFICATION NUMBER.
3. NOTIFY SDG&E AT LEAST 10 WORKING DAYS PRIOR TO EXCAVATING WITHIN 10' OF SDG&E UNDERGROUND HIGH VOLTAGE TRANSMISSION POWER LINES. (I.E., 69 KV & HIGHER)

CONSTRUCTION STORM WATER PROTECTION NOTES

1. TOTAL SITE DISTURBANCE AREA (ACRES) TBD
   HYDROLOGIC UNIT/ WATERSHED TBD
   HYDROLOGIC SUBAREA TBD
2. THE CONTRACTOR SHALL COMPLY WITH THE REQUIREMENTS OF THE
   ☐ WPCP
   THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100
   ☐ SWPPP
   THE PROJECT IS SUBJECT TO MUNICIPAL STORM WATER PERMIT NO. R9-2013-0001 AS AMENDED BY R9-2015-0001 AND R9-2015-0100 AND CONSTRUCTION GENERAL PERMIT ORDER 2009-0009-DWQ AS AMENDED BY ORDER 2010-0014-DWQ AND 2012-0006-DWQ
   TRADITIONAL: RISK LEVEL 1 ☐ 2 ☐ 3☐
   LUP: RISK TYPE 1 ☐ 2 ☐ 3 ☐
3. CONSTRUCTION SITE PRIORITY
   ☐ ASBS ☐ HIGH ☐ MEDIUM ☐ LOW

ABBREVIATIONS

ACP	ASBESTOS CEMENT PIPE	EXIST	EXISTING
ADJ	ADJUST	FL	FLOWLINE
BC	BEGIN CURVE	H	HEIGHT
BEG	BEGIN	HORZ.	HORIZONTAL
BCR	BEGIN CURB RETURN	LF	LINEAR FEET
BLVD	BOULEVARD	LT	LEFT
BRG.	BEARING	MH	MANHOLE
CI	CAST IRON	MIN	MINIMUM
℄	CENTER LINE	MOD	MODIFIED
CONC	CONCRETE	N	NORTHING
CSP	CALTRANS STANDARD PLANS	NO.	NUMBER
CT	COURT	PI	POINT OF INTERSECTION
E	EASTING	PL	PROPERTY LINE
EC	END CURVE	PVC	POLYVINYL CHLORIDE
ELEC	ELECTRICAL	R	RADIUS
EL, ELEV	ELEVATION	RCB	REINFORCED CONCRETE BOX
EQ	EQUAL	RCP	REINFORCED CONCRETE PIPE
		RCSC	REINFORCED CONCRETE STEEL CYLINDER

RT	RIGHT	VAR	VARIES
R/W	RIGHT OF WAY	VCES	VITRIFIED CLAY EXTRA STRENGTH
SCRW	STEEL CYLINDER ROD WRAPPED	VCP	VITRIFIED CLAY PIPE
SD	STORM DRAIN	VERT.	VERTICAL
STA	STATION	W	WIDTH
STLCL	STEEL CYLINDER	WSE	WATER SURFACE ELEVATION
SWR	SEWER	WTR	WATER
TEL	TELEPHONE		
TRANS	TRANSITION		

EXISTING STRUCTURES

EX WATER MAIN & VALVES	
EX WATER METER	
EX FIRE HYDRANT	
EX SEWER MAIN & MANHOLES	
EX STORM DRAINS, CULVERT, & STRUCTURES	
EX STORM DRAIN MANHOLE	SD
EX PAVEMENT (PROFILE)	
EX GROUND LINE (PROFILE)	
EX TRAFFIC SIGNAL	TS
EX STREET LIGHT	SL
GAS MAIN	
ELEC. COND., TEL. COND., CATV	----E-----T-----C--
EX TRAFFIC CONTROL BOX	
EX ELEC STRUCTURES	
EX CATV STRUCTURE	
EX TELEPHONE STRUCTURE	
EX GAS VALVE	
EX UTILITY POLE	

SHEET INDEX

SHEET NO.	DISCIPLINE CODE	TITLE	LIMITS
1	G-1	COVER SHEET	
2	C-1	TYPICAL CROSS SECTIONS	
3	C-2	CHANNEL PLAN & PROFILE	STATION 8+00 TO STATION 13+00
4	C-3	CHANNEL PLAN & PROFILE	STATION 13+00 TO STATION 21+00
5	C-4	CHANNEL PLAN & PROFILE	STATION 21+00 TO STATION 29+00
6	C-5	CHANNEL PLAN & PROFILE	STATION 29+00 TO STATION 37+00
7	C-6	CHANNEL PLAN & PROFILE	STATION 36+50 TO STATION 44+00
8	C-7	CHANNEL PLAN & PROFILE	STATION 44+00 TO STATION 49+50
9	C-8	SITE PLAN	
10	C-9	SITE PLAN	
11	C-10	SITE PLAN	
12	C-11	SITE PLAN	
13	C-12	SITE PLAN	
14	C-13	SITE PLAN	
15	C-14	SITE PLAN	
16	C-15	SEWER PLAN & PROFILE	STATION 1+00 TO STATION 5+00

DISCIPLINE CODE

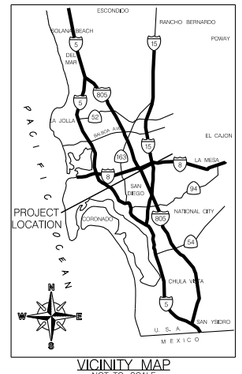
G GENERAL
C CIVIL

LEGEND

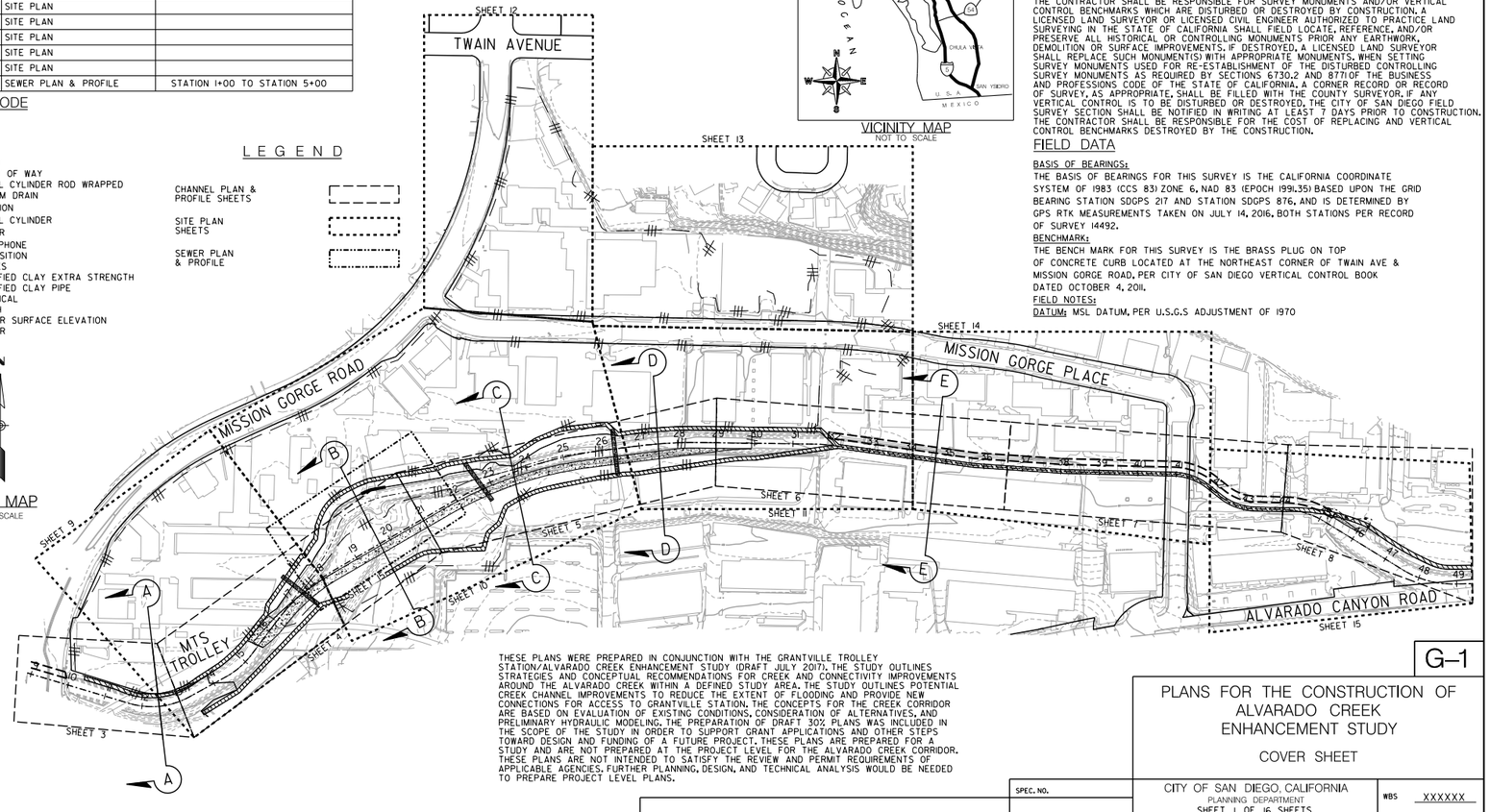
CHANNEL PLAN & PROFILE SHEETS
SITE PLAN SHEETS
SEWER PLAN & PROFILE

TRAFFIC CONTROL NOTES:

THE CONTRACTOR SHALL, PER SECTION X-XX.X.X OF THE CONTRACT SPECIAL PROVISIONS, PREPARE TRAFFIC CONTROL WORKING DRAWINGS AND SUBMIT THEM TO THE RESIDENT ENGINEER. THE WORKING DRAWINGS WILL BE SENT TO THE ENGINEERING TRAFFIC CONTROL SECTION FOR REVIEW AND APPROVAL. THE CONTRACTOR SHALL ALLOW A MINIMUM OF 20 WORKING DAYS FOR REVIEW OF THE WORKING DRAWINGS. UPON APPROVAL OF THE TRAFFIC CONTROL PLAN, THE ENGINEERING TRAFFIC CONTROL SECTION WILL ISSUE A TRAFFIC CONTROL PLAN (TCP) PERMIT. WORK SHALL NOT BEGIN IN THE PUBLIC RIGHT OF WAY WITHOUT THE APPROVED TCP PERMIT.



VICINITY MAP
NOT TO SCALE



KEY MAP
NO SCALE

LEGEND

IMPROVEMENTS	STANDARD DRAWINGS	SYMBOL
CONCRETE CHANNEL	SDD-108	
PEDESTRIAN PATH	SDD-108	
PEDESTRIAN BRIDGE	SDD-108	
CENTERLINE		
DAYLIGHT		
REINFORCED BOX CULVERT		
PROPOSED SEWER		
WATER SURFACE ELEVATION		

WORK TO BE DONE

THE PROJECT PROPOSES THE REALIGNMENT AND WIDENING OF THE ALVARADO CREEK CHANNEL BETWEEN WARING ROAD AND MISSION GORGE ROAD, IN ACCORDANCE WITH THESE SPECIFICATIONS AND PLANS NUMBERED XXXXX-01-D THROUGH XXXXX-16-D.

MONUMENTATION/SURVEY NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR SURVEY MONUMENTS AND/OR VERTICAL CONTROL BENCHMARKS WHICH ARE DISTURBED OR DESTROYED BY CONSTRUCTION. A LICENSED LAND SURVEYOR OR LICENSED CIVIL ENGINEER AUTHORIZED TO PRACTICE LAND SURVEYING IN THE STATE OF CALIFORNIA SHALL FIELD LOCATE, REFERENCE, AND/OR PRESERVE ALL HISTORICAL OR CONTROLLING MONUMENTS PRIOR ANY EARTHWORK, DEMOLITION OR SURFACE IMPROVEMENTS. IF DESTROYED, A LICENSED LAND SURVEYOR SHALL REPLACE SUCH MONUMENT(S) WITH APPROPRIATE MONUMENTS. WHEN SETTING SURVEY MONUMENTS USED FOR RE-ESTABLISHMENT OF THE DISTURBED CONTROLLING SURVEY MONUMENTS AS REQUIRED BY SECTIONS 6730.2 AND 8771 OF THE BUSINESS AND PROFESSIONS CODE OF THE STATE OF CALIFORNIA, A CORNER RECORD OR RECORD OF SURVEY, AS APPROPRIATE, SHALL BE FILLED WITH THE COUNTY SURVEYOR. IF ANY VERTICAL CONTROL IS TO BE DISTURBED OR DESTROYED, THE CITY OF SAN DIEGO FIELD SURVEY SECTION SHALL BE NOTIFIED IN WRITING AT LEAST 7 DAYS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE COST OF REPLACING AND VERTICAL CONTROL BENCHMARKS DESTROYED BY THE CONSTRUCTION.

FIELD DATA

BASIS OF BEARINGS:
THE BASIS OF BEARINGS FOR THIS SURVEY IS THE CALIFORNIA COORDINATE SYSTEM OF 1983 (CCS 83) ZONE 6, NAD 83 (EPOCH 1991.35) BASED UPON THE GRID BEARING STATION SDGPS 217 AND STATION SDGPS 876, AND IS DETERMINED BY GPS RTK MEASUREMENTS TAKEN ON JULY 14, 2016, BOTH STATIONS PER RECORD OF SURVEY 14492.

BENCHMARK:
THE BENCH MARK FOR THIS SURVEY IS THE BRASS PLUG ON TOP OF CONCRETE CURB LOCATED AT THE NORTHEAST CORNER OF TWAIN AVE & MISSION GORGE ROAD, PER CITY OF SAN DIEGO VERTICAL CONTROL BOOK DATED OCTOBER 4, 2011.

FIELD NOTES:
DATUM: MSL DATUM, PER U.S.G.S ADJUSTMENT OF 1970

THESE PLANS WERE PREPARED IN CONJUNCTION WITH THE GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY (DRAFT JULY 2017). THE STUDY OUTLINES STRATEGIES AND CONCEPTUAL RECOMMENDATIONS FOR CREEK AND CONNECTIVITY IMPROVEMENTS AROUND THE ALVARADO CREEK WITHIN A DEFINED STUDY AREA. THE STUDY OUTLINES POTENTIAL CREEK CHANNEL IMPROVEMENTS TO REDUCE THE EXTENT OF FLOODING AND PROVIDE NEW CONNECTIONS FOR ACCESS TO GRANTVILLE STATION. THE CONCEPTS FOR THE CREEK CORRIDOR ARE BASED ON EVALUATION OF EXISTING CONDITIONS, CONSIDERATION OF ALTERNATIVES, AND PRELIMINARY HYDRAULIC MODELING. THE PREPARATION OF DRAFT 30% PLANS WAS INCLUDED IN THE SCOPE OF THE STUDY IN ORDER TO SUPPORT GRANT APPLICATIONS AND OTHER STEPS TOWARD DESIGN AND FUNDING OF A FUTURE PROJECT. THESE PLANS ARE PREPARED FOR A STUDY AND ARE NOT PREPARED AT THE PROJECT LEVEL FOR THE ALVARADO CREEK CORRIDOR. THESE PLANS ARE NOT INTENDED TO SATISFY THE REVIEW AND PERMIT REQUIREMENTS OF APPLICABLE AGENCIES. FURTHER PLANNING, DESIGN, AND TECHNICAL ANALYSIS WOULD BE NEEDED TO PREPARE PROJECT LEVEL PLANS.

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San Diego · Riverside · Orange · Sacramento · San Luis Obispo · Phoenix · Tucson · Denver
rickengineering.com

J-17571A

CONSTRUCTION CHANGE / ADDENDUM

CHANGE	DATE	AFFECTED OR ADDED SHEET NUMBERS	APPROVAL NO.

WARNING
0 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO SCALE.

The City of SAN DIEGO

SPEC. NO.

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 1 OF 16 SHEETS

WBS XXXXXX

APPROVED
FOR CITY ENGINEER XXXXX XXXXX
DEPUTY CITY ENGINEER
DATE XXXXX
RCE#

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER
DESIGNED BY XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-01-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

PRELIMINARY
NOT FOR CONSTRUCTION

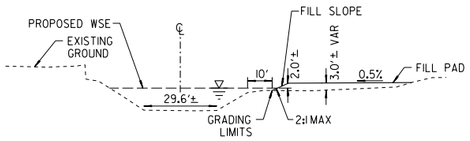
G-1

PLANS FOR THE CONSTRUCTION OF ALVARADO CREEK ENHANCEMENT STUDY

COVER SHEET

ALVARADO CREEK ENHANCEMENT STUDY

NOTE:
FILL PADS SHOWN FOR REFERENCE ONLY. USED FOR RESIDENTIAL BUILDINGS, NOT OPEN SPACE OR PARKING.



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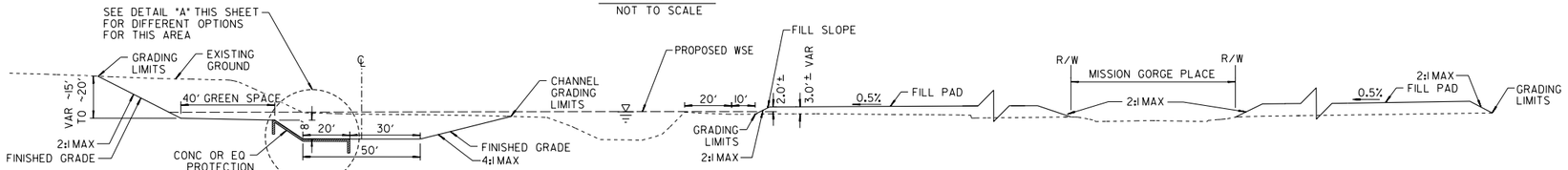

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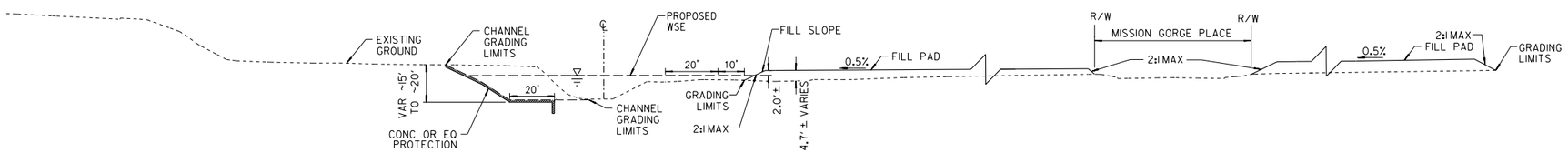

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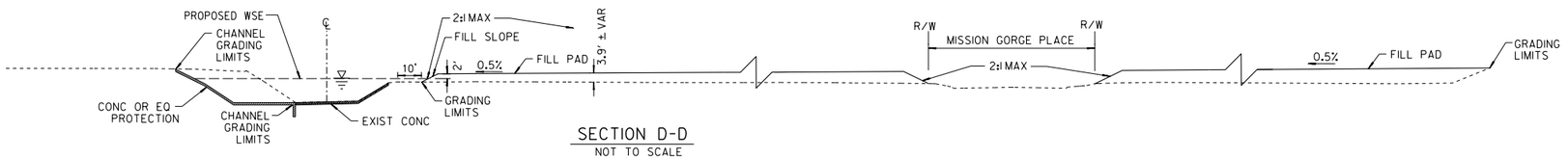

SECTION D-D
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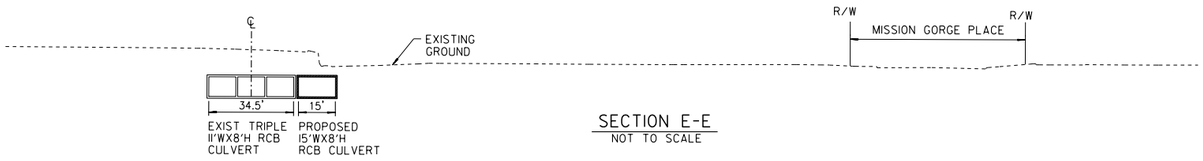

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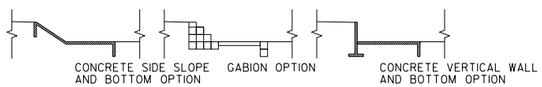

DETAIL "A"
SCALE: 1" = 20'

RICK ENGINEERING COMPANY
San Diego
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C-1

ALVARADO CREEK ENHANCEMENT STUDY

TYPICAL CROSS SECTIONS

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 2 OF 16 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER — DATE
XXXXX XXXXX — XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY
XXXXX XXXXX
PROJECT MANAGER

DIRECTED BY
XXXXX XXXXX
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

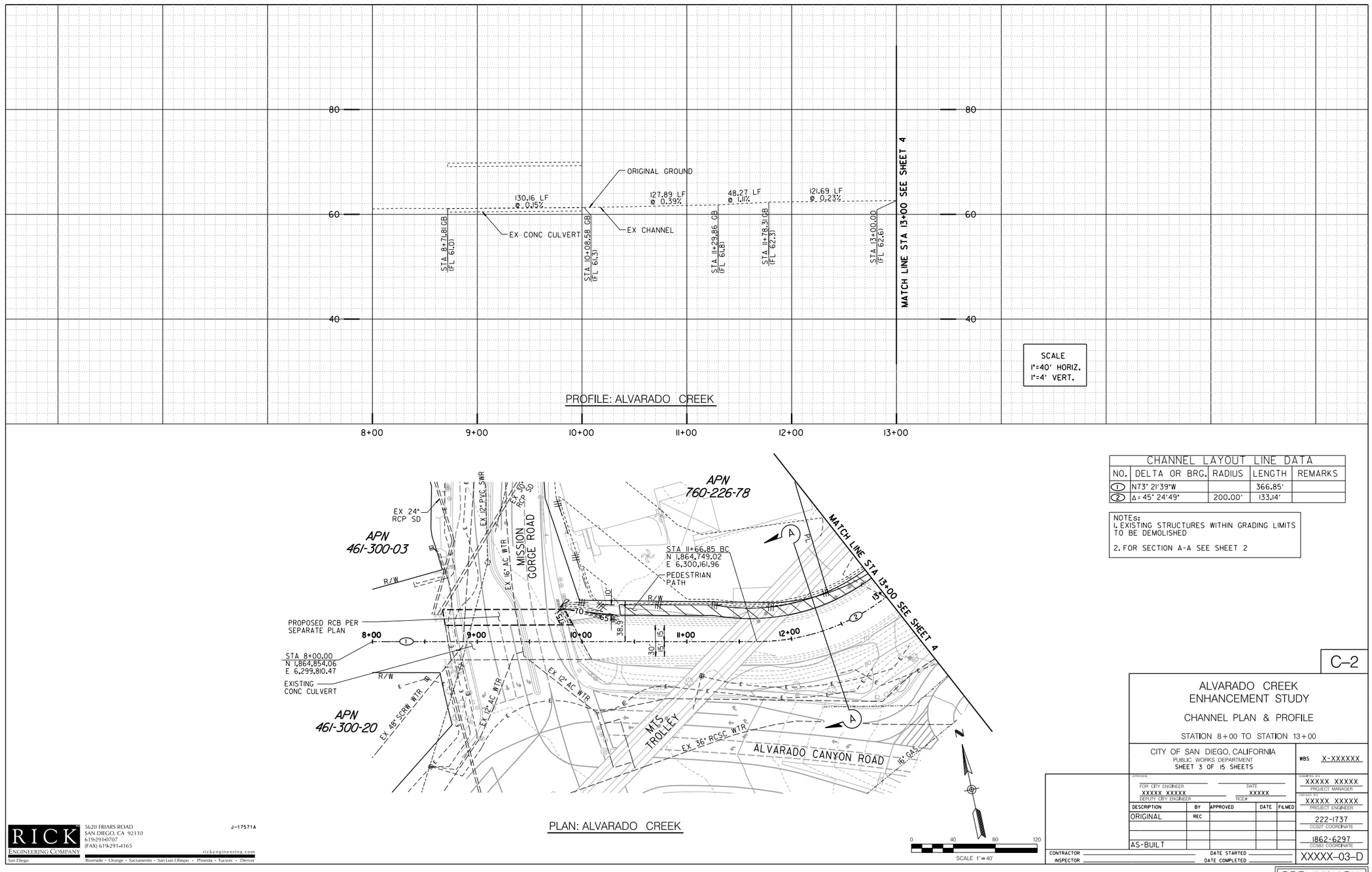
222-1737
CCS27 COORDINATE

1862-6297
CCS83 COORDINATE

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

XXXXX-02-D

PRELIMINARY



CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
①	N73° 21'39"W		366.85'	
②	Δ = 45° 24'49"	200.00'	133.14'	

NOTES:
1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

2. FOR SECTION A-A SEE SHEET 2

ALVARADO CREEK ENHANCEMENT STUDY

C-2

ALVARADO CREEK
ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 8+00 TO STATION 13+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 3 OF 15 SHEETS

WBS X-XXXXXX

APPROVED FOR CITY ENGINEER XXXXX XXXXX DEPUTY CITY ENGINEER — DATE XXXXX — RCE#

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER

CHECKED BY XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE

1862-6297 CCS83 COORDINATE

XXXXX-03-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

PRELIMINARY
NOT FOR CONSTRUCTION

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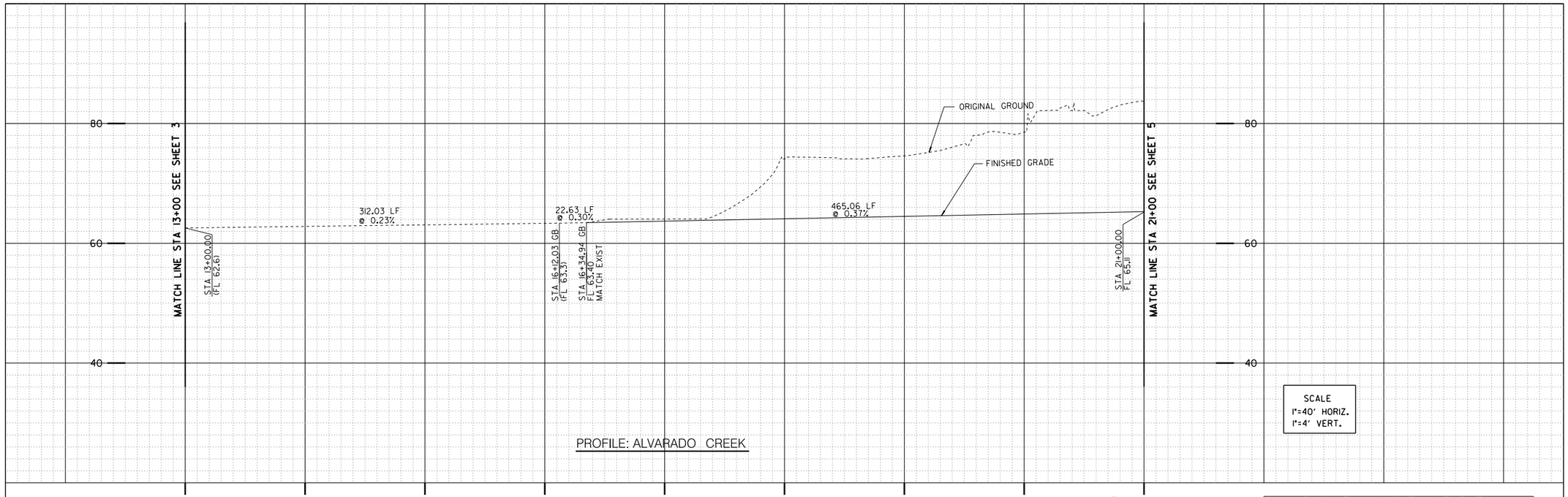
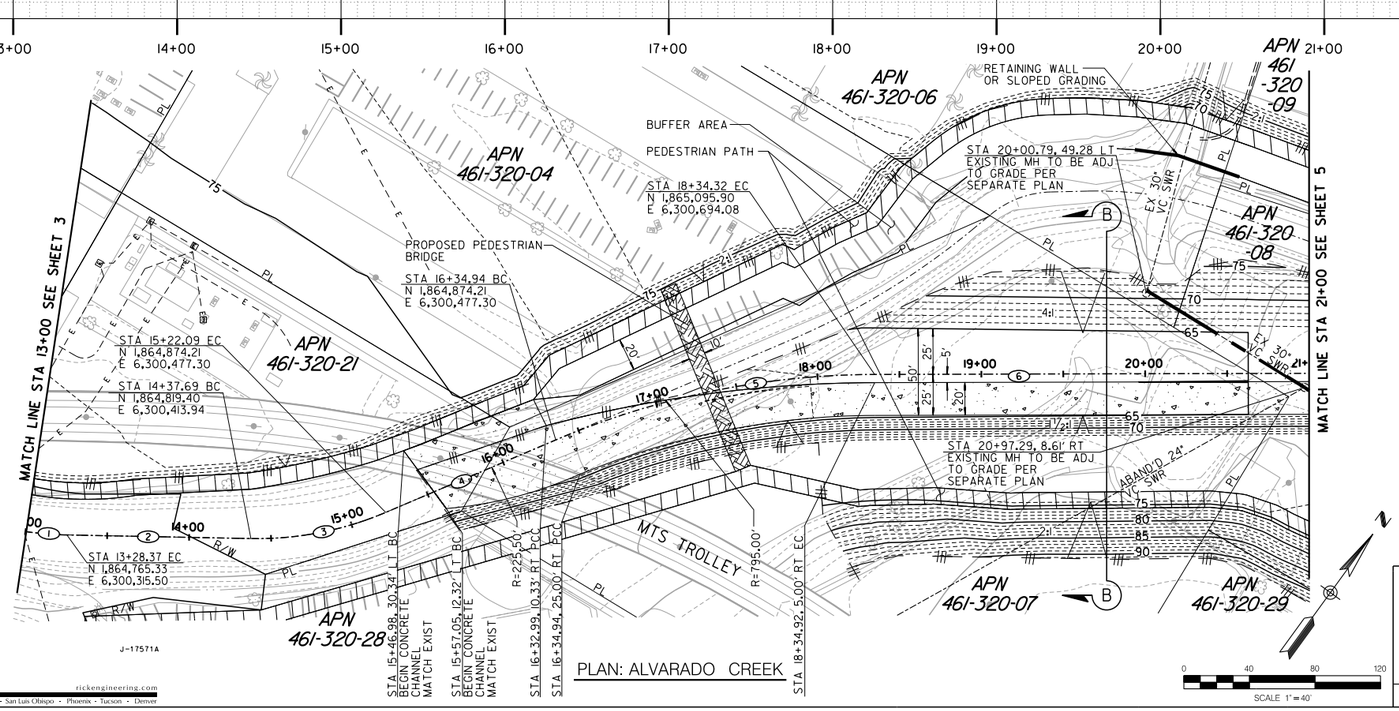
ALVARADO CREEK ENHANCEMENT STUDY



PROFILE: ALVARADO CREEK

SCALE
1"=40' HORIZ.
1"=4' VERT.



PLAN: ALVARADO CREEK

CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	Δ = 45° 24'49"	200.00'	25.38'	
2	N61° 13'32"E		112.31'	
3	Δ = 24° 10'49"	200.00'	84.40'	
4	N37° 02'44"E		112.85'	
5	Δ = 22° 54'56"	500.00'	199.98'	
6	N59° 57'39"E		265.08'	

NOTES:
1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED
2. FOR SECTION B-B SEE SHEET 2

C-3

ALVARADO CREEK
ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 13+00 TO STATION 21+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 4 OF 15 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER — DATE
XXXXX XXXXX — XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY: XXXXX XXXXX PROJECT MANAGER
CHECKED BY: XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-04-D

CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

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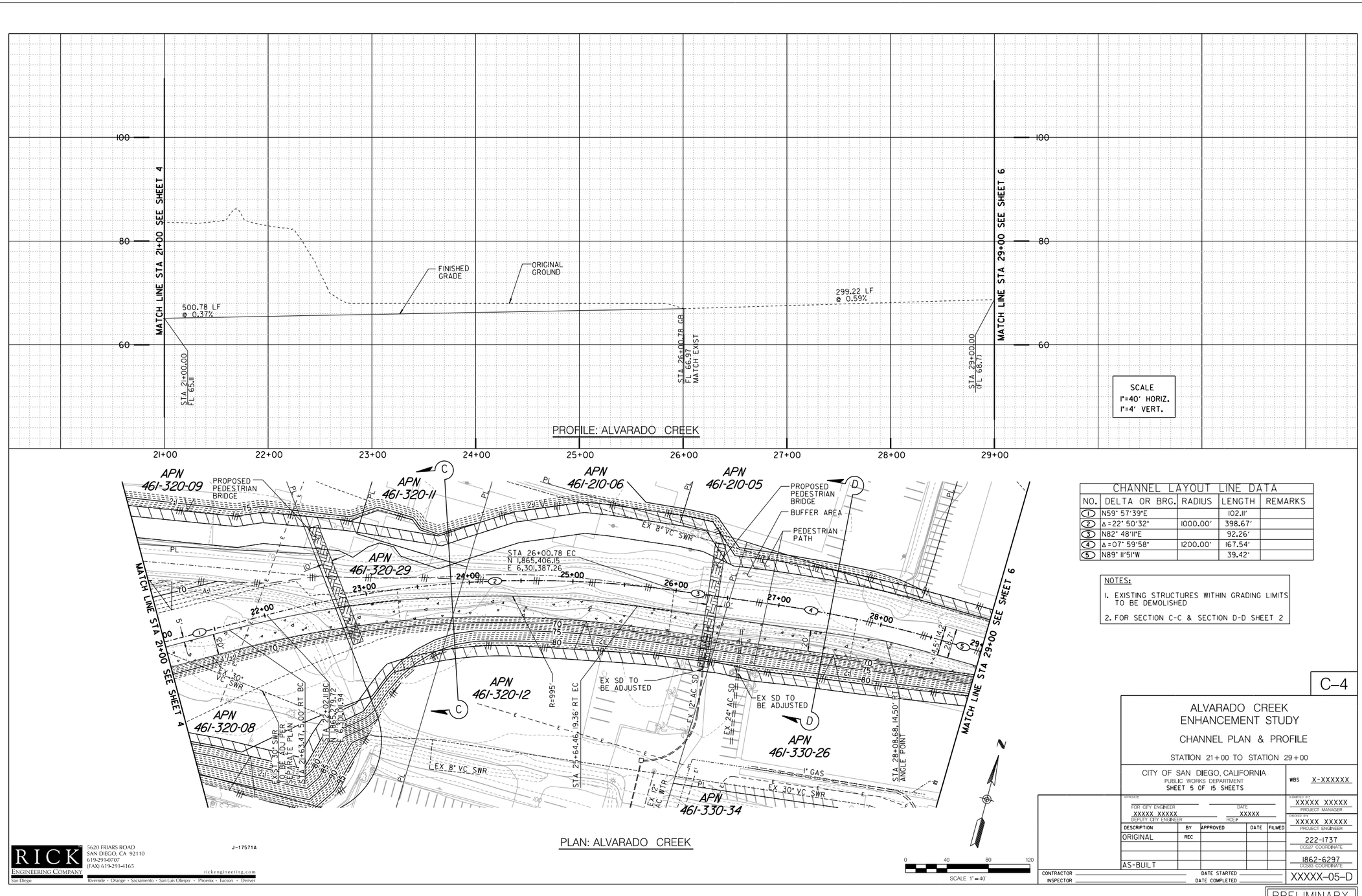

CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N59° 57'39"E		102.11'	
2	Δ=22° 50'32"	1000.00'	398.67'	
3	N82° 48'11"E		92.26'	
4	Δ=07° 59'58"	1200.00'	167.54'	
5	N89° 11'51"W		39.42'	

NOTES:

1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED
2. FOR SECTION C-C & SECTION D-D SHEET 2

PLAN: ALVARADO CREEK

C-4

ALVARADO CREEK ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 21+00 TO STATION 29+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 5 OF 15 SHEETS

#BS X-XXXXXX

APPROVED FOR CITY ENGINEER XXXXX XXXXX DEPUTY CITY ENGINEER — DATE XXXXX — RCE#

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER

ORIGINAL BY XXXXX XXXXX PROJECT ENGINEER

222-1737 CCS27 COORDINATE

1862-6297 CCS83 COORDINATE

XXXXX-05-D

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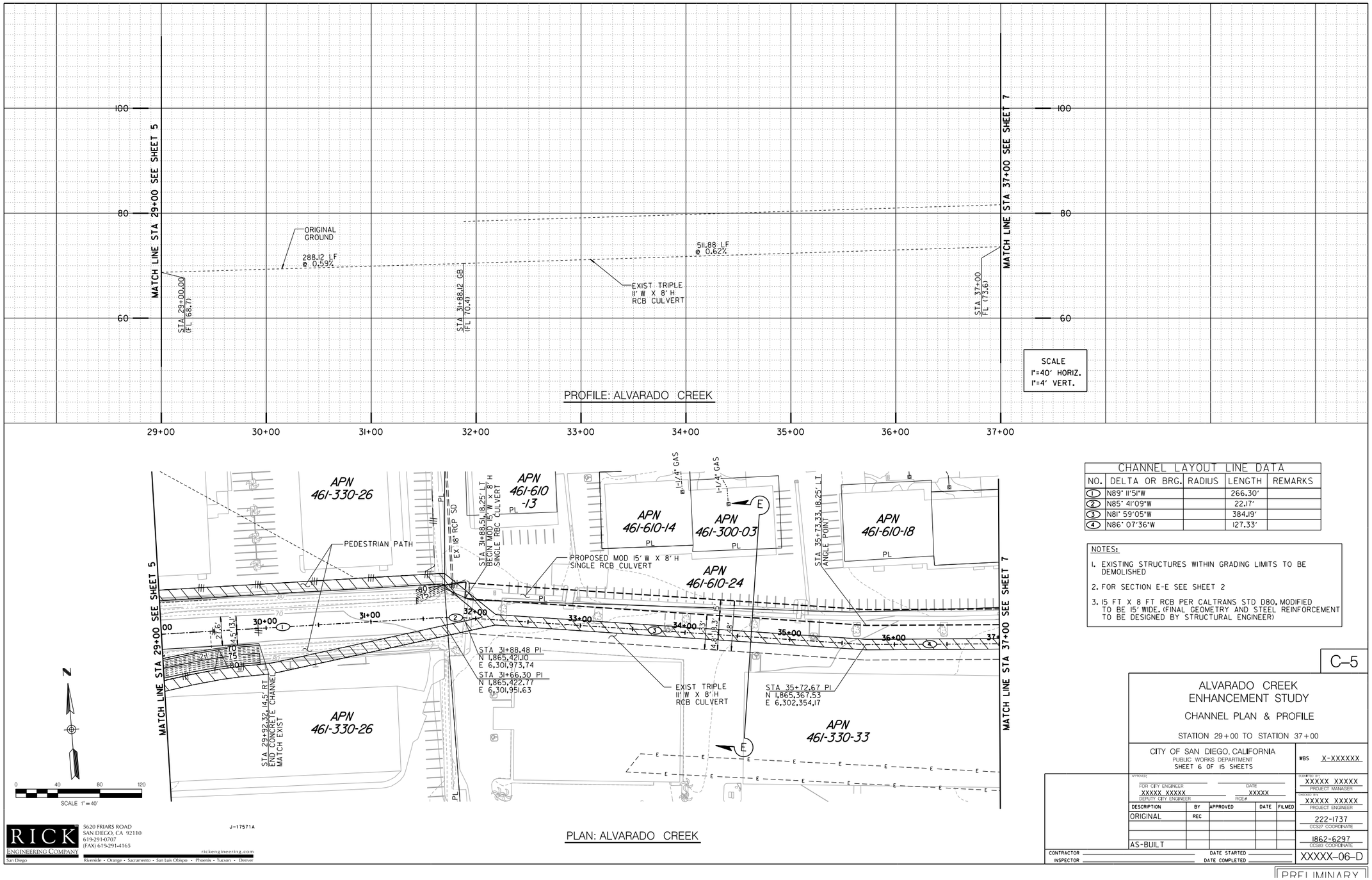

CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N89° 11'51"W		266.30'	
2	N85° 41'09"W		22.17'	
3	N81° 59'05"W		384.19'	
4	N86° 07'36"W		127.33'	

NOTES:

1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED
2. FOR SECTION E-E SEE SHEET 2
3. 15 FT X 8 FT RCB PER CALTRANS STD D80, MODIFIED TO BE 15' WIDE. (FINAL GEOMETRY AND STEEL REINFORCEMENT TO BE DESIGNED BY STRUCTURAL ENGINEER)

C-5

ALVARADO CREEK ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 29+00 TO STATION 37+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 6 OF 15 SHEETS

WBS X-XXXXXX

APPROVED FOR CITY ENGINEER XXXXX XXXXX DEPUTY CITY ENGINEER — DATE XXXXX — RCE#

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER

CHECKED BY XXXXX XXXXX PROJECT ENGINEER

222-1737 CCS27 COORDINATE

1862-6297 CCS83 COORDINATE

XXXXX-06-D

CONTRACTOR — DATE STARTED

INSPECTOR — DATE COMPLETED

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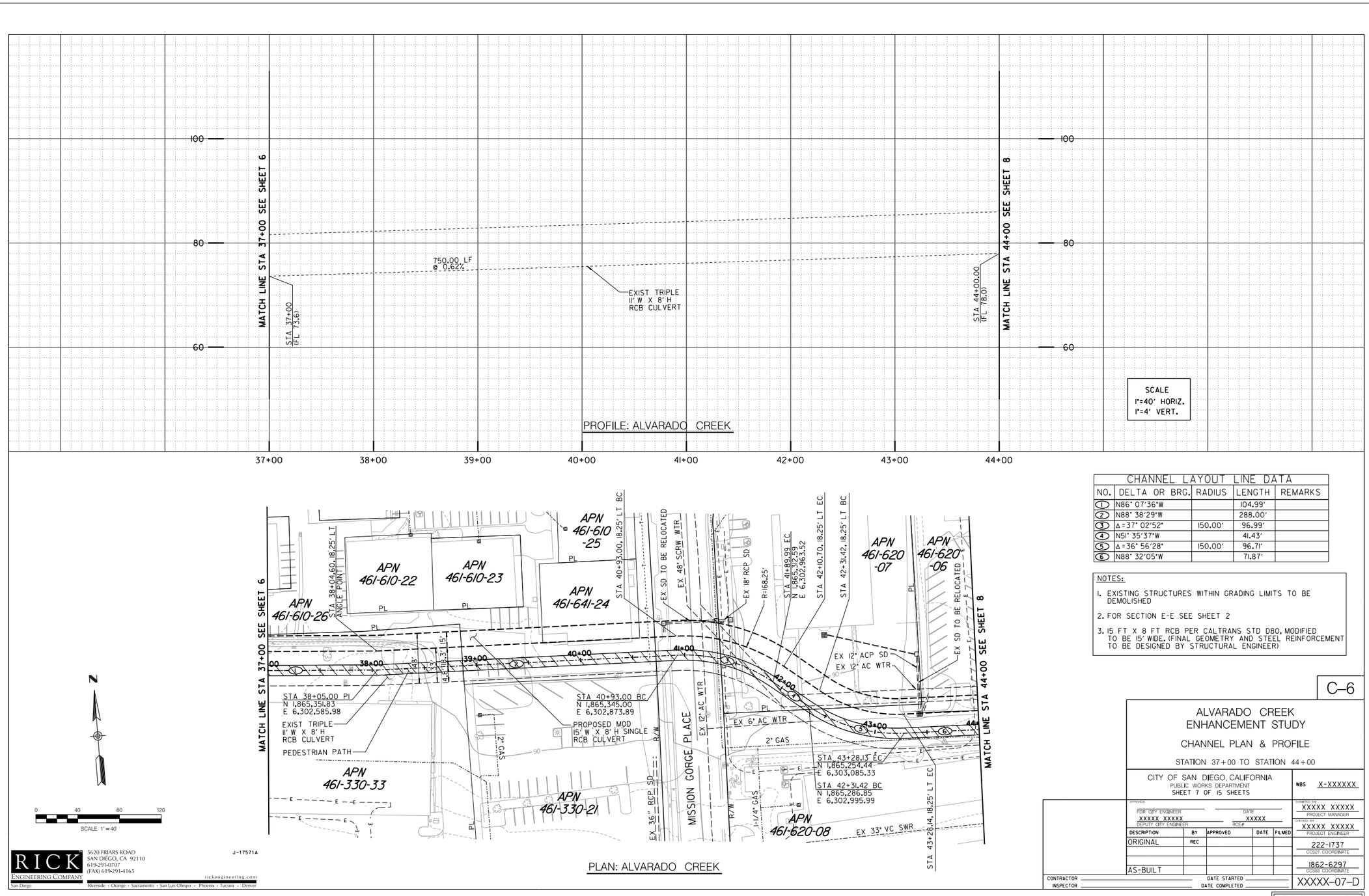

PLAN: ALVARADO CREEK

CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N86° 07'36"W		104.99'	
2	N88° 38'29"W		288.00'	
3	Δ = 37° 02'52"	150.00'	96.99'	
4	N51° 35'37"W		41.43'	
5	Δ = 36° 56'28"	150.00'	96.71'	
6	N88° 32'05"W		71.87'	

NOTES:

1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED
2. FOR SECTION E-E SEE SHEET 2
3. 15 FT X 8 FT RCB PER CALTRANS STD D80, MODIFIED TO BE 15' WIDE. (FINAL GEOMETRY AND STEEL REINFORCEMENT TO BE DESIGNED BY STRUCTURAL ENGINEER)

C-6

ALVARADO CREEK ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 37+00 TO STATION 44+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 7 OF 15 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER — DATE
XXXXX XXXXX — XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY
XXXXX XXXXX
PROJECT MANAGER

CHECKED BY
XXXXX XXXXX
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737
CCS27 COORDINATE

1862-6297
CCS83 COORDINATE

XXXXX-07-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

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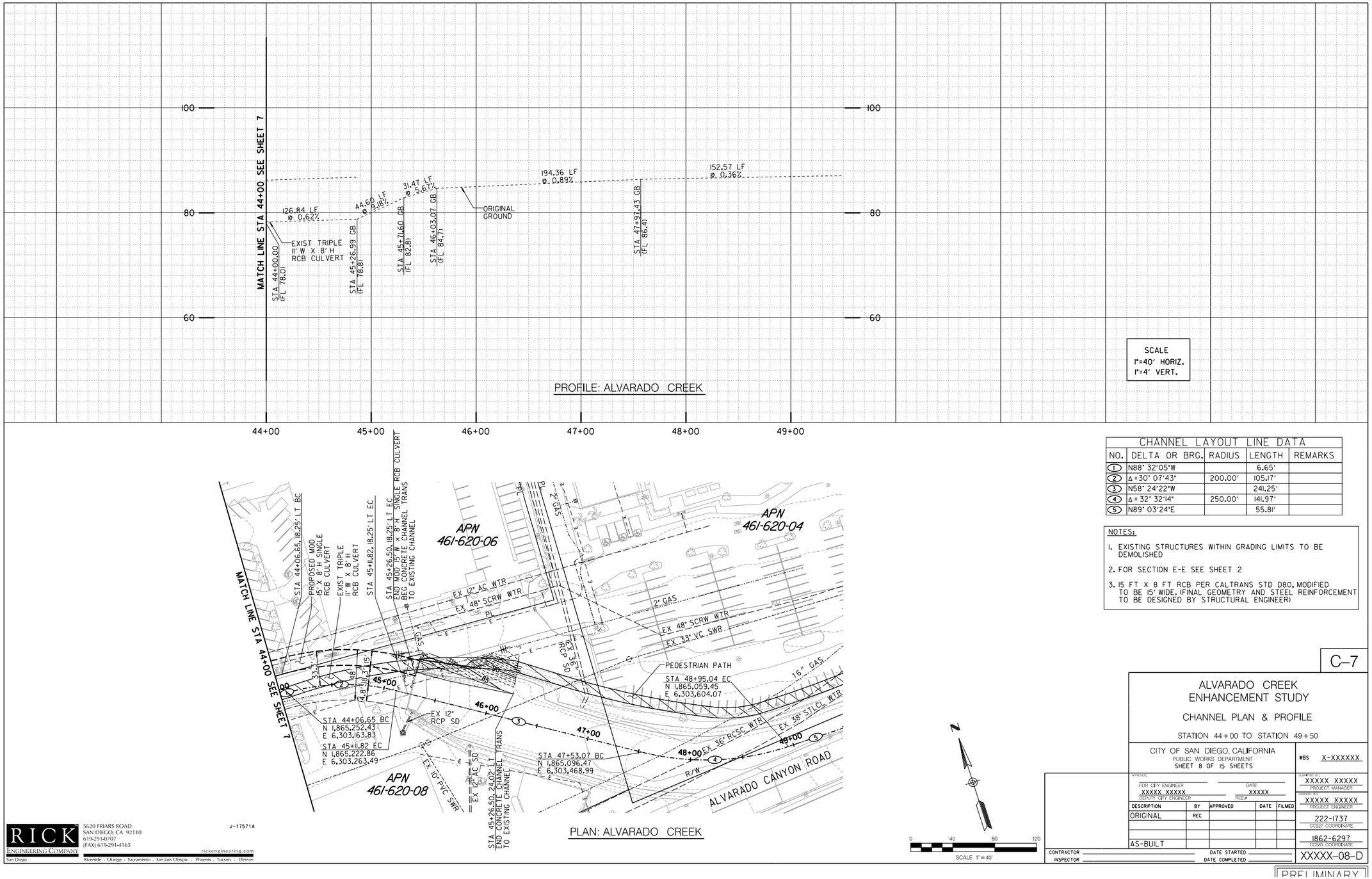
ALVARADO CREEK ENHANCEMENT STUDY



CHANNEL LAYOUT LINE DATA				
NO.	DELTA OR BRG.	RADIUS	LENGTH	REMARKS
1	N88° 32'05"W		6.65'	
2	Δ=30° 07'43"	200.00'	105.17'	
3	N58° 24'22"W		241.25'	
4	Δ=32° 32'14"	250.00'	141.97'	
5	N89° 03'24"E		55.81'	

NOTES:

1. EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED
2. FOR SECTION E-E SEE SHEET 2
3. 15 FT X 8 FT RCB PER CALTRANS STD D80, MODIFIED TO BE 15' WIDE. (FINAL GEOMETRY AND STEEL REINFORCEMENT TO BE DESIGNED BY STRUCTURAL ENGINEER)

C-7

ALVARADO CREEK ENHANCEMENT STUDY

CHANNEL PLAN & PROFILE

STATION 44+00 TO STATION 49+50

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 8 OF 15 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER XXXXX XXXXX
DEPUTY CITY ENGINEER
DATE XXXXX
RCE#

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER
CHECKED BY XXXXX XXXXX PROJECT ENGINEER
222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-08-D

PRELIMINARY

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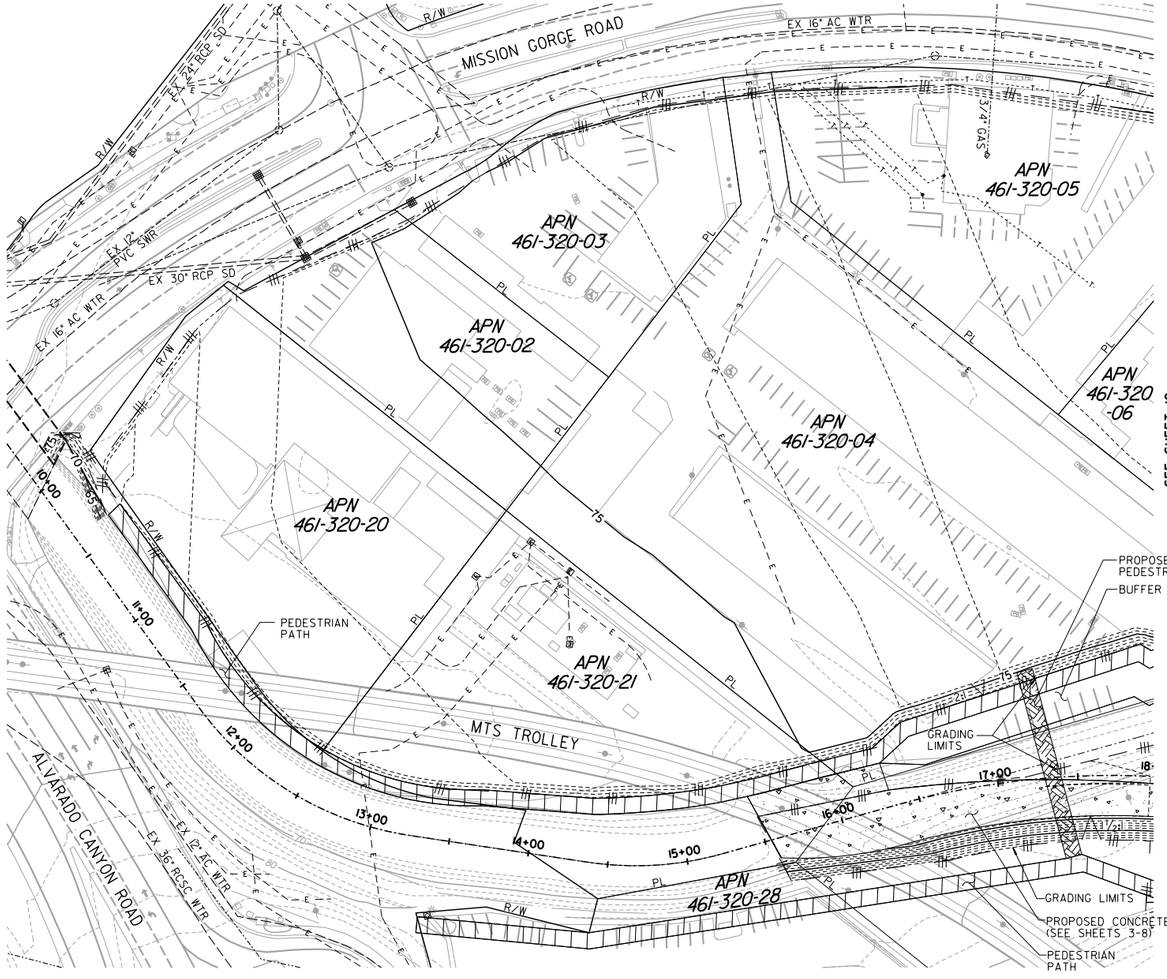

NOTE:
EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

0 40 80 120
SCALE 1" = 40'

C-8

ALVARADO CREEK ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 9 OF 16 SHEETS

WBS X-XXXXXX

FOR CITY ENGINEER — DATE
XXXXX XXXXX — XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY: XXXXX XXXXX PROJECT MANAGER
CREATED BY: XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-09-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

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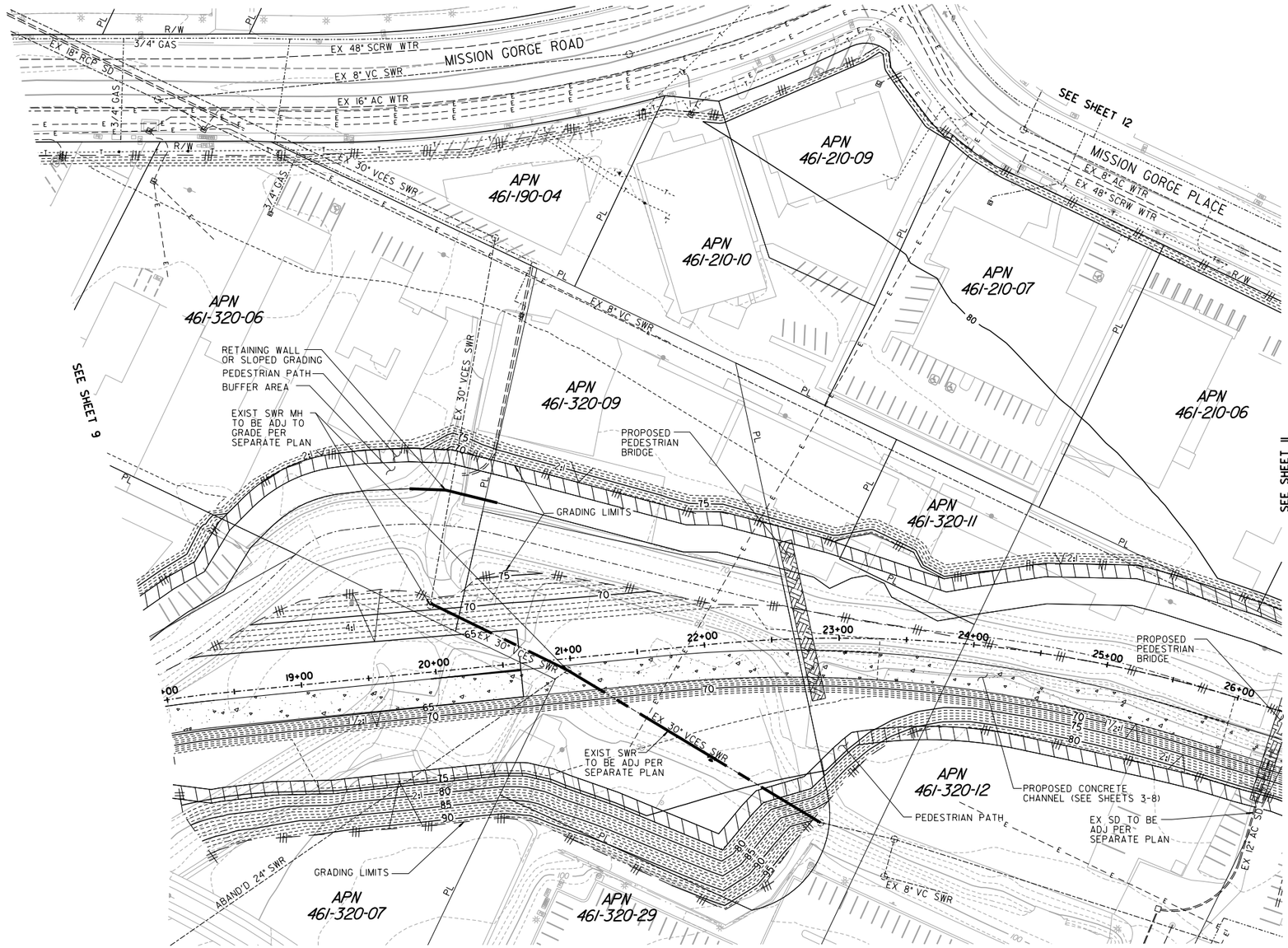

NOTE:
EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

0 40 80 120
SCALE 1" = 40'

C-9

ALVARADO CREEK ENHANCEMENT STUDY

SITE PLAN

MISSION GORGE ROAD

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 10 OF 16 SHEETS

WBS X-XXXXXX

APPROVED:
FOR CITY ENGINEER — DATE
XXXXX XXXXX — XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY: XXXXX XXXXX PROJECT MANAGER
CHECKED BY: XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-10-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

PRELIMINARY

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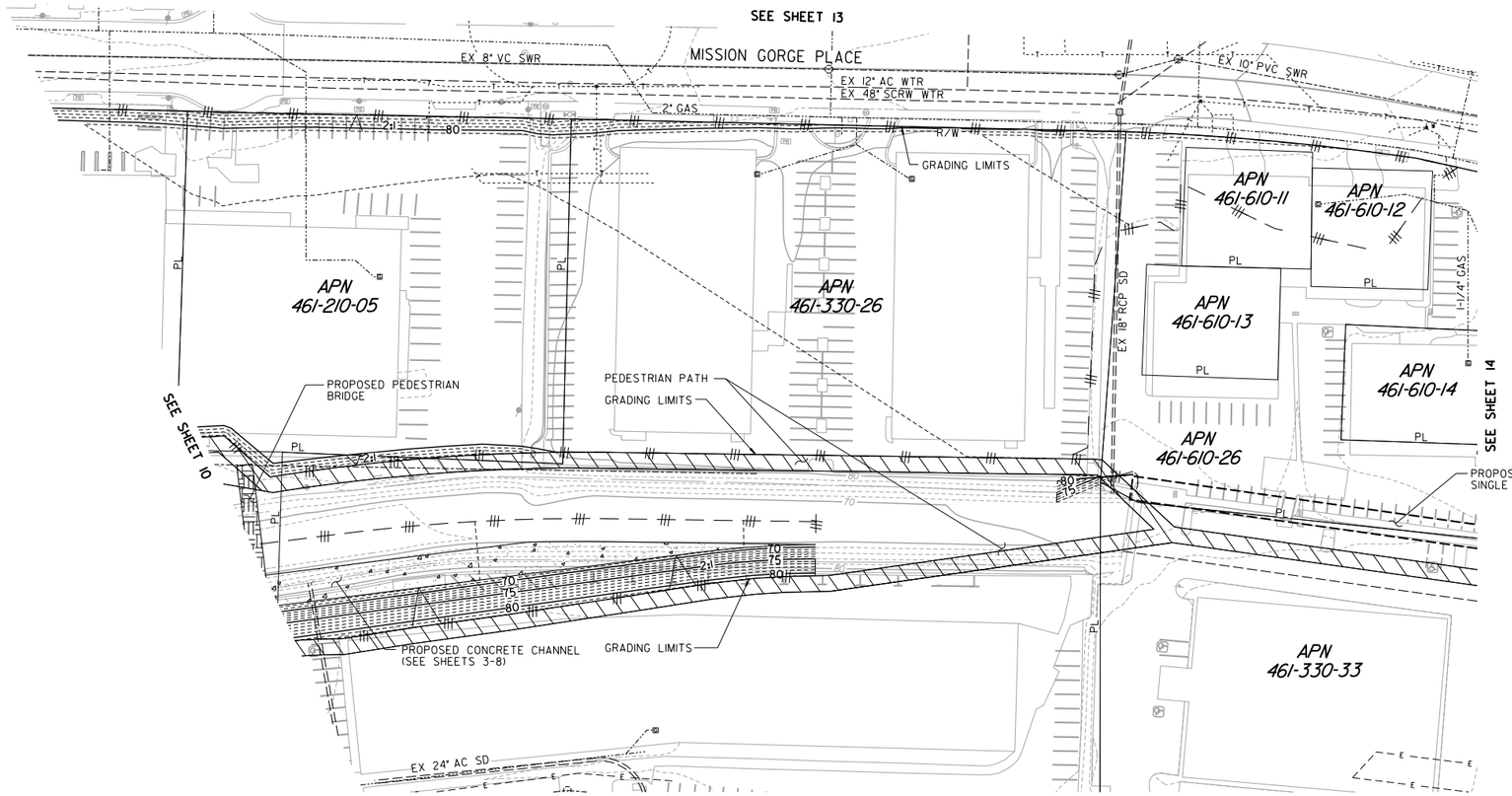

NOTE:
EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

ALVARADO CREEK ENHANCEMENT STUDY

C–10

ALVARADO CREEK
ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 11 OF 16 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER XXXXX XXXXX DEPUTY CITY ENGINEER — DATE XXXXX — RCE#

SUBMITTED BY XXXXX XXXXX PROJECT MANAGER

CHECKED BY XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE

1862-6297 CCS83 COORDINATE

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

XXXXX–11–D

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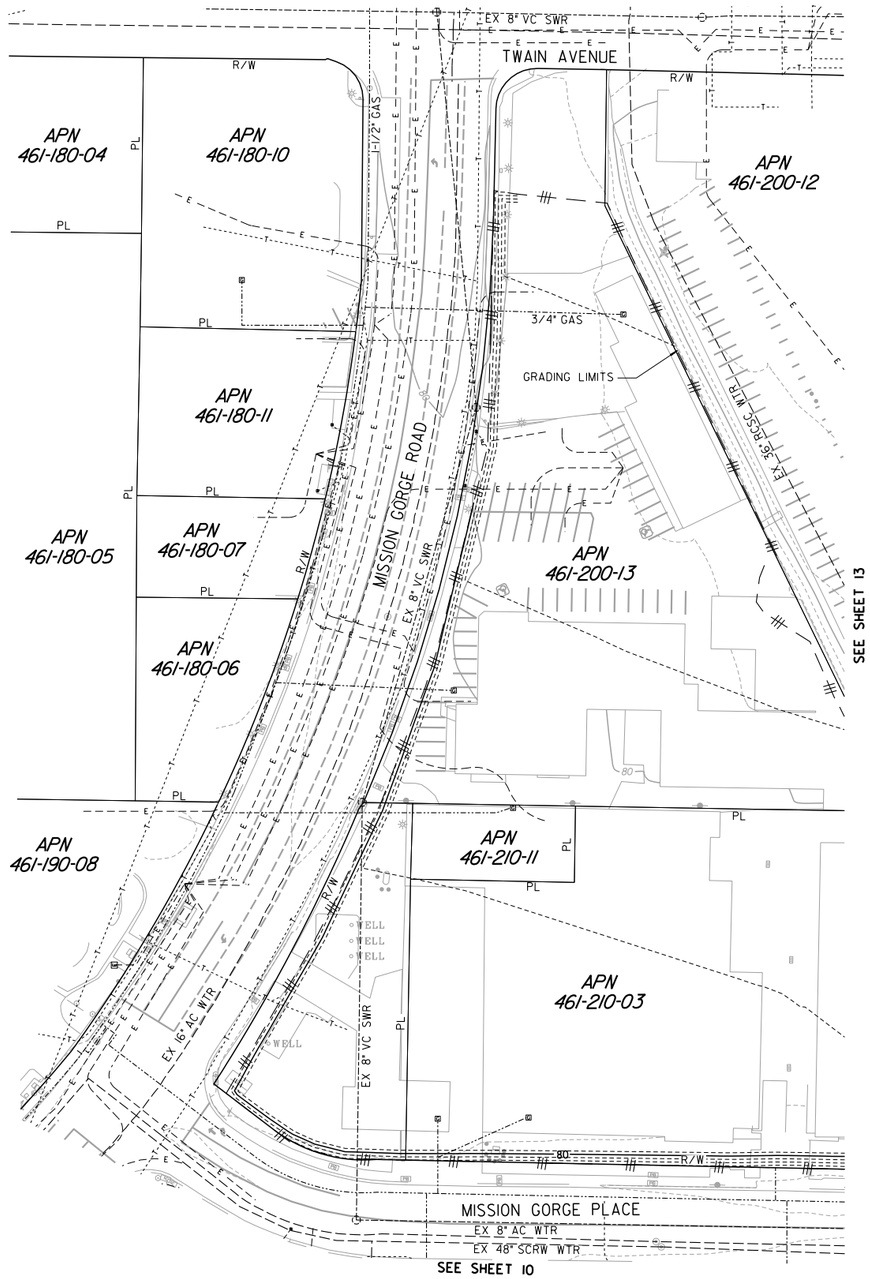

NOTE:
EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

N

0 40 80 120
SCALE 1" = 40'

C–11

ALVARADO CREEK ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 12 OF 16 SHEETS

WBS X-XXXXXX

APPROVED:
FOR CITY ENGINEER XXXXX XXXXX — DATE XXXXX
DEPUTY CITY ENGINEER — RCE#

SUBMITTED BY: XXXXX XXXXX PROJECT MANAGER
CHECKED BY: XXXXX XXXXX PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX–12–D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

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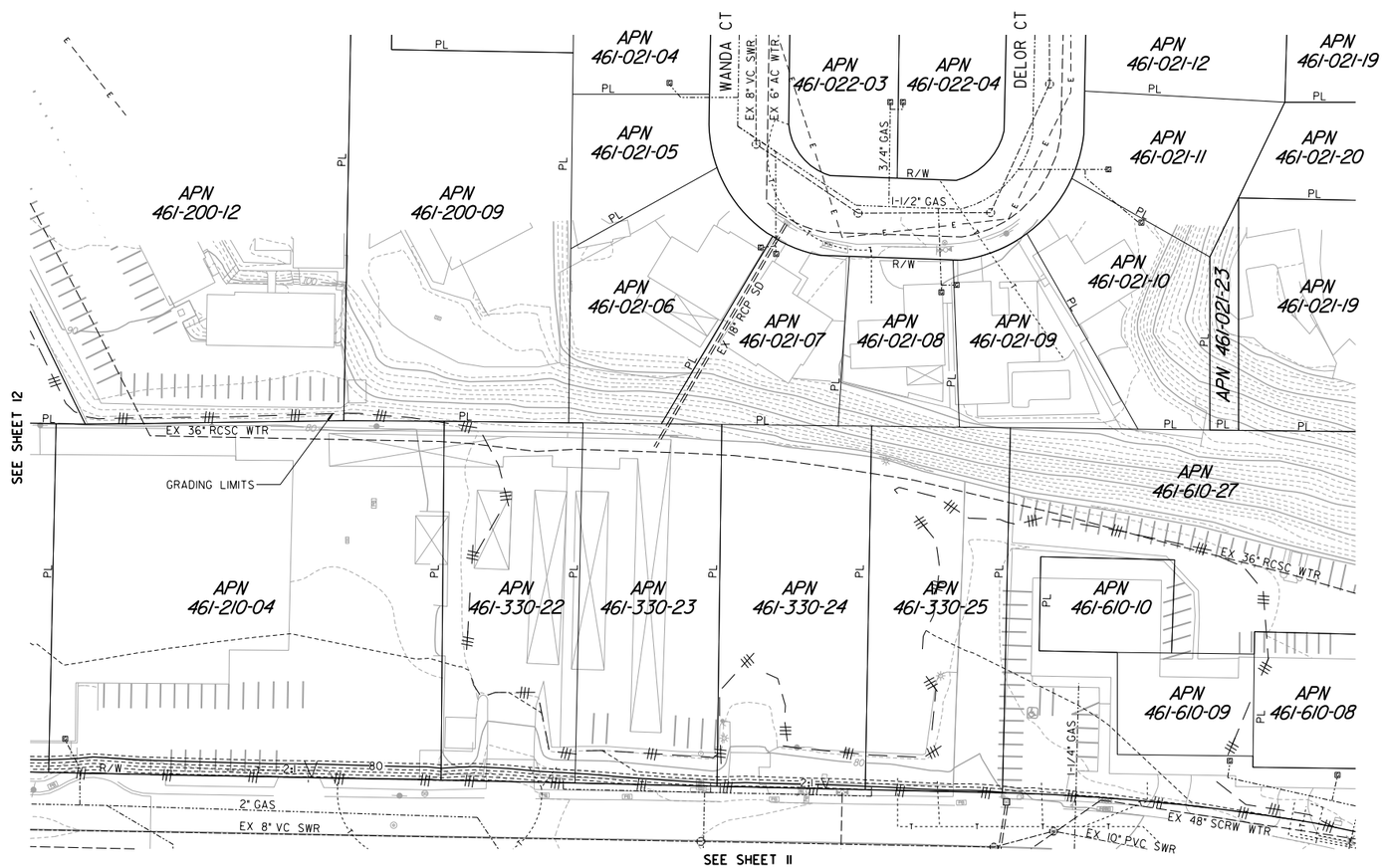

NOTE:
EXISTING STRUCTURES WITHIN GRADING LIMITS TO BE DEMOLISHED

N

0 40 80 120
SCALE 1" = 40'

C–12

ALVARADO CREEK ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 13 OF 16 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER _____ DATE _____
XXXXX XXXXX XXXXX
DEPUTY CITY ENGINEER RCE#

SUBMITTED BY
XXXXX XXXXX
PROJECT MANAGER

APPROVED BY
XXXXX XXXXX
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737
CCS27 COORDINATE

1862-6297
CCS83 COORDINATE

XXXXX–13–D

CONTRACTOR _____ DATE STARTED _____
INSPECTOR _____ DATE COMPLETED _____

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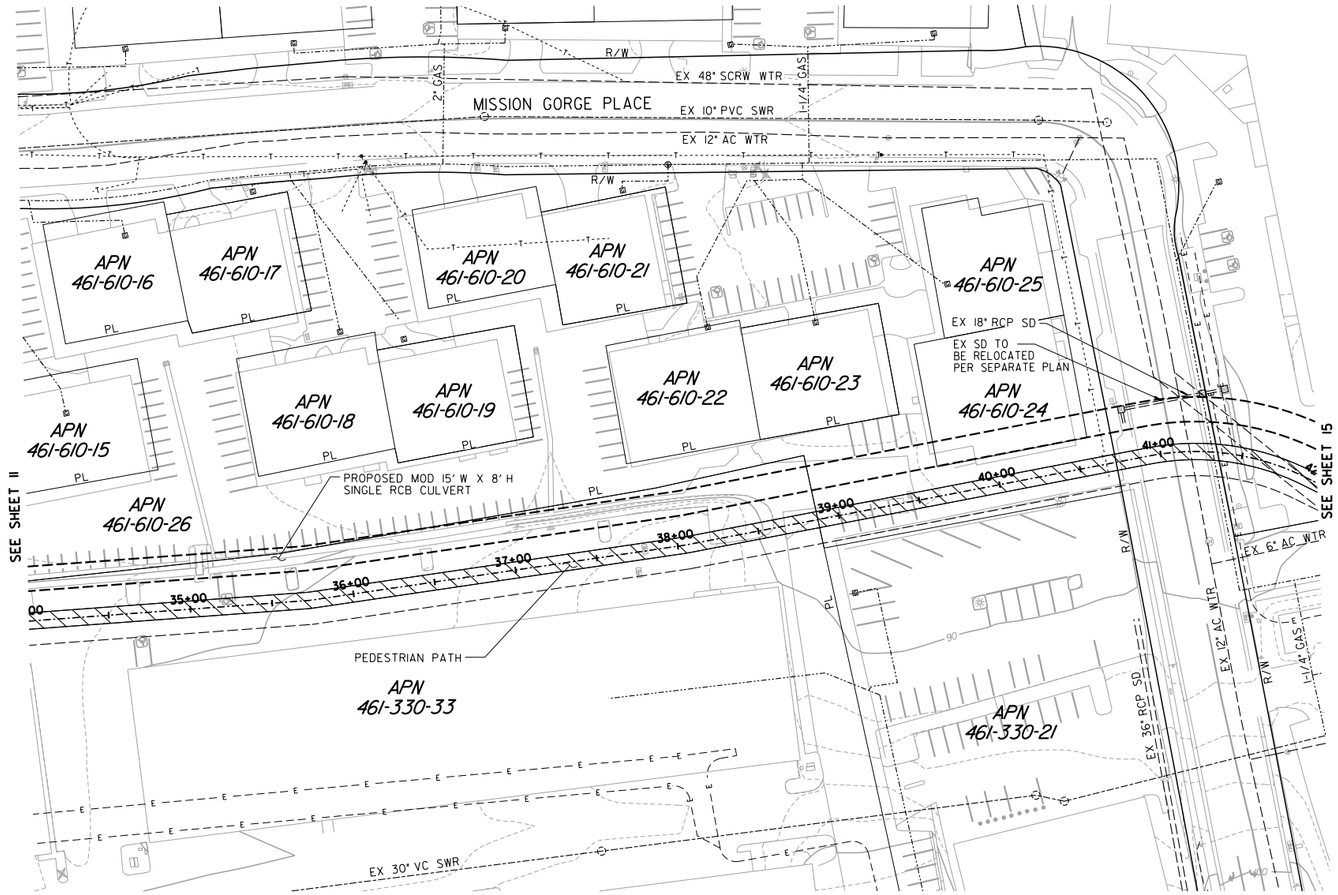
ALVARADO CREEK ENHANCEMENT STUDY



NOTE:
NO GRADING WORK BEING DONE IN THIS AREA.
FOR REFERENCE ONLY.

N

0 40 80 120
SCALE 1" = 40'

C-13

ALVARADO CREEK ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET OF 16 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER
XXXXX XXXXX
DEPUTY CITY ENGINEER
DATE
XXXXX
RCE#

DRAWN BY
XXXXX XXXXX
PROJECT MANAGER

CHECKED BY
XXXXX XXXXX
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737
CCS27 COORDINATE

1862-6297
CCS83 COORDINATE

XXXXX-14-D

CONTRACTOR
INSPECTOR
DATE STARTED
DATE COMPLETED

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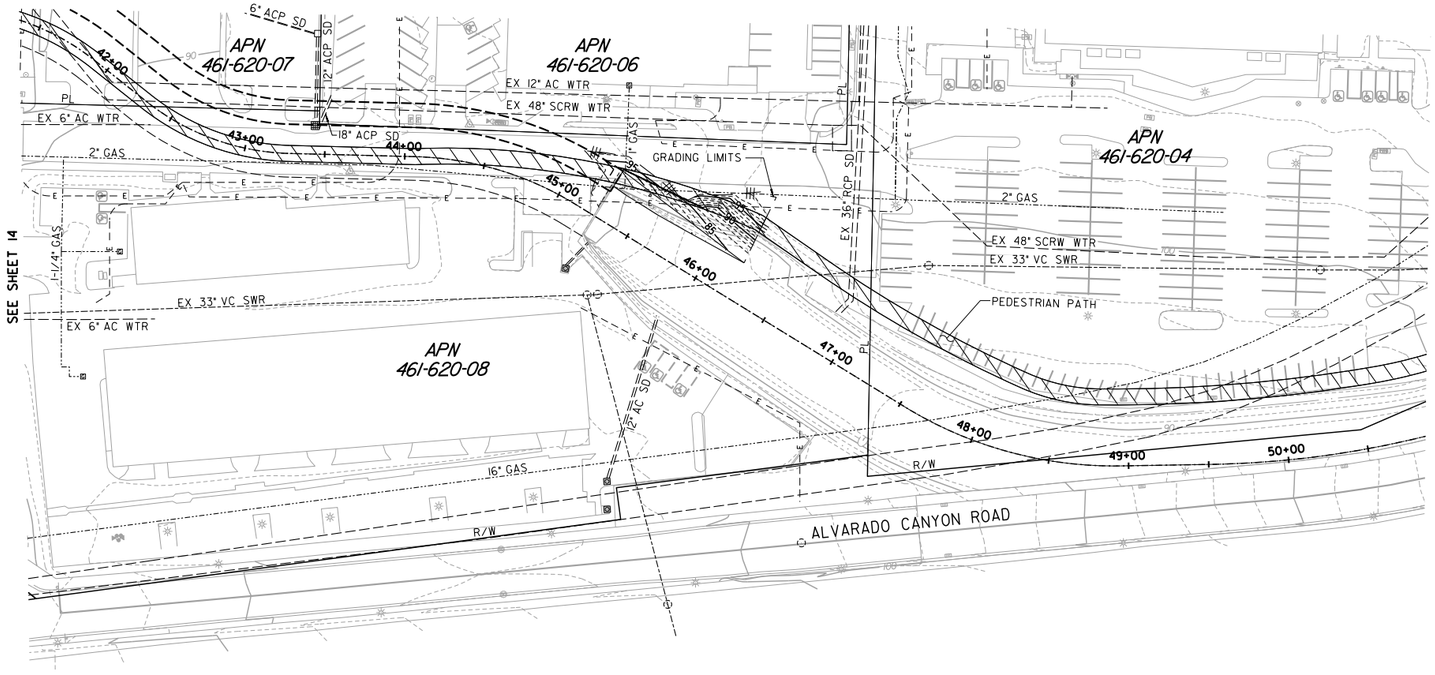

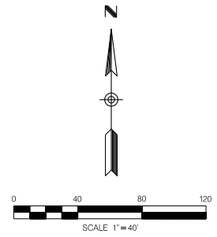

ALVARADO CREEK ENHANCEMENT STUDY

C–14

ALVARADO CREEK
ENHANCEMENT STUDY

SITE PLAN

CITY OF SAN DIEGO, CALIFORNIA
PLANNING DEPARTMENT
SHEET 15 OF 16 SHEETS

WBS X-XXXXXX

APPROVED
FOR CITY ENGINEER _____ DATE _____
XXXXX XXXXX
DEPUTY CITY ENGINEER RCE#

SUBMITTED BY
XXXXX XXXXX
PROJECT MANAGER

CHECKED BY
XXXXX XXXXX
PROJECT ENGINEER

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

222-1737
CCS27 COORDINATE

1862-6297
CCS83 COORDINATE

XXXXX–15–D

CONTRACTOR _____ DATE STARTED _____
INSPECTOR _____ DATE COMPLETED _____

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Riverside - Orange - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver

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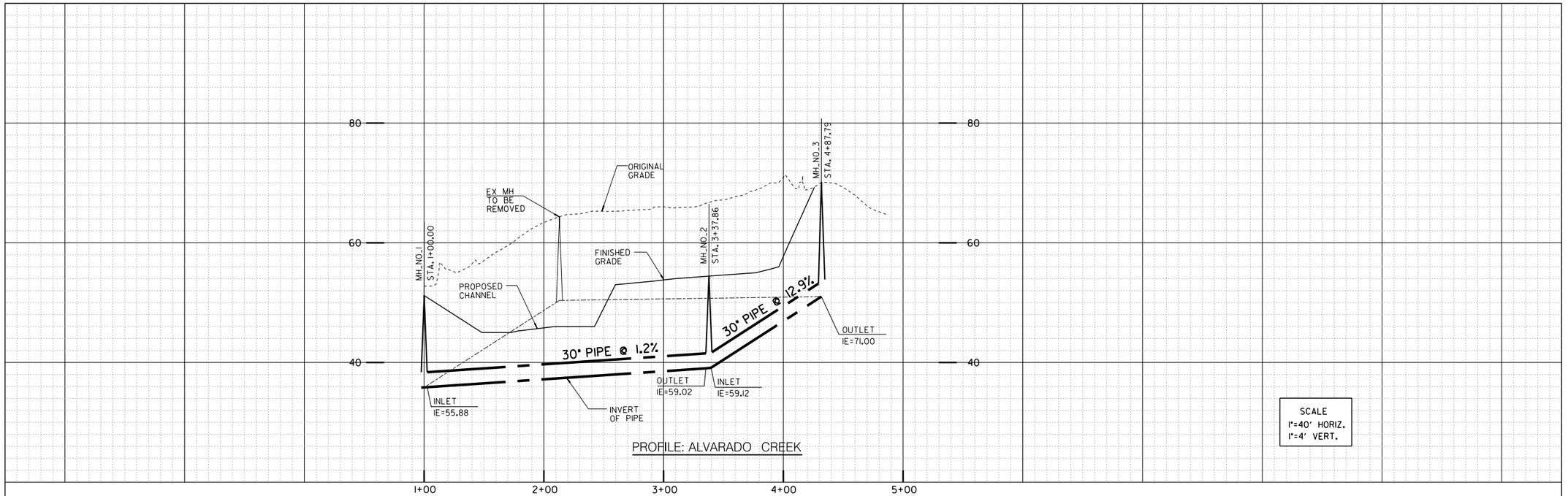
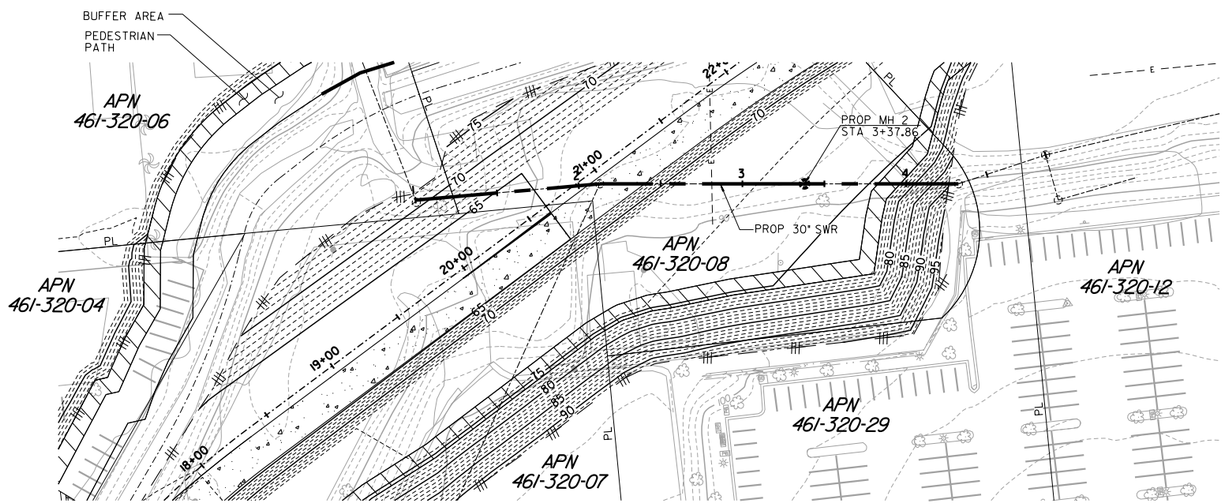


PROFILE: ALVARADO CREEK

SCALE
1"=40' HORIZ.
1"=4' VERT.



PLAN: ALVARADO CREEK

NOTES:
SEWER TO BE CONSTRUCTED PER SEPARATE PLAN.
PROVIDED FOR REFERENCE ONLY.

N

0 40 80 120
SCALE 1"=40'

ALVARADO CREEK ENHANCEMENT STUDY

C-15

ALVARADO CREEK
ENHANCEMENT STUDY

SEWER PLAN & PROFILE

STATION 1+00 TO STATION 5+00

CITY OF SAN DIEGO, CALIFORNIA
PUBLIC WORKS DEPARTMENT
SHEET 16 OF 15 SHEETS

WBS X-XXXXXX

APPROVED: FOR CITY ENGINEER — DATE
XXXXX XXXXX
DEPUTY CITY ENGINEER — RCE#

DESCRIPTION	BY	APPROVED	DATE	FILMED
ORIGINAL	REC			
AS-BUILT				

SUBMITTED BY: XXXXX XXXXX PROJECT MANAGER
CHECKED BY: XXXXX XXXXX PROJECT ENGINEER
222-1737 CCS27 COORDINATE
1862-6297 CCS83 COORDINATE
XXXXX-16-D

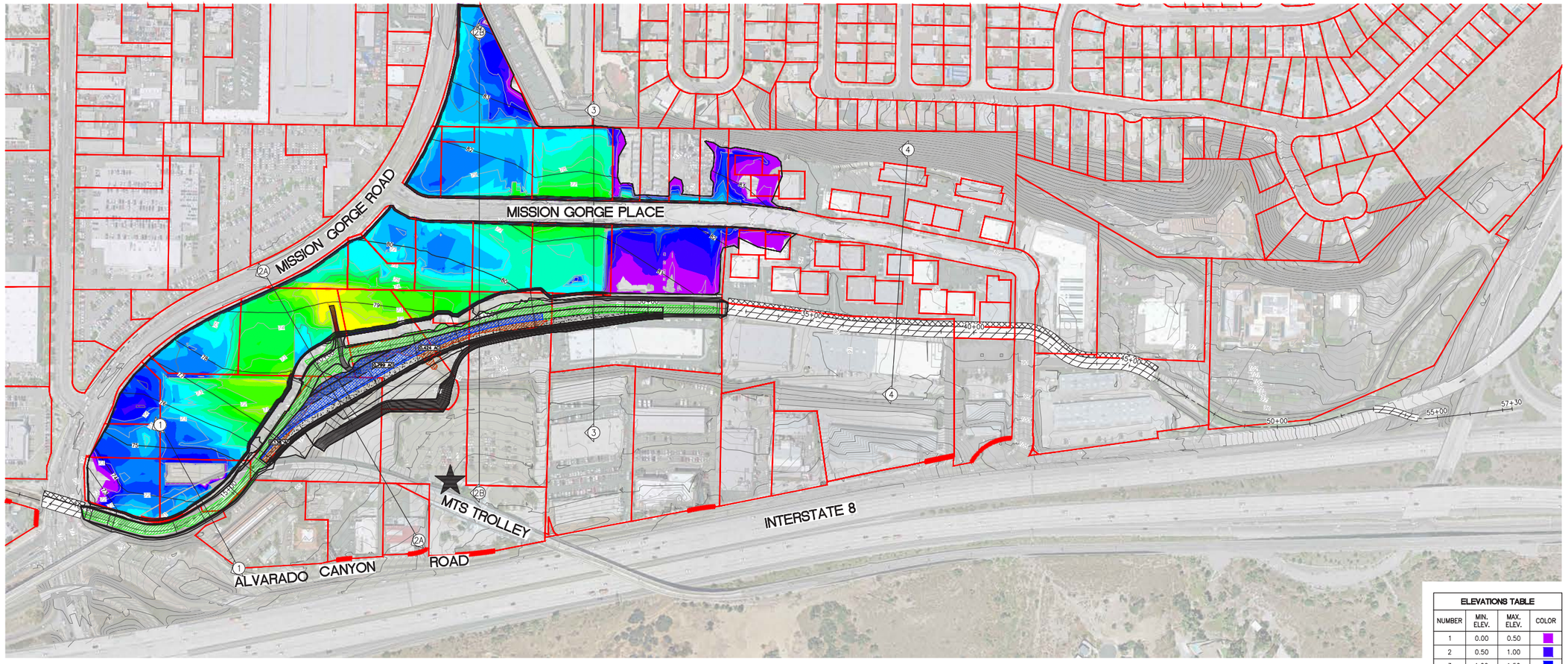
CONTRACTOR — DATE STARTED
INSPECTOR — DATE COMPLETED

PRELIMINARY

RICK ENGINEERING COMPANY
San Diego
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619-291-0707
(FAX) 619-291-4165
rickengineering.com
Riverside - Orange - Sacramento - San Luis Obispo - Phoenix - Tucson - Denver

J-17571A

ATTACHMENT 7 - FILL DEPTH MAP



LEGEND (EXISTING CONDITIONS)

PROPERTY LINE

20+00 CHANNEL STATION DESIGNATION (FEET) BY THIS STUDY)

GRANTVILLE TROLLEY STATION

EXISTING ACCESS ROAD

LEGEND (PROPOSED)

PROPOSED CENTERLINE

PROPOSED CHANNEL TOE

PROPOSED CHANNEL TOP

PROPOSED LIMITS OF GRADING

REINFORCED CONCRETE BOX CULVERT

SENSITIVE WETLAND/RIPARIAN VEGETATION COMMUNITIES

0.138 AC WETLAND AREA–IMPACTED (RIPARIAN)

0.424 AC WETLAND AREA–IMPACTED (ARUNDO)

0.799 AC WETLAND AREA–CREATED/ENHANCED

PROFILES SHOWN ON SEPARATE SHEET

ELEVATIONS TABLE			
NUMBER	MIN. ELEV.	MAX. ELEV.	COLOR
1	0.00	0.50	
2	0.50	1.00	
3	1.00	1.50	
4	1.50	2.00	
5	2.00	2.50	
6	2.50	3.00	
7	3.00	3.50	
8	3.50	4.00	
9	4.00	4.50	
10	4.50	5.00	
11	5.00	5.50	
12	5.50	6.00	
13	6.00	6.50	
14	6.50	7.00	
15	7.00	7.50	
16	7.50	8.00	
17	8.00	8.50	
18	8.50	9.00	
19	9.00	9.50	
20	9.50	10.00	

N

0 140' 280' 560'

GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
PRELIMINARY DRAFT PREFERRED PLAN

RICK ENGINEERING COMPANY
5620 FRIARS ROAD
SAN DIEGO, CA 92110
619.291.0707
(FAX)619.291.4165
rickengineering.com
San Diego Riverside Sacramento Orange Phoenix Tucson

PROJECT NO. 17571AW, 06/2017

APPENDIX E

COST ESTIMATE

TABLE E-1: ITEMIZED COST ESTIMATE

TITLE: **GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY**
Perferred Design Alternative - Preliminary Estimate
CONTRACT NO.:
ENGINEER'S OPINION: **$10,392,200**
PROJECT MANAGER:

				ENGINEER'S OPINION	
ITEM	**DESCRIPTION**	**QUANTITY**		**UNIT**	**AMOUNT**
	Preconstruction Services				
	Mobilization	1	LS	$4,000.00	$4,000.00
	Subtotal				**$4,000.00**
	Landscape Irrigation				
	Temporary Irrigation	3,580	SF	$0.50	$1,790.00
	Subtotal				**$1,790.00**
	Miscellaneous Surface Improvements				
	Porous Concrete	1,310	CY	$450.00	$589,500.00
	Subtotal				**$589,500.00**
	Grading				
	Clear and Grub	3,580	SF	$0.91	$3,265.23
	Excavate and Export	8,330	CY	$20.00	$166,600.00
	Subtotal				**$169,865.23**
	Miscellaneous Improvements				
	Pedestrian Bridge	3,600	SF	$320.00	$1,152,000.00
	Subtotal				**$1,152,000.00**
	Drainage				
	PCC Box Culvert	1,470	LF	$2,700.00	$3,969,000.00
	PCC Drainage Channel	1,510	LF	$1,072.20	$1,619,022.00
	Subtotal				**$5,588,022.00**
	Sewer				
	30" PVC Sewer Main	340	LF	$194.00	$65,960.00
	Sewer Manhole	1	EA	$1,135.00	$1,135.00
					$67,095.00
				Construction Subtotal	**$7,572,300**
				SWPPP	**$28,000**
				Field Orders (if applicable)	**$20,000**
				Eng. Design (5% of Const. Subtotal)	**$378,700**
				Contingency (20% of Const. Subtotal)	**$1,514,500**
				Const. Bond (5% of Const. Subtotal)	**$378,700**
				Environmental Permitting/Monitoring	**$500,000**
				Project Total	**$10,392,200**

NOT FOR CONSTRUCTION.
FOR STUDY PURPOSES ONLY.

Notes:
1. Details of fill area not included in this study. Cost associated with fill import, landscaping, improvements, etc. for the fill area north of Alvarado Creek are not included in this cost estimate.

APPENDIX F

SUMMARY OF COMMUNITY ENGAGEMENT

1 NAVAJO COMMUNITY PLANNERS: FLOODING SUBCOMMITTEE MEETING

September 7, 2016 | 1-3 PM

AGENDA

1-1:15pm: Welcome and Introductions

1:15pm: Meeting begins

Meeting Purpose

- Review the Alvarado Creek Enhancement Project update process and purpose
- Discuss planning group members' vision for the Project and key concerns
- Solicit input from community members on their priorities for the Project

Agenda

1. Alvarado Creek Enhancement Project Purpose and Process (10 minutes)
    a. Scope and schedule
    b. Relationship to other planning efforts
    c. Public outreach program
2. Existing Conditions Analysis (15 minutes)
3. Discussion of Project Vision and Key Issues (up to one hour)
4. Any Other Public Comment (10 minutes)
5. Wrap-Up and Next Steps

PRESENTATION

Grantville Trolley Station/Alvarado Creek Enhancement Project

Flooding Subcommittee Meeting

September 7, 2016

DYETT & BHATIA
Urban and Regional Planners

1 of 30

Agenda

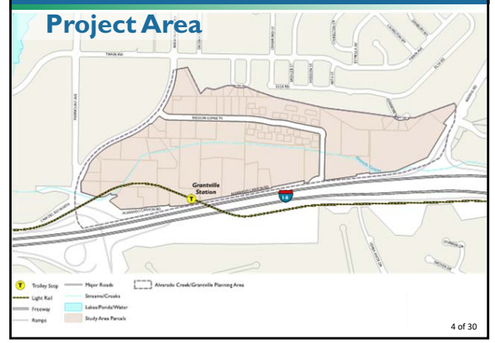
1. Project Purpose and Process
2. Preliminary Existing Conditions Analysis
3. Discussion of Project Vision and Key Issues
4. Wrap-up and Next Steps

2 of 30

1. Project Purpose and Process

3 of 30

Project Area



4 of 30

Project Purpose

- Address flooding along Alvarado Creek
  - *Potential solutions include widening and realigning creek channel*
- Increase access to Grantville Trolley Station
  - *For instance, connect properties to the north of station via pedestrian/bike bridge over creek*
- Enhance Alvarado Creek as an amenity
  - *Create circulation network for bicyclists and pedestrians*
  - *Explore concepts for parks along and adjacent to the creek*
  - *Enhance connections to the creek*
- Improve the creek's water quality

5 of 30

Project Background

- Alvarado Creek revitalization has been previously studied
- This Project was precipitated by the Grantville Focus Plan Amendment (adopted 2015), which includes the following objectives:
  - *Encourage transit-oriented development*
  - *Create active, attractive, and pedestrian-focused environment*
  - *Provide more housing choices*
  - *Provide opportunity for pedestrian-bicycle bridge over Alvarado Creek*
- Revitalization of Alvarado Creek is also a component of the San Diego River Park Master Plan
- The Project funded by grant from San Diego's regional planning agency (SANDAG)

6 of 30

Project Timeline

	Existing Conditions and Hydrology Analysis	Conceptual Design and Feasibility Testing	Preferred Design Refinement and Trail Design
Summer 2016	- Data gathering and analysis		
Fall 2016	- Existing Conditions Report - Feasibility Criteria		
Winter 2016/17	- Multi-Pronged Outreach - Multi-Pronged Outreach Summary	- Alternatives Development - Feasibility Testing	- Educational Signage Plan
Spring 2017	- Final Hydrology Report	- Technical Working Group - Community Workshop	- Feasibility Scoring for Creek Alternatives
Summer 2017			- Feasibility Scoring for Trail Alternatives

*CPG meeting will be held during project, schedule TBD.

7 of 30

Project Timeline

Fall 2017	- Outreach on Preferred Alternative and Feasibility Report
Winter 2017/18	- Draft and Final Revitalization Plan and Feasibility Report
Spring 2018	- 30% Construction Drawings - Cost Estimate
Summer 2018	- Project completion

8 of 30

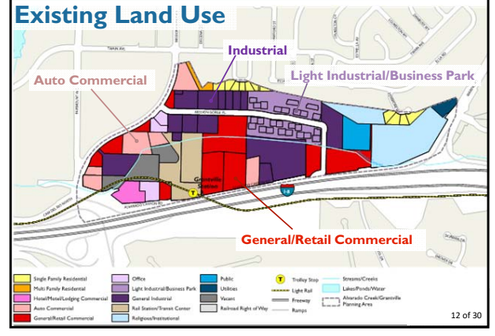
2. Preliminary Existing Conditions Analysis

9 of 30

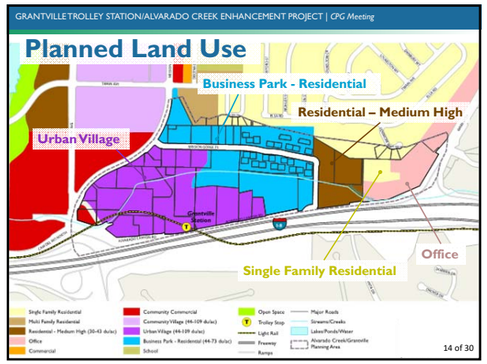
10 of 30

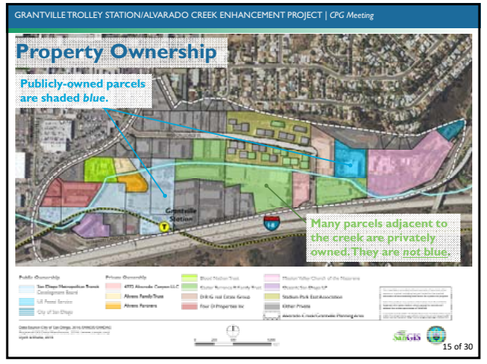
11 of 30

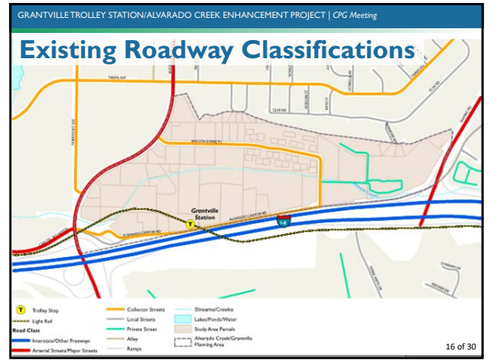
Existing Land Use

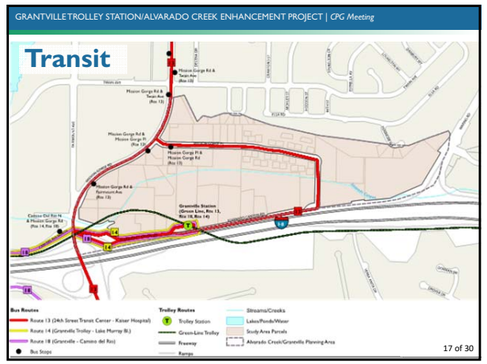


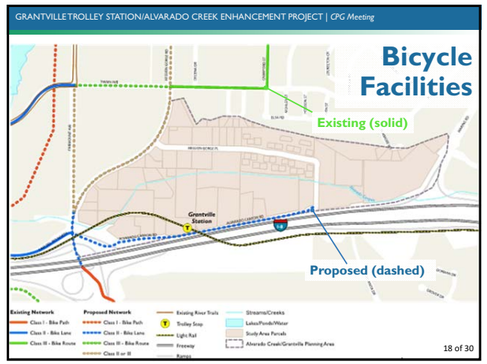
12 of 30

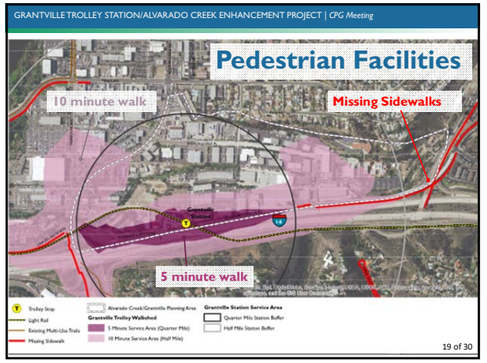


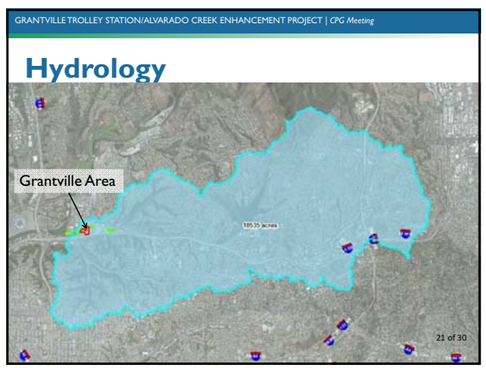












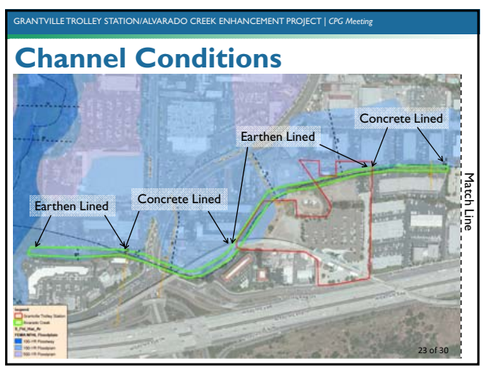
GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT PROJECT | *CPG Meeting*

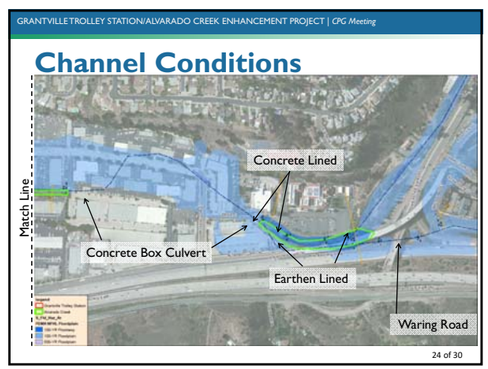
Hydrology

FEMA Effective Flow Rate Data

Location Along Alvarado Creek	Drainage Area (sq. miles)	10-year storm event flowrate (cfs)	50-year storm event flowrate (cfs)	100-year storm event flowrate (cfs)
Upstream of Waring Road	12.1	2,300	3,700	4,300
Downstream of Waring Road	13.4	2,600	4,300	4,800
At San Diego River	14.0	2,700	4,500	5,100

22 of 30





Channel Conditions

Consistent flooding

Source - ABC 10 news article: http://www.10news.com/news/team-10/grantville-business-owner-says-city-not-doing-enough-to-stop-recurring-floods
Dated – January 2016

Last City of San Diego Maintenance Date: October 2015

3. Discussion

Discussion

- What would you like this Project to achieve?
- What concerns, if any, do you have?
- What other opportunities does this area have?

Project Objectives:

Flooding

Connectivity

Alvarado Creek as an amenity

Water Quality

Discussion

Key to this Project's public participation strategy is to meet people where they are.

Where, when, and how do you suggest we reach out to community members (e.g., specific events, locations, days of the week)?

4. Next Steps

- Existing Conditions Report (Fall 2016)
- Multi-Pronged Outreach (Fall 2016)
- Develop channel improvement and trail alignment alternatives (Winter 2016 – 2017)

Thank you and keep in touch!

Seth Litchney, Project Manager
SLitchney@sandiego.gov
(619) 236-6892

2

NAVAJO COMMUNITY PLANNERS: FLOODING SUBCOMMITTEE MEETING

January 11, 2017 | 6:30-8 PM

AGENDA

1-1:15pm: Welcome and Introductions

1:15pm: Meeting begins

Meeting Purpose

- Review the Alvarado Creek Enhancement Project update process and purpose
- Discuss planning group members' vision for the Project and key concerns
- Solicit input from community members on their priorities for the Project

Agenda

1. Call to Order
2. Roll Call of Board Members
3. Modifications to Agenda (2/3 vote requirement to change Information items to Action Items prior to agenda adoption)
4. Minutes: Approval of the December 14, 2016 Meeting Minutes

Officers Report
Chair – Matt Adams
Vice Chair – Jay Wilson
Treasurer – Marilyn Reed

Elected Officials' Reports

5. Public Comment on Non-Agenda Items (3 minutes each)
6. Informational Presentations:

   a. Alvarado Storm Drain/Creek Project: Lisa Lind

   b. San Carlos Library Design: David Pfeifer, architect

Action Items:
Election Committee – Creation of the NCPI Election Committee for the Wednesday, March 8, 2017 Board of Directors election.

Community Group Reports:

- Allied Gardens Community Council
- Del Cerro Action Council
- San Carlos Area Council
- Mission Trails Regional Park Advisory Board

Old Business / New Business / Adjourn

PRESENTATION

Grantville Trolley Station/Alvarado Creek Enhancement

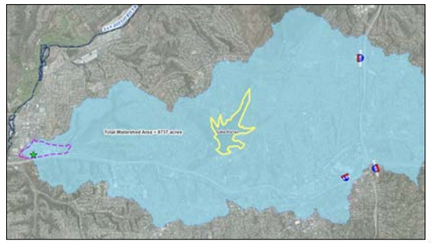
Navajo Community Planners Meeting
January 11, 2017

The City of SAN DIEGO

Study Area and Objectives

- Address flooding, **stormwater**, and water quality issues;
- Increase **access** to the trolley and Alvarado Creek;
- Enhance Alvarado Creek as an **amenity** that includes pedestrian/ bicycle trails; and
- Foster **transit oriented development** adjacent to the Grantville Trolley Station.

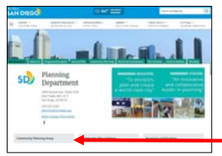
Alvarado Creek Watershed



Timeline

Existing Conditions Report

- Available at the City of San Diego Website: https://www.sandiego.gov/planning/community/profiles/navajo#Grantville Trolley Station/Alvarado Creek Enhancement Study



Select Community Planning Areas

Community Planning Areas

- Eastern Areas
- Encanto
- Fairbanks Ranch Country Club
- Greater Golden Hill
- Kearny Mesa
- Kensington-Talmadge
- La Jolla
- Linda Vista
- Midway Pacific Hwy Corridor
- Miramar Ranch North
- Mira Mesa
- Mission Beach
- Mission Valley
- Navajo
- Normal Heights

Scroll down and select Navajo

Select Study

Grantville Trolley Station/Alvarado Creek Enhancement Study

The Grantville Trolley Station/Alvarado Crek Enhancement Study focuses on addressing flooding, improving access to the Grantville Trolley Station, improving water quality, and transforming Alvarado Creek into an amenity. A revitalized creek corridor can enhance the experience around the trolley station for future development.

Project Fact Sheet

Existing Conditions Report and Community Workshop information coming soon

Existing Conditions (2017)

Biological Resources (2016)

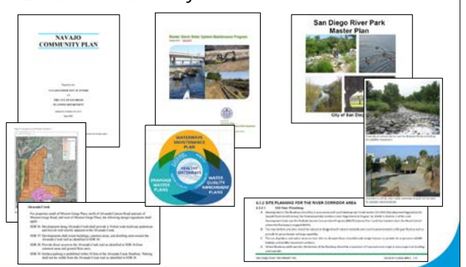
Select Report

Existing Conditions Summary

LAND USE	
Ownership	→ Opportunities to discuss revitalization plan
Existing development faces away from creek	→ Supplemental development regulations

---

Land Use Summary



Land Use Summary

Land Use Summary

Existing Conditions Summary

LAND USE	
Ownership	→ Opportunities to discuss revitalization plan
Existing development faces away from creek	→ Supplemental development regulations
TRANSPORTATION NETWORK AND ACCESS	
Lack of internal streets	→ Transit-oriented development
Limited access to the trolley	→ Bridge connection over the creek

Planning Department

Transportation and Access

sandiego.gov

Planning Department

Existing Conditions Summary

LAND USE	
Ownership	→ Opportunities to discuss revitalization plan
Existing development faces away from creek	→ Supplemental development regulations
TRANSPORTATION NETWORK AND ACCESS	
Lack of internal streets	→ Transit-oriented development
Limited access to the trolley	→ Bridge connection over the creek
BIOLOGICAL RESOURCES	
Natural areas and jurisdictional resources	→ Sensitive design and green infrastructure
Permitting and regulations	→ Opportunities for open areas and buffers

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Biological Resources

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Hydrology and Water Quality

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Planning Department

Hydrology and Water Quality

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Alternatives Development and Feasibility

- Storm water function
- Land availability
- Route directness and continuity
- Regulatory permitting
- Sustainability
- Cost

...and more!

sandiego.gov

Planning Department

Next steps – Tentative Schedule

Flooding Subcommittee – late January

Community Workshop - February 15th

Online Survey

Navajo Planners – March

www.sandiego.gov/planning/community/profiles/navajo#Grantville Trolley Station/Alvarado Creek Enhancement Study

sandiego.gov

3

DEL CERRO ACTION COUNCIL AGENDA

January 26, 2017 | 7 PM

AGENDA

1. Call meeting to Order
2. Pledge of Allegiance
3. Approval of January Agenda
4. Approval of the October DCAC General Meeting Minutes
5. Community Police Report

- SDPD Community Relations Officer John Steffen
- SDSU Police Community Resource Officer Mark Peterson and Nicole Borunda, Community Relations Manager for SDSU

6. DCAC Officers Report

- President Report
- Vice President Report
- Treasurer Report

7. Elected Officials Report:

- Councilmember Scott Sherman: Liz Saidkhanian, Council Representative for Del Cerro
- Congresswoman Susan Davis Representative

8. Main Topics:

- Lisa Lind, Senior Planner for the City and Project Manager for resolving the Alvarado Creek/ Storm Drain Flooding issue in Grantville, will provide a Power Point presentation on the "Grantville Trolley Station/Alvarado Creek Enhancement Study"
- Mark Rawlins, Friends of Del Cerro, provide update on the Del Cerro Maintenance Assessment District.

9. Old Business
10. New Business
11. Next Meeting – Thursday, April 27 – 7 p.m. in Temple Emanu-El
12. Adjourn

4 COMMUNITY WORKSHOPS

February 13 & 15, 2017

The City of SAN DIEGO

You're invited to participate

Grantville Trolley Station/ Alvarado Creek Enhancement Study

Community Workshops

February 13TH
5:30-7:00 PM

Mission Trails Regional Park
Visitor Center
One Father Junipero Serra Trail

AND

February 15TH
11:30 AM – 1:00 PM

Junior Achievement San Diego
4756 Mission Gorge Place

(Directions provided on back)

The study is being led by the City of San Diego, and is funded by a Smart Growth Incentive Program grant from the San Diego Association of Governments (SANDAG). An Existing Conditions Report is available on the study area at this website:

www.sandiego.gov/planning/community/profiles/navajo#Grantville Trolley Station/Alvarado Creek Enhancement Study

SANDAG TransNet

Objectives

Address flooding, stormwater, and water quality

Increase access to the Grantville Station and Alvarado Creek

Enhance Alvarado Creek as an amenity that includes pedestrian/bicycle trails

Foster transit oriented development adjacent to the Grantville Station

Contact
Lisa Lind
(619) 236-6531
llind@sandiego.gov

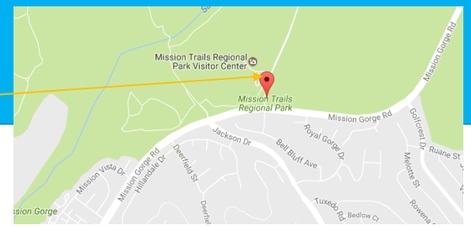
1010 Second Ave. Suite 1100, San Diego, CA 92101 | (619) 235-5200 | planning@sandiego.gov | sandiego.gov/planning

Directions to Community Workshops

February 13th: Mission Trails Regional Park Visitor Center, One Father Junipero Serra Trail

The entrance to the Visitor Center parking lot is on the left, just before the pipe gate, off Father Junipero Serra Trail.

Visitor Center



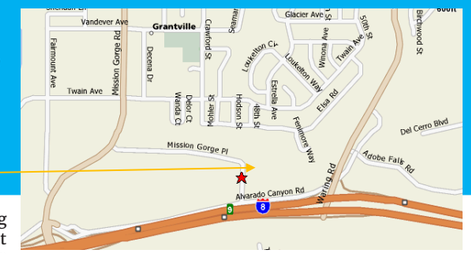
From I-8 - Take Interstate 8 to the Mission Gorge Road/Fairmount Avenue exit. Turn north onto Mission Gorge Road and proceed for 4.2 miles. When you pass the Jackson Drive intersection, move into the left lane. Look for the large wooden Mission Trails Regional Park sign on the left side of the road, and turn left onto Father Junipero Serra Trail.

From Highway 52 - Take Highway 52 to the Mast Blvd. exit. Driving from the west, turn left onto Mast Blvd, go under the freeway to the first traffic signal at West Hills Parkway, and turn right. Driving from the east, exit Mast Blvd. and turn right. Turn right again at the first traffic signal onto West Hills Parkway and right onto Mission Gorge Road. Proceed south on Mission Gorge Road for 2.4 miles. Look for the large wooden Mission Trails Regional Park sign on the right side of the road, and turn right onto Father Junipero Serra Trail.

February 15th: Junior Achievement San Diego, 4756 Mission Gorge Place

Park in space that does not have a "Reserved" sign. Alternate parking is available at the Mission Church of the Nazarene at the bottom of the hill. Please contact the Junior Achievement office should you have any trouble finding the building: (619) 682-5155.

Junior Achievement



From I-8 Heading West - Exit Waring Road, heading north. Take a sharp right onto Adobe Falls Road. Continue over the bridge, heading west, onto what is now Alvarado Canyon Road. Make a right turn at the first stop sign, which is Mission Gorge Place. Make a right into the second driveway, heading east. Pass the post office and take the next left turn up the hill to the large white building.

From I-8 Heading East - Take Interstate 8 East to Mission Gorge Road. Make a left onto Mission Gorge Road. Make 1st right under the bridge onto Alvarado Canyon Road. (Turn away from Starbucks and Chili's.) Follow the freeway to your right, obeying the yield sign (rather than the stop sign to the left). Continue on Alvarado Canyon to the stop sign at Mission Gorge Place. Make a left turn onto Mission Gorge Place. Take an immediate right onto the second driveway, heading east. Pass the post office and take the next left turn up the hill to the large white building.

1010 Second Ave. Suite 1100, San Diego, CA 92101 | (619) 235-5200 | planning@sandiego.gov | sandiego.gov/planning

BOARDS

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY

FLOOD CONTROL/CAPACITY AND CREEK AMENITIES

One goal of this study is to address the issue of flooding in the Study Area. The following is a list of flood control strategies and creek amenities that will help mitigate flooding in the Study Area.

- CREEK RE-ALIGNMENT
- DEEPEN CHANNEL
- RAISE BANK HEIGHT
- WIDEN CHANNEL REACHES
- NATURAL CHANNEL BOTTOM
- ENHANCE CHANNEL SIDES (GABIONS)
- REDUCE BARRIERS/ CULVERTS
- TRAIL ALIGNMENT
- LINEAR PARKS
- POCKET PARKS
- HABITAT BUFFERS
- GREEN STREETS

FLOOD CONTROL INFRASTRUCTURE PROJECT EXAMPLES

Creek Re-alignment

Habitat Buffers

Pocket Park

Natural Channel Bottom

Trail Alignment

Green Street

Linear Park

Reduce Barriers

Enhance Channel Sides (gabions)

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY

ALVARADO CREEK OVERVIEW

Within the Study Area, the Alvarado Creek channel extends approximately 4,400 feet from Mission Gorge Road to Waring Road onramp to Westbound I-8. The portion of the creek in the Study Area is a series of open channels and box culverts and is divided into several reaches, identified as 1 through 6 and Mission Gorge Road.

Opportunities for Enhancement

The Navajo Community Plan and the San Diego River Park Master Plan have provided the following recommendations for Alvarado Creek:

- Improve water flow for Alvarado Creek to connect to the San Diego River.
- Enhance pedestrian and bicycle connectivity to the creek and to Grantville Trolley Station
- Improve open space and trail connections with Alvarado Canyon and Navajo Canyon.

REACH CAPACITY SUMMARY

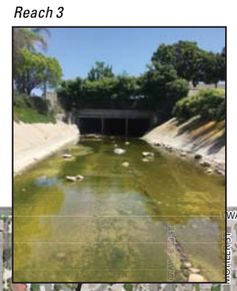
Reach	*Channel Type*	*Bottom Width*	*Approx. Length*	*Existing Capacity*
Mission Gorge Road	Triple RCB	33	128	10-year
1	Concrete Trapezoidal	29.5	550	25-year
2	Vegetated	13 to 16	1,100	2-year
3	Concrete Trapezoidal	29.5	550	25-year
4	Triple RCB	33	1,340	25-year
5	Concrete Trapezoidal	45	175	25-year
6	Concrete & Vegetated Trapezoidal	44	550	<25-year

REACH PHOTO MAP


Mission Gorge Road


Reach 1


Reach 2


Reach 3


Reach 4


Reach 5


Interstate 8/Waring Road


Reach 6

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY

ALTERNATIVE 1 - Linear Park

FLOOD MANAGEMENT

- Widening the creek channel bottom in Reaches 1 through 3*
- New underground culvert adjacent to the existing underground culvert in Reach 4
- Floodable linear park adjacent to the creek in Reaches 1 through 3

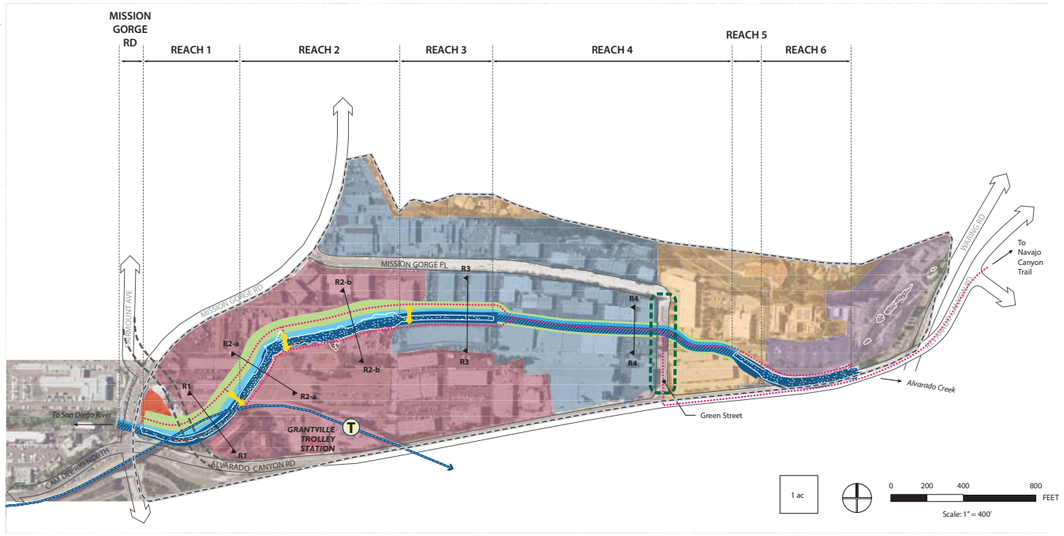
ACCESS AND AMENITY

- Linear park adjacent to the creek in Reaches 1 through 3
- Recreational corridor over the new and proposed culverts in Reach 4
- Pedestrian/bicycle bridges over the creek in Reaches 1, 2, and 3
- Multi-use trails along the creek*
- Trail connections to the San Diego River and Navajo Canyon Trail*
- Green street along Mission Gorge Place*

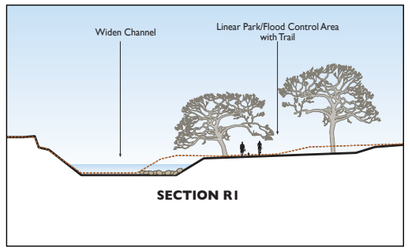
* Indicates a feature common to all alternatives.

EXERCISE

Place a sticker next to the Cross-Section that indicates, out of the three alternatives, your preferred treatment for each Reach of Alvarado Creek.



Section R1 Stickers



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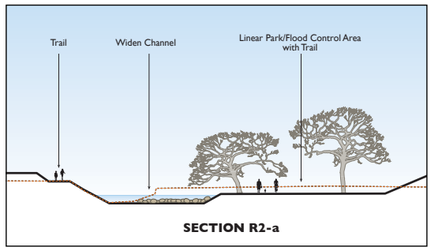
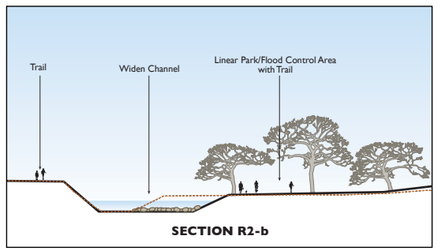
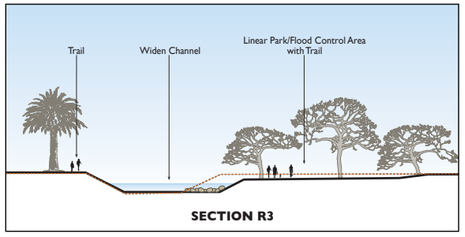


Section R2-b Stickers



Section R3 Stickers



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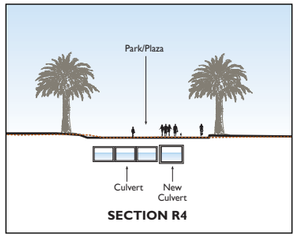

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY

ALTERNATIVE 2 - Pocket Parks

FLOOD MANAGEMENT

- Widening the creek channel bottom in Reaches 1 through 3*
- New open channel with a predominantly natural bottom, adjacent to the existing underground culvert in Reach 4
- Floodable pocket parks to the north and the south of the creek channel in Reaches 1 and 2

ACCESS AND AMENITY

- Pocket parks to the north and the south of the creek channel in Reaches 1 and 2
- Pedestrian/bicycle bridges in Reaches 1 through 4
- Multi-use trails along Alvarado Creek*
- Trail connections to the San Diego River and Navajo Canyon Trail*
- Green street along Mission Gorge Place*

* Indicates a feature common to all alternatives.

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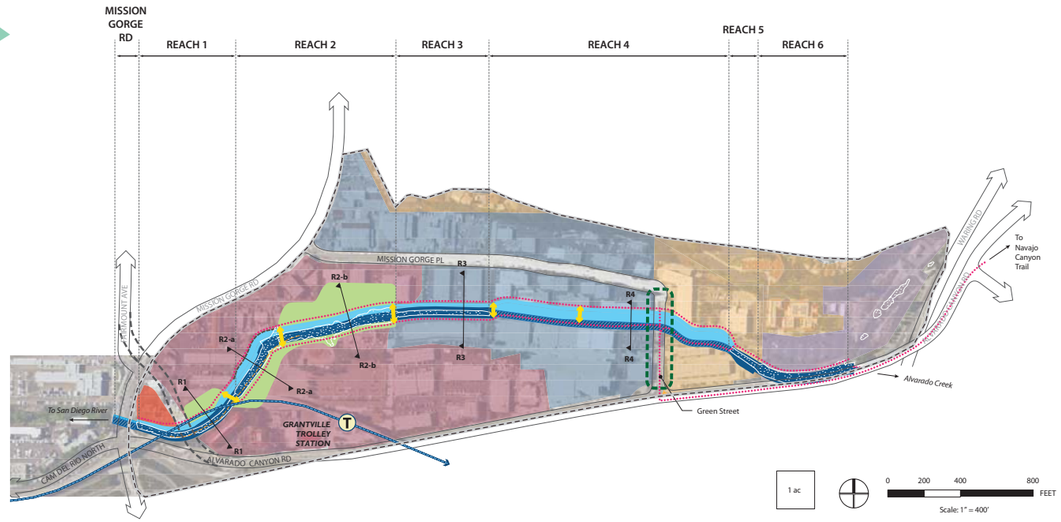
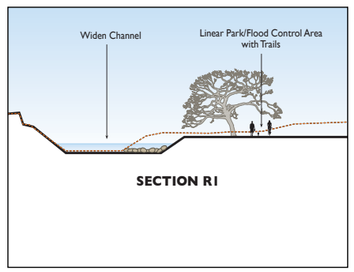


CREEK IMPROVEMENT
- Existing Open Channel
- Existing Underground Culvert
- Existing Sensitive Wetland/Riparian Vegetation Community (white)
- Proposed Open Channel
- Proposed Underground Culvert
- Proposed Creek Center Line Realignment

CONNECTIVITY/OPEN SPACE IMPROVEMENT
- Proposed Park/Flood Control Area
- Proposed Multi-Use Trail
- Proposed Pedestrian/Bicycle Bridge
- Proposed Alvarado Canyon Road Realignment

PROPOSED COMMUNITY PLAN LAND USE (SIMPLIFIED)
- Urban Village
- Business Park/Residential
- Residential
- Office
- Community Commercial
- Trolley Line
- Grantville Trolley Station/ Alvarado Creek Enhancement Study Area

Section R1 Stickers



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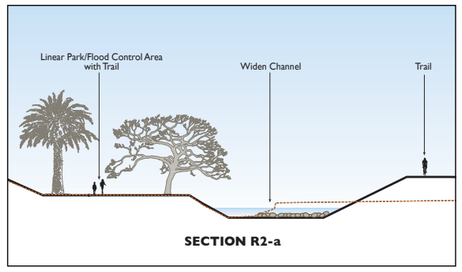
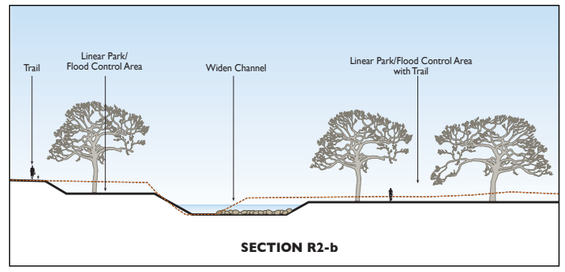
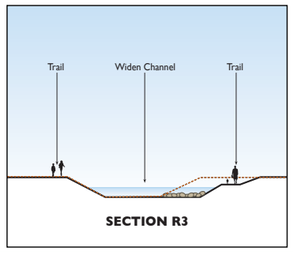


Section R2-b Stickers



Section R3 Stickers



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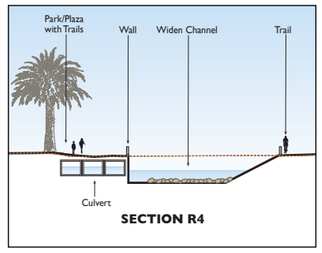


GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY

ALTERNATIVE 3 - Grand Park

FLOOD MANAGEMENT

- Widening the creek channel bottom in Reaches 1 through 3*
- New concrete, open channel adjacent to the existing underground culvert in Reach 4
- Large, floodable parks on both sides of the channel in Reaches 1 through 3

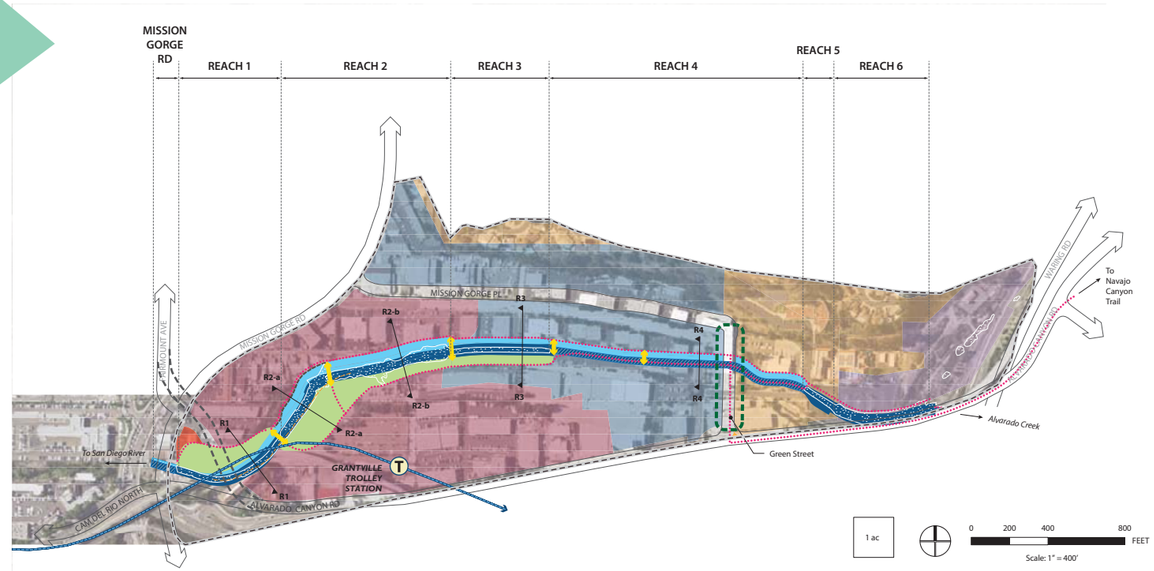
ACCESS AND AMENITY

- Large parks to the north of Reach 1 and to the south of Reach 2 and 3
- Pedestrian/bicycle bridges in Reaches 1 through 4
- Multi-use trails along Alvarado Creek*
- Trail connections to the San Diego River and Navajo Canyon Trail*
- Green street along Mission Gorge Place*

* Indicates a feature common to all alternatives.

EXERCISE

Place sticker next to the Cross-Section that indicated, out of the three alternatives, your preferred treatment for each Reach of Alvarado Creek.



CREEK IMPROVEMENT

- Existing Open Channel
- Existing Underground Culvert
- Existing Sensitive Wetland/Riparian Vegetation Community (white)
- Proposed Open Channel
- Proposed Underground Culvert
- Proposed Creek Center Line Realignment

CONNECTIVITY/OPEN SPACE IMPROVEMENT

- Proposed Park/Flood Control Area
- Proposed Multi-Use Trail
- Proposed Pedestrian/Bicycle Bridge
- Proposed Alvarado Canyon Road Realignment

PROPOSED COMMUNITY PLAN LAND USE (SIMPLIFIED)

- Urban Village
- Business Park/Residential
- Residential
- Office
- Community Commercial
- Trolley Line
- Grantville Trolley Station/ Alvarado Creek Enhancement Study Area

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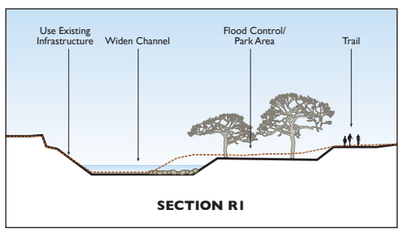

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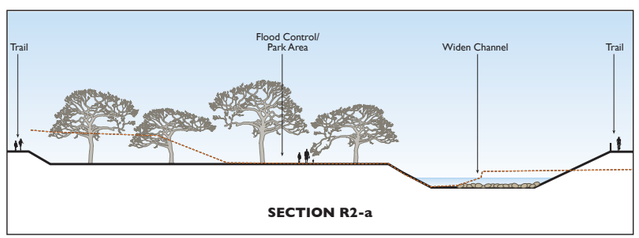

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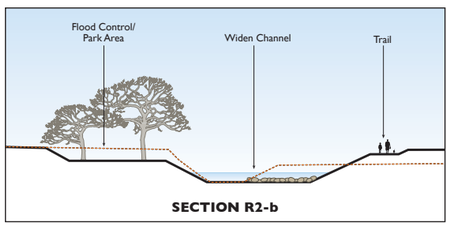

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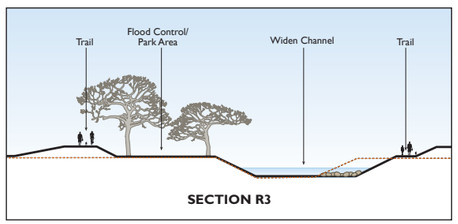

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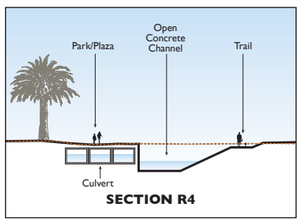


PRESENTATION

Grantville Trolley Station/Alvarado Creek Enhancement Project

OPEN HOUSE

February 13, 2017

DYETT & BHATIA
Urban and Regional Planners

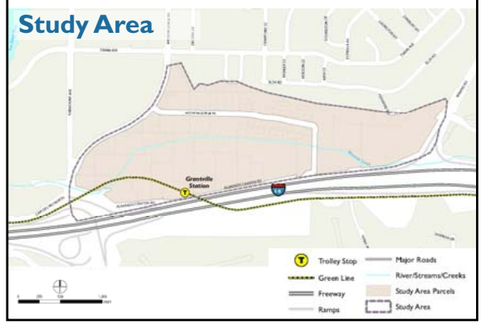
RICK ENGINEERING

Agenda

Open House

- *Review materials around the room*
- *Ask questions*
- *Provide feedback!*

Study Area



Study Background

- Alvarado Creek revitalization has been previously studied
- This Study was precipitated by the Grantville Focus Plan Amendment (adopted 2015), which includes the following objectives:
  - *Encourage transit-oriented development*
  - *Create active, attractive, and pedestrian-focused environment*
  - *Provide more housing choices*
  - *Provide opportunity for pedestrian-bicycle bridge over Alvarado Creek*
- Revitalization of Alvarado Creek is also a component of the San Diego River Park Master Plan
- The Project funded by grant from San Diego's regional planning agency (SANDAG)

Study Purpose

- Address flooding along Alvarado Creek
  - *Potential solutions include widening and realigning creek channel*
- Increase access to Grantville Trolley Station
  - *For instance, connect properties to the north of station via pedestrian/bike bridge over creek*
- Enhance Alvarado Creek as an amenity
  - *Create circulation network for bicyclists and pedestrians*
  - *Explore concepts for parks along and adjacent to the creek, to provide opportunities for the thousands of new residents that could move into the area*
  - *Enhance connections to the creek*
- Improve the creek's water quality

Study Timeline

Existing Conditions Analysis
- Data gathering and analysis
- Existing Conditions Report
- Meeting with Navajo Community Planner's Flooding Subcommittee

Preferred Design Refinement
- Preferred Creek Improvement Alternatives
- Preferred Trail Design Alternatives
- Education Signage, Lighting, and Trail Design

Existing Conditions Analysis	Conceptual Design and Testing	Preferred Design Refinement	Draft and Prepare Feasibility Report
Summer 2016	Fall 2016 – Winter 2016/17	Spring 2017	Summer 2017 – Fall 2017

Conceptual Design and Testing
- Develop initial creek alignment and trail alternatives
- Community Workshops**
- Evaluate alternatives

Draft and Prepare Feasibility Report
- Feasibility Report
- Draft Preferred Plan
- Community Workshop

Role of Alternatives

- Show different possibilities for achieving the Study's objectives
- The Alternatives are based on existing conditions analysis and community feedback
- Interventions have the potential to be mixed and matched
- Form basis for Preferred Alternative to follow

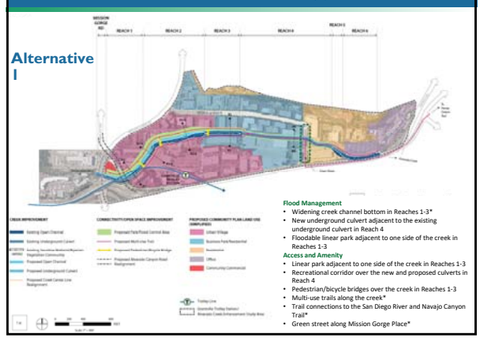
Open House Format

- Please visit each of the stations around the room
- City staff and consultants will be present at each station to answer questions and facilitate discussion
- Fill out a comment card for additional feedback and thoughts on the alternatives!

Open House Stations

- Future Land Use
- Transportation Network
- Biological Conditions and Resources
- Flooding
- Flood Control/Capacity and Creek Amenities
- Alvarado Creek Overview
- Alternatives 1, 2, and 3

Alternative 1



Alternative 1

Flood Management

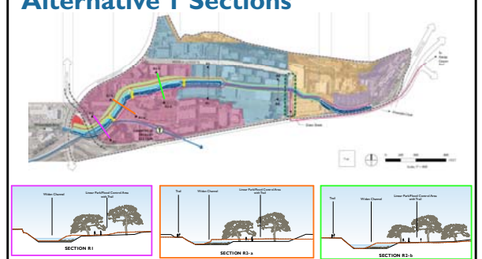
- Widening creek channel bottom in Reaches 1-3*
- New underground culvert adjacent to the existing underground culvert in Reach 4
- Floodable linear park adjacent to one side of the creek in Reaches 1-3

Access and Amenity

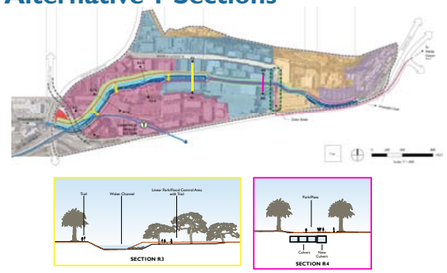
- Linear park adjacent to one side of the creek in Reaches 1-3
- Recreational corridor over the new and proposed culverts in Reach 4
- Pedestrian/bicycle bridges over the creek in Reaches 1-3
- Multi-use trails along the creek*
- Trail connections to the San Diego River and Navajo Canyon Trail*
- Green street along Mission Gorge Place*

** Indicates a feature common to all alternatives*

Alternative 1 Sections



Alternative 1 Sections



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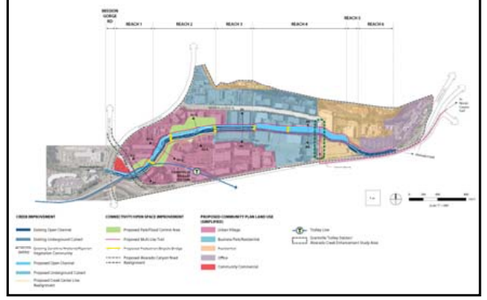

Alternative 2

Flood Management

- Widening creek channel bottom in Reaches 1-3*
- New open channel with a predominantly natural bottom, adjacent to the existing underground culvert in Reach 4
- Floodable pocket parks to the north and the south of the creek channel in Reaches 1 and 2

Access and Amenity

- Pocket parks to the north and the south of the creek channel in Reaches 1 and 2
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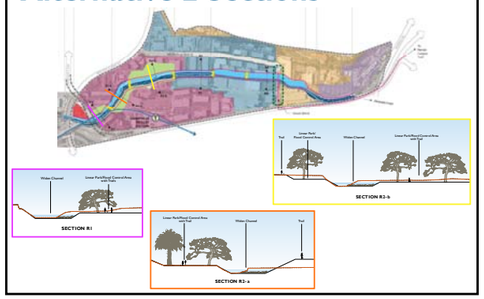


Alternative 2 Sections

Alternative 3

Alternative 3

Flood Management

- Widening creek channel bottom in Reaches 1-3*
- New underground culvert adjacent to the existing underground culvert in Reach 4
- Large, floodable park that spans both sides of the creek in Reaches 1-3

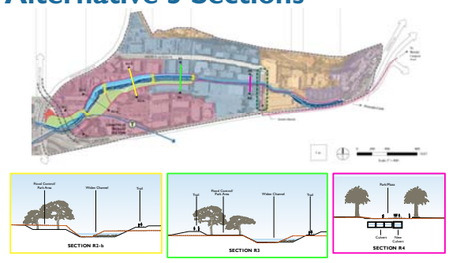
Access and Amenity

- Large park that spans both sides of the creek in Reaches 1-3
- Pedestrian/bicycle bridges over the creek in Reaches 1-3
- Multi-use trails along the creek*
- Trail connections to the San Diego River and Navajo Canyon Trail*
- Green street along Mission Gorge Place*

** Indicates a feature common to all alternatives*

Alternative 3 Sections

Alternative 3 Sections



Next Steps

Preferred Design Refinement – Spring 2017

- *Educational Signage, Lighting, and Trail Design*
- *Preferred Creek Improvement Alternative*
- *Preferred Trail Design Alternative*

Thank you and keep in touch!

Lisa Lind, Project Manager
LLind@sandiego.gov
(619) 236-6531

Project Website
http://tiny.cc/alvaradocreekstudy

5

NAVAJO COMMUNITY PLANNERS: FLOODING SUBCOMMITTEE MEETING

April 14, 2017 | 10:30 AM – 12 PM

AGENDA

10:30-10:40am: Introductions

10:40pm: Meeting begins

Meeting Purpose

- Provide Schedule and Status Update for Alvarado Creek Enhancement Study
- Provide Summary of Community Workshops and Alternatives Development
- Discuss Flooding Subcommittee members' input on feasibility criteria and Draft Preliminary
- Preferred Alternative

Agenda

1. Alvarado Creek Update (10 minutes)
   a. Study Objectives
   b. Schedule
   c. Review of Alternatives Development and Community Workshops Results
2. Discussion of Feasibility Criteria (15 minutes)
3. Discussion of Draft Preliminary Preferred Alternative (40 minutes)
4. Any Other Public Comment (10 minutes)
5. Wrap-Up and Next Steps (5 minutes)

PRESENTATION

Grantville Trolley Station/Alvarado Creek Enhancement Study

Flooding Subcommittee

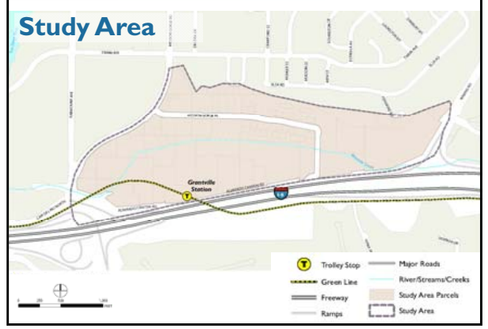
April 14, 2017

The City of SAN DIEGO | DYETT & BHATIA Urban and Regional Planners | RICK

Agenda

1. Introduction
2. Brief Presentation
   - *Overview and Schedule*
   - *Existing Conditions Summary*
   - *Preliminary Alternatives Summary*
   - *Community Workshop Feedback Summary*
3. Feasibility Criteria
   - *Overview*
   - *Exercise*
4. Draft Preliminary Preferred Alternative
   - *Brief Overview of How it was Developed*
   - *Review the Draft Preliminary Preferred Alternative*
5. Implementation
6. Discussion

Study Area



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- Address flooding along Alvarado Creek
  - *Potential solutions include widening and realigning creek channel*
- Increase access to Grantville Trolley Station
  - *For instance, connect properties to the north of station via pedestrian/bike bridge over creek*
- Enhance Alvarado Creek as an amenity
  - *Create circulation network for bicyclists and pedestrians*
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Preferred Design Refinement
- Preferred Creek Improvement Alternatives
- Preferred Trail Design Alternatives
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Existing Conditions Analysis → Conceptual Design and Testing → Preferred Design Refinement → Draft and Prepare Feasibility Report

Summer 2016 | Fall 2016 | Winter 2016/17 | Spring 2017 | Summer 2017

Conceptual Design and Testing
- Develop initial creek alignment and trail alternatives
- Community Workshops**
- Evaluate alternatives

Draft and Prepare Feasibility Report
- Feasibility Report
- Draft Preferred Plan
- Community Workshop

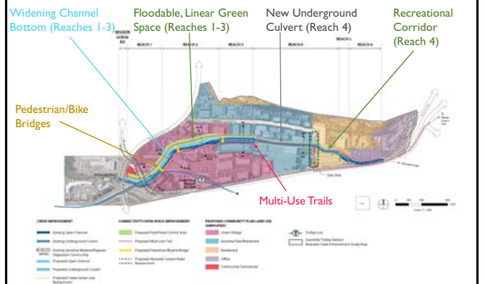
Existing Conditions Summary

LAND USE	
Ownership	→ Opportunities to discuss revitalization plan
Existing development faces away from creek	→ Supplemental development regulations
TRANSPORTATION NETWORK AND ACCESS	
Lack of internal streets	→ Transit-oriented development
Limited access to the trolley	→ Bridge connection over the creek
BIOLOGICAL RESOURCES	
Natural areas and jurisdictional resources	→ Sensitive design and green infrastructure
Permitting and regulations	→ Opportunities for open areas
HYDROLOGY AND WATER QUALITY	
Varied widths and channel types	→ Alternative design concepts
Topography and elevation	→ Increased channel capacity

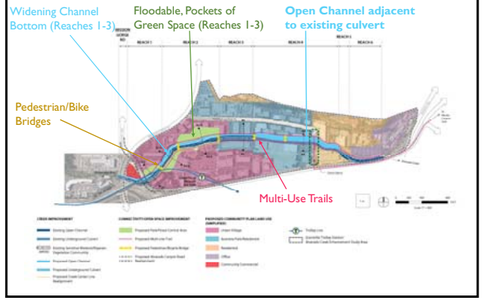
Common Elements of Preliminary Alternatives

- Channel bottom widened to 50' in Reaches 1-3
- Culvert under Mission Gorge Road
- Floodable green space
- Multi-use trail system, that includes connections to San Diego River and Navajo Canyon Trail
- Bicycle/pedestrian bridges
- Green Street along Mission Gorge Place

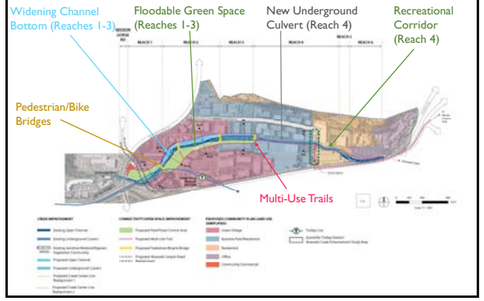
Alternative 1



Alternative 2



Alternative 3

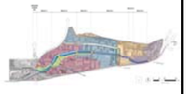


Community Workshops

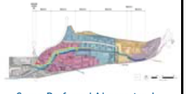
- Two workshops were held in February
- Showed 3 Alternatives for achieving the Study's objectives
- Discussed existing conditions analysis, Alternatives, and received feedback
- Feedback formed basis for Draft Preliminary Preferred Alternative

Community Workshop Feedback

- General preference for Alternative 3
- Some also expressed a preference for Alternative 1
- Property owners expressed concerns about:
  - *Impacts of creek widening on private property*
  - *The ability to meaningfully develop property*
  - *Equitable distribution of property impacts*



General Preference for Alternative 3



Some Preferred Alternative 1

Feasibility Criteria

- Flooding Is Managed
- Water quality is improved and stormwater is managed
- Impacts to private property are minimized
  - *Proposed creek alignment minimizes, to the extent feasible, impacts on adjacent private property*
  - *To the extent proposed creek alignment impacts private property, owners maintain the ability to meaningfully develop property*

Feasibility Criteria (cont'd)

- Biological impacts are minimized
  - *Impacts to the sensitive vegetative communities in the Study Area (Reach 2) are mitigated*
  - *There is no net loss to wetland communities and a wetland buffer is provided*
- Connections within the Study Area are increased
  - *This includes:*
    - Increasing access to the Trolley Station
    - Providing bicycle/pedestrian bridges over the creek
    - Incorporating a continuous 10'-wide multi-use trail

Feasibility Criteria (cont'd)

- Alvarado Creek is transformed into an amenity
  - *Open space for new residents*
  - *Views are opened up*
  - *Educational opportunities incorporated into trail design*
- The proposed design is context-sensitive
  - *Materials in the channel are natural or use existing infrastructure*
- The proposed improvements are feasible
  - *Estimated costs*
  - *Permitting/regulatory concerns*
  - *Concerns of property owners and community members are taken into account*

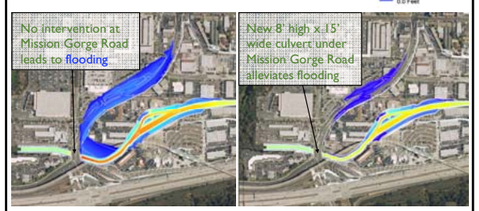
Feasibility Criteria Exercise

Draft Preliminary Preferred Alternative Development

- Draft Preliminary Preferred Alternative based on:
  - *Existing conditions analysis*
  - *Community feedback*
  - *Stakeholder feedback*
  - *Feasibility criteria*
  - *Hydraulic modeling*
- Mixed, matched, and adjusted Reaches from the 3 preliminary alternatives

Draft Preliminary Preferred Alternative Development

Mission Gorge Road/Reach 1

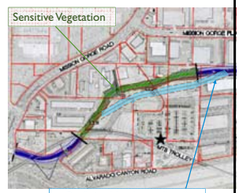


Prior Iterations of Draft Preliminary Preferred Alternative

Draft Preliminary Preferred Alternative Development

Reach 2

- *Realigned channel to the south to:*
  - Minimize impacts on sensitive vegetative communities + wetlands
  - Provide space on-site to mitigate impacts
  - Accommodate wetland buffer
- *Iterated floodable green space to minimize impacts on property, provide flood control, and buffer wetlands*



Draft (and further refined) Channel Realignment

Draft Preliminary Preferred Alternative Development

Reach 3

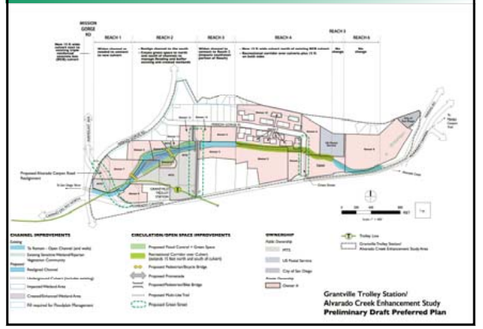
- *Modeling showed that channel widening is required only as needed to connect to Reach 2 improvements*
- *Impacts western portion of the Reach*

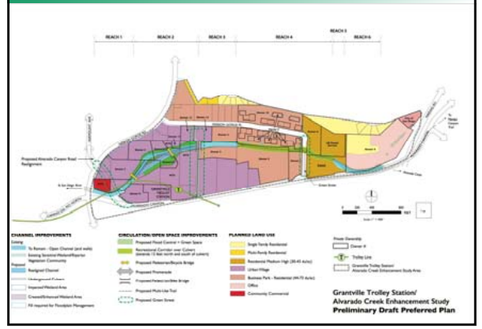
Draft Preliminary Preferred Alternative Development

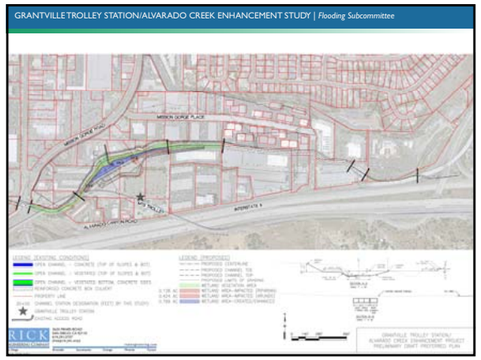
Reach 4

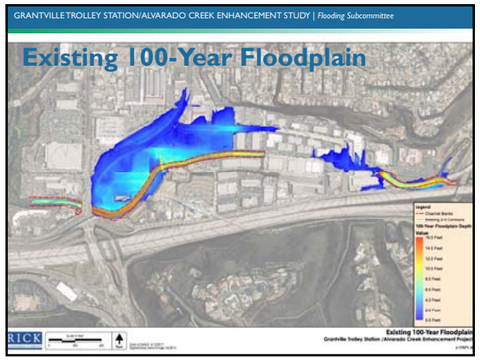
- *New 8' high x 15' wide culvert required under Reach 4 to manage flooding*
- *Floodable green space in area of flooding would not solve flooding issue*

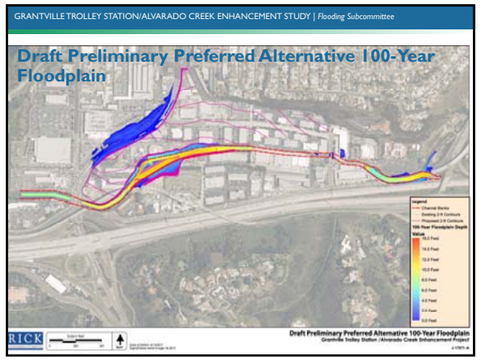
Draft Preliminary Preferred Alternative

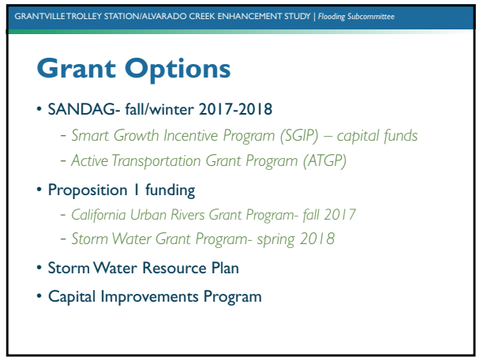


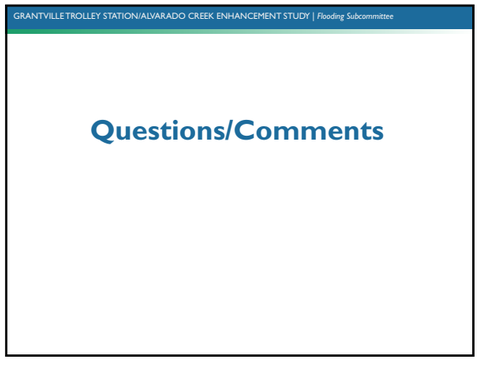


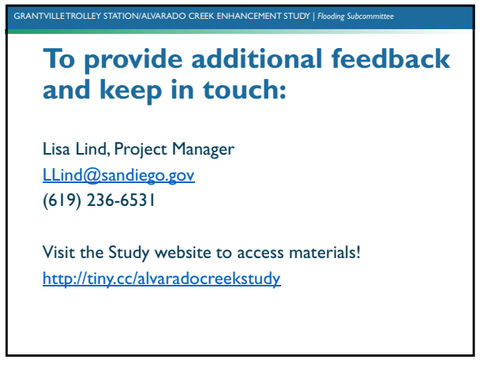

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
MISSION GORGE PLACE
INTERSTATE 8
GRANTVILLE TROLLEY STATION/
ALVARADO CREEK ENHANCEMENT PROJECT
PRELIMINARY DRAFT PREFERRED PLAN
RICK


GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
Existing 100-Year Floodplain
RICK
Existing 100-Year Floodplain
Grantville Trolley Station /Alvarado Creek Enhancement Project


GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
Draft Preliminary Preferred Alternative 100-Year Floodplain
RICK
Draft Preliminary Preferred Alternative 100-Year Floodplain
Grantville Trolley Station /Alvarado Creek Enhancement Project


GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
Grant Options
• SANDAG- fall/winter 2017-2018
- Smart Growth Incentive Program (SGIP) – capital funds
- Active Transportation Grant Program (ATGP)
• Proposition 1 funding
- California Urban Rivers Grant Program- fall 2017
- Storm Water Grant Program- spring 2018
• Storm Water Resource Plan
• Capital Improvements Program

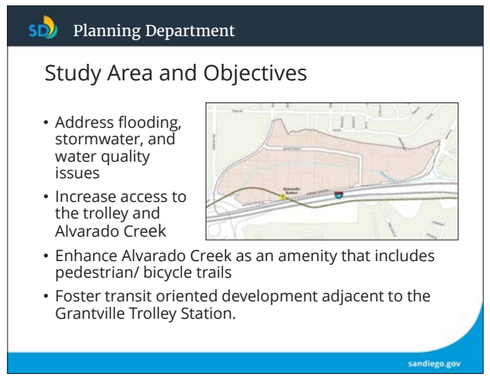

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
Questions/Comments

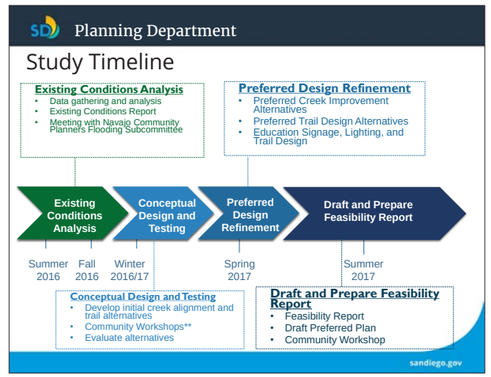

GRANTVILLE TROLLEY STATION/ALVARADO CREEK ENHANCEMENT STUDY | Flooding Subcommittee
To provide additional feedback and keep in touch:
Lisa Lind, Project Manager
LLind@sandiego.gov
(619) 236-6531
Visit the Study website to access materials!
http://tiny.cc/alvaradocreekstudy

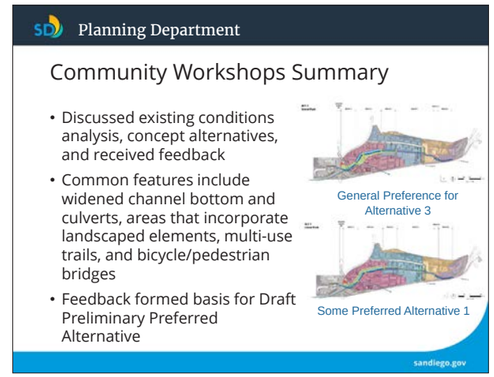
6 NAVAJO COMMUNITY PLANNERS MEETING

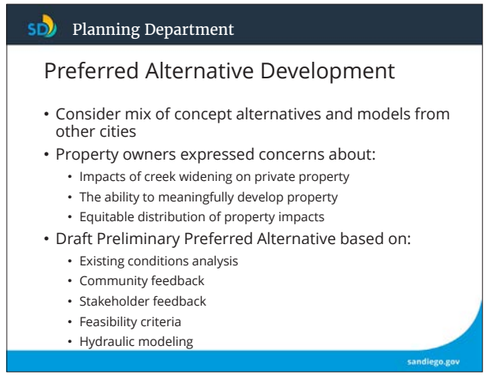
May 10, 2017

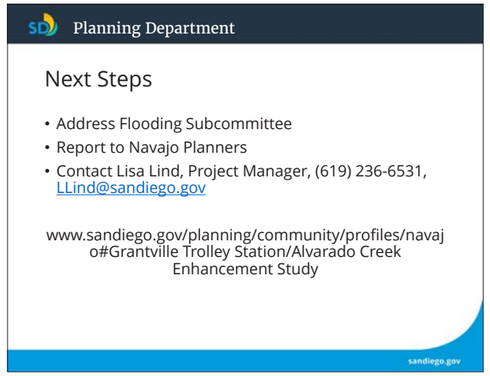
PRESENTATION











7

NAVAJO COMMUNITY PLANNERS: FLOODING SUBCOMMITTEE MEETING

June 9, 2017 | 1–2:30 PM

AGENDA

1:00 - 1:10pm: Introductions

1:10pm: Meeting begins

Meeting Purpose

- Present Refinements to Preferred Alternative
- Discuss Flooding Subcommittee members' comments and questions on Draft Preferred Alternative

Agenda

1. Preferred Alternative Presentation (20 minutes)
2. Discussion of submitted comments and questions (40 minutes)

- Density and Supplemental Development Regulations
- Cross section components and uses in green space/flood control area
- Coordination between property owners and other agencies

3. Additional comments (10 minutes)
4. Revitalization Study Schedule (10 minutes)

2:30pm: Meeting adjourns

PRESENTATION

Grantville Trolley Station/Alvarado Creek Enhancement Study

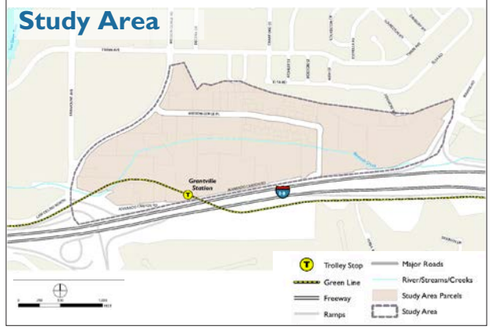
Flooding Subcommittee of the Navajo Community Planning Group
June 9, 2017

The City of SAN DIEGO · DYETT & BHATIA Urban and Regional Planners · RICK

Agenda

1. Introduction
   - *Purpose and Schedule*
   - *Existing Conditions Summary*
   - *Preliminary Alternatives*
2. Draft Preliminary Preferred Plan
   - *Brief Overview of Development*
   - *Overview of April Discussion*
   - *Refinement of Preferred Plan*
3. Discussion and Additional Comments

Study Area



Study Purpose

- Address flooding along Alvarado Creek
  - *Potential solutions include widening and realigning creek channel*
- Increase access to Grantville Trolley Station
  - *Connect properties to the north of station via pedestrian/bike bridge over creek*
- Enhance Alvarado Creek as an amenity
  - *Create circulation network for bicyclists and pedestrians*
  - *Explore concepts for parks along and adjacent to the creek, to provide opportunities for the thousands of new residents that could move into the area*
  - *Enhance connections to the creek*
- Improve the creek's water quality

Study Timeline

Existing Conditions Analysis
- Data gathering and analysis
- Existing Conditions Report
- Meeting with Navajo Community Planners Flooding Subcommittee

Preferred Design Refinement
- Preferred Creek Improvement Alternatives
- Preferred Trail Design Alternatives
- Education Signage, Lighting, and Trail Design

Existing Conditions Analysis → Conceptual Design and Testing → Preferred Design Refinement → Draft and Prepare Feasibility Report

Summer 2016 · Fall 2016 · Winter 2016/17 · Spring 2017 · Summer 2017

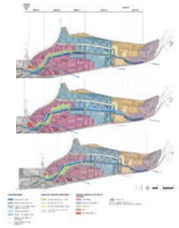
Conceptual Design and Testing
- Develop initial creek alignment and trail alternatives
- Community Workshops**
- Evaluate alternatives

Draft and Prepare Feasibility Report
- Feasibility Report
- Draft Preferred Plan
- Community Workshop

Existing Conditions Summary

LAND USE	
Ownership	→ Opportunities to discuss revitalization plan
Existing development faces away from creek	→ Supplemental development regulations
TRANSPORTATION NETWORK AND ACCESS	
Lack of internal streets	→ Transit-oriented development
Limited access to the trolley	→ Bridge connection over the creek
BIOLOGICAL RESOURCES	
Natural areas and jurisdictional resources	→ Sensitive design and green infrastructure
Permitting and regulations	→ Opportunities for open areas
HYDROLOGY AND WATER QUALITY	
Varied widths and channel types	→ Alternative design concepts
Topography and elevation	→ Increased channel capacity

Preliminary Alternatives



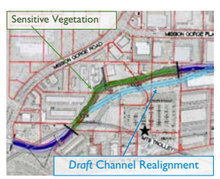
- Common Elements:
  - *Channel bottom widened to 50' in Reaches 1-3*
  - *Culvert under Mission Gorge Road*
  - *Floodable green space*
  - *Multi-use trail system, that includes connections to San Diego River and Navajo Canyon Trail*
  - *Bicycle/pedestrian bridges*
  - *Green Street along Mission Gorge Place*

Preferred Preliminary Plan Development

- Feedback from community workshops formed basis for Preferred Alternative
  - *Impacts of creek widening on private property*
  - *The ability to meaningfully develop property*
  - *Equitable distribution of property impacts*
- Modeling and Feasibility Criteria considered in refining the design
  - *Flooding is managed*
  - *Water quality is improved and stormwater is managed*
  - *Impacts to private property are minimized*
  - *Biological impacts are minimized*
  - *Connections within the Study Area are increased*
  - *Alvarado Creek is transformed into an amenity*
  - *The proposed design is context-sensitive*
  - *The proposed improvements are feasible*

Mission Gorge Road/Reach 1

Reach 2



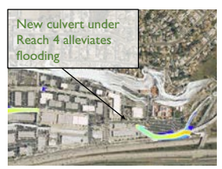
- *Realigned channel to the south to minimize impacts on sensitive vegetative and add wetland buffer*

Prior Iterations of Draft Preliminary Preferred Alternative

Reach 3

- *Modeling showed that channel widening is required only as needed to connect to Reach 2 improvements*

Reach 4



- *New 8' high x 15' wide culvert required under Reach 4 to manage flooding*

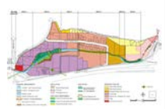
Summary of April Discussion

- Draft Preliminary Preferred Plan based on:
  - *Existing conditions analysis*
  - *Community feedback*
  - *Stakeholder feedback*
  - *Feasibility criteria*
  - *Hydraulic modeling*
- Discussion on further refinements:
  - *Modeling results of additional creek widening and proximity to San Diego River*
  - *Fill areas for building pads and Mission Gorge Place*
  - *Consider conceptual cross sections to better understand benefits and impacts to private property*
  - *Implementation and phasing*

Summary of Refinements

April 13 preliminary draft preferred plan

- Fill – less fill indicated north of channel (channel width remains the same)
- Mission Gorge Place – no longer elevated
- Promenade – now located on existing vehicular access ways (e.g., parking lots)
- Pedestrian/Bicycle Bridge – additional crossing where Promenade previously sited (intersection of Reach 2 + 3)
- Multi-Use Trail – expanded in Reach 6 to provide potential future connection to Navajo Canyon Trail



Today's draft preferred plan

Summary of Additional Questions

- Allowed density
  - *Alternate materials and flood control with vertical walls*
- Uses/Activities in Buffer and Green Space Areas:
  - *Landscaping*
  - *Storm water retention and treatment*
  - *Paths, observation decks, structures, etc.*

Summary of Additional Questions

- Multi-use Paths and Bridge Connections
  - *Multiple benefits*
  - *Proximity to creek, wetland buffer, floodable green space, and development area*
  - *Location of bridge crossings*
  - *Permitted placement of bridge pillars*
  - *Concerns with public access*
- Permitting and Resource Agencies:
  - *Coordination and certainty*

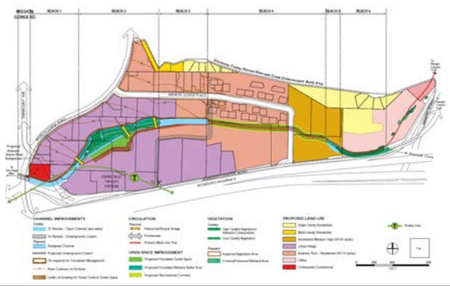
Summary of Additional Questions

- Discussion of Conceptual Cross Section for Reach 1
- Additional clarification and discussion:
  - *Setback requirement from the wetland buffer*
  - *Preference for Option 1 for Reach 2, with fire lanes, private streets and plaza/paseos up to the pedestrian trail or the edge of the wetland buffer.*
  - *Wetland Buffer areas as Environmentally Sensitive Lands (ESL)*
  - *Distinguish "Floodable Green Space" and "Wetland Buffer"*

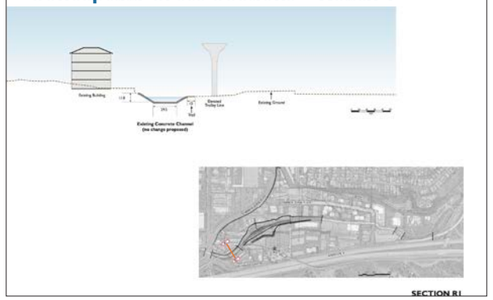
Summary of Additional Questions

- Additional clarification and discussion (cont'd):
  - *Understand location of multi-use trail on north and south side of creek in relation to proposed wetland buffer*
  - *Difference between Section Reach 1 and Section Reach 2a transition*
  - *Gabion or terraced walls allowed within the buffer areas or only the realigned channel walls*
  - *Cantilever decks, patios, etc. be allowed to hang over the wetland buffer area or floodable green space*
  - *Responsibility for the maintenance*
  - *Wetland buffer areas to comply with storm water requirements and other BMPs*
  - *Incentives to property owners*

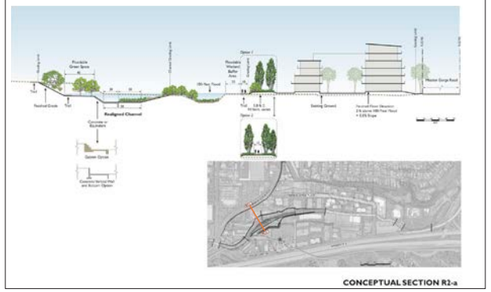
Additional Refinements and Questions



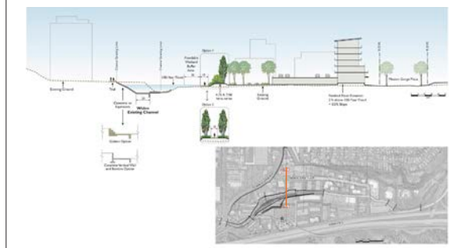
Conceptual Cross Sections – Reach 1



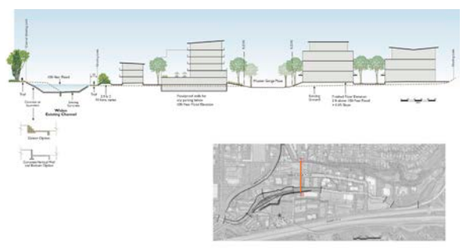
Conceptual Cross Sections – R2-a



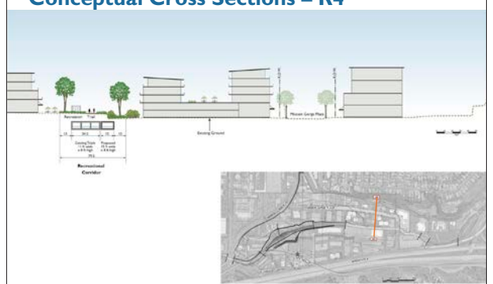
Conceptual Cross Sections – R2-b



Conceptual Cross Sections – R3



Conceptual Cross Sections – R4



Questions/Comments

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