City of Vista Required
DRAFT

WATER QUALITY TECHNICAL REPORT

For

Paseo Santa Fe
Green Street Project

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June 26, 2012

CERTIFICATION

This Water Quality Technical Report (WQTR) has been prepared under the direction of the following Registered Civil Engineer. The Registered Civil Engineer (Engineer) attests to the technical information contained herein and the engineering data upon which the following design recommendations, conclusions and decisions are based. The selection, sizing, and preliminary design of stormwater treatment and other control measures in this report meet the requirements of Regional Water Quality Control Board Order R9-2007-0001 and subsequent amendments.

_____ _____

Tory R. Walker Date
REGISTERED CIVIL ENGINEER

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ATTACHMENTS

Attachment 1 – Final / Signed "City of Vista's Checklist for New Development and Redevelopment Projects" (pages 3-6 of Checklist)

Attachment 2 – General Site Map

Attachment 2A – Detailed Site Map/BMP map

Attachment 3 – Tables 2-2, 2-3, and 2-5, Beneficial Uses

Attachment 4 – 303(d) List

Attachment 5 – Portions of Drainage Study for South Santa Fe Avenue Detention Basin, April 10, 2010

Attachment 6 – Stormwater Pollutant Sources/Source Control Checklist

Attachment 7 – Water Quality Summary

1.0 INTRODUCTION

This Water Quality Technical Report (WQTR) is required by the City of Vista (City) for all development and redevelopment projects, pursuant to the City of Vista Stormwater Management and Discharge Control Ordinance (Municipal Code Section 13.18). The purpose of this WQTR is to address the water quality impacts from the proposed Paseo Santa Fe Green Project. The site design, source control and treatment control Best Management Practices (BMPs) will be utilized to provide long term solution to protecting water quality. This WQTR is subject to revisions as needed to accommodate changes to the project design, or as required by the City and/or Engineer.

2.0 APPLICABILITY AND PROJECT TYPE

Based on the criteria established in Order R9-2007-0001 NPDES No. CAS0108758 Section D.1, and review of the City's Stormwater Standards Manual Section G (local SUSMP) Chapters 1 and 3, and after completion of the City of Vista's Checklist for New Development and Redevelopment, the proposed project is identified as a Priority Project

Since the proposed project has been identified as a Priority Project, this WQTR includes design and supporting calculations for site design Low Impact Development (LID) BMPs, Source Control BMPs, and Treatment Control BMPs.

The final/signed "City of Vista's Checklist for New Development and Redevelopment Projects" is included as Attachment 1.

3.0 PROJECT OVERVIEW

3.1 Project Location

The project site is located in the City of Vista, along the South Santa Fe Avenue corridor, bounded by Civic Center Drive on the east and Broadway on the northwest.. Figures 3.1 and 3.2 illustrate the project location. Figure 3.3 includes the project details, as further discussed in this section.

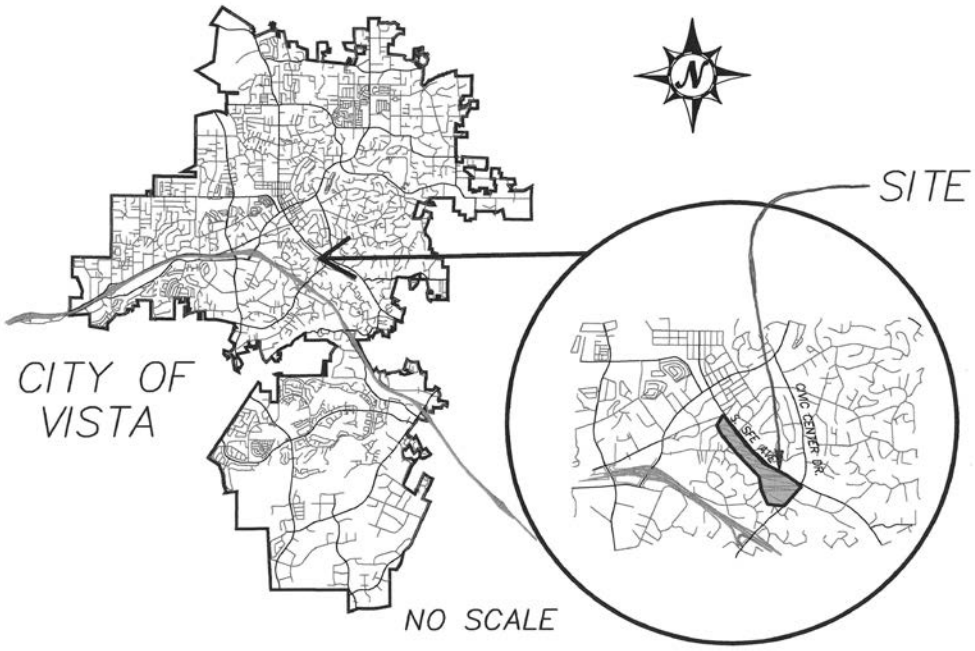


Figure 3.1 Vicinity Map

Note - Figure 3.2 General Site Map (Attachment 2) is found at end of report

3.2 Project Description

The Paseo Santa Fe Green Street Project is a revitalization project in the central Vista downtown area, and is a vital component of the overall downtown revitalization. The revitalization of this corridor will transform an underutilized area into a pedestrian-friendly, transit-friendly, area-wide destination. Proposed project infrastructure features are relocation of utilities, realignment of streets, traffic-calming roundabout intersections, creation of a linear park, drainage improvements, parking, and aesthetic lighting. The revitalization will also include extensive stormwater and Low Impact Development (LID) provisions, such as bioretention planter areas, median infiltration, storm drain high-rate media filters (for treatment of offsite tributary flows), and porous paving/permeable pavers in pedestrian and decorative areas. The final product of revitalization will be a sustainable mixed-use development of shops, residential, commercial, retail, public transit, and park. The

project will feature aesthetic designs for walkways, planters, lighting, street furniture, and pavement treatment. The result of the Paseo Santa Fe Green Street project will be reduced pollutant loading and reduced environmental stressors for the Buena Vista Creek watershed, and some retention of stormwater volumes through the implementation of Best Management Practices (BMP's) described in this report. This is an overall benefit to the Buena Vista Creek Watershed, including both Buena Vista Creek and Buena Vista Lagoon.

Note - Figure 3.3 Detailed Site Map (Attachment 2A) is found at end of report.

3.3 Project Size

The overall Paseo Santa Fe project (revitalization area) is approximately 60 acres, while the approximate footprint for the Paseo Santa Fe Green Street project is approximately 19.5 acres.

3.4 Impervious and Pervious Surface areas

The existing Paseo Santa Fe (South Santa Fe corridor) area is extensively commercial and industrial with impervious building and parking areas predominating with an approximately 85-90% impervious area. The proposed project will implement LID features such as porous pavement, permeable pavers, extensive landscaping/bioretention, and median infiltration, all contributing to a more pervious overall footprint and the corresponding reduction in water quality storm volume.

3.5 Other

The Paseo Santa Fe Green Project also benefits from the ongoing South Santa Fe Drainage Improvements, which will eliminate the FEMA floodplain from the project area by containing the 100-year flow within the drainage facilities. An important aspect of the proposed Paseo Santa Fe Green Street project is the treatment of offsite flows prior to runoff into the project footprint area. While the main focus of the project is project-footprint LID and water quality treatment, the additional benefit of the perimeter/offsite treatment is significant. The current project drainage patterns, as described in Section 4.3, are generally tributary surface flows entering the South Santa Fe (proposed Paseo Santa Fe) corridor radially from north and south tributary areas. Existing curb inlets, and additional proposed curb inlets, will be retrofitted or constructed with high-rate biomedia filtration capabilities, which will also enhance the project landscape and tree palettes, while providing treatment of offsite pollutants that would otherwise enter the Paseo Santa Fe corridor. The City of Vista is not required to treat these offsite–generated pollutants, but propose to do so as a way to enhance downstream beneficial uses in Buena Vista Creek.

4.0 PROJECT SITE ASSESSMENT

This section includes information used to consider the potential water quality and hydrologic impacts from the proposed project. This information is important when considering the appropriate BMPs to reduce identified potential impacts, as well as when designing low impact development (LID), source control and treatment control measures to reduce those impacts.

4.1 Land Use and Zoning

The proposed land use for the project area will be mixed-use (commercial/retail/residential), commercial, retail, residential, and a linear park. This proposed land use will replace the existing extensive commercial, and higher density residential. The watershed area tributary to the Paseo Santa Fe project contains varying densities of residential, and some commercial, retail, and public facility as well.

4.2 Existing Topography

The Paseo Santa Fe corridor topography will be unchanged with the revitalization. The elevations at the easterly upstream limit of the project are at elevation 350 feet and the westerly limit at about 328 feet, near Broadway, approximately 3,500 feet downstream. The corridor follows the Buena Vista Creek tributary (mostly underground) from southeast to northwest, with a relatively flat slope.

4.3 Existing and Proposed Drainage

The Paseo Santa Fe corridor follows the Buena Vista Creek tributary from southeast to northwest, with a large box culvert in Mercantile Street providing the (existing) trunk conveyance for the watershed. Currently, tributary areas on either side of the corridor drain into the lower-lying areas along South Santa Fe and Mercantile, where storm drain systems carry the runoff into the box culvert at several locations. The proposed project will provide for upgraded trunk storm drains as necessary to capture the offsite tributary runoff entering the corridor, and connect to the box culvert, which will probably be realigned with the project. In addition to the trunk storm drains for the offsite flows, onsite flows (after treatment) will drain into the same trunk systems, or a parallel trunk system in the proposed pervious median in the center of the redeveloped Paseo Santa Fe corridor.

4.4 Watershed and Receiving Waters

The proposed project is located within the Carlsbad Hydrologic Unit, Buena Vista Creek Hydrologic Area, and the Vista Hydrologic Sub-area (Basin number 904.22). The surface and groundwater receiving waters located in the area and downstream of this project include Buena Vista Creek and Buena Vista Lagoon. Tables 2-2 and 2-5 from the "Water Quality Plan for the San Diego Basin" list water quality objectives for a variety of potential pollutants required to sustain the beneficial uses of inland surface waters and ground waters in the Buena Vista Creek Watershed.

The existing beneficial uses of inland surface waters for the Buena Vista Creek Watershed (904.22) include Agricultural Supply (AGR), Industrial Service Supply (IND), Contact Water Recreation (REC-1), Non-contact Water Recreation (REC-2), Warm Freshwater Habitat (WARM), and Wildlife Habitat (WILD). See Table 2-2 in the Attachments.

The existing beneficial uses of ground waters for the Buena Vista HSA include Municipal and Domestic Supply (MUN), Agricultural Supply (AGR), and Industrial Service Supply (IND). See Table 2-5 in the Attachments.

4.5 303(d) Listed Receiving Waters

The impaired waterbodies listed on the 303(d) list for the Vista Hydrologic Sub-Area (904.22) are Buena Vista Creek and Buena Vista Lagoon. According to the 303(d) list, published by the San Diego Regional Water Quality Control Board, Buena Vista Creek is listed for sediment toxicity, and Buena Vista Lagoon is listed for indicator bacteria, nutrients and sediment/siltation.

4.6 Total Maximum Daily Loads (TMDLs)

There are no TMDLs provided for these watersheds.

4.7 Soil Type(s) and Conditions

Soil types in the project footprint are predominately artificial fills, type D soil, and the proposed project will provide the appropriate soils for infiltration, planting, and biofiltration, at the final design stage.

5.0 POLLUTANTS OF CONCERN

This section of the WQTR identifies pollutants of concern. Buena Vista Lagoon is listed as impaired for sediment, bacteria, and nutrients. Buena Vista Creek is listed as impaired for Selenium and sediment toxicity. The project bioretention and infiltration BMP's will address these pollutants of concern, as described in more detail in Section 7 of this report.

5.1 Project Categories and Features

The project categories are highlighted in Table 5-1 on the next page.

5.2 Pollutants of Concern

The anticipated project pollutants, based on the categories of development in Table 5-1, are sediment, nutrients, heavy metals, oil and grease, nutrients, trash and debris, and bacteria and viruses. The project will generate very little sediment loading, due to the small amount of grading anticipated (revitalization project). Buena Vista Lagoon is impaired for sediment and the LID features provided by this project will provide an overall sediment loading reduction to the creek and lagoon.

5.3 Project Water Quality Analyses

See section 5.4 below for water quality information for the BVC Watershed.

5.4 Project Watershed Information

Recent studies covering the watershed in which this project is located include the following:

- *Buena Vista Lagoon Creek SEP Application* dated May 27, 2008
- *Buena Vista Lagoon Restoration Feasibility Analysis Report* dated June 2004
- *Buena Vista Lagoon Environmental Impact Report NOP/NOI* dated May 2007
- *Carlsbad Watershed Plan Section 4.2: Buena Vista Cree Watershed (Project Clean Water – State Water Resources Control Board)*
- *San Diego Municipal Copermittees 2010-2011 Receiving Waters and Urban Runoff Monitoring Final Report,* Weston Solutions, Jan 2012
- *Carlsbad Watershed Urban Runoff Management Plan Annual Report,* Carlsbad Watershed Copermittees, Jan 2012

Table 5-1 Potential Pollutants for Project Categories

	General Pollutant Categories								
Priority Project Categories	Sediment	Nutrients	Heavy Metals	Organic Compounds	Trash & Debris	Oxygen Demanding Substances	Oil & Grease	Bacteria & Viruses	Pesticides
Detached Residential Development	X	X			X	X	X	X	X
Attached Residential Development	X	X			X	P(1)	P(2)	P	X
Commercial Development >one acre	P(1)	P(1)	X	P(2)	X	P(5)	X	P(3)	P(5)
Heavy Industry	X		X	X	X	X	X		
Automotive Repair Shops			X	X(4)(5)	X		X		
Restaurants					X	X	X	X	P(1)
Hillside Development >5,000 ft2	X	X			X	X	X		X
Parking Lots	P(1)	P(1)	X		X	P(1)	X		P(1)
Retail Gasoline Outlets			X	X	X	X	X		
Streets, Highways & Freeways	X	P(1)	X	X(4)	X	P(5)	X	X	P(1)

X = anticipated
P = potential
(1) A potential pollutant if landscaping exists on-site.
(2) A potential pollutant if the project includes uncovered parking areas.
(3) A potential pollutant if land use involves food or animal waste products.
(4) Including petroleum hydrocarbons.
(5) Including solvents.

6.0 HYDROLOGIC CONDITIONS OF CONCERN/ GEOTECHNICAL CONSIDERATIONS/DRAINAGE REPORT

This section of the WQTR identifies hydrologic conditions of concern and geotechnical considerations related to the proposed project. Impacts to the hydrologic regime resulting from development typically include increased runoff volume and velocity; reduced infiltration; increased flow frequency, duration, and peaks; faster time to reach peak flow; and water quality degradation. A change to a priority project site's hydrologic regime is considered a condition of concern if the change impacts downstream channels and habitat integrity. Conditions of concern can include problems such as flooding, erosion, scour, and other impacts that can adversely and permanently affect channel and habitat integrity.

The Paseo Santa Fe Green Street Project will result in a net benefit to the Buena Vista Creek watershed, from a hydrological basis, by reducing runoff volumes through proposed LID designs. In addition, the increased landscaping areas, decrease in impervious areas, and source controls, all will contribute to the hydromodification and pollutant load reduction in Buena Vista Creek. The downstream channels of the creek will benefit from the reduction in stream flows, and restoration of beneficial uses will be enhanced.

Hydrologic Considerations for the Paseo Santa Fe Green Street Project:

The Paseo Santa Fe corridor is part of a larger South Santa Fe Corridor, which has been studied for floodplain reduction for this vital City of Vista revitalization area. The South Santa Fe Drainage Project Drainage Study, dated April 6, 2010, is attached with this report for reference (pertinent excerpts). Overall hydrological data for the watershed is contained in that report.

- Project Location: The project site is located in the City of Vista, along the South Santa Fe Avenue corridor, bounded by Civic Center Drive on the east and Broadway on the northwest. Figures 3.1 and 3.2 illustrate the project location.

- Site Topography: The Paseo Santa Fe corridor topography will be unchanged with the revitalization. The elevations at the easterly upstream limit of the project are at elevation 350 feet and the westerly limit at about 328 feet, near Broadway, approximately 3,500 feet downstream. The corridor follows the Buena Vista Creek tributary (mostly underground) from southeast to northwest, with a relatively flat slope.

- Drainage features: The Paseo Santa Fe corridor follows the Buena Vista Creek tributary from southeast to northwest, with a large box culvert in Mercantile Street providing the (existing) trunk conveyance for the watershed. Currently, tributary areas on either side of the corridor drain into the lower-lying areas along South Santa Fe and Mercantile, where storm drain systems carry the runoff into the box culvert at several locations. The proposed project will provide for upgraded trunk storm drains as necessary to capture the offsite tributary runoff entering the corridor, and connect to the box culvert, which might also be realigned with the project. In addition to the trunk storm drains for the offsite flows, onsite flows (after treatment) will drain into the same trunk systems, or a parallel trunk system in the proposed pervious median in the center of the redeveloped Paseo Santa Fe corridor.

- Relevant hydrologic and environmental factors: The South Santa Fe corridor has been mapped in a floodplain for years; the construction of trunk storm drains and inlets, prior to the Paseo Santa Fe Green Street Project, will enhance the overall carrying capacity in the corridor and provide containment of the 100-year flows.
- Proposed hydrologic conditions: The Paseo Santa Fe Green Street project will reduce runoff volume, increase infiltration, and reduce pollutant loads.
- Significant impact on downstream channels and habitat integrity: The downstream geomorphology and hydromodification will be enhanced through the reduction in runoff volume due to the project LID features.
- Project hydrology analyses: See section at top of this page.
- Project watershed information: See Section 5.4.
- Hydrology Report Summary: See Tables 1 and 2 in Section 7 – (BMP's), for flow information.
- Project geotechnical reports will be prepared at the final design stage of the project.

7.0 BEST MANAGEMENT PRACTICES (BMPs)

Minimizing the proposed project's effects on water quality, as well as compliance with State and local requirements can be most effectively achieved by using a combination of BMPs which include Low Impact Design (LID) Site Design, Source Control, and for Priority projects shall include Treatment Control measures. These design and control measures employ a multi-level strategy. The strategy, which is detailed in the City's Stormwater Standards Manual Section G (local SUSMP), consists of: 1) reducing or eliminating post-project runoff; 2) controlling sources of pollutants; and 3) treating stormwater runoff before discharging it to the storm drain system or to receiving waters.

This WQTR and the proposed BMPs for the proposed project have been developed to minimize drainage impacts identified in Section 5 and the introduction of pollutants identified in Section 4 into the municipal storm drain system and/or ultimate drainage receiving waterbody.

7.1 LID Site Design Strategies and BMPs

Conceptually, there are four LID strategies for managing runoff from buildings and paving:

1. Optimize the site layout;
2. Use pervious surfaces;
3. Disperse runoff; and
4. Design Integrated Management Practices (IMPs).

The Paseo Santa Fe Green Street Project utilizes all of the above strategies by connecting hard surface runoff to bioretention areas, directing stormwater from vehicular areas to pervious concrete and pavers, and utilizing the extensive softscape and landscape planter areas for additional runoff dispersal.

7.1.1 Optimize Site Layout

In order to minimize grading and to preserve existing site features and topography, the analyses conducted in Section 6 were utilized to optimize the site layout. The Paseo Santa Fe Green Street concept will provide extensive softscape/landscape elements, pervious pavers, pervious concrete in parking areas, route roof runoff to bioretention areas.

7.1.2 Use Pervious Surfaces

Several pervious surfaces are proposed for the project. Strategically placed porous concrete will be implemented in the street corridor parking areas, along with permeable paver treatments at crosswalks and other decorative paver areas. The center of the main project roadway will be a depressed median with permeable pavers throughout. The combination of porous concrete, permeable pavers, and median permeable paver treatment, will provide infiltration and pollution-reduction of water quality flows, and a reduction in stormwater volumes. Extensive landscape and softscape areas will also contribute to the overall pervious area.

7.1.3 Disperse Runoff

Bioretention areas are proposed within planter islands, both in the parking stall rows, and also spaced strategically throughout the corridor. Parking stall rows will be designed to route runoff from paved areas to bioretention planters. In addition roof drains will outlet into the bioretention areas. The project street section will be designed to drain toward the center median, with permeable pavers provided there to allow infiltration and treatment of flows, in addition to the storm runoff volume reduction.

7.1.4 Integrated Management Practices (IMPs)

The selected IMPs for the project are bioretention and infiltration. Runoff from parking areas and roofs will be routed to bioretention areas within landscape planter islands and traffic circles. Treatment will be provided through the planting and the filter section (refer to sheet 4 of 4 of the Site/BMP map for a typical cross section detail). The center median, permeable pavers, and the porous concrete areas are the infiltration IMPs. Runoff from impervious areas will be routed to these areas for filtration and stormwater retention. Design calculations, assumptions and further details are provided in Section 7.2 and 7.3 below.

7.2 Documentation of Drainage Management Areas (DMAs)

7.2.1 Defining Drainage Management Areas

Project DMA's will be delineated at the final design stage of the project. The project DMA delineation and calculations will be provided when that information is available (as the project moves forward to final design). Project treatment volumes for the bioretention and infiltration IMP's are provided in Section 7.3, using preliminary treatment areas, preliminary impervious ratio estimate, and anticipated filtration cross sections, as shown on the BMP map/exhibit, sheet 4 of 4 (details).

7.3 Treatment Control BMP/IMP Calculations

Treatment control calculations are provided with Tables 1 and 2 on the next page. Table 1 notes the offsite areas and water quality flows for the tributary areas that will be treated with the high-rate biomedia filters at the project perimeter. Note that this is supplemental treatment for non-project areas to be provided as an extra benefit by the City. The land uses, impervious ratios, and subsequent runoff coefficients were extracted from the South Santa Fe Drainage Study Report Dated April 10, 2010. Refer also to Figure 7.1, the Paseo Santa Fe Green Street Project Hydrology Exhibit, attached after Tables 1 and 2.

Table 2 provides the treatment calculations and supporting data for the project footprint infiltration and bioretention IMP's. Land use and impervious area ratios are estimated from the proposed project land use categories: mixed use, commercial, and residential. Water Quality volumes are calculated using the San Diego County 85th percentile runoff depth and the calculated c-value and tributary area.

Table 1: Water Quality Treatment Summary - Offsite Tributary Areas

(Treatment that is above and beyond what is required)

Sub-basin	**Area (ac)**	**Land Use**	**% Impervious**	**C-Value**	**Q10 (cfs)***	**Q100 (cfs)***	**WQ Flow (cfs)****	**BMP*****	
O-1	9.8	C/P	75	0.73			1.4	High-rate	
O-2	27.6	R/C1	30	0.52			2.9	Biofiltration	
O-3	2.9	C/R/MU	75	0.77			0.4	"	
O-4	13.6	MU	75	0.77			2.1	"	
O-5	1.1	C	80	0.79			0.2	"	
Total:	**55.0**		53	0.59	94	138	6.5	"	
(Offsite)									

Land Use Abbreviations:

C - Commercial
R - Retail
MU - Mixed Use (Residential/Retail/Commercial)
R - Residential (Note - % impervious based on varying densities of residential)
P - Public/church

1 - 26.0 acres residential, 1.6 acres commercial

***** From SSFe Drainage Project Drainage Report April 2010, and SSFe CLOMR June 2008.
** 85th% WQ flow =C x I x A, where C = runoff coefficient, I = 0.2 in/hr (SD County) and A = area (AC)
*** See Site/BMP map for preliminary inlet BMP locations
Note - Proposed Offsite Treatment BMP's are Clearwater BMP Curb Inlet filter inserts (existing inlets), and Curb Inlet bio-filtration BMPs
See Hydrology-Drainage Map for designation of offsite and onsite areas.

Table 2: Project Footprint Area Treatment BMP's

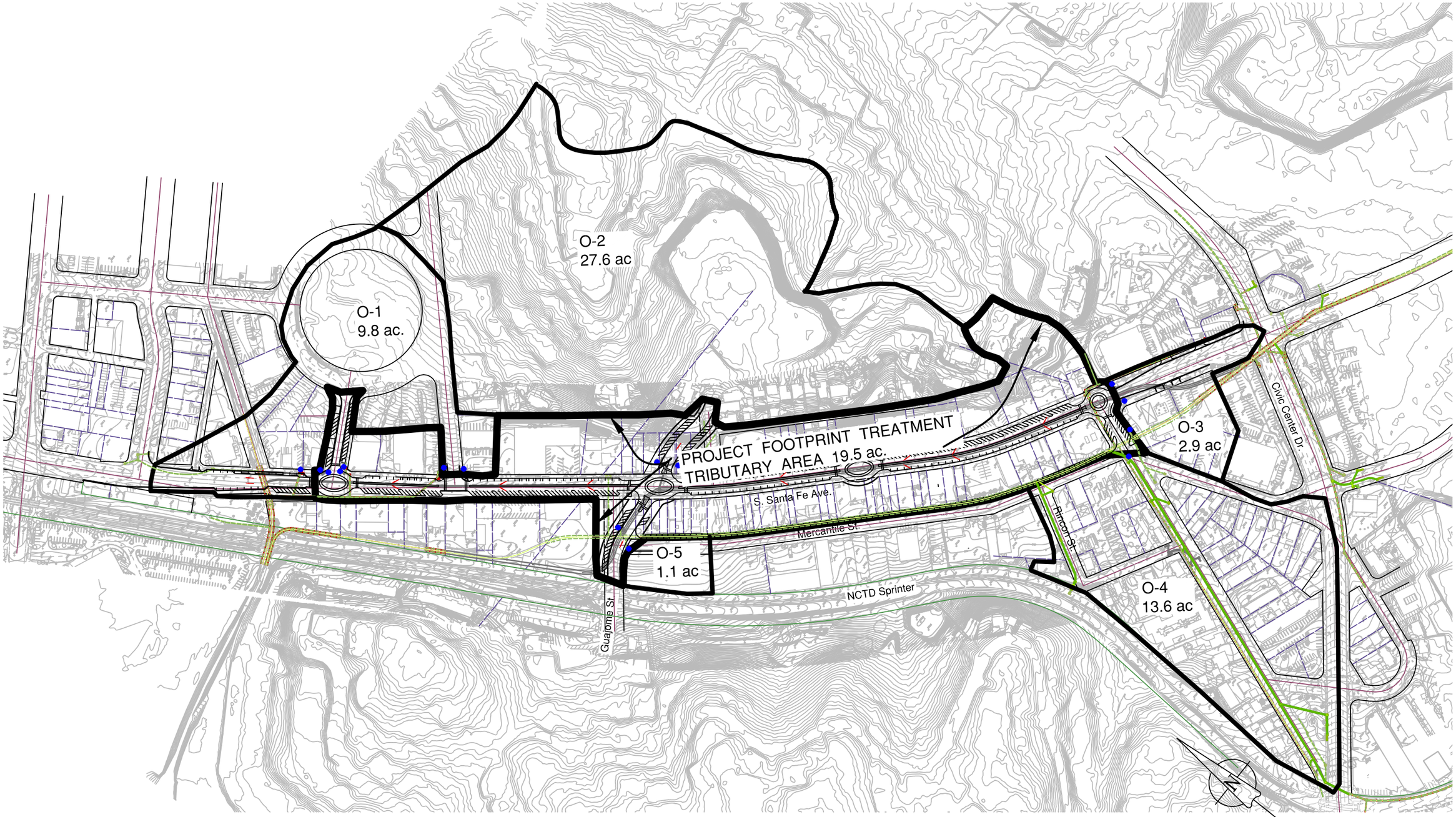
BMP	Tributary Area (ac)	Land Use	% Impervious	Q10 (cfs)*	Q100 (cfs)*	BMP Treatment Area (sf)	BMP Volume (ft3)	Calculated** WQ Volume (ft3)
Landscape Bioretention		C/R/MU	80			8,600	20,340	
		C/R/MU						
Median Infiltration		C/R/MU	80			9,700	15,520	
		C/R/MU						
Porous Pavement &		C/R/MU	80			7,500	5,750	
Permeable Pavers								
		C=						
Total:	**19.5**	0.79	80	33	49	25,800	41,610	38,569

*Note-Onsite area refers to approximate areas to be treated with on-site (proposed project) bioretention areas and infiltration area (median infiltr., porous paving and permeable pavers).

** 85th% WQ vol.= 3630C x d x A where C = runoff coefficient, d=85% depth (= .69 inches in Vista per SD County map) and A = area (acres)

Land Use Abbreviations:

C - Commercial
R - Retail
MU - Mixed Use (Residential/Retail/Commercial)



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PASEO SANTA FE GREEN STREET PROJECT
HYDROLOGY EXHIBIT

SCALE 1" = 300'
DATE : JUNE 12, 2012

Figure 7.1

7.3.1 Selection

Quantification of the Expected Influent and Effluent Concentrations of the Targeted Pollutants.

The targeted pollutants (or pollutants expected to be present) are TSS, Nutrients (preliminarily represented in this study by Total Phosporus (TP), Total Nitrogen (TN), Nitrites and Nitrates (NOx)), and heavy metals ((mainly Copper (Cu) and Zinc (Zn)). This information is in accordance with Table 5-1 (Potential pollutants for project categories) and also following EPA's Table 1, adapted from the San Diego Coopermitees, and available at http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=123 . An additional targeted pollutant is bacteria, but as the complexity of its analysis and the variability of its expected value are significant, a preliminary assessment of inflow and outflow concentration is not only futile, but also misleading and more likely to misrepresent conditions to be measured at a later phases.

The inflow concentrations of the pollutants listed in Table 7-3 (TSS, TP, TN, NOx, Cu-Total, Zn-Total) correspond to expected values determined from two main sources: The PLOAD Model for Marina del Rey Harbor, a USEPA Region 9 Study for the neighboring Santa Ana Region, and additional information gathered from the EPA Report 5927A "Results of the Nationwide Urban Runoff Program", Volume I. Post-development inflow concentrations could be significantly larger or smaller than the expected values due to the variability of the potential contaminants, local precipitation and runoff conditions, public education, and final site-specific land use. Lower inflow concentrations will not be surprising, as the importance of education, source control and setting the development as an example for water quality management by the City of Vista could have positive effects in the behavior of the people contributing to the generation of the pollutant loads.

Table 7-3 Project's Expected Influent and Effluent Concentrations

Weighted Average of Pollutants per all land uses	TSS (mg/l)	TP (µg/l)	TN (µg/l)	NOx (µg/l)	Cu-Tot (µg/l)	Zn-Tot (µg/l)
Inflow Concentration	70	450	2500	1200	41	250
Outflow Concentration	7.3	190	1400	600	21	44

Outflow concentrations of each pollutant are related to the inflow concentration by the overall removal expectation. The expected removal of contaminants is a function of the type of BMP selected, the maintenance cycle, the type of events occurring (wet, dry or normal year), and the overall initial state of the system. Typical effectiveness of management practices for runoff control has been established based upon the EPA Effectiveness Table, information that is available at the web page already mentioned. The BMPs selected (infiltration trench, porous pavement, bio-retention medians with filtering practices and potentially submerged gravel), have been statistically combined in terms of effectiveness and contributing area to determine an average expected design pollutant removal. The pollutant removal of the treatment train was conservatively applied to the Inflow Concentrations to determine the Outflow Concentrations shown in Table 1. Potential improvements in removal efficiency could be achieved in later phases of the project, when

measurements and specific design improvements can be suggested (longer detention periods, optimum media selection, improved vegetation selection, etc.).

Applicability of Selected BMPs for Pollutant Removal

Based on the USEPA Pollutant Removal Table, optimum removal of the expected pollutants can be achieved with the selected BMPs. For TSS, EPA recommends the use of infiltration practices, mainly infiltration trenches and porous pavement, plus filtering practices. Regarding nutrients, porous pavement is one of the most efficient ways to reduce total Nitrogen, and infiltration trenches have the best overall removal for TP, TN and NOx. Regarding heavy metals, bioretention BMPs have the largest overall removal efficiency for Cu and Zn removal. When the site specific constraints are considered (in terms of land use, space limitation, large amount of existing utilities that prevent the use of large volume BMPs, and other conditions), the design team optimized the selection of BMPs to the maximum extent practicable and within the limits of a preliminary assessment. Potential improvements could later be added in the detail design phase.

Table 7-5 provides a general comparison of how various types of treatment facilities perform for each group of pollutants. The pollutants for the proposed project are identified in Section 5 above.

TABLE 7-5 Groups of Pollutants and Relative Effectiveness of Treatment Facilities.

Pollutants of Concern	Bioretention Facilities (LID)	Settling Basins (Dry Ponds)	Wet Ponds and Constructed Wetlands	Infiltration Facilities or Practices (LID)	Media Filters	Higher-rate media filters	Trash Racks & Hydro -dynamic Devices	Vegetated Swales
Coarse Sediment and Trash	High	High	High	High	High	High	High	High
Pollutants that tend to associate with fine particles during treatment	High	High	High	High	High	Medium	Low	Medium
Pollutants that tend to be dissolved following treatment	Medium	Low	Medium	High	Low	Low	Low	Low

Based on this, the following types of facilities have been selected for the proposed project:

- Infiltration facilities: 1) center street median infiltration through permeable paves over filter section of sand and aggregate; and 2) infiltration through porous concrete and permeable pavers over a filter section of sand and aggregate. Both provide treatment volume based on detaining and infiltrating a volume equivalent to the 85th percentile 24-hour event.
- Bioretention facilities: Provided with the planted/landscaped bioretention areas throughout the project (see BMP map sheet 4 for cross section design). The bioretention and infiltration provided is sized with a volume equivalent to the 85th percentile 24-hour event.

7.3.2 Design and Sizing

Calculations for the infiltration and biorention IMP's are provided at the beginning of Section 7, on previous pages. DMA's will be provided at the final design stage of the project.

7.4 Alternatives to Integrated LID Design

Alternatives to the proposed project LID measures have and will be considered as the project moves toward the final design stage. The BMP's selected were the best possible BMP's, taking the project's constraints into consideration.

7.5 Source Control BMPs

It is anticipated that the following pollutants could be generated at this site: (referring to Table 5.1) Sediment, nutrients, heavy metals, trash and debris, oxygen-demanding substances, oil and grease, and pesticides.

Based on these anticipated pollutants and operational activities at the site the following summarizes the Source Control BMPs to be installed and/or implemented onsite:
(refer to attachment 6 for Source Control Checklist)

- Integrated Pest Management Practices
- Efficient irrigation using smart irrigation controllers
- Inlet Stenciling and Signage
- Outreach efforts will target local businesses to enhance use of source control BMPs such as using covered outdoor storage areas, proper trash storage, efficient landscaping, etc.

8.0 PROJECT PLAN(s) & BMP LOCATION MAP

The Site Map/BMP Map (4 sheets) found in attachment 2A illustrate the proposed project and the BMPs that will be implemented as described in Section 7 of this WQTR. Table 1 in Section 7 of this report lists on-site BMP's, and Table 2 lists BMP's for the offsite drainage areas.

9.0 BMP MAINTENANCE

Operation and Maintenance of onsite BMPs within the Paseo Santa Fe Green Street will be the responsibility of the City of Vista. O&M plans, details, methods, and frequencies will be provided at the project final engineering stage.

9.1 Facility Ownership & Maintenance Agreements

The City of Vista will be the owner of the LID and structural BMPs for the project. Upon completion of the project, the ongoing maintenance of landscaping and smart irrigation controllers will be carried out through the City of Vista's public works department. Ongoing maintenance of the stormwater LID elements, and porous pavement, will be maintained by departments within the City.