
4.7 - Hydrology and Water Quality

4.7.1 - Introduction

This section describes the existing setting regarding hydrology and water quality and potential effects from project implementation on the site and its surrounding area. Descriptions and analysis in this section are based, in part, on information contained in the Preliminary Hydrology Report, prepared in May 2007 by PBS&J Engineers and the offsite hydrology study prepared by Exponent in 2007, both of which are included in Appendix G of this EIR.

As explained in Section 1, *Introduction*, this project-level DEIR, where applicable, incorporates by reference information and analysis contained in the City of San Bernardino General Plan EIR and the Paradise Hills Specific Plan EIR, certified by the San Bernardino City Mayor and Common Council in 2005 and 1993, respectively. The General Plan EIR contemplated buildout of the General Plan at a programmatic level and concluded that all impacts related to hydrology and water quality were less than significant after mitigation. The Paradise Hills EIR provided project-level analysis of the smaller Paradise Hills project and concluded that all impacts related to hydrology and water quality were less than significant after the implementation of mitigation.

This DEIR accounts for modifications to the baseline conditions that have occurred since certification of the previous EIRs and changes that have increased the size and intensity of the Proposed Project. Accordingly, not all of the conclusions in the previous EIRs are applicable to the Proposed Project and new analysis is provided for potential impacts not previously considered in those documents.

4.7.2 - Environmental Setting

Climate

The site is located within the foothills of the San Bernardino Mountains on the north end of the San Bernardino Valley. The San Bernardino County Hydrology Manual dated 1986 and the City of San Bernardino Master Plan of Drainage were used to develop the hydrological parameters for this hydrology analysis. According to County data, the 10-year, 24-hour estimated maximum precipitation amount is 1.05 inches and the 100-year, 24-hour maximum precipitation amount is 1.5 inches for the project area. This compares to an annual precipitation estimate of 9.5 inches averaged over the entire region (CSB website, 2007).

Regional Hydrology

A review of the San Bernardino County Watershed Atlas indicates that the western portion of the site drains into the Devil Canyon Detention Basin, while the eastern portion of the site drains into the Sycamore Basin. The Badger Canyon drainage is bounded by Devil Canyon to the west and Sycamore Canyon to the east. All of these canyons drain the foothills of the San Bernardino Mountains to the north.

Localized Drainage

The site is bisected by Badger Creek, which flows south out of the San Bernardino Mountain foothills and drains an area of approximately 900 acres. Badger Creek flows into the Sycamore Basin, then south via the West Badger flood control diversion channel across Northpark Boulevard. The location of local drainages is shown in Exhibit 7.2.

Runoff from the western portion of the site flows along the Devil Canyon levee into the Devil Canyon Basin. During periods of peak flow, runoff from the Devil Canyon Basin flows southwest along the Devil Creek Diversion and intersects the Cable Creek Flood Control Channel. From here, the merged flows continue southwest as the Devil Canyon Diversion Channel, eventually reaching the Cajon Creek Wash approximately 3 miles southwest of the project site.

Badger Canyon itself encompasses approximately 460 acres while its three other tributary canyons drain an additional 440 acres. The western portion of the site south of the San Andreas Fault is a sloping alluvial terrace that contains a number of “finger” drainages that flow mainly from northeast to southwest, often along indistinct channels. During heavy rains, runoff currently often overflows the small channels to sheet flow over much of the terrace area.

As indicated in the preliminary hydrology report (PBS&J 2007), the project site has no significant existing infrastructure for stormwater detention or the enhancement of stormwater quality other than the County-maintained debris basins located immediately south of the project site. A summary of the 2007 PBS&J preliminary hydrology report is discussed later in this Section.

Soil Hydraulic Characteristics

CHJ Inc. conducted several geotechnical investigations on the project site, which are available in Appendix E of this DEIR. These reports investigated, among other things, the soil conditions present onsite. These investigations indicate that onsite soils are generally characterized by medium to high hydraulic conductivity or good drainage with medium to high surface permeability. Because of that, they were classified as hydrologic group “C” soils for the purposes of the hydrology study (page 2, PBS&J 2007).

Flooding

The most recent Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the project area is Panel 06071C7930F dated September 2007. The FIRM map indicates the project site is located within the Zone X designation, which signifies “locations outside the 100-year and 500-year floodplains.” As a result, the project site is not at risk of flooding during a 100-year storm.

Groundwater

The site is located in the Bunker Hill Groundwater Basin as described by the Santa Ana Region RWQCB Basin Plan. Groundwater management in the Bunker Hill Basin is performed by the San Bernardino Valley Water Conservation District (SBVWCD). The Basin has limited existing

municipal, domestic, and agricultural water supply use according to the RWQCB's Basin Plan Report. Similar to the Basin Plan Report, the California Department of Water Resources published Bulletin 118 in 2003. Bulletin 118 details the groundwater basins throughout California. According to Bulletin 118, historical records of groundwater elevations in the Bunker Hill Groundwater Basin are over 150 feet as measured at the CSUSB campus (SBVWCD 2007). Results from CHJ Inc. geotechnical investigations indicate that groundwater across the site is greater than 52 feet below the surface (i.e., the limit of geotechnical borings on the site).

The total groundwater storage capacity of this basin is estimated at 5,976,000 acre-feet. Pumping data indicates 164,319 acre-feet of urban extraction, and natural recharge of 23,861 acre-feet. Artificial recharge is reported at 15,835 acre-feet, with an average subsurface inflow to be about 22,500 acre-feet (SBVWCD 2007). The Bunker Hill Subbasin contains several contamination plumes, one of which is in proximity to the project site. The Newark and Muscoy plumes are spread around the east and west sides of the Shandon Hills in northern San Bernardino. These plumes consist of TCE and PCE, and are designated Superfund sites. These plumes do not underlie the UHSP project site specifically, but do affect the underlying groundwater basin for this area and to the west.

Water Quality

Surrounding land uses largely affect surface water quality, with both point- and non-point-source discharges contributing contaminants to surface waters. A majority of the surrounding land area consists of vacant undeveloped land. The steep canyons coming out of the San Bernardino Mountain foothills to the north transport large amounts of debris and sediment during periods of high runoff. Pollutant sources further downstream include residential areas, business parks, streets, rooftops, exposed earth at construction sites, automobiles, and landscaped areas. Pollutants of concern in discharges from these uses (and from proposed residential development on the project site) include certain heavy metals, excessive sediment production from erosion, petroleum hydrocarbons from sources such as motor oil, certain pesticides associated with the risk of acute aquatic toxicity, excessive nutrient loads, and trash.

Based on numerous studies conducted by the U.S. EPA to characterize the nature of urban stormwater runoff, including the National Urban Runoff Program (NURP), the USGS Urban Stormwater Database, and the Federal Highway Administration study of stormwater runoff loadings from highways, sufficient data exists to characterize the basic nature of stormwater discharges based on land use. More recently, the University of Alabama and the Center for Watershed Protection were awarded an EPA Office of Water 104(b)3 grant in 2001. The grant will fund collection and evaluation of stormwater data from a representative number of NPDES municipal separate storm sewer system (MS4) and stormwater permit holders. This dataset is referred to as the National Stormwater Quality Database (NSQD), which provides median event concentration values for associated land use classes and typical water quality parameters. Table 4.7-1 provides a summary of the values contained in

NSQD for selected land uses, which indicates typical suburban residential development contributes a number of materials that can pollute local surface waters, including coliform bacteria and phosphorus.

Table 4.7-1: Typical Surface Water Pollutants Contributions

Parameter	Overall	Residential	Commercial	Freeways	Open Space
Area (acres)	56.0	57.3	38.8	1.6	73.5
Percent Impervious	54.3	37.0	83.0	80.0	2.0
Precipitation Depth (inches)	0.47	0.46	0.39	0.54	0.48
Total Suspended Solid (mg/L)	58	48	43	99	51
Biological Oxygen Demand (mg/L)	8.6	9.0	11.9	8.0	4.2
Chemical Oxygen Demand (mg/L)	53	55	63	100	21
Fecal Coliform MPN/100mL)	5,081	7,750	4,500	1,700	3,100
Ammonia (NH ₃) (mg/L)	0.44	0.31	0.50	1.07	0.30
(Nitrite + Nitrate) (NO ₂ + NO ₃) (mg/L)	0.6	0.6	0.6	0.3	0.6
Nitrogen, Total Kjeldahl (mg/L)	1.4	1.4	1.6	2.0	0.6
Phosphorous, total (mg/L)	0.27	0.30	0.22	0.25	0.25
Cadmium, total (µg/L)	1.0	0.5	0.9	1.0	0.5
Copper, total (µg /L)	16.0	12.0	17.0	35.0	5.3
Lead, total (µg /L)	16	12	18	25	5
Nickel, total (µg /L)	8.0	5.4	7.0	9.0	ND
Zinc, total (µg /L)	116	73	150	200	39
ND = not detected, or insufficient data to present as a median value. Source: Center for Watershed Protection. 2004					

The project site contributes runoff into Reach 4 of the Santa Ana River, which includes the river from the Bunker Hill Dike south to Mission Boulevard Bridge in Riverside. That bridge marks the upstream limit of rising water induced by the flow constriction in the Riverside Narrows. Until about 1985, rising water from upstream and wastewater discharges percolated and the lower part of the reach was dry. Flows are now perennial, but may not remain so as new projects are built. Much of this reach is also operated as a flood control facility (Santa Ana River Basin Plan, RWQCB 1995).

Regulatory Framework

Federal Clean Water Act

The Clean Water Act (CWA), as amended by the Water Quality Act of 1987, is the major federal legislation governing water quality. The objective of the CWA is “to restore and maintain the chemical, physical, and biological integrity of the Nation’s waters.” Important applicable sections of the CWA are as follows:

- Section 301 prohibits the discharge of any pollutant by any person, except as in compliance with Sections 302, 306, 307, 318, 402, and 404 of the CWA. Sections 303 and 304 provide for water quality standards, criteria, and guidelines.
- Section 401 requires an applicant for any federal permit that proposes an activity which may result in a discharge to “waters of the United States” to obtain certification from the State that the discharge will comply with other provisions of the Act. Certification is provided by the RWQCBs.
- Section 402 establishes the National Pollution Discharge Elimination System (NPDES) a permitting system for the discharge of any pollutant (except for dredge or fill material) into waters of the United States. This permit program is administered by the RWQCB, and discussed in detail below.
- Section 404 establishes a permit program for the discharge of dredge or fill material into waters of the United States. This permit program is administered by USACE.

Potential impacts on jurisdictional waters and wetlands are evaluated in Section 4.3, *Biological Resources*.

National Flood Insurance Program

FEMA administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities complying with FEMA regulations that limit development in floodplains. FEMA issues flood insurance rate maps for communities participating in the NFIP. These maps delineate flood hazard zones in the community. Executive Order 11988 (Floodplain Management) addresses floodplain issues related to public safety, conservation, and economics. It requires:

- Avoidance of incompatible floodplain development;
- Consistency with the standards and criteria of the NFIP; and
- Restoration and preservation of the natural and beneficial floodplain values.

California Porter-Cologne Water Quality Control Act

The State of California’s Porter-Cologne Water Quality Control Act (California Water Code Section 13000, et seq.) provides the basis for water quality regulation within California. The Act requires a “Report of Waste Discharge” for any discharge of waste (liquid, solid, or otherwise) to land or surface waters that may impair a beneficial use of surface or groundwater of the State. Waste discharge requirements (WDRs) resulting from the Report are issued by the RWQCB, as discussed further below. In practice, these requirements are typically integrated with the NPDES permitting process.

The State Water Resources Control Board (SWRCB) carries out its water quality protection authority through the adoption of specific Water Quality Control Plans (Basin Plans). These plans establish water quality standards for particular bodies of water. California water quality standards are composed of three parts: the designation of beneficial uses of water, water quality objectives to

protect those uses, and implementation programs designed to achieve and maintain compliance with the water quality objectives.

The Santa Ana Region RWQCB is responsible for the Basin Plan that covers this portion of San Bernardino County including the project site. The RWQCB implements management plans to modify and adopt standards under provisions set forth in section 303(c) of the Federal CWA and California Water Code (Division 7, Section 13240). Under Section 303(d) of the 1972 CWA, the State is required to develop a list of waters with segments that do not meet water quality standards.

Beneficial Uses and Water Quality Objectives

The RWQCB is responsible for the protection of beneficial uses of water resources within this portion of San Bernardino County. Beneficial uses are the desired resources, services, and qualities of the aquatic system that are supported by achieving and protecting high-water quality. The Regional Board adopted the most recent Basin Plan on January 24, 1995 for the 2,800-square-mile basin that sets forth the beneficial uses identified for water bodies within the region. The Basin Plan was prepared in compliance with the federal CWA and the State Porter-Cologne Water Quality Control Act. The Basin Plan establishes beneficial uses for major surface waters and their tributaries, water quality objectives that are intended to protect the beneficial uses of the Basin, and implementation programs to meet stated objectives and to protect the beneficial uses of water in the Basin.

According to the Basin Plan, Reach 4 of the Santa Ana River has a number of beneficial uses, including municipal supply, agriculture, groundwater recharge, both contact and non-contact recreation, warm water habitat for fish and other aquatic species, and support of waterfowl and terrestrial wildlife. The Cajon Creek and Devil Canyon Creek, both of which are much closer to the project site than the Santa Ana River, do not support agriculture but do have all the other beneficial uses indicated for Reach 4 of the Santa Ana River. In addition, Cajon Creek is known to support a number of listed or otherwise sensitive plant and animal species (Table 3-1, RWQCB 1995).

Additionally, water quality objectives for all surface waters in the region have been set concerning bacteria, bioaccumulation, biostimulatory substances, color, dissolved oxygen, floating material, oil and grease, population and community ecology, pH, salinity, sediment, settleable material, suspended material, sulfide, tastes and odors, temperature, toxicity, turbidity, and ammonia. Objectives for specific chemical constituents are additionally regulated, depending upon the beneficial use of the water body. Specific water quality objectives and standards for surface waters are outlined in the Basin Plan. Table 4.7-2 summarizes the water quality objectives for the project area from the regional Basin Plan.

Table 4.7-2: Regional Water Quality Objectives

Drainage	Water Quality Objectives (mg/L)						
	TDS	Hardness	Na	Cl	N	SO4	COD
Devil Canyon Creek	275	125	35	20	1	25	5
Cajon Creek	200	100	30	10	1	20	5
Reach 4 – Santa Ana River	700	350	110	140	10	150	30
Bunker Hill 1 Groundwater Basin	260	190	15	10	1	45	--
mg/L = milligrams per liter		Hardness = calcium carbonate					
TDS = total dissolved solids		Na = sodium					
Cl = chlorine		N = nitrogen as total inorganic nitrogen for surface water but as NO ₃ for groundwater					
COD = chemical oxygen dissolved							
Source: Table 4-1, Santa Ana River Basin Plan, RWQCB 1995							

Total Maximum Daily Loads

A total maximum daily load (TMDL) refers to the amount of a specific pollutant a river, stream, or lake can assimilate and still meet federal water quality standards as provided in the CWA. A TMDL accounts for all sources of pollution, including point sources, non-point sources, and natural background sources. Section 303(d) requires that regulatory agencies determine TMDLs for all water bodies that do not meet water quality standards, and the Section 303(d) list of impaired water bodies described earlier provides a prioritization and schedule for development of TMDLs for the State.

The State WQCB, in compliance with the Section 303(d) of the CWA [33 USC Section 1313(d)] prepared, and the EPA approved, a 2006 list of impaired water bodies in the State of California. The list includes a priority schedule for the development of TMDLs for each contaminant or “stressor” impacting the water body. The Hydrologic Sub-Area 801.44 is the Santa Ana River, Reach 4, which is just downstream of the Devil’s Canyon basins and the Cajon Creek is a major tributary to that portion of the Santa Ana River. This hydrologic sub-unit is on the 303(d) list for non-point source pathogens (RWQCB website 2007). While the major source of pathogens is typically septic wastewater treatment systems, runoff from new urban development is a concern if it adds additional pollutants to the receiving sub-unit.

General Construction Stormwater NPDES Permit

The Santa Ana RWQCB administers the NPDES stormwater permitting program in the urbanized portion of the San Bernardino Valley (i.e., non-desert areas) for construction activities. Construction activities disturbing 1 acre or more of land are subject to the permitting requirements of the NPDES General Permit for Discharges of Storm Water Runoff Associated with Construction Activity (Permit 99-08-DWQ). For qualifying projects, the project applicant must submit a Notice of Intent (NOI) to the RWQCB to be covered by the General Construction Permit prior to the beginning of construction. The General Construction Permit requires the preparation and implementation of a SWPPP, which must also be completed before construction begins. Implementation of the SWPPP starts with the

commencement of construction and continues through the completion of the project. Upon completion of the project, the applicant must submit a Notice of Termination to the RWQCB to indicate that construction is completed. The disturbance areas associated with construction of structures and facilities associated with the project is anticipated to exceed the threshold requiring coverage under the General Construction Permit.

Local - San Bernardino Countywide NPDES Municipal Stormwater Permit

The City's General Plan acknowledges that water pollution is of national importance and the federal CWA established the NPDES permit program to address the problem. The CWA requires that cities "effectively prohibit non-stormwater discharges into the storm sewers" and "require controls to reduce the discharge of pollutants to the maximum extent practicable." Cities are now required to obtain NPDES permits to discharge their storm water into the storm drains and implement BMPs on new construction in order to prevent illegal discharges to storm drains and runoff from construction sites, restaurants, outdoor storage sites, and industrial areas. All development activities within the City are required to comply with NPDES permit No. CAG998001 and RWQCB Order No. R8-2003-0061 for discharges into storm sewers (Safety Element, CGP 2005).

Local – Master Plans of Drainage

Both the City and County of San Bernardino maintain criteria for the conceptual layout and design of drainage improvements for flood control facilities under their purview. Hydrology studies for individual projects are required to be consistent with these plans in terms of location and sizing of flood protection improvements. Criteria for the conceptual layout and design of drainage improvements for the UHSP were adopted based on the current guidelines of the City of San Bernardino and San Bernardino County Flood Control District (SBCFCD). The project site is located north of various SBCFCD facilities that are part of the County's master plan for controlling storm runoff out of the San Bernardino Mountains to the north. The SBCFCD has developed a comprehensive Master Plan of Drainage (MPD) that incorporates many local Comprehensive Storm Drain Plans (CSDP) prepared by cities and the County to provide comprehensive protection for city and county residents and properties. The CSDPs evaluate existing drainage systems to identify deficiencies and recommend improvements and new facilities in an area. The Proposed Project site is closest to the Southwestern Portion Area of the County's Comprehensive Storm Drain Plan 7 (CSDP 7). A further analysis of the projects proposed drainage plan compared to SBCFCD Master Plan of Drainage is discussed below.

Hydrology and Hydrologic Calculations PBS&J (October 4, 2007)

PBS&J conducted an analysis on the drainage plan for Tentative Tract 18140 (University Hills Specific Plan) compared to the requirements of the San Bernardino County Flood Control District (SBCFCD) Master Plan of Drainage. The analysis determined the site drains into two major basins: Badger Basin and Sycamore Basin. Badger Canyon is a natural drainage that runs north to south through the site along with an unnamed course, which runs north to south between the western and eastern portions of the Proposed Project. A series of debris basins, detention basins, and percolation

basins, maintained by the San Bernardino County Flood Control District (SBCFCD) total approximately 920 acres.

Approximately 168 acres of the total acres of the Proposed Project will be mass graded, totaling 18 percent. The remaining 753 acres within the drainage area will not be graded, or the grading will be limited. The total project site will consist of two portions, the West Village (125 acres) and the East Village (42.4 acres).

Three drainage areas are tributary to the project site. The most significant is the drainage tributary to Badger Canyon, which is calculated to be 460 acres. This drainage area enters the site from the north and continues southerly through the site, and then drains into the existing flood control debris basin adjacent to Badge Hill. The remainder of the offsite drainage enters the site in various smaller concentrations as sheet flow. Approximately 70 percent of the combined onsite and offsite drainage occurs in Badger Canyon, and drains in a natural sheet flow condition onto the existing earthen channel that links two debris basins south of the Proposed Project, and then flows in a westerly direction. The remaining 30 percent of the tributary area flows toward the Sycamore basin, which also drains into an earthen channel that flows in a southerly direction, and then ultimately drains into a covered concrete lined channel that crosses Northpark Blvd in Little Mountain Drive. Furthermore, vegetative cover varies from medium dense in areas with southern exposure and medium to heavy in areas with a northern exposure. The areas within the foothills are generally light to medium cover.

The analysis used the San Bernardino County Hydrology Manual (1986) and the City of Yucaipa Master Plan of Drainage to develop the hydrological parameters for 25-year and 100-year storm events. "These rainfall values are 1.05 inch for the 10-year storm event, and 1.5 inches for the 100-year storm event. Twenty-five year discharges were determined by interpolating between 10-year and 100-year values with a slope of 0.60 in accordance with SBCFCD methods".

The analysis used SBCFCD criteria for the conceptual layout and design of drainage improvements for the proposed project. SBCFCD criteria are as follows: "All underground storm drains proposed in the study are intended to collect local urban runoff and offsite undeveloped flows. These drains are located in existing and proposed street rights-of-way including proposed easements. For local and major streets located in the study area, runoff from the 25-year storm is allowed to flow in the streets until it reaches the top of curb; however the 100-year storm flow, on the other hand, is allowed to flow within street section until it reaches the street right-of-way limit. If either of these two conditions is exceeded, the study proposed to construct an underground storm drain. All conduits are proposed to be reinforced concrete pipes (RCP). The minimum pipe size is 18" RCP, and the minimum cover is 2 feet." The PBS&J analysis recommended the following drainage improvements, which can also be seen in Exhibits A-D in the Hydrology and Hydrologic Calculations report.

- "Line A: This underground storm drain is proposed to collect runoff flow from the central portion of the project site of the West Village, and offsite flow northerly of the project site.

- The calculated flow is $Q_{100} = 294$ cfs and Line "A" is sized to be 54" RCP. The tributary area contributing is 103.7 acres. It connects to an existing flood control facility as shown on Exhibit "A". Line "C" is tributary to Line "A" as also shown on Hydrology Map Exhibit A."
- "Line B: This underground facility is proposed, offsite flow north of the project, and to collect runoff flows tributary to the north, and northwest side of the project from the West Village. The storm drain Line "B" is sized to be a 60" RCP to carry a flow of $Q_{100} = 275$ cfs. It drains to an existing flood control facility as shown on Exhibit "A". The tributary area is calculated to be 111 acres."
 - "Line C: This underground storm drain is proposed to collect runoff flow to the northeast and southeast portion of the project site, the calculated flow is $Q_{100} = 145.3$ cfs and Line "C" is sized to be 42" RCP. The tributary area is 41.4. It connects into Storm drain Line A as shown on Exhibit A."
 - "Lines D1 and D2: Those underground storm drains are proposed to collect runoff flow to the northwest and west portion of the East Village of the project site, the calculated flow is $Q_{100} = 243$ cfs and Line "D1" is sized to be 42" RCP. The tributary is 128.8 acres. Line "D1" outlets to an existing flood control facility as shown on Exhibit B. Line D2 is proposed to drain subarea D2 from the East Village, the calculated flow is 13.5 cfs and is sized to be 24" RCP. The tributary area is 9.2 acres. Line D2 outlets into natural stream as shown on Exhibit "C"."
 - "Line F: This underground storm drain is proposed to collect runoff flow to and northeast portion of the East Village of the project site, the calculated flow is $Q_{100} = 262$ cfs and Line "F" is sized to be 54" RCP. The tributary area is 139.4 acres. Line "F" outlets to an existing flood control facility as shown on Exhibit B."

Local - City of San Bernardino General Plan

The Utilities Element of the City's General Plan establishes the following policies related to hydrology and water quality:

Goal 9.4: "Provide appropriate storm drain and flood control facilities where necessary."

- **Policy 9.4.1:** Ensure that adequate storm drain and flood control facilities are provided in a timely manner to protect life and property from flood hazards.
- **Policy 9.4.2:** Upgrade and expand storm drain and flood control facilities to eliminate deficiencies and protect existing and new development.
- **Policy 9.4.3:** Maintain existing storm drain and flood control facilities.
- **Policy 9.4.4:** Require that adequate storm drain and flood control facilities be in place prior to the issuance of certificates of occupancy. Where construction of master planned facilities is not feasible, the Mayor and Common Council

may permit the construction of interim facilities sufficient to protect present and short-term future needs. (LU-1)

- **Policy 9.4.5:** Implement flood control improvements that maintain the integrity of significant riparian and other environmental habitats.
- **Policy 9.4.6:** Minimize the disturbance of natural water bodies and natural drainage systems. (LU-1)
- **Policy 9.4.7:** Develop San Bernardino's flood control system for multipurpose uses, whenever practical and financially feasible.
- **Policy 9.4.8:** Minimize the amount of impervious surfaces in conjunction with new development. (LU-1)
- **Policy 9.4.9:** Develop and implement policies for adopting Sustainable Stormwater Management approaches that rely on channels. Sustainable Stormwater Management techniques include use of pervious pavements, garden roofs, and bioswales to treat stormwater, and reusing stormwater for non-potable water uses such as landscape irrigation and toilet/urinal flushing. (LU-1)
- **Policy 9.4.10** Ensure compliance with the Federal CWA requirements for NPDES permits, including requiring the development of Water Quality Management Plans, Erosion and Sediment Control Plans, and SWPPPs for all qualifying public and private development and significant redevelopment in the City. (LU-1)
- **Policy 9.4.11** Implement an urban runoff reduction program consistent with regional and federal requirements, which includes requiring and encouraging the following examples of BMPs in all developments:
 - Increase permeable areas, utilize pervious materials, install filtration controls (including grass lined swales and gravel beds), and divert flow to these permeable areas to allow more percolation of runoff into the ground;
 - Replanting and hydroseeding of native vegetation to reduce slope erosion, filter runoff, and provide habitat;
 - Use of porous pavement systems with an underlying stone reservoir in parking areas;
 - Use natural drainage, detention ponds, or infiltration pits to collect and filter runoff;
 - Prevent rainfall from entering material and waste storage areas and pollution-laden surfaces; and
 - Require new development and significant redevelopment to utilize site preparation, grading, and

- Other BMPs that provide erosion and sediment control to prevent construction-related contaminants from leaving the site and polluting waterways. (LU-1)

Analysis: The Drainage Master Plan and the Sustainability Development Guidelines of the UHSP are consistent with the City's requirements to protect residents and structures from flooding, and to protect water quality in local and regional drainages. The Conceptual Water Quality Management Plan (DEIR, Appendix G) outlines how the project will protect surface and groundwater quality both for short-term construction and long-term occupancy of the Proposed Project.

The Safety Element of the City's General Plan states that, "flooding is also a very real issue in San Bernardino. We need to be aware of the potential for floods from our mountain canyons and streams and from urban runoff. To prevent flooding of the City, the capacity of the storm drain system must consistently be evaluated and improved as needed. Storm drains and flood control facilities within the City include channels, storm drains, street waterways, natural drainage courses, dams, basins, and levees. Storm drain and flood control facilities in the planning area are administered by four different entities: City of San Bernardino (Public Works and Public Services Departments); San Bernardino County Flood Control District; USACE; and San Bernardino International Airport and Trade Center" (Safety Element, CGP 2005). The Safety Element of the City's General Plan establishes the following policies related to water quality and flood control:

Goal 10.4: "Minimize the threat of surface and subsurface water contamination and promote restoration of healthful groundwater resources."

- **Policy 10.4.1:** Promote integrated inter-agency review and participation in water resource evaluation and mitigation programs.
- **Policy 10.4.2:** Protect surface water and groundwater from contamination.
- **Policy 10.4.3:** Eliminate or remediate old sources of water contamination generated by hazardous materials and uses.
- **Policy 10.4.4:** Develop programs and incentives for prevention of groundwater contamination and clean up of known contaminated sites.

Analysis: The project site does not represent an existing or suspected source of surface or groundwater contamination. The potential impacts of developing the project site are addressed relative to Goals 9.4 and 10.4 above. The proposed UHSP is consistent with this goal and these policies.

Goal 10.5: "Reduce urban run-off from new and existing development."

- **Policy 10.5.1:** Ensure compliance with the Federal CWA requirements for NPDES permits, including developing and requiring the development of Water Quality Management Plans for all new development and significant redevelopment in the City. (LU-1)
- **Policy 10.5.2:** Continue to implement an urban runoff reduction program consistent with regional and federal requirements, which includes requiring and encouraging the following:
 - Increase permeable areas to allow more percolation of runoff into the ground;
 - Use natural drainage, detention ponds or infiltration pits to collect runoff;
 - Divert and catch runoff using swales, berms, green strip filters, gravel beds and French drains;
 - Install rain gutters and orient them towards permeable surfaces; and
 - Construct property grades to divert flow to permeable areas;
- **Policy 10.5.3:** Cooperate with surrounding jurisdictions and the County to provide adequate storm drainage facilities.
- **Policy 10.5.4:** Require new development and significant redevelopment to utilize site preparation, grading and foundation designs that provide erosion control to prevent sedimentation and contamination of waterways. (LU-1)
- **Policy 10.5.5:** Ensure compliance with the requirements for SWPPPs or Water Quality Management Plans for all new development or construction activities.
- **Policy 10.5.6:** Coordinate with appropriate federal, state, and local resource agencies on development projects and construction activities affecting waterways and drainages.

Analysis: A Conceptual Water Quality Management Plan was prepared for this project (see Appendix G) which outlines the various short- and long-term BMPs that the project will implement to help protect water quality. In addition, the Specific Plan contains a number of sustainable development guidelines that will help protect water quality through intelligent project design, such as the use of bio-swales to pre-treat runoff before it reaches the stormdrain system, and pervious pavement and other treatments to help reduce offsite runoff and promote local groundwater recharge. In these ways, the UHSP is consistent with this goal and these policies.

Goal 10.6: “Protect the lives and properties of residents and visitors of the City from flood hazards.”

- **Policy 10.6.1:** Maintain flood control systems and restrict development to minimize hazards due to flooding.

- **Policy 10.6.2:** Use natural watercourses as the City’s primary flood control channels whenever feasible.
- **Policy 10.6.3:** Keep natural drainage courses free of obstructions.
- **Policy 10.6.4:** Evaluate all development proposals located in areas that are subject to flooding to minimize the exposure of life and property to potential flood risks.
- **Policy 10.6.5:** Prohibit land use development and/or the construction of any structure intended for human occupancy within the 100-year flood plain as mapped by the FEMA unless adequate mitigation is provided against flood hazards.
- **Policy 10.6.6:** Encourage new development to utilize and enhance existing natural streams, as feasible.
- **Policy 10.6.7:** Utilize flood control methods that are consistent with RWQCB Policies and BMPs.
- **Policy 10.6.8:** Review development proposals for projects within the City’s Sphere of Influence and encourage the County to disapprove any project that cannot be protected with an adequate storm drain system.
- **Policy 10.6.9:** Ensure major drains in developed areas have a pipeline capacity to comply with the Flood Control District’s Comprehensive Storm Drain Plans for development of the City’s storm drain system.
- **Policy 10.6.10:** Design local drains in foothill areas to convey 25-year storm flows where downstream systems are lacking and street systems are not present.
- **Policy 10.6.11:** Design major drains in foothill to convey 100-year flows within a pipe or channel areas where downstream systems are lacking and street systems are not present.
- **Policy 10.6.12:** Develop a process to study flooding issues and create appropriate regulations. This could include the creation of “alluvial districts,” local quasi-government entities designed to inform homeowners of flood risks as well as advise the floodplain land use decisions of the City.

Analysis: The project hydrology studies indicate the master drainage plan of the UHSP complies with the requirements of the City’s Master Plan of Drainage and these policies. Onsite drainage control structures have been designed based on the preliminary hydrology studies for the project (PBS&J 2007)(Exponent 2007) consistent with City requirements (see DEIR Appendix G).

NOP Comments

At the second scoping meeting, Dr. Norman Meeks from CSUSB commented that placing new houses, structures, and residents in this alluvial fan area which is subject to flooding, was inherently

dangerous, even if the development complies with applicable flooding and other hazard abatement regulations. In addition, during the second NOP comment review period a comment letter received by the Department of Public Health, commenting that the proposed property will be pursuant to the Water Code Section 10910 and is required to apply to the CDPH for a water supply permit.

Methodology

The impact analysis evaluates the project in relation to its possible impacts on local drainage patterns, local and regional water quality, and local groundwater resources. The impact analysis focuses on foreseeable changes to the existing conditions described above in the context of the significance criteria presented below. Impacts to hydrology are quantitatively assessed, while those for water quality are generally qualitative. Impacts of the project are identified for both the construction and operation of all project facilities, including the staging areas required for these facilities. The Master Plan of Drainage incorporates these flood protection design guidelines into the UHSP project, as shown in Exhibit 4.7-2.

As will be discussed in further detail in Section 4.14 (Utility Systems), a PBSJ hydrology study for the project identified the following six drainage systems or improvements that would need to be constructed on the project site to handle runoff during expected storm conditions (Exhibit 4.14-3):

- **Line A:** This line would drain the central portion of the site as well as receiving offsite flows from north of the site. It would have a Q100 (a 100-year storm flow) of 294 cubic feet per second (cfs) and require a 54-inch diameter reinforced concrete pipe (RCP).
- **Line B:** This underground facility would collect runoff from north of the site and convey it along the northwest side of the West Village area. It would have a Q100 of 275 cfs and require a 60-inch diameter RCP.
- **Line C:** This underground storm drain would collect runoff from the northeast and northwest portions of the development. It would have a Q100 of 145.3 cfs and require a 42-inch diameter RCP.
- **Line D1/D2:** These underground lines would collect runoff from the northwest and west portion of the East Village area. Its Q100 flow would be 243 cfs and would require a 42-inch diameter RCP. Line D2 would drain the rest of the East Village area with a Q100 of 13.5 cfs and require a 24-inch diameter RCP.
- **Line F:** This underground storm drain would collect runoff from the northeast portion of the East Village area. It has a Q100 of 262 cfs and requires a 54-inch diameter RCP to convey flows.

The Exponent hydrology study establishes design criteria for the drainage culverts crossing the access roads, including Badger Creek and Sycamore Canyon, as well as a large bulking factor to assure that

project roadways and land uses will be adequately protected during large storm events (Exponent 2007).

4.7.3 - Thresholds of Significance

According to the CEQA Guidelines', Appendix G, Environmental Checklist, to determine whether hazards and hazardous materials are significant environmental effects, the following questions are analyzed and evaluated. Would the project:

- a.) Violate any water quality standards or waste discharge requirements (WDRs)?
- b.) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted?
- c.) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation on- or off-site?
- d.) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?
- e.) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?
- f.) Otherwise substantially degrade water quality?
- g.) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?
- h.) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?
- i.) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?
- j.) Inundation by seiche, tsunami, or mudflow?

4.7.4 - Project Impacts and Mitigation Measures

This section discusses potential impacts associated with the development of the project and provides mitigation measures where appropriate.

Short-Term Construction Water Quality

Impact HYD-1: Construction activities associated with the Proposed Project could adversely impact water quality.

Impact Analysis

Development of the Proposed Project would require extensive construction and grading. During these activities, there would be the potential for surface water to carry sediment from onsite erosion and small quantities of pollutants into the stormwater system and local waterways. Soil erosion may occur along project boundaries during construction in areas where temporary soil storage is required. Small quantities of pollutants have the potential for entering the storm drainage system, thereby potentially degrading downstream water quality.

Construction of the Proposed Project would also require the use of gasoline and diesel-powered heavy equipment, such as bulldozers, backhoes, water pumps, and air compressors. Chemicals such as gasoline, diesel fuel, lubricating oil, hydraulic oil, lubricating grease, automatic transmission fluid, paints, solvents, glues, and other substances would be utilized during construction. An accidental release of any of these substances could degrade the water quality of the surface water runoff and add pollution into the drainage system.

The NPDES stormwater permitting programs regulate stormwater quality from construction sites. Under the NPDES permitting program, the preparation and implementation of SWPPPs are required for construction activities more than 1 acre in size. The SWPPP must identify potential sources of pollution that may be reasonably expected to affect the quality of stormwater discharges as well as identify and implement BMPs that ensure the reduction of these pollutants during stormwater discharges. BMPs for stormwater quality treatment are classified as structural and non-structural. Structural measures may include biofilters, wetlands, infiltration basins, or mechanical structures designed to remove pollutants from stormwater. Non-structural measures such as street sweeping, public education, or hazardous substance recycling centers are preventive measures intended to control the source of pollutants.

Prior to construction grading, the applicant must file an NOI to comply with the General NPDES Construction Permit issued to the RWQCB and prepare the SWPPP, which addresses the measures that would be included in the project to minimize and control construction and post-construction runoff to the “maximum extent practicable.” However, without these documents available for review as part of the DEIR, the City is unable to determine their adequacy in achieving applicable water quality standards. For this reason, the implementation of the prescribed mitigation would be required to ensure that the project SWPPP and Grading Plan include measures necessary to minimize water quality impacts as a result of project construction.

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

MM HYD-1a Prior to the issuance of grading permits for any portion or phase of the project, the project applicant shall receive City approval SWPPP and Grading Plan to the City of San Bernardino that identify specific actions and BMPs to prevent stormwater pollution from construction sources. These BMPs shall be consistent with the Conceptual Water Quality Management Plan prepared for the project by PBS&J Engineers (see DEIR Appendix G). The plans shall identify a practical sequence for site restoration, BMP implementation, contingency measures, responsible parties, and agency contacts. The applicant shall include conditions in construction contracts requiring the plans to be implemented and shall have the ability to enforce the requirement through fines and other penalties. The plans shall incorporate control measures in the following categories:

- Soil stabilization practices;
- Dewatering practices (if necessary);
- Sediment and runoff control practices;
- Monitoring protocols; and
- Waste management and disposal control practices.

Once approved by the City, the applicant's contractor shall be responsible throughout the duration of the project for installing, constructing, inspecting, and maintaining the control measures included in the SWPPP and Grading Plan.

MM HYD-1b Each SWPPP shall identify pollutant sources that could affect the quality of stormwater discharges from the construction site. Control practices shall include those that effectively treat target pollutants in stormwater discharges anticipated from project construction sites. To protect receiving water quality, the SWPPP shall include, but is not limited to, the following elements:

- Temporary erosion control measures (such as fiber rolls, staked straw bales, detention basins, temporary inlet protection, check dams, geofabric, sandbag dikes, and temporary revegetation or other ground cover) shall be employed for disturbed areas.
- No disturbed surfaces will be left without erosion control measures in place during the winter and spring months (September 30 – March 30).
- Sediment shall be retained onsite by a system of sediment basins, traps, or other appropriate measures. Of critical importance is the protection of existing catch basins that eventually drain to Cajon Creek.
- The construction contractor shall prepare Standard Operating Procedures for the handling of hazardous materials on the construction site to eliminate or reduce discharge of materials to storm drains.

- BMPs performance and effectiveness shall be determined either by visual means where applicable (i.e., observation of above-normal sediment release), or by actual water sampling in cases where verification of contaminant reduction or elimination, (inadvertent petroleum release) is required to determine adequacy of the measure.
- Native grasses or other appropriate vegetative cover shall be established on the construction site as soon as possible after disturbance.

Level of Significance After Mitigation

Less than significant impact.

Long-Term Operational Water Quality

Impact HYD-2: Land use activities associated with the Proposed Project could adversely impact water quality.

Impact Analysis

Development of the Proposed Project would create the potential for two substantial water quality effects. First, the existing vegetated pervious ground cover on undeveloped lots would be converted to impervious surfaces, including the rooftops and parking lots, which can neither absorb water nor remove pollutants. Secondly, urban development creates new pollution sources as human population density increases and brings with it proportionately higher levels of automobile use, landscaping, etc. Examples of such pollutants and their respective sources are heavy metals, such as copper from brake pad wear and zinc from tire wear; oil and grease from engines; and fertilizers and pesticides from landscaping. As a result of these two changes, the runoff leaving the developed urban area is significantly greater in volume, velocity, and pollutant load than the pre-development runoff from the same area. Further, these pollutants would be efficiently conveyed through existing drainage infrastructure and eventually reach Cajon Creek.

In response to these concerns, the Preliminary Hydrology Report for the project (refer to Appendix G) describes a system for managing stormwater pollutants and peaks flows generated from the project on a flow-through basis. The project stormwater management system would provide an integrated management plan consisting of multiple BMPs, including green roofs, bioswales, permeable pavement, and stormwater detention within the swales. Preliminary locations for each of these facilities are shown in the previous Exhibit 4.7-2, but they require more advanced hydrologic modeling to ensure accurate sizing and facility requirements.

A large portion of annual runoff is produced by small storms that occur many times a year. The MS4 permit will treat 80 percent of average annual runoff, and will include a project flow-based IMP treatment facility. The treatment facility will accommodate a 0.2-inch/hour inflow with a preliminary design. The preliminary design will ensure the rainfall intensity will treat approximately 80 percent of the average annual runoff, and will be consistent with the C.3 Guidebook.

However, given its preliminary nature, the Preliminary Hydrology Report does not provide a clear indication of the effectiveness of the proposed treatment measures in treating the anticipated and potential pollutants of concern generated from the project as provided in Table 4.7-1. These pollutants include pathogens, heavy metals, nutrients, pesticides, organic compounds, sediments, trash and debris, oxygen demanding substances, and oil and grease. The effectiveness of bioswales, green roofs, and permeable pavement in treating each of these pollutants varies, contingent on numerous factors, and in certain instances can result in degradation of shallow groundwater.

The treatment capacity of the proposed BMPs are in many instances not capable of providing complete treatment of each of these pollutants, even if runoff is routed through multiple BMPs. For example, the limited data that are available for bioswales suggest relatively high removal rates for some pollutants, but minimal removal for some bacteria and soluble nutrients. In addition, the removal efficiency of bioswales at reducing particulate concentrations of heavy metals is variable and may, under ideal circumstances, achieve only 50 percent removal. Less information is available regarding the treatment effectiveness of porous or permeable pavement and green roof technologies, which are most effective in minimizing peak flows.

Based on the local soil conditions present and considering the use of engineered fill, the Conceptual Water Quality Management Plan demonstrates that the proposed 2.6 acres of bioswales will provide the level of treatment anticipated. The Conceptual Water Quality Management Plan uses the 0.2-inch/hour criterion to develop a consistent Countywide sizing factor for “dry” swales, planters, and bioretention areas when used for stormwater treatment only (i.e., not for flow control) and is based on facilities constructed with a specified sandy loam mix with an infiltration rate of at least 5 inches per hour. As provided in the CHJ geotechnical investigations, the soil conditions in the upper 3 to 5 feet consist of sandy loam and silty loamy sand with small to medium sized cobble and occasional boulders (GeoMat 2007)(CHJ 2005).

The State suggests that a percolation rate of 0.5 inch per hour or more, and a permeable soil layer of 4 feet or more are critical for success of infiltration BMPs. As a result, the performance of infiltration BMPs may be limited by poor soil permeability, which for clayey and silty substrates may be as low as 0.001 to 0.01 centimeter per second. However, onsite soils are medium to highly permeable, which means they will allow for the continued percolation of stormwater once the project is completed.

The incorporation of infiltration technologies also carries the potential to subject local groundwater resources to urban pollutants that may be present in runoff by creating a direct, more efficient conduit. Several important local and regional drainages, including Cable Creek, Devil Creek Channel, and ultimately Cajon Creek and the Santa Ana River are downstream of the Proposed Project site. Unmitigated, urban pollutants might eventually reach these drainages and contribute to cumulative contamination including other urban and suburban sources. For these reasons, the implementation of the prescribed mitigation would be required to minimize potential water quality

impacts from non-point sources of pollution to the “maximum extent practicable” and a less than significant level.

This determination is based on a responsible entity monitoring and managing water quality during the “life” of this project – for the UHSP project, the designated maintenance organization will be the Landscape and Lighting Maintenance District (LLMD).

Level of Significance Before Mitigation

Potentially significant impact.

Mitigation Measures

MM HYD-2a Landscaping Management Plan. The developer shall develop and implement a Landscaping Management Plan (LMP) for landscaped areas with the goal of reducing potential discharge of herbicides, pesticides, fertilizers, and other contaminants to local waterways. All contractors involved in project-related landscaping conducted during the individual phases of development, as well as maintenance of landscaping following project completion, shall complete their work in strict compliance with the LMP. The applicant shall be responsible for ensuring that requirements of the LMP are provided to and instituted by future project land owners and managers following project completion. The LMP shall be prepared by a licensed landscape architecture firm with experience in methods to reduce or eliminate the use of landscape chemicals that could cause adverse effects to the environment. At a minimum, this LMP shall:

1. Require that pesticides and fertilizers not be applied in excessive quantities, and only applied at times when rain is not expected for at least 2 weeks, in an effort to minimize leaching and runoff into the storm drainage system.
2. Encourage the use of organic fertilizers and mulching of landscaped areas to inhibit weed growth and reduce water demands.
3. Utilize native, perennial, drought-tolerant vegetation to minimize irrigation needs.
4. Specify the maintenance measures to be used (e.g., mowing) and will specify an application schedule for all fertilizer amendments and pesticide applications.
5. Identify a list of preferred herbicides and pesticides and instances in which their use would be appropriate and the associated application rate.

MM HYD-2b Water Quality Maintenance Reports. The UHSP project shall form a Landscaping and Lighting Maintenance District (LLMD) to monitor water quality and provide regular reports to the City regarding water quality on the project site. A qualified

professional shall be retained through the LLMD to prepare and provide annual documentation to the City Engineer that the onsite BMPs (i.e., water quality devices, improvements, and procedures) are functioning as planned to effectively protect water quality both onsite and on downstream uses/drainages. This includes the function and condition of bioswales, street sweeping, etc. These reports shall be made to the satisfaction of the City Engineer in consultation with the RWQCB if necessary. If a report indicates water quality objectives are not being met and/or the RWQCB has expressed concerns in this regard, the LLMD will take appropriate steps and/or make appropriate improvements to achieve these objectives, to the satisfaction of the City Engineer.

Level of Significance After Mitigation

Less than significant impact.

Groundwater

Impact HYD-3: The project may substantially deplete groundwater supplies or interfere substantially with groundwater recharge.

Impact Analysis

Water service for the project would be provided via existing water mains owned and maintained by the City of San Bernardino Utilities Department and no wells are proposed to be dug or used as part of the Proposed Project. A Water Supply Assessment (WSA) was prepared by the City of San Bernardino Municipal Water Department that demonstrates the project has an adequate supply of potable water during anticipated drought and non-drought conditions for a period of at least 20 years, as required under SB 221. For more information on water supply, see Section 4.14, *Utilities*.

As provided in the setting discussion, groundwater was encountered to a depth of at least 52 feet below the ground surface (bgs) in the project area. In addition, historic well data indicates water levels in the general area are well over 100 feet bgs. Therefore, the placement of project-related structural foundations will not require construction dewatering,

Onsite soils are moderately to highly permeable and this area has historically be used to help recharge local groundwater supplies by the use of the large debris basins also acting as detention basins during periods of prolonged rain.

Development of the project site will substantially increase the amount of impervious surface coverage on the project site, which would interfere with continued recharge of runoff from natural soils on the terrace portion of the project site. However, the inclusion of bioswales and porous/permeable pavement, as part of the project's integrated water management plan, will improve the recharge of onsite runoff to the local groundwater.

It should be noted that the incorporation of pervious pavement and other infiltration technologies also carries the potential to subject local groundwater resources to urban pollutants that may be present in runoff by creating a direct, more efficient conduit. Unmitigated, these pollutants could become concentrated in the shallow aquifer. With the implementation of the prescribed mitigation mentioned above, this impact would be reduced to a less than significant level.

Level of Significance Before Mitigation

Potentially significant impact

Mitigation Measures

Implementation of Mitigation Measures HYD-2a and HYD-2b will effectively reduce this impact.

Level of Significance After Mitigation

Less than significant impact.

Alterations to Existing Drainage Patterns

Impact HYD-4:	Development of the Proposed Project would create additional impervious surface coverage and alter existing drainage patterns, potentially leading to downstream flooding or substantial erosion or siltation on or offsite.
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Impact Analysis

Development of the project site has the potential to alter the infiltration characteristics of the project site, increasing both the volume and discharge rate of stormwater runoff, which could contribute to downstream flooding or exceed the capacity of stormwater drainage systems. Site grading will also change the drainage pattern of the site. Potential locations where erosion may occur after construction include scouring at storm drain outlets.

The preliminary drainage calculations for the project are presented in Appendix G for pre- and post-development conditions (PBS&J 2007)(Exponent 2007). The results are based on appropriately conservative assumptions in terms of flow routing, slope length, gutter flow velocity, etc. for all undeveloped and existing pervious areas. Based on these factors, the Proposed Project's storage requirements are conservatively estimated based on the expected 100-year runoff from Badger Canyon and its attendant 900-acre drainage area. The project hydrology studies indicate that the project will not require onsite detention during a 100-year event. It should be noted this conclusion includes a 50 percent contingency and large bulking factor due to the project's location at the base of the San Bernardino Mountain foothills.

Based on the calculated storage requirements, the Preliminary Hydrology Report (see Appendix G) proposes that bioswales and permeable pavement stormwater treatment techniques be engineered to detain stormwater for the period required to curb peak flows. The primary storage capacity would be provided within the bioswales, which would be constructed at a depth of approximately 3 to 4 feet below the surrounding grade to act as a temporary storage facility during design rainfall events.

Level of Significance Before Mitigation

Less than significant impact.

Mitigation Measures

No mitigation is required.

Level of Significance After Mitigation

Less than significant impact.

Exceed Capacity of Downstream Drainage Conveyance Systems

Impact HYD-5: Development of the Proposed Project would create or contribute runoff water that could exceed the capacity of existing or planned stormwater drainage systems.

Impact Analysis

Runoff originating from the site drains to both the Sycamore Flood Control Basin southeast of the site and the Devil Canyon Basins southwest of the site. The hydrology and hydraulic calculations for the Proposed Project (PBS&J 2007) indicate that downstream flows will not be increased beyond existing flows after the construction of the proposed flood control improvements (Appendix G). The proposed flood control improvements for the project are further discussed in Section 4.14 and illustrated in Exhibit 4.14-3. The project is required to detain runoff up to the 100-year design event (Exponent 2007)(PBS&J 2007). Implementation of planned drainage improvements and prescribed mitigation will help ensure that the project would not create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems.

Level of Significance Before Mitigation

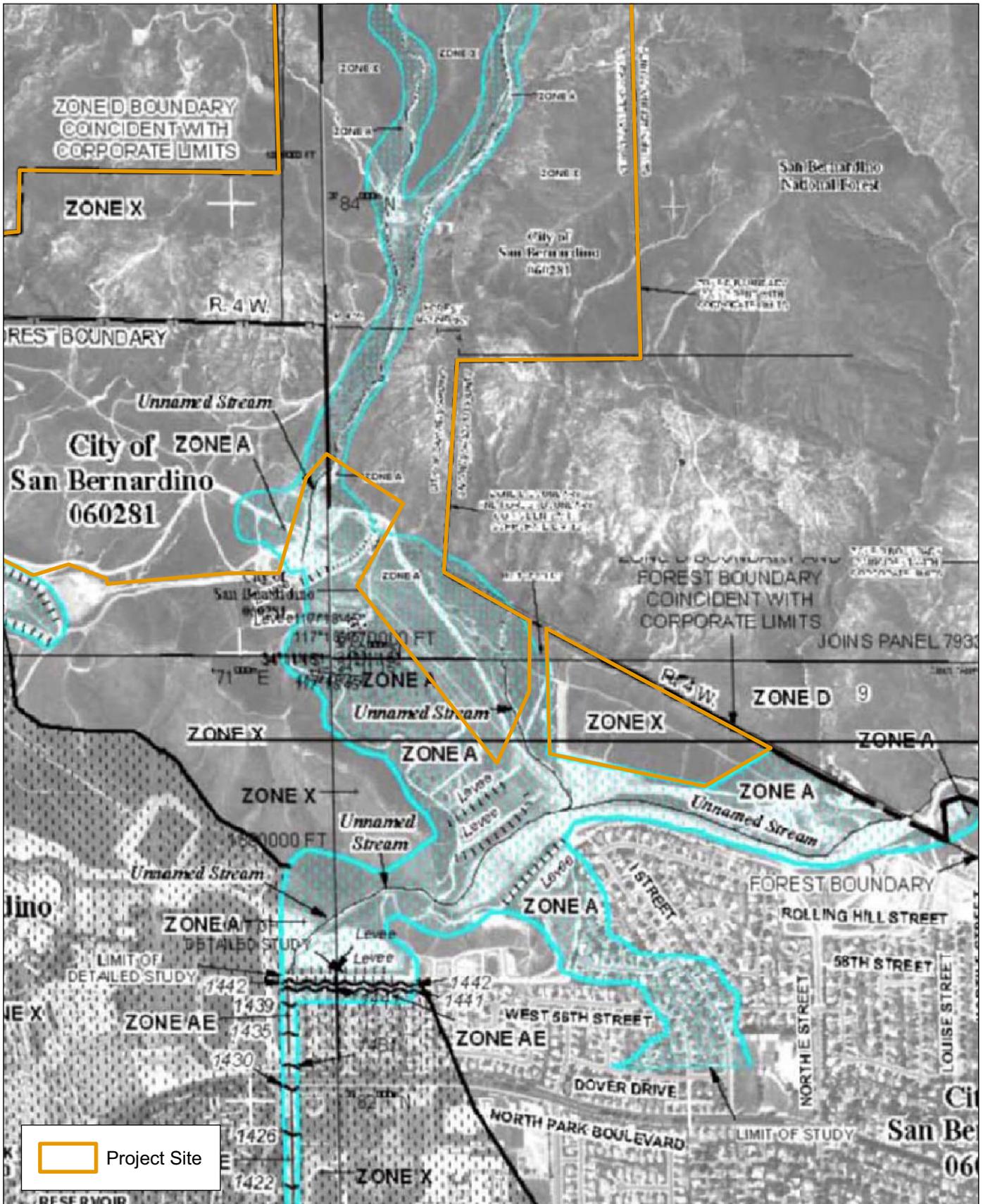
Potentially significant impact.

Mitigation Measures

MM HYD-5 Prior to approval of any final maps, the developer shall submit drainage plans to the City Public Works Department for review and approval. The City shall review and approve all storm drain improvement plans prior to issuance of any encroachment or building permits that involve flood control facilities.

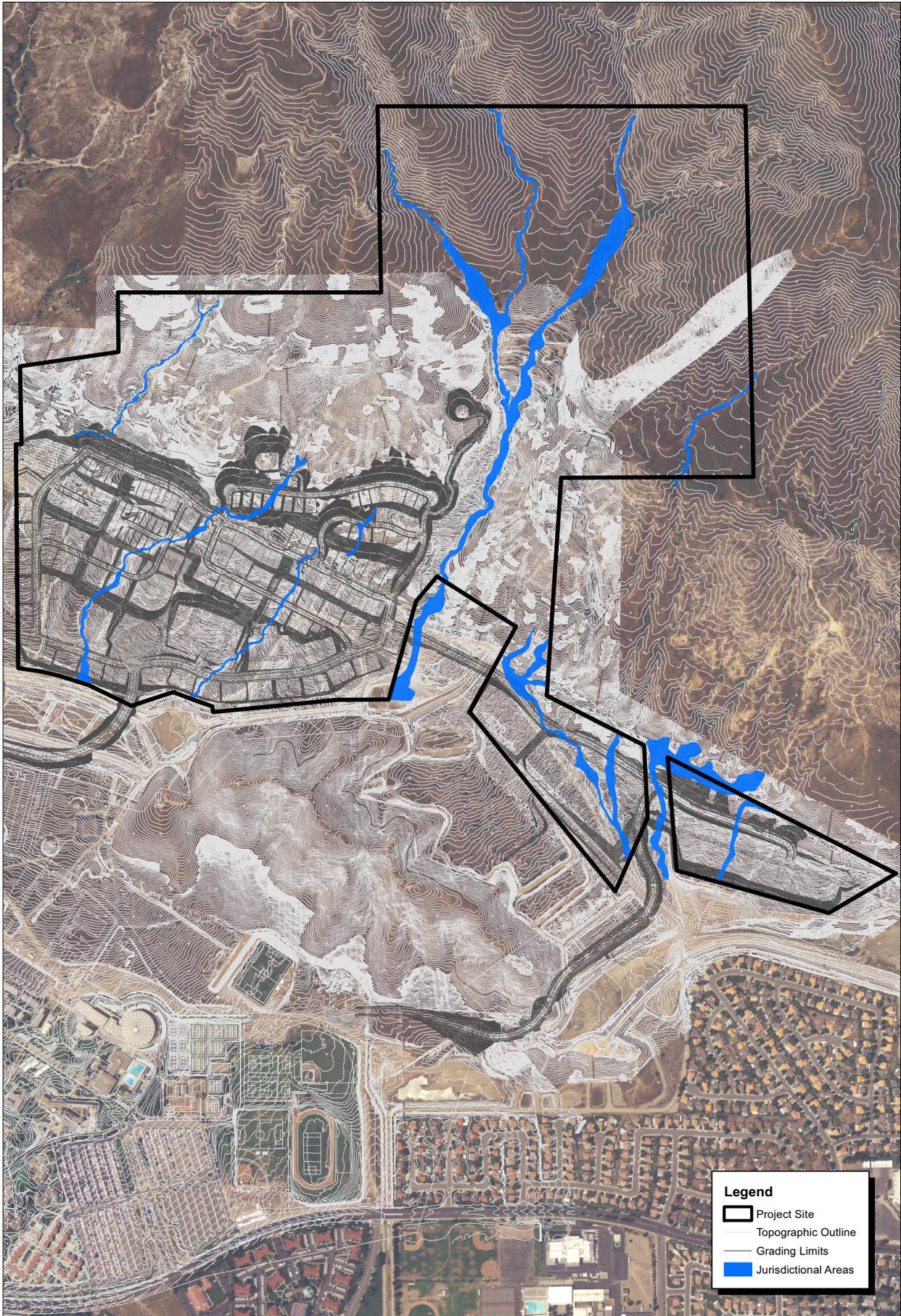
Level of Significance After Mitigation

Less than significant impact.



Source: FEMA.gov.





Source: National Agriculture Imagery Program for San Bernardino County (2005) & PBS&J.



Michael Brandman Associates

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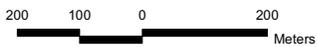


Exhibit 4.7-2 Onsite Drainages

UNIVERSITY HILLS SPECIFIC PLAN EIR

