4.8 HYDROLOGY AND WATER QUALITY

4.8.1 INTRODUCTION

This section describes existing hydrologic conditions at the project site and in its vicinity, and analyzes the potential for the proposed Davidon (28-lot) Residential Project component and the Putnam Park Extension Project component (Scott Ranch project or "proposed project") to affect water quality, groundwater recharge, site drainage, and flooding. It also presents potential impacts related to hydrology and water quality from the construction and operation of the Helen Putnam Regional Park Trail (regional park trail), which is considered a related project because it would provide a connection from proposed trails in the Putnam Park Extension Project component to existing trails in Helen Putnam Regional Park. (see **Section 4.8.4.4** below).

This analysis is based on the previous EIR prepared for a previous larger version of the project on the project site; the proposed revised drainage plan; as well as an analysis of the project's consistency with the current NPDES General Permit (see **Appendix 4.8**).

4.8.2 ENVIRONMENTAL SETTING

4.8.2.1 Regional Hydrology

The project site is situated within the Kelly Creek watershed, which is a tributary of Thompson Creek that ultimately drains into the lower Petaluma River. The Petaluma River begins in headwater streams on the slopes of Sonoma Mountain and flows in a southeasterly direction to San Pablo Bay. Upstream of San Antonio Creek at the Marin/Sonoma County line, the Petaluma River valley covers an area of approximately 87 square miles, with a maximum width of just under 11 miles between Sonoma Mountain and Laguna Lake. Thompson Creek intersects the Petaluma River about 1.5 miles upstream of the beginning of the broad marshlands that parallel the river between Highway 101 and the bay. As a result, most of the developed areas in downtown Petaluma subject to occasional river flooding by the Petaluma River are located upstream of the point at which Thompson Creek, including runoff from the project site, enters the river system.

Average annual rainfall in the project vicinity is just under 25 inches. Nearly 95 percent of this precipitation falls during the winter rainy season, October through April, with the heaviest rainfall typically occurring in December, January, and February. During a 30-minute duration, 10-year recurrence interval storm, peak rainfall intensity is approximately 1.0 inch per hour and increases to 1.31 inches per hour during a 30-minute, 100-year storm. Air temperatures range from below freezing in winter to above 100 degrees Fahrenheit in summer.

4.8.2.2 Project Site Hydrology

The project site is located near the upstream end of the Kelly Creek valley that begins in the low hills to the south and west of downtown Petaluma. Project site elevations range from about 100 feet above mean sea level (amsl) in the eastern portion of the project site to 380 feet amsl near the southwestern corner of the project site. The Kelly Creek watershed is bounded to the west by slopes of Helen Putnam Regional Park and drains the natural ravine that bisects the project site from west to east. On the south side of the stream, the rolling ground rises up toward the crest of a small hill located just beyond the southwest corner of the project site. Slopes range between 20 and 25 percent through most of this area, except where they flatten to between five and 15 percent on a bench adjacent to the 8 to 10-foot deep incised stream channel. Upstream of the D Street culvert, the Kelly Creek watershed contains nearly 360 acres, and includes the entire project site, except for 4 acres in the northwest corner, as described below.

Most of the project site is currently covered by steeply sloping grasslands, with scattered tree cover, and has been used primarily for cattle grazing. Other than cattle waste and minor erosion caused by cattle tracks, and a segment of Windsor Drive that cuts across the northern part of the project site, there do not appear to be any significant sources of on-site surface water pollution. The few contaminants that do not seep into the surrounding hillsides or into the bed of Kelly Creek are carried downstream to the Petaluma River and eventually to San Pablo Bay.

A major unnamed tributary to Kelly Creek (termed "D Street tributary" in this RDEIR) runs from south to north along the east side of the project site, approximately 200 feet west of D Street. Slopes on the west side of the tributary are the steepest on the project site, approaching 40 percent, while on the east side, adjacent to D Street, they are as low as 3 percent. The tributary channel intersects Kelly Creek approximately 150 feet upstream of an existing 90-inch x 90-inch culvert that carries Kelly Creek to the east side of D Street.

A stock pond has been constructed on the property, in a natural drainage ravine in the middle of the southerly hillside, perched about 40 feet above the Kelly Creek streambed and 350 feet north of the southerly property line. Overflow from this stock pond has been diverted out of its ravine and now meanders across the hill to an adjacent draw, where it has combined with natural seepage to create a narrow, winding wetland approximately 600 feet in length.

On the north side of Kelly Creek, the topography is largely defined by a ridge line that descends from Helen Putnam Regional Park through the Victoria Subdivision, cuts across the northwest corner of the project site, then roughly parallels the site's northerly boundary and D Street until gradually blending into the surrounding terrain above Sunnyslope Avenue. Ground on the project side of this ridge slopes south and

east toward Kelly Creek. Slopes are similar to those found on the south side of Kelly Creek, except the relatively flat stream-side bench is much smaller, limited to a small area adjacent to D Street.

The only portion of the project site that does not drain naturally and directly to the upper Kelly Creek watershed is an area located on the north side of the ridge, covering about 4.25 acres in the northwestern corner of the project site. This area drains north, away from Kelly Creek, into the Victoria storm drain system (which flows through a series of storm drains, ultimately emptying into Kelly Creek near Sunnyslope Avenue).

4.8.2.3 Downstream Hydrology

Downstream of the D Street culvert, Kelly Creek flows northward to Pinnacle Drive, continues north along the frontage of Pinnacle Heights, then bends northeast away from D Street through several rural residential properties before reaching Sunnyslope Avenue near the intersection with Sunnyslope Road. In the stretch of Kelly Creek between D Street and Sunnyslope Road, as well as in the section below Sunnyslope Avenue, the stream channel runs through private properties, whose owners are responsible for channel maintenance as required to convey upstream runoff and protect their adjacent lands. In this same stretch there are two existing privately owned culverts of Kelly Creek, nearby 20 and 120 Sunnyslope Road, that have limited capacities. At the intersection of Sunnyslope Avenue and Sunnyslope Road, the stream passes through a diversion structure that routes moderate to high flows into a 5-foot diameter bypass culvert ("Kelly Creek bypass") that runs east on Sunnyslope Avenue and then north on G Street. Low flows enter a 6-foot diameter culvert under Sunnyslope Avenue that discharges into the open channel continuation of lower Kelly Creek, which follows roughly in its historic alignment along rear lot lines between D Street and F Street. At Eighth Street, the Kelly Creek open channel enters a 5-foot culvert that takes it over to G Street, then north on G Street to Seventh Street, where it re-joins the Kelly Creek bypass and discharges into an underground piped section of Thompson Creek.

Calculations prepared by the Sonoma County Water Agency (SCWA, 2003) indicate that the peak, 10-year flow at the upstream end of the lower Kelly Creek channel (at Sunnyslope Avenue) is 85 cubic feet per second (cfs), and it increases to 115 cfs by the time it reaches Thompson Creek at G Street. The peak 10-year flow in the Kelly Creek bypass, by contrast, is 190 cfs throughout its entire length. Peak 25-year flows in the Thompson Creek main channel and in the Thompson Creek bypass, at Sunnyslope Road, are 151 cfs and 330 cfs, respectively. There is no calculated increase in flow along the length of the Thompson Creek bypass, but the peak open channel Thompson Creek flow increases to 200 cfs by the time the creek reaches G Street. Added together, these combined bypass culvert and open channel flows result in a peak 25-year flow at the confluence of Kelly and Thompson Creeks (at the G Street arch culvert) of 837 cfs, which increases to 886 cfs by the time it reaches the Petaluma River outfall.

The Water Agency did not identify a need for improvements within the Thompson/Kelly Creek stream system (other than improved storm water collection facilities on some local streets), so it is assumed the existing main line and diversion culverts were found to have sufficient capacity to accommodate runoff from the Agency's 25-year design storm. In addition, in 2006 the City's storm drain model determined that the bypass culverts "… provide the necessary capacity to prevent flooding" during a 100-year storm. However, some of the privately owned culverts that carry Kelly Creek underneath driveways between D Street and Sunnyslope Avenue may be undersized and not have the capacity to accommodate the 10-year storm without overtopping. It is also noted that the Kelly Creek and Thompson Creek bypass culverts were designed to limit downstream flows to levels that do not exceed the capacity of each stream's section of bypassed channel. As a result, during periods of very high runoff, excess flows that the bypass culverts cannot accommodate must eventually end up back in these channels, since they provide a natural drainage outlet within the local topography. The City included improvements to the Kelly Creek storm drain system near Sunnyslope Avenue as one of several potential storm drain projects within the Floodplain Management Plan (City of Petaluma, 2015), but these improvements was listed as unfunded at that time. Implementation of the proposed project would not adversary contribute to or exacerbate these existing conditions.

4.8.2.4 Project Site Soils and Groundwater

The approximately 58-acre project site is currently undeveloped, except for a roadway (a 1,500-foot portion of Windsor Drive), a barn complex (consisting of three barns and an old dairy equipment cleaning shed), an unoccupied mobile home, and the remnants of a collapsed farm house that had been destroyed by fire. Clay-rich soils cover the flatter parts of the project site, mainly on either side of Kelly Creek, as a result of the deposit of alluvium along the Kelly Creek floodplain and colluvium at the toe of the surrounding slopes. On the steeper slopes around the site perimeter, a much thinner layer of soil (generally no more than one to two feet thick) mantles the property's sandstone and shale bedrock formations. The hillside soils and valley bottom soils are derived from the same underlying bedrock, so they exhibit roughly similar characteristics that include relatively low permeability, slow runoff potential, and a slight to moderate erosion hazard.

The clay soils limit infiltration on most of the project site, so it is likely that most infiltration occurs where the Kelly Creek and D Street tributary stream beds have down cut through the alluvial soils to the underlying fractured bedrock. The project site is not located within an area of either confirmed or potential regional groundwater recharge, as shown on the City's map of Groundwater Resources (West Yost, 2004). As a result, the project site is expected to make a minimal contribution to the recharge of the broader area's groundwater reserves.

4.8.2.5 Water Quality

The receiving water for runoff from the project site is Kelly Creek, and ultimately the Petaluma River. Three sediment-sensitive beneficial uses have been identified in the Petaluma River (cold freshwater habitat, fish migration, and fish spawning), and the river is included on the SWRCB's most recent (2016) published 303(d) list of water bodies with impaired water quality, indicating it does not meet Basin Plan limits for specific pathogens, nutrients, pesticides (diazinon), nickel, sediment, and trash (California Water Boards, 2019).

4.8.3 REGULATORY CONSIDERATIONS

This section describes the federal, state, and local regulatory context to be considered for the proposed project, and addresses hydrology and water quality concerns, including development strategies, stormwater pollution prevention plans, and stormwater management practices.

4.8.3.1 Federal and State Regulations

Section 402 of the Clean Water Act- National Pollutant Discharge Elimination System

The Clean Water Act (CWA) authorizes the U.S. Environmental Protection Agency to regulate water quality in California by controlling the discharge of pollutants to water bodies from point and non-point sources through the National Pollution Discharge Elimination System (NPDES).

NPDES Regulations for Municipalities

In Petaluma and the San Francisco Bay Area, NPDES permits are administered by the San Francisco Bay Regional Water Quality Control Board (RWQCB), a division of the State Water Resources Control Board (SWRCB). Phase I of the NPDES program covered discharges from industrial sites, construction sites larger than five acres, and municipal separate storm sewer systems (MS4s) serving populations of more than 100,000 people. The Phase II expansion of the MS4 program in 1999 expanded its coverage to include "Small" MS4s that serve:

- Urbanized areas as defined by the U.S. Census;
- Areas of high growth or high growth potential;
- Areas that discharge to sensitive water bodies or another regulated MS4; and,
- Areas that make a significant contribution to pollution of waters of the U.S.

Because Petaluma is a designated urbanized area (but serving less than 100,000 people), its storm water discharges are permitted under the NPDES requirements for Small MS4s. The SWRCB has established a general permit process that allows the RWQCB to more efficiently regulate storm water discharges from Small MS4s. The current general permit is the SWRCB-adopted *General Permit for the Discharge of Storm Water from Small MS4s* (Water Quality Order No. 2013-0001-DWQ, NPDES General Permit No. CAS000004) and all eligible MS4s are required to comply with its provisions, which include construction- and post-construction-phase stormwater runoff controls and water quality best management practices (BMPs) for new development.

According to the Storm Water Phase II Rule, small MS4 owners/operators must reduce pollutants in storm water to the maximum extent practicable (MEP) to protect water quality. The regulations specify that compliance with the MEP requirement can be attained by developing a storm water management plan that addresses the six minimum control measures described in the storm water regulations.

The NPDES general permit include post-construction provisions to prevent non-storm water discharges, minimize the discharge of pollutants in storm water runoff, and prevent a development-caused worsening of stream channel erosion and sediment deposition resulting from hydromodification of a watershed. In order to minimize pollutant discharges, projects must provide the capacity to either infiltrate or evaporate all runoff generated by the 85th percentile storm event,[1] typically through the application of low impact development (LID) design principles that seek to minimize the amount of land covered by impervious surfaces and maximize opportunities for infiltration. Treatment measures must be provided for runoff that cannot be diverted from the site's storm water discharges in this way, using specified Best Management Practices (BMPs) that are able to remove or otherwise neutralize identified pollutants. High flow rates that cannot be sufficiently reduced by site design strategies must be controlled through the provision of detention storage or through stabilization of downstream conveyances that would be adversely affected. Because treatment and detention facilities will require maintenance for the life of a development project, developers must also establish a dedicated funding responsibility for either the future owners of the land or a designated public entity. In its role as an MS4 operator and permit holder, the City of Petaluma is required to enforce these site design and water quality protection measures for all new and redevelopment projects within its jurisdiction. To ensure and enforce that BMPs are properly installed, operated, and maintained, the City of Petaluma adopted a Stormwater Management or Treatment Facilities Operation and Maintenance Agreement. This Agreement between the City of Petaluma and property owner assigns

1 The 85th percentile storm represents a specific intensity for which all storms of lesser or equal intensity generate 85 percent of the total annual rainfall, while more intense storms only generate 15 percent of the total. Consequently, treatment facilities designed to accommodate runoff from the 85th percentile storm have sufficient capacity to treat 85 percent of total annual runoff.

property owner responsibility to maintain BMPs for the life of the project and gives the City permission to inspect the BMPs whenever necessary to ensure stormwater compliance.

Construction Sites

The SWRCB administers the NPDES *General Permit for Discharges of Stormwater Runoff Associated with Construction Activity* (General Construction Permit). In order to cover a construction project disturbing 1 acre or more of land under the General Construction Permit, a project must submit a Notice of Intent to the State Board prior to the beginning of construction. Effective July 1, 2010, all dischargers are required to obtain coverage under the Construction General Permit Order 2009-0009-DWQ adopted on September 2, 2009, as amended by 2010-0014-DWQ and 2012-006-DWQ. The General Construction Permit requires that projects develop and implement a Stormwater Pollution Prevention Plan (SWPPP), identifying potential sources of pollution and specifying runoff controls during construction for the purpose of minimizing the discharge of pollutants in stormwater from the construction area. The SWPPP should contain a site map which shows the construction site perimeter, existing and proposed buildings, lots, roadways, storm water collection and discharge points, general topography both before and after construction, and drainage patterns across the project. The SWPPP must list BMPs the discharger will use to protect storm water runoff and the placement of those BMPs. Additionally, the SWPPP must contain a visual monitoring program; a chemical monitoring program for "non-visible" pollutants to be implemented if there is a failure of BMPs; and a sediment monitoring plan if the site discharges directly to a water body listed on the 303(d) list for sediment.

The permit also includes post-construction standards with the requirement for all construction sites to match pre-project hydrology to ensure that the physical and biological integrity of aquatic ecosystems is maintained. This “runoff reduction” approach is analogous in principle to LID and will serve to protect related watersheds and water bodies from both hydrologic-based and pollution impacts associated with the post-construction landscape.

Section 401 of the Clean Water Act

Under the Clean Water Act (CWA), the U.S. Army Corps of Engineers (Corps) administers permitting programs that authorize impacts to "waters of the United States" including "wetlands" and "other waters." Such impacts may not be permitted until the SWRCB, acting through its regional boards, certifies that the activities covered by the permit will not violate water quality standards. Certification must be consistent with the requirements of the federal CWA, CEQA and CESA, and with the SWRCB's mandate to protect beneficial uses of waters of the state.

The San Francisco Bay RWQCB has adopted the Corps' policy that there shall be "no net loss" of wetlands. Thus, prior to waiving or certifying water quality, the RWQCB will impose requirements on a proposed project to ensure there are no impacts on existing wetlands, or, if such impacts are unavoidable, that they are fully mitigated.

California Porter-Cologne Act

The Porter-Cologne Act requires "any person discharging waste, or proposing to discharge waste, within any region that could affect the waters of the State (any surface water or groundwater, including saline waters) to file a report of discharge" with the local RWQCB by submitting an application for waste discharge. The RWQCB determines if a project should be regulated pursuant to this act based on the likelihood that it would pose any "threat" to water quality. The San Francisco Bay RWQCB considers the placement of clean fill in waters of the State to constitute "pollution," because it can potentially alter existing water quality, which may adversely affect its beneficial uses.

California Fish and Game Code

Existing stream channels in California are protected under sections 1600-1603 of the State Fish and Game Code. These regulations specify that it is a landowner's responsibility to obtain a state permit before undertaking any modifications within an existing stream channel up to the top of bank. Stream channels are defined by the California Department of Fish and Wildlife (CDFW) as exhibiting evidence of scour, having a definable bank, or having or being capable of supporting riparian vegetation. This definition would apply to Kelly Creek and the D Street tributary (Please refer to **Section 4.4, Biological Resources**, of this RDEIR for additional discussion of the project site's existing biological resources and for a description of associated project impacts and mitigation requirements).

4.8.3.2 Local Regulations

Sonoma County Water Agency

The Sonoma County Water Agency (Sonoma Water, formerly SCWA) developed criteria to guide the design and construction of storm drain systems within Sonoma County. These guidelines, called the 'Sonoma County Water Agency Flood Control Design Criteria' (FCDC) were first developed and used throughout the County in 1966, and were last revised in 1983. In August 2019, Sonoma Water released a draft 'Flood Management Design Manual' intended to update and replace the FCDC (Sonoma Water, 2019). As of the preparation of this EIR, the Design Manual was still in draft form, but a final version is expected to be released in the spring of 2020.

City of Petaluma Storm Water Program

As noted above, the operators of municipal storm sewer systems are regulated under the CWA, which requires them to comply with the permitting provisions of the NPDES. To meet this requirement, in November of 2003 the City of Petaluma adopted a Small MS4 NPDES Storm Water Management Plan (Winzler and Kelly, 2003), which describes, among other things, the City's measurable water quality goals, a timetable for achieving these goals in compliance with NPDES regulations, and recommended BMPs for the protection of surface water quality during construction and throughout the life of public and private development projects. The City's Storm Water Program is responsible for implementation of this plan, which, during the initial permit term, has focused on identifying the BMPs that can most effectively reduce the concentrations of pathogens, nutrients, pesticides, and sediment in the City's storm water. In addition, the Storm Water Program reviews all SWPPPs prepared for private development projects in the City to ensure they conform to the City's SWMP. The City's SWMP has not yet been updated to include new provisions within the latest NPDES permit, especially related to hydromodification and emphasis on low impact development (LID) (see **Appendix 4.8** for the project's compliance with LID and stormwater management requirements). However, the Bay Area Stormwater Management Agencies Association (BASMAA, 2019) recently released a guidance document for compliance with the Phase II NPDES permit in Marin, Napa, Solano, and Sonoma Counties. The guidance document outlines the process for implementing appropriate LID and other controls for reducing potential impacts to stormwater quality and hydromodification and provides specific design considerations and parameters for stormwater BMPs for new and re-development projects.

City of Petaluma Floodway and Floodplain Districts Ordinance

Chapter 6 of the City's Implementing Zoning Ordinance is the City's Floodway and Floodplain Districts Ordinance, which establishes restrictions on the use of properties or portions of properties that are situated within the City of Petaluma and within the Petaluma River Basin Floodplain and Floodway areas, as defined in the ordinance.

City of Petaluma General Plan

The City of Petaluma *2025 General Plan* policies related to hydrology and water quality that are applicable to the proposed project are summarized below. The revised Project application also includes revisions to one General Plan policy that is specific to the project site. For a detailed discussion of requested policy changes and project consistency with applicable hydrology and water quality and land use policies for the *2025 General Plan*, please refer to **Section 4.9, Land Use and Planning**, of this RDEIR.

Community Design, Character, and Green Building

Policy 2-P-68: Preserve the uniqueness of the property at the intersection of D Street and Windsor Drive (Scott Ranch) through incorporation of the following criteria in the future development process:

- Maintain a minimum of a 100′ setback along Kelly Creek and its tributaries.[2]

Biology and Natural Resources

Policy 4-P-1: Protect and enhance the Petaluma River and its tributaries through a comprehensive river management strategy of the following programs:

C. Require design review to address the relationship and stewardship of that project to the river or creek for any development on sites with frontage along the river and creeks.

D. Create setbacks for all tributaries to the Petaluma River extending a minimum of 50 feet outward from the top of each bank, with extended buffers where significant habitat areas, vernal pools, or wetlands exist. Development shall not occur within this setback, except as part of greenway enhancement (for example, trails and bikeways). Where there is degradation within the zone, restoration of the natural creek channels and riparian vegetation is mandatory at time of adjacent development.

E. Facilitate compliance with Phase II standards of the National Pollutant Discharge Elimination System (NPDES) to improve the water quality and aesthetics of the river and creeks.

G. Expand the planting and retention of trees along the upper banks of the river and creeks to reduce ambient water temperature and shade out invasive, non-native species.

I. Develop a consistent design for site furniture, a wayfinding system, and educational signage in the PRC and along the creeks and tributaries leading to it to heighten the recognition and value of the river and its ecosystem.

J. Utilize the Parks and Recreation, Water Resources & Conservation, Public Works departments, property owners (e.g. Landscape Assessment Districts) and/or other appropriate public agencies (e.g. Sonoma County Water Agency) to manage the long

2 See proposed revisions to this policy in **Section 3.0, Project Description**.

term operations, maintenance responsibilities, and stormwater capacity associated with the river and tributary greenways.

K. Prohibit placement of impervious surfaces in the Floodway (i.e. Parking lots, roadways, etc.) with the exception of pathways and emergency access improvements.

L. Continue to implement, where appropriate, flood terrace improvements to reduce localized flooding in concert with habitat enhancement projects.

Water Resources

Policy 8-P-19: Ensure adequate water supply during emergency situations by developing potential groundwater resources and aquifer storage capacity, combined with management of surface water, to meet overall emergency water supply objectives. The City's groundwater resources shall be preserved to meet emergency needs and to offset peak demands.

B. Work cooperatively with the County of Sonoma to protect and preserve Petaluma groundwater resources, including the preservation and enhancement of significant recharge areas within the watershed.

D. Preserve oak woodlands, upland native grassland, and wetland areas identified as contributing to groundwater recharge; at a minimum for areas identified within the Groundwater Feasibility Study, Technical Memo 4, dated February 2004 (Technical Appendix Volume 4).

Policy 8-P-20: Manage groundwater as a valuable and limited shared resource by protecting potential groundwater recharge areas and stream sides from urban encroachment within the Petaluma watershed. (See, at a minimum, those areas defined as possible recharge areas set forth in Technical Appendix Volume 4, Groundwater Feasibility Study, 2004, or revisions thereto.)

A. Control construction of impervious surfaces in groundwater recharge areas. Potential recharge area protection measures at sites in groundwater recharge areas include, but are not limited to:

a. Restrict coverage by impervious materials;

b. Limit building or parking footprints;

c. Require construction of percolation ponds on site;

d. Require surface drainage swales.

Policy 8-P-35: C. Work with regulatory and advisory agencies to facilitate preservation and environmental enhancement of the natural corridor for species of importance and native to the area.

H. The City shall facilitate and advise property owners to ensure the maintenance of privately owned creeks and channels (e.g., Kelly Creek). Assistance may include facilitation of regulatory permitting and design standards.

Policy 8-P-36: Require development on sites greater than 1/4 acre in size to demonstrate no net increase in peak day stormwater runoff, to the extent deemed practical and feasible.

Policy 8-P-38: All development activities shall be constructed and maintained in accordance with Phase 2 National Pollutant Discharge Elimination System (NPDES) permit requirements.

A. The Water Resources and Conservation Department shall review, and have the authority to conditionally approve, all development permits to ensure compliance with NPDES Phase 2 requirements.

B. Maintain, update as needed, and implement the City's Storm Water Management Plan to retain a current storm water discharge permit with the California Regional Water Quality Control Board.

C. A funding mechanism, such as a storm water utility fee, shall be implemented by the City to ensure a dedicated source of funds is available for all surface water drainage system maintenance and improvement needs.

Policy 8-P-39: Consider, to the extent practicable, requiring sustainable site design practices as outlined in the 'Sustainable Site Planning' text box contained herein:

- Reduce imperviousness by limiting building footprint and using permeable paving or landscaping to break up expanses of impervious surfaces.
- Cluster development on sites to minimize disturbance.
- Use canopy trees to absorb rainwater and slow water flow.

- Direct runoff into or across vegetated areas to help filter runoff and encourage groundwater recharge.
- Preserve, or design into the infrastructure, naturally vegetated areas that are in close proximity to parking areas, buildings, and other impervious expanses in order to slow runoff, filter out pollutants, and facilitate infiltration.
- Reduce street widths for internal circulation.
- Remove curbs and gutters from streets, parking areas, and parking islands, where appropriate, to allow storm water sheet flow into vegetated areas.
- Use devices such as bioretention cells, vegetated swales, infiltration trenches, and dry wells to increase storage volume and facilitate infiltration.
- Grade to encourage sheet flow and lengthen flow paths to increase the runoff travel time in order to reduce the peak flow rate.
- Disconnect impervious areas from the storm drain network and maintain natural drainage divides to keep flow paths dispersed.
- Disconnect roof downspouts and direct storm water into vegetated areas or into water collection devices.
- Install cisterns or sub-surface retention facilities to capture rainwater for use in irrigation and non-potable uses.
- Install "eco-roofs" (vegetated or garden roofs).
- Use native plants (or adaptable species) to establish an adaptable and low maintenance landscape that requires less irrigation and are appropriate for the climatic conditions.
- Use naturally occurring bio-chemical processes in plants located in tree box filters, swales, and planter boxes.
- Divert water away and disconnect from the storm drain using correctional drainage techniques.

4.8.4 IMPACTS AND MITIGATION MEASURES

4.8.4.1 Significance Criteria

In accordance with Appendix G of the *2019 California Environmental Quality Act (CEQA) Guidelines*, the impact of the proposed project on hydrology and water quality would be considered significant if it would:

- violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality;
- substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the proposed project may impede sustainable groundwater management of the basin;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or through addition of impervious surfaces, in a manner that would:
  - result in substantial erosion or siltation on-site or off-site,
  - substantially increase the rate or amount of runoff in a manner which would result in flooding on or offsite,
  - create or contribute runoff water which would exceed the capacity of existing planned stormwater drainage systems or provide substantial additional sources of polluted runoff, or
  - impede or redirect flood flows;
- risk release of pollutants in flood hazard, tsunami, or seiches zones due to project inundation;
- conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan.

4.8.4.2 Methodology

This section analyzes the potential hydrologic and water quality impacts associated with the proposed project, based on the project description (**Section 3.0**) and preliminary storm drainage studies (BKF Engineers 2018). Impacts are also analyzed within the context of local, state, and federal regulations.

4.8.4.3 Project Impacts and Mitigation Measures

Impact HYD-1: **The proposed project would result in the discharge of stormwater that could violate water quality standards, degrade surface or groundwater quality, and cause hydromodification. (*Potentially Significant; Less than Significant with Mitigation*)**

Stormwater contaminants from the site may be present in the runoff that is discharged from both the construction and post-construction phases of the proposed project. The potential for site runoff to affect surface or groundwater quality is evaluated below.

Surface water quality

Construction Phase

Clearing, grading, and other construction activities would increase the potential for on-site erosion, potentially leading to increased turbidity and sedimentation in Kelly Creek on the project site and in downstream reaches (including the Petaluma River). Sedimentation may degrade in-stream habitat and reduce flow capacity at downstream culverts and open channels, potentially inducing or exacerbating flooding. Other pollutants that might impact surface water quality during project construction include petroleum products (gasoline, diesel, kerosene, oil and grease), hydrocarbons from asphalt paving, paints, solvents, and litter.

Because the project would disturb more than one acre of land, the Applicants are required to prepare a SWPPP, per NPDES general construction permit requirements through the SWRCB. The SWPPP would address potential erosion and sedimentation issues through a project-specific erosion control plan, as well as other BMPs to reduce the potential for spills and other contamination from on-site construction activities. Appropriate measures for control of sediment and other pollutants from construction sites are included in the "*Construction Handbook of Best Management Practices*" (CASQA 2015). The project SWPPP is likely to include, but is not limited to, the following BMPs that address construction water-quality impacts:

- If the entire site is not graded in a single operation, leave existing vegetated areas undisturbed until construction of improvements on each portion of the development site is ready to begin;
- Immediately re-vegetate or otherwise protect all disturbed areas from both wind and water erosion upon completion of grading;
- Collect storm water runoff into stable drainage channels and/or small drainage basins to prevent the buildup of large, potentially erosive storm water flows;
- Direct runoff away from all areas disturbed by construction;
- Use sediment ponds or siltation basins to trap eroded soils before runoff is discharged into on-site or off-site drainage culverts and channels;

- Install straw rolls, hay bales or other approved materials below all disturbed areas adjacent to Kelly Creek to prevent eroded soils from entering the stream channel. Maintain these facilities until all disturbed upslope areas are fully stabilized, in the opinion of the City Engineer;

- To the extent possible, schedule major site development work involving excavation and earthmoving for construction during the dry season;

- Develop and implement a program for the handling, storage, use, and disposal of fuels and hazardous materials. The program shall also include a contingency plan covering accidental hazardous material spills;

- Avoid cleaning, fueling, or maintaining vehicles on-site, except in an area designated to contain and treat runoff; and

- After construction is completed, inspect all drainage facilities immediately downstream of the grading site for accumulated sediment, and clear these facilities of debris and sediment as necessary.

Proper implementation of the project-specific SWPPP would reduce the potential construction-related surface-water quality impacts to a less-than-significant level. However, because a project-specific SWPPP has not been prepared at this time, the potential remains for project construction runoff to adversely affect surface-water quality and the impact is considered potentially significant.

In addition, construction of the edges of fill pads for housing, barn restoration, the multi-use loop trail, as well as stormwater conveyance, treatment, and detention facilities, may occur in locations adjacent to Kelly Creek or other buffer areas near sensitive wetlands or habitat. These areas are likely to be more sensitive to construction activities, and special consideration would be needed to limit impacts to these water bodies.

Mitigation Measure HYD-1a is set forth below to guide the SWPPP development process and ensure that surface-water quality impacts during construction are minimized, and **Mitigation Measure HYD-1b** is set forth to minimize impacts to sensitive wetland and riparian areas. Implementation of Mitigation Measures **HYD-1a** and **HYD-1b** would reduce project impact during construction on surface water quality and sensitive wetland and riparian areas to a less-than-significant level.

Operational Phase

The proposed project would increase the amount of impervious surfaces within the sub-watershed, including new roadways, driveways, parking areas, sidewalks, and rooftops. Roads, driveways, and parking areas are prone to contributing oil, grease, metal brake dust, tire wear and trash to stormwater runoff. While roof runoff does not typically contribute stormwater contaminants at levels as high as from

parking areas, driveways and access roads, there is still some contribution from airborne deposition of particulate matter. In addition, the driveways, roads, and associated stormwater drainage system provide an efficient conveyance system for other potential contaminants, including fertilizers and pesticides, to the receiving stream. Untreated, the above contaminant sources are likely to adversely impact surface water quality in Kelly Creek and downstream water bodies.

As with other projects within the City, the proposed project would be required to comply with the *NPDES General Permit for the Discharge of Storm Water from Small MS4s* (SWRCB 2013), which prescribes methods for residential developments to control and treat stormwater runoff. The Small MS4 General Permit requires project proponents to incorporate site design measures, source controls, stormwater treatment measures, and/or other LID measures to reduce stormwater runoff and limit the transport of pollutants to receiving waters. The Small MS4 General Permit also requires implementation of source control measures for specific pollution-generating activities such as accidental spills or leaks, landscape/outdoor pesticide use, and for pools, ponds, or other water features.

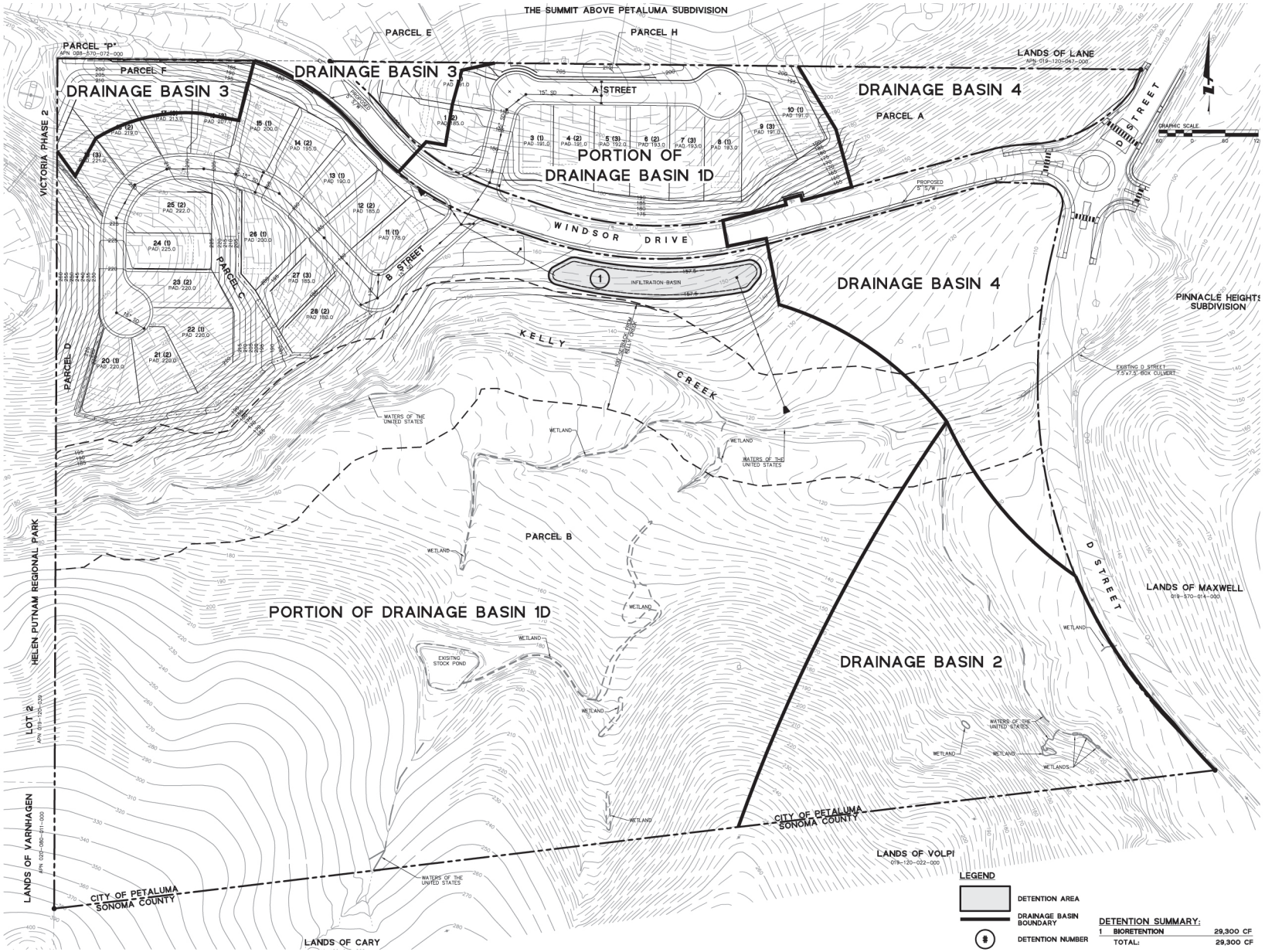
To comply with the requirements of the Small MS4 General Permit, the proposed project includes a site drainage plan, presented in **Figure 4.8-1, Proposed Drainage Improvements**. The plan proposes two separate detention/bio-infiltration facilities to collect runoff from impervious surfaces and provide water quality treatment functions per NPDES requirements. The primary bioretention facility would be located south of Windsor Drive and would treat stormwater runoff from the new roads, driveways and housing units and portions of Windsor Drive west of the facility location. This bioretention facility would also receive runoff from the small parking lot located south of Windsor Drive. A second detention/bio-infiltration facility would be located at the southwest corner of Windsor Drive and D Street and would provide treatment of runoff from the eastern portion of Windsor Drive[3] that is currently untreated. An additional stormwater treatment facility may also be required to treat runoff from the proposed main parking lot (south of Kelly Creek off D Street). If this parking lot is paved with impermeable pavement, a linear bio-swale or other bio-treatment facility would be installed along the edge of that parking lot to meet NPDES stormwater quality standards. The new sidewalks planned along D-Street and Windsor Drive would include either bio-swales, or drainage to a self-retaining area or another planned bioretention feature. The proposed project may implement other LID measures to further reduce stormwater quality impacts, such as disconnected roof downspouts to encourage on-site infiltration.

In addition, a minimum of a 100-foot residence and fence setback from the centerline of Kelly Creek would be maintained, and all residential development would be setback at least 50 feet from the top of the bank

3 The second basin is not shown on the project Utility Plan but is included on the Putnam Park Extension Project component Conceptual Plan.

of Kelly Creek. Also, the 27-space main parking lot off D Street would be set back 50 feet from the D Street tributary. These setbacks would provide additional protection against stormwater quality impacts to Kelly Creek.

Separate from the direct effects on water quality, increased runoff generated on the project site as a result of the increase in impervious surfaces would have the potential to result in 'hydromodification' in Kelly Creek and drainages downstream of the project site. Hydromodification is defined as the change in the natural hydrologic processes and runoff characteristics (i.e., interception, infiltration, overland flow, interflow, and groundwater flow) caused by urbanization or other land use changes that result in increased stream flows and changes in sediment transport, and thereby result in water quality impacts. The Small MS4 General Permit requires projects to control for hydromodification effects of impervious areas. To comply with this provision, the proposed project would be required to implement management measures such that post-project runoff does not exceed estimated pre-project flow rates for the 2-year, 24-hour storm. Preliminary storm drainage studies for the project assessed the 100- and 10-year events and concluded that discharge into Kelly Creek would be similar to predevelopment conditions with the installation of the proposed detention facility south of Windsor Drive (BKF Engineers 2018). To control runoff from a 2-year storm event, stormwater quality treatment measures (i.e., swales) would be required. However, project-specific stormwater treatment measures will be identified once final designs are completed. Therefore, in the absence of final design plans which is required to demonstrate that the post-project runoff does not exceed estimated pre-project flow rates for the 2-year, 24-hour storm, the proposed project has the potential to result in hydromodification in the receiving waters. This represents a potentially significant impact on surface water quality. **Mitigation Measure HYD-1c** is set forth to reduce the post-construction impact of the proposed project on surface water quality and potential hydromodification to a less than significant level. It requires the Applicants to submit to the City, for review and approval, a final set of stormwater management measures/controls that demonstrate compliance with the Small MS4 General Permit and compliance with the 2019 BASMAA guidance document (2019), which includes specific design criteria to meet treatment control requirements. Because the proposed development is a relatively low-density project and a significant proportion of open space would be preserved, fitting treatment features into the final design is not expected to be a constraint. It is important to note that the presence of low-infiltration soils at the project site may limit the potential to implement bioretention basins that infiltrate exclusively to native soil. Under these conditions, underdrains may be required to provide appropriate stormwater treatment.



SOURCE: BKF Engineering, 2019

FIGURE **4.8-1**

Proposed Drainage Improvements

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As described in **Section 3.5.2, Putnam Park Extension Project Component**, the proposed project would stabilize slopes on either of Kelly Creek with native woody plantings and native grasslands that would be protected and enhanced. If any soil disturbance impacts native grasslands, the affected park or pasture area would be seeded with native grassland species suited for the site.

The proposed project also includes a multi-use trail network of approximately one mile. This trail network would be surfaced with ADA-compliant material, such as park tread, asphalt, or decomposed granite. The project also includes two proposed trails that run north/south parallel to D Street. One proposed Class 1 trail that travels north along D Street would be surfaced with asphalt or other stabilized surfaces. The other proposed trail would travel north through the Putnam Park Extension Project component, along the west side of the main parking lot, through a proposed playground area, over a footbridge above Kelly Creek, and through the barn center. This trail would be surfaced with ADA-compliant material. Stormwater runoff from the trails could result in erosion and discharge of sediment into the creek. **Mitigation Measure HYD-1d** is proposed to address this potentially significant impact, which requires that trail paths be designed to drain runoff into pervious areas not susceptible to erosion. Implementation of Mitigation Measures **HYD-1c** and **HYD-1d** would reduce the proposed project's post-construction impact on surface water quality to a less-than-significant level.

In addition, the proposed project would include an improvement to an off-site sidewalk along the east side of D Street between Windsor Drive and Sunnyslope Avenue. The sidewalk improvement would replace the existing asphalt sidewalk with City standard concrete sidewalk for a distance of approximately 800 feet to connect with the existing sidewalk on D Street. This sidewalk is current paved and therefore, proposed improvements would not result erosion or discharge of sediments during operation.

Groundwater quality

As discussed above, in **Section 4.8.2.4, Project Site Soils and Groundwater**, the low-infiltration soils at the site provide limited opportunity for groundwater recharge, and the existing infiltration that does occur at the site does not contribute to an aquifer that is of regional significance. The stormwater treatment BMPs discussed above are intended to maximize infiltration, assuming infiltration rates are sufficient that depth to the seasonal groundwater peak elevation meets the performance/design standards of the BMPs. If not, underdrains may be required. Under either scenario, with implementation of the BMPs as outlined in **Mitigation Measure HYD-1c,** the proposed project would meet water quality treatment standards and the impact would be reduce to a less-than-significant level**.**

In addition, there are no known sources of potential groundwater contamination at the site that would be at risk of increased rate of mobilization through concentrated recharge of stormwater within the bio-

infiltration basins. As such, there is a less-than-significant impact to groundwater quality as a result of the proposed project.

Mitigation Measures:

HYD-1a Prior to issuance of grading permits for the proposed project, the City of Petaluma shall verify that the Applicants have prepared a SWPPP in accordance with the requirements of the statewide Construction General Permit. The SWPPP shall be designed to address the following objectives: (1) all pollutants and their sources, including sources of sediment associated with construction, construction site erosion, and all other activities associated with construction activity are controlled; (2) where not otherwise required to be under a Regional Water Quality Control Board permit, all non-stormwater discharges are identified and either eliminated, controlled, or treated; (3) site BMPs are effective and result in the reduction or elimination of pollutants in stormwater discharges and authorized non-stormwater discharges from construction activity; and (4) stabilization BMPs are installed to reduce or eliminate pollutants after construction is completed. The SWPPP shall be prepared by a qualified SWPPP developer. The SWPPP shall include the minimum BMPs required for the identified Risk Level. BMP implementation shall be consistent with the BMP requirements in the most recent version of the California Stormwater Quality Association Stormwater Best Management Handbook-Construction or the Caltrans Stormwater Quality Handbook Construction Site BMPs Manual.

HYD-1b In areas within 50 feet of sensitive habitat areas, construction activities should be planned to avoid, to the extent feasible, disturbance of riparian vegetation, including trees and their root systems. The SWPPP shall specifically address special considerations for controlling sediment and other pollutants within these areas, through additional erosion control measures (such as berms and temporary retention/settling basins that divert runoff away from the creek banks, limiting the use of heavy construction vehicles within the riparian zone, or conserving and replacing topsoil during grading near the riparian zone to speed up the re-establishment of stabilizing vegetation), to limit grading near riparian areas to occur only during the dry-season. Erosion control measures shall also include staged grading to reduce the area of exposed soil at any one period of time, and/or other measures specifically tailored to riparian and sensitive areas.

HYD-1c The project shall implement appropriate post-construction stormwater treatment measures to reduce water quality and hydromodification impacts to downstream reaches, as required by the current post construction controls requirements of the Small MS4

General Permit. Upon completion of the final project design, the Applicants shall provide documentation to the City of stormwater management measures that show compliance with the Small MS4 General Permit. The report shall delineate individual drainage management areas (DMAs) within the project site and provide analysis to show compliance with the volumetric or flow-based treatment criteria as described in the Small MS4 General Permit and outlined in the 2019 BASMAA (2019) guidance document. The report shall also include design calculations that show post-project runoff for the 2-year, 24-hour storm event does not exceed pre-project flow for each DMA, and that each DMA has appropriate stormwater quality treatment based on flow- or volumetric-based calculation, as outlined in the Small MS4 General Permit and in compliance with the 2019 BASMAA guidance document (2019). The final documentation shall be submitted to the City for approval before the beginning of grading.

HYD-1d The proposed multi-use trails shall be designed to direct stormwater runoff away from Kelly Creek and D-Street tributary and/or to vegetated pervious areas not susceptible to erosion. The path shall be designed to limit the amount of runoff concentrated from any one portion of the path in order to prevent gullying. In areas close to Kelly Creek or otherwise not suitable for distributed discharge of runoff, stormwater treatment measures such as swales shall be implemented to protect the creek.

Significance after Mitigation: Implementation of **Mitigation Measures HYD-1a** through **-1d** would reduce the impact to a less than significant level.

Impact HYD-2: The proposed project would not substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that it would impede sustainable groundwater management. (*Less than Significant*)

The proposed project would not pump groundwater at the project site to supply water to the residential sites. There are three inactive agricultural wells on the project site that may be improved and used to help establish plantings in the park area (during the first three to five years), and possibly provide a minimal amounts of water for irrigation of plantings around the playground, parking lots, and barn center.

The project would increase impervious surface area at the project site, which could reduce groundwater infiltration. As described above, the City of Petaluma maintains a groundwater supply system for standby or emergency situations and has General Plan provisions in place to preserve groundwater recharge areas to protect this supply. The project site, however, is not located within a significant groundwater recharge

area, nor does it directly overly a priority groundwater basin as defined by DWR.[4] DWR Bulletin 118-4 classified the project area as a "slow recharge area" due to low infiltration rate and relatively high slope (Figure 7 in CA DWR, 1982). The project site is comprised entirely of low-infiltration soils (hydrologic group C and D) due to high clay content. Much of the site (approximately 60 percent of the project area) has a land-surface slope of greater than 20 percent. Areas adjacent to the Kelly Creek corridor have lower slope (6-12 percent), but still low rates of infiltration, suggesting that recharge even in these areas is minor. West Yost Associates (2004) suggest that groundwater recharge within the tributary channels of the Petaluma River is a significant source of recharge to groundwater. Though Kelly Creek is not within the subwatershed identified as having the highest potential for stream recharge, the mechanism may still be valid.

As noted previously, the main parking lot and the residential buildings within the project site would be set back at least 100 feet from the centerline of Kelly Creek and 50 feet from the top of the bank of Kelly Creek and the D Street tributary. As a result, the creek corridor would remain largely unaffected by the proposed development, and thus any recharge that does occur within the stream channel itself would continue to occur similar to post-project conditions. In addition, runoff generated within the project site would continue to be discharged into Kelly Creek. Furthermore, approximately 75 percent of the 58.6-acre project site would remain undeveloped and would be preserved as open space without affecting existing infiltration. The proposed development at the project site is planned as low-density residential, with lot sizes between 0.23 and 0.83 acres. Stormwater treatment measures for impervious surfaces would be designed to maximize infiltration in order to reduce runoff (see discussion above under **Impact HYD-1**), and minimize potential impacts to groundwater recharge. Therefore, the proposed project would not substantially interfere with groundwater recharge or impede sustainable groundwater management, and the impact would be less than significant.

Mitigation Measures: No mitigation measures are required.

Impact HYD-3: **The proposed project would substantially alter the existing drainage pattern of the site or area in a manner that would result in substantial alteration of stream or river or through the addition of impervious surfaces in a manner that would result in erosion or siltation on- or off-site. (*Potentially Significant; Less than Significant with Mitigation*)**

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[4] Kelly Creek drains toward the Petaluma Valley, which is classified as "medium priority" for groundwater management, but the project itself does not overly the groundwater sub-basin.

Construction impacts associated with erosion or siltation both on and off-site are discussed in **Impact HYD-1**, above. Implementation of the project-specific SWPPP (as required by **Mitigation Measure HYD-1a**) would mitigate the impact related to erosion and siltation during project construction to a less-than-significant level.

With regard to runoff generated by the new impervious surfaces added by the project to the project site, as discussed in **Impact HYD-1,** compliance with the NPDES General Permit as required by **Mitigation Measure HYD-1c** would limit hydromodification effects that could induce in-stream erosion and cause siltation in downstream reaches. With mitigation, the impact would be less than significant.

Much of the project site is currently used for grazing cattle, which would continue on portions of the project site during the operation phase. No internal fencing is present at the site under existing conditions. As part of the Putnam Park Extension Project component, the existing stock pond and the areas of headcut/ephemeral drainages stabilization would be fenced from livestock (as described in **Section 3.0, Project Description**), reducing the potential for erosion in those areas. Additionally, as shown in **Figure 3.0-4**, the Putnam Park Extension Project component would exclude cattle from access to the D Street Tributary and all of Kelly Creek, with the exception of a single livestock corridor across Kelly Creek that would link the pasture areas in the south and northeast portions of the project site. This exclusion area would help with the establishment of additional riparian vegetation and reduce the potential for erosion in and adjacent to the creek channels relative to existing conditions.

The proposed project would construct up to three stormwater outfalls along Kelly Creek (with the third outfall along the D Street tributary in the case of an installation of a bio-treatment facility associated with the main parking lot, if paved). One of these outfalls would be located near the eastern boundary of the project site, at a location adjacent to relative channel stability provided by the D Street Culvert. The potential outfall of the stormwater swale to treat runoff from the main parking lot would drain to the D Street tributary. As discussed previously, Kelly Creek is incised through the project site, with evidence of existing bank instability in some locations. High flows from stormwater outfalls could cause or exacerbate erosion of the banks if appropriate energy dissipation is not incorporated. This would represent a potentially significant impact. **Mitigation Measure HYD-3** is intended to guide the design of stormwater outfalls to reduce this potential impact to a less-than-significant level.

Mitigation Measures:

HYD-3 Stormwater outfalls to Kelly Creek and the D Street tributary shall be designed to reduce the potential to cause bank instability. Outfall locations near (or especially across from) existing or potential bank instabilities shall be avoided so that

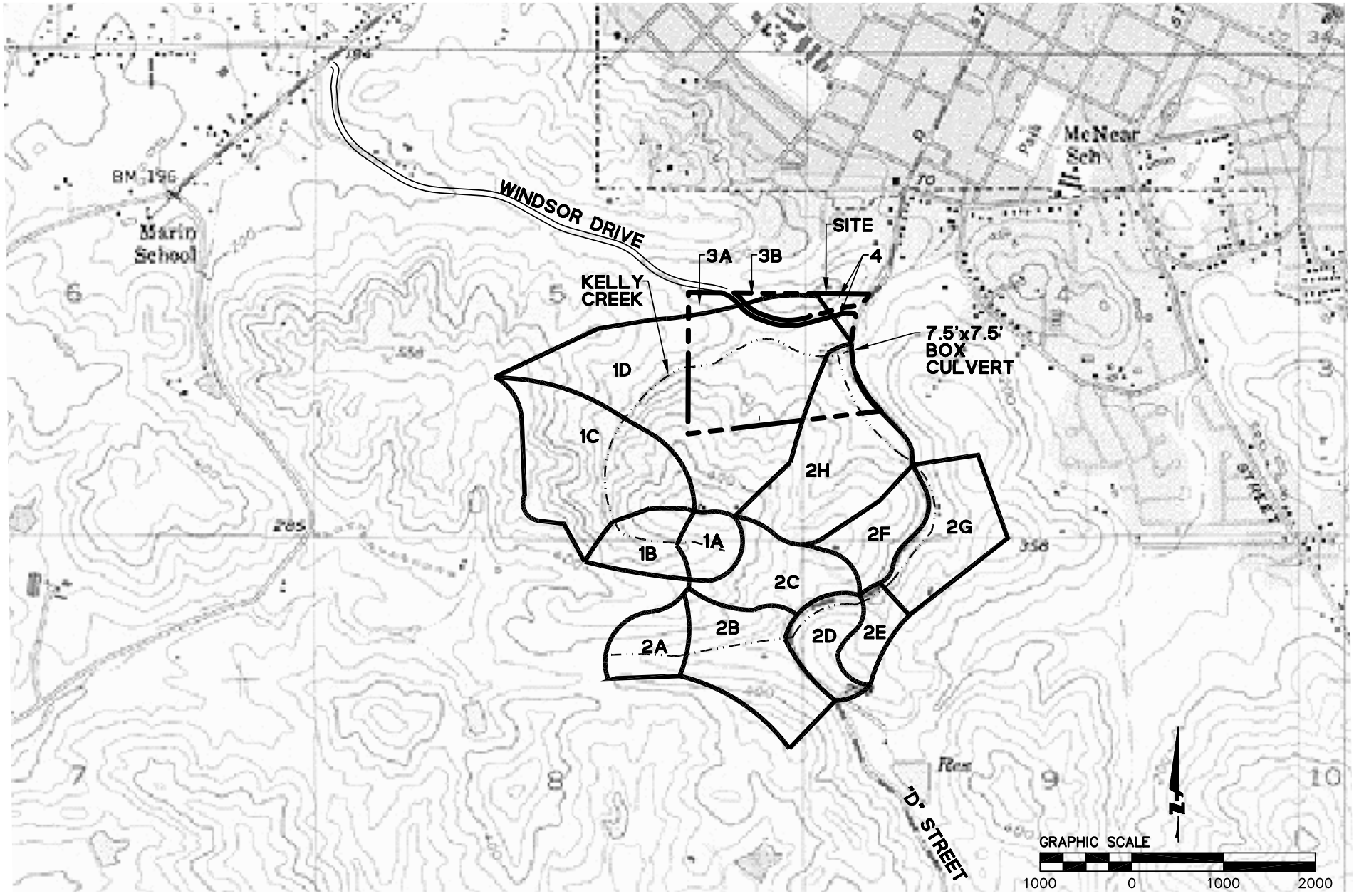
outflows do not exacerbate erosion. Appropriate energy dissipation, such as boulder aprons, biostabilization, or directing outfalls in a downstream rather than cross-channel direction, shall be incorporated to reduce the potential to cause erosion.

Significance after Mitigation: Implementation of **Mitigation Measure HYD-3** would reduce the impact to a less than significant level.

Impact HYD-4: **The proposed project would substantially alter the existing drainage pattern of the site or area in a manner that would substantially increase the rate or amount of surface runoff that would result in flooding on- or off-site. (*Potentially Significant; Less than Significant with Mitigation*)**

The project site includes three primary drainage areas that currently drain to different discharge points. The project site is within the following drainage basins or sub basins: 3A, 3B, 4, 1D, and 2H. The majority of the project site (sub-basins 1D and 2H in **Figure 4.8-2, Site Drainage**) drains internally to Kelly Creek, and exits the project site at the Kelly Creek culvert under D Street. A small portion of the project site north of Windsor Drive (sub-basin 4) currently drains directly to the D Street storm drain system which discharges to Kelly Creek downstream of D Street. A small sub-basin (sub-basin 3), in the northwestern portion of the project site, currently drains to Windsor Drive and flows west into the existing Victoria subdivision storm drain that ultimately discharges to Kelly Creek at Sunnyslope Avenue.

Under post-project conditions, some, portions of sub-basin 3A and 3B would continue to drain to Windsor Drive and through the Victoria subdivision storm drain system and discharge to Kelly Creek at Sunnyslope Avenue. However, much of that area (and all of the new impervious area) would be diverted to the new stormwater system along the A Street alignment, ultimately discharging to Kelly Creek after flowing through the proposed bio-infiltration/detention facility south of Windsor Drive. Similarly, portions of sub-basin 4 would be developed and incorporated as part of sub-basin 1. The preliminary storm drainage study (BKF Engineers 2018) showed that peak flows (for the 10- and 100-year events) to the Victoria subdivision storm drain system would be less under post project conditions due to reduced sub-basin area, resulting in no impact related to flooding within the Victoria subdivision.



SOURCE: BKF Engineering, 2019

FIGURE **4.8-2**

Site Drainage

IMPACT SCIENCES

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Similarly, drainage area to the D-Street storm drain system from sub-basin 4 would be reduced as well, with corresponding reduction in peak flow discharged from the D-Street storm drain to Kelly Creek downstream of D-Street. Sub-basins 1D and 2H would continue to drain into Kelly Creek similar to existing conditions, with the addition of a bioretention/infiltration basin, within sub-basin 1D, to treat stormwater flows from the new residential development of sub-basin 1D. The eastern portion of Windsor

Drive would discharge into a new bioretention/infiltration basin west of D Street and then to Kelly Creek instead of discharging to the D Street storm drain. The effect of this change in drainage pattern along with the increase in the volume of runoff due to the project on downstream flooding is evaluated below.

Thompson and Kelly Creek System Flooding

Construction of the proposed project would result in new impermeable surfaces and routing of stormwater flows to Kelly and Thompson creek system. Without appropriate controls, these changes would increase runoff rates and increase peak flows in Kelly and Thompson creek system. BKF Engineers prepared a preliminary storm drainage study for the Davidon (28-lot) Residential Project component and found that, without controls, the project would increase the 10-year peak flow from 180 cfs to 183 cfs (1.7 percent increase), and the 100-year peak flow from 255 cfs to 260 cfs (2.1 percent increase).[5] Increases of this magnitude could induce or exacerbate flooding in downstream reaches, especially in areas where flooding has been previously reported near the Sunnyslope Avenue/Sunnyslope Road intersection.

In order to address potential downstream flooding impacts (and comply with local regulations), BKF analyzed the detention capacity that would be needed for the Davidon (28-lot) Residential Project component to maintain peak flows at or below existing conditions. BKF estimated that a total of 7,730 cubic feet (0.18 acre-feet) of storage would be needed for a 10-year storm event, and 10,977 cubic feet (0.25 acre-feet) of storage for a 100-year storm event. Detention volume for the Davidon (28-lot) Residential Project component would be incorporated either through adapting the proposed bioretention/infiltration basin(s) at the site (the primary bioretention basin would likely be able to detain as much as 29,000 cubic feet), or by using oversized storm drain pipes with restricted outlet structures within the project site.

It is important to note that the analyzed detention volumes are conservatively high due to two factors. First, the study did not incorporate any detention that might be gained through implementation of LID or stormwater treatment features. Second, the study assumed imperviousness associated with lots smaller

5 Numbers cited in this section are for the sum of Tributary 1 and Tributary 2; effectively the potential increase at the D-Street culvert. Peak flow would be decreased for Tributaries 3 and 4 due to reduction in contributing watershed area.

than one fourth of an acre, whereas many of the lots for this project will be larger than one fourth of an acre, with correspondingly lower imperviousness.

The BKF study analyzed only the Davidon (28-lot) Residential Project component, and not the Putnam Park Extension Project component. Additional detention volume may be required as a result of the parking lots and sidewalks proposed as part of the Putnam Park Extension Project component and located south of Windsor Drive (on the north side of Kelly Creek), and along D Street (south of Kelly Creek). The additional detention volume required for these areas would be small relative to the project as a whole, and would be feasible to incorporate into the existing plans for control of peak flows given the excess volume available in the main detention and infiltration basin. Alternatively, detention would be incorporated into stormwater BMP features adjacent to the proposed parking areas.

Therefore, adequate detention capacity can be provided on the project site and flooding within the Kelly and Thompson Creek system would not occur as a result of the proposed project. However, the design and configuration of these basins may change during the final design process, and when integrating stormwater quality treatment measures. Therefore, **Mitigation Measure HYD-4a** is set forth below to guide the design process and ensure that final designs maintain peak flows at or below existing levels. As such, the proposed project's impact related to altering drainage patterns and flooding is less than significant.

All treatment and detention facilities would require maintenance for the life of a development project to remain effective. Therefore, developers must also establish a dedicated funding responsibility for either the future owners of the land or a designated public entity. In its role as an MS4 operator and permit holder, the City of Petaluma is required to enforce these site design and water quality protection measures for all new and redevelopment projects within its jurisdiction. Lack of maintenance could result in significant impacts. **Mitigation Measure HYD-4b** is set forth below to ensure maintenance of all detention facilities reduce the impact to a less-than-significant level.

Petaluma River Flooding

As described previously, flooding along the Petaluma River is a prominent concern within the City, and increases in the 100-year peak flow at the Petaluma River as a result of the proposed project would constitute a significant impact. Project detention (described above) would limit such increases within the Thompson/Kelly Creek watershed. The Thomson/Kelly Creek watershed is located in the very downstream portion of the much larger Petaluma River watershed and has a much lower time-of-concentration than the River (about 35 minutes and 2.5 hours, respectively). As such, flow from the Thompson/Kelly Creek watershed has mostly past by the time flow peaks in the Petaluma River, and this watershed contributes relatively minor amounts of flow at the River's peak. However, detention at the project site would tend to

delay flows from the site, and potentially cause peaks to coincide resulting in slight increases in peak flow at the Petaluma River, even though peak flow in Thompson/Kelly Creek would not increase. This would represent a potentially significant impact. **Mitigation Measure HYD-4c** is set forth to guide final detention designs so that peak flows from the project site do not add to the peaks in Petaluma River. Implementation of this mitigation measure would reduce this potential impact to a less-than-significant level.

Mitigation Measures:

HYD-4a Prior to final map approval, the Applicants shall submit final detention design that shows that appropriate controls have been included to ensure that the post-project 10- and 100-year peak flows will not exceed pre-project peaks. Hydrologic analyses and final detention designs shall be consistent with the standards outlined in the Sonoma Water's Flood Management Design Manual, adopted May 19, 2020. Total detention volume may be less than the volume projected in the preliminary hydrologic analysis if final analysis shows appropriate compliance through integrated LID/water quality treatment/detention features. Final hydrologic analysis and detention sizing shall include potential increases in peak flow due to all new impervious surfaces associated with the proposed project, including the parking areas.

HYD-4b The project Applicants shall prepare and execute, in coordination with the City Engineer or other privately funded and operated maintenance mechanism which ensures that maintenance of all detention facilities will be provided as necessary to continuously provide the required volume storage in a 10-year storm and in a 100-year storm, throughout the life of the project, and shall include a financing mechanism acceptable to the City Engineer to ensure that the required maintenance will be performed.

HYD-4c The project Applicants shall design, in coordination with the City Engineer, on-site detention facilities sufficient to detain on-site and release runoff from storm events such that any runoff temporarily detained on-site is released either before or after the expected peak flood flow of the Petaluma River and that any release of runoff temporarily detained on-site does not contribute to an increase in peak flood periods on the Petaluma River. Prior to final map approval, the project Applicants' final stormwater detention design calculations shall be subject to review by the City's stormwater consultant and City Engineer. The project

Applicants shall be responsible for funding all costs and providing the required technical information to the City.

Significance after Mitigation: Implementation of **Mitigation Measures HYD-4a** through **-4c** would reduce the impacts to a less than significant level.

Impact HYD-5: **The proposed project would not substantially alter the existing drainage pattern of the site or area in a manner that would create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems, or provide substantial additional sources of polluted runoff. (*Less than Significant*)**

The proposed project would increase the amount of impervious surfaces within the sub-watershed, including new roadways, driveways, two small parking areas, and rooftops. Increased impervious area associated with the proposed project would potentially increase peak flows without proper control. Peak flow increases could exceed the capacity of downstream infrastructure within the watershed.

The City's 2025 General Plan Policy 8-P-36 requires new development to "demonstrate no net increase in peak day stormwater runoff, to the extent deemed practical and feasible." Comments received from the Sonoma County Water Agency (Water Agency) on the previous EIR for the larger project proposed for this site recommended that the project maintain compliance with the Water AgencyFlood Control Design Criteria. The analysis by BKF Engineers described above has been prepared in accordance with these procedures and provides analysis of both the 10-year and 100-year events. Storm drain requirements are calculated using the Rational Method, which assumes a runoff coefficient based on land use and slopes, and a rainfall intensity and concentration representative of the San Francisco Bay area. For all drainage basins within the project site, the peak runoff during such events was calculated for both the pre- and post-project conditions (see **Impact HYD-4** above).

As part of a City-wide modeling effort, West Consultants (2006) conducted a surface water modeling analysis that included the Kelly-Thompson Creek sub-watershed, calibrated based on data and observations from the large December 2005 storm event. That analysis concluded that, even without new detention, the sub-watershed infrastructure has sufficient capacity to contain the 100-year flood under built-out conditions (which include development at the project site). Public comments on the previous EIRs noted that localized flooding has occurred along Sunnyslope Avenue at Sunnyslope Road, as well as further downstream of Sunnyslope Avenue to Twelfth Street and Grossland Way. These observations, in contrast to the West (2006) findings, suggest that there may be other issues affecting flooding within the

watershed,[6] but regardless, the proposed project would implement controls to maintain peak flows at or below pre-project levels (see **Impact HYD-4** above) and there would be a less-than significant impact of the project on the capacity of stormwater drainage systems downstream.

A small portion of the project area north of Windsor Drive currently drains to the D Street storm drain system which discharges to Kelly Creek downstream of D Street, but will drain to Kelly Creek upstream of D Street after the project is completed. This shift would result in additional flow at the D Street culvert, and as such may impact the capacity of that culvert.[7] BKF Engineers analyzed the capacity of the Kelly Creek culvert at D Street, and found that the existing culvert has sufficient capacity to accommodate the post-project 100-year event, and therefore no modifications to existing infrastructure are required as a result of this shift.

As discussed previously, a small portion of the project area (in the northwest corner of the site), currently drains to Windsor Drive and flows west into the existing Victoria subdivision storm drain that ultimately discharges to Kelly Creek at Sunnyslope Avenue. As part of the storm drain improvements of the proposed project, the existing flow from the northwest corner of the project site would be diverted to the proposed detention basin north of Kelly Creek. Therefore, as shown in the BKF Engineers analysis, post-project peak flows to this system for the 10- and 100-year events would be less under post project conditions (due to reduced sub-basin area), resulting in no adverse impact to existing storm-drain infrastructure for the Victoria subdivision and downstream segments.

Sources of stormwater pollution are addressed under **Impact HYD-1**, and as that analysis shows, with mitigation, the impact on water quality would be less than significant.

Mitigation Measures: No mitigation measures are required.

Impact HYD-6: **The proposed project would substantially alter the existing drainage pattern of the site or area in a manner that would redirect flood flows. (*Potentially Significant; Less than Significant with Mitigation*)**

As discussed above, there is no FEMA-designated 100-year flood zone within the proposed project site and the 100-year flood would be contained within the incised stream channel. The elevation of the lowest

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6 The comments did not mention whether the localized flooding was directly related to flow within Kelly Creek rather than secondary systems in that area that drain to the creek, for example.

7 Because this drainage alteration essentially moves the discharge point of flow from that sub-basin from the downstream to the upstream side of the culvert, there will be no net change in flow within the creek as a result.

building pads for the proposed residences is at 178 feet amsl, nearly 30 feet above the elevation of the top of the bank of Kelly Creek, thus structures built on these pads would be well above an elevation that would affect or redirect flood flows. Grading for the project site would be limited to elevations above the top of the bank of Kelly Creek, and grading would be limited to only the northwestern portion of the project site. As such, grading activities from the proposed project would not significantly affect or redirect flood flows that are contained within the Kelly Creek channel.

The Putnam Park Extension Project component proposes three separate pedestrian bridges across Kelly Creek. Piers, abutments, or supports for these crossings could impede and or redirect flood flows within the Kelly Creek corridor. **Mitigation Measure HYD-6** is proposed to reduce this potential impact by requiring the design of the pedestrian footbridges to maximize the natural channel cross section and reduce potential obstruction of in-stream flow. With the implementation of **Mitigation Measure HYD-6** potential impacts associated with redirecting flood flows would be less than significant.

Mitigation Measures:

HYD-6 Pedestrian bridges across Kelly Creek shall be designed to fully span the channel in order to reduce the potential to impede streamflow. If full-span lengths are not feasible, bridge supports shall be designed to maximize the natural channel cross-section area in order reduce the potential obstruction to in-stream flow.

Significance after Mitigation: Implementation of **Mitigation Measures HYD-6** would reduce the impacts to a less than significant level.

Impact HYD-7: The proposed project would not result in flood hazard, tsunami, or seiche zones that would risk release of pollutants due to project inundation. (*Less than Significant*)

The City's surface water management standard requires that a development storm drain system must safely pass the flows from a 10-year storm event within a piped or natural creek system. The policy allows the use of curb-to-curb street capacity to contain the flows from a 25-year storm event, and the flows from a 50-year storm event must be contained within the public right-of-way. All residential development finished floor elevations must be placed such that they are above the 100-year flood elevation. Compliance with these regulations would limit potential risk of release of pollutants due to flooding within the project site to a less-than-significant level (See **Impact HYD-4** for an analysis of downstream flooding).

The project site is located in the upper part of the Kelly Creek watershed, with no potential impact as a result of a tsunami or seiche.

Mitigation Measures: No mitigation measures are required.

Impact HYD-8: **The proposed project would not substantially alter the existing drainage pattern of the site or area in a manner that would conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan (*Less than significant*)**

The proposed project is located in the headwaters of Kelly Creek, which ultimately drains to the Petaluma River and San Francisco Bay, which are both included in the San Francisco Bay Basin (Region 2) Water Quality Control Plan ('Basin Plan'; SFRWQCB, 2017). As discussed under **Impact HYD-1**, the proposed project would implement stormwater quality BMPs consistent with the NPDES stormwater permit, and as such would not conflict or obstruct the implementation of the Basin Plan.

The proposed project is not located within the boundaries of a groundwater basin as defined by the California Department of Water Resources. Flow from the site, discharges to Kelly Creek, which flows eastward toward the Petaluma River, and thus is tributary to the area defined as the Petaluma Valley Groundwater Basin. As discussed under Impact HYD-2, the project site is not located within an area of either confirmed or potential regional groundwater recharge and consists of soils with generally low infiltration capacity. The proposed project would also limit the residential development and associated impervious area on the 58-acre site to only about 12 acres, with the remaining area developed as the Putnam Park Extension Project component. For these reasons, the development proposed at the project site would not conflict with or obstruct implementation of a sustainable groundwater management plan and the potential impact would be less than significant.

Mitigation Measures: No mitigation measures are required.

4.8.4.4 Regional Park Trail Impacts and Mitigation Measures

Environmental Setting

The proposed regional park trail is located near the upstream end of Kelly Creek within Helen Putnam Regional Park. The proposed alignment of the regional park trail passes through areas with moderate to steep slopes with dense tree coverage along the proposed path. The regional park trail alignment is

currently undeveloped and the underlying soils exhibit characteristics such as high runoff and a moderate to severe erosion hazard.

Impacts and Mitigation Measures

RPT Impact HYD-1: The implementation of the proposed regional park trail project would not have a significant impact related to water quality, hydromodification, erosion, flooding, and other hazards. (***Less than Significant***)

Water Quality and Hydromodification

The proposed regional park trail would not alter existing drainage patterns in a manner that would result in substantial erosion or siltation. The regional park trail would not be paved, in contrast to the paved multi-use trail through the Scott Ranch project. As such, the regional park trail would be unlikely to concentrate flows that would result in significant erosion or siltation, especially given the existing clayey soils along the alignment that already have a relatively high runoff coefficient. Rolling dips, switchbacks, and other hydrologic control measures would be incorporated in order to limit concentration of flow on long sections of the regional park trail. In addition, appropriate erosion control and runoff protection measures would be incorporated at and near streams and crossings to provide additional protection against hydrologic impacts. Thus, the regional park trail impact to water quality and hydromodification would be less than significant.

Erosion

There would be nominal grading and an armored dip would be constructed along the proposed regional park trail to control erosion at the locations where the regional park trail would cross or be close to drainages. There would be an armored ford crossing in one area of the regional park trail. An armored ford crossing consists of rip rap installation along the creek bed where the regional park trail crosses the creek. The creek is intermittent at this location, and construction would take place when the stream is dry in order to minimize potential impacts. A number of erosion control features such as a rock rip rap area and drainage lenses would be incorporated into the proposed regional park trail. Areas disturbed during construction would be hydroseeded with native grasses to help reestablish the vegetation and avoid erosion. There would be minimal improvements needed for the proposed regional park trail, and therefore, surface runoff would not be affected to a significant degree and the impact would be less than significant.

Flooding and Other Hazards

No housing or structures would be constructed as part of the regional park trail. Thus, the proposed regional park trail would not place housing or structures within a 100-year flood hazard area. The project alignment is located in the upper part of the Kelly Creek watershed, with no potential to be affected by a tsunami or seiche. Although mudflows could on occasions occur along the regional park trail, these would be removed and the regional park trail would be restored. Therefore, impacts of the regional park trail development and use on hydrology and water quality would be less than significant.

Mitigation Measures: No mitigation measures are required.

4.8.4.5 Cumulative Impacts and Mitigation Measures

The cumulative context to assess the Scott Ranch project impacts includes development within the Kelly Creek watershed and in the vicinity of the project site. The watershed is used as the geographic unit for cumulative analysis based on the concept that many water quality problems, like the accumulation of pollutants or nonpoint source pollution, are best addressed at the watershed level. In addition, California's regulatory framework for protection of water quality focusses on the watershed.

The regional park trail would be also located in the Kelly Creek watershed. However, because it would be an unpaved 4-foot trail and would not create new impervious surfaces that would generate additional runoff, it would not contribute substantially to any of the cumulative impacts discussed below.

Cumulative Impact HYD-1: **The proposed Scott Ranch project, in conjunction with other past, present and reasonably foreseeable future development, would not result in a significant cumulative impact related to hydrology and water quality. (*Less than Significant*)**

Water Quality, Erosion, and Hydromodification

The proposed project could, in conjunction with other projects within the City and surrounding area, contribute urban runoff pollutants to downstream receiving waters, resulting in degradation of water quality in Kelly Creek, and eventually the Petaluma River. As described in **Impact HYD-1**, the proposed project would implement **Mitigation Measures HYD-1a** through **1d** and incorporate LID and stormwater treatment measures, per NPDES requirements, to minimize, control and/or treat stormwater runoff. Similarly, other developments within the City would be required to comply with these regulations. Per the Petaluma General Plan 2025 Environmental Impact Report (Dyett & Bhatia 2006), as a result of compliance

with NPDES General Permit regulations (which is required by law as well as General Plan Policy 8-P-37), cumulative development within the City of Petaluma, including the proposed project, would result in a less-than-significant impact on water quality and downstream hydrology. As such the cumulative impact of the project related to water quality and hydromodification would be less than significant.

Flooding

Increases in impervious area at the proposed project site could incrementally increase stormwater flows which, combined with similar increases due to other potential future projects within the watershed, could cumulatively impact flooding in downstream reaches. As described in **Impact HYD-4**, the proposed project would incorporate stormwater detention to provide no net increase in peak flows for the 10- and 100-year storm events, and would implement **Mitigation Measure HYD-4c** to ensure that the project does not contribute flows to the Petaluma River when the river peaks in the area where the Kelly and Thompson Creek system discharges. In addition, as part of the project's compliance with the NPDES stormwater permit, the project would incorporate LID and stormwater treatment measures designed to maximize infiltration and evapotranspiration of stormwater runoff, minimizing increases in runoff for smaller storms. Similar measures implemented within other projects, as required by the City and NPDES regulations, would result in a less-than-significant cumulative impact related to flooding.

As discussed in Impact HYD-6, project grading and development would be limited to elevations above the top of the bank of the Kelly Creek channel, which fully contains the 100-year flood, and would not redirect flood flows. The entire south side of Kelly Creek would be preserved as open park space, and only limited grading (associated with the infiltration basins and redeveloped barn area) is proposed for the eastern portion of the northern side of the creek. Thus, cumulative impacts related to redirecting or altering flood flows would be less than significant.

Mitigation Measures: No mitigation measures are required.

4.8.5 REFERENCES

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