This section discusses and analyzes the surface hydrology, groundwater, and water quality characteristics of the County and the proposed project. This analysis addresses impacts to hydrology and water quality and identifies mitigation measures to lessen those impacts. See Section 4.12 (Public Services and Utilities) for a more detailed discussion regarding water supplies and demand.

Specifically, this section provides the following information regarding hydrology and water quality that are evaluated in this DEIR:

- Identification of current hydrologic baseline of the County associated with surface water and groundwater conditions that includes identification of key watersheds and associated water features, precipitation, flood conditions, groundwater basins and associated conditions of the basins and water quality (see Section 4.11.1 below and **Appendix H**).

- A description of the current federal, state, regional and County policies, regulations and standards that are associated with the hydrologic conditions of the County (see Section 4.11.2 below).

- Identification of significant hydrologic impacts associated with the proposed General Plan Update (see Section 4.11.3 below). The impact analysis makes use of hydrologic modeling to identify the type and degree of potential impacts based on a range of potential vineyard development conditions in the future (see **Appendix H**) as well as consideration of current Napa County Conservation Regulations (County Code Chapter 18.108) and Best Management Practices (BMPs) that are typically applied to mitigate impacts (see **Appendix I**).

4.11.1 EXISTING SETTING

SURFACE WATER

Napa County is located within the Coast Range physiographic province northeast of San Francisco. The County is bordered to the east by California's Central Valley and to the west by the Coast Ranges. The topography of Napa County consists of a series of parallel northwest-trending mountain ridges and intervening valleys of varying sizes. These parallel northwest-trending mountain ridges subdivide the County into three principal watersheds: Napa River watershed, Putah Creek/Lake Berryessa watershed, and Suisun Creek watershed. The Study Area and the three principal watersheds are shown in **Figure 4.11-1**.

Napa River Watershed

The Napa River watershed extends in a northwesterly direction roughly 45 miles from San Pablo Bay to the hills north of Calistoga, and includes primarily a central valley floor and eastern and western mountains to either side of the valley floor (see **Figure 4.11-1**). Valley floor elevations in the Napa Valley range from approximately 400 feet above sea level (asl) in the northern mountains to sea level at San Pablo Bay. The highest peak surrounding the valley is Mt. St. Helena at an elevation of 4,343 feet. The valley is bound to the west by the Mayacamas Mountains ranging from 1,000 to 2,700 feet asl, to the north by Mt. St. Helena, and to the east by a northwest-trending range of mountains that are generally above 2,000 feet asl. The southern portion of the Napa Valley is very flat, and elevations range from near sea level to approximately 200 feet asl along the flanks.

Moving north, the width of the valley floor becomes progressively narrower, from around 5 miles wide in the south to about 1 mile wide in the northern Napa Valley. To the southwest of the valley lies the Carneros region, and to the southeast lies the American Canyon area. Located within the valley floor area are the City of Napa and the towns of Yountville, Oakville, Rutherford, St. Helena, and Calistoga.

The Napa River, the largest river in the Napa County, drains the watershed and empties into San Pablo Bay to the south. The lowest reaches of the Napa River and tributaries in the lower Napa Valley are tidally influenced due to the proximity to San Pablo Bay. Along the Napa River, the tidal influence is observed northward into the City of Napa.

In terms of water supply resources and infrastructure, approximately 1,000 natural and human-made surficial storage facilities are thought to exist in Napa Valley. Of these storage facilities, five were considered significant enough to be included in the regional study and modeling analysis: Kimball Reservoir, Bell Canyon Reservoir, Lake Hennessey, Rector Reservoir, and Milliken Reservoir. Their source, size, and operational purpose are presented in **Table 4.11-1**.

TABLE 4.11-1
MAJOR STORAGE FACILITIES IN NAPA RIVER WATERSHED

Storage Facility Name	Storage Capacity (acre-feet)	Primary Sources	Operation/Ownership
Kimball Reservoir	335	Napa River	City of Calistoga
Bell Canyon Reservoir	2,050	Bell Creek	City of St. Helena
Lake Hennessey	31,000	Conn Creek, Sage Creek, Chiles Creek	City of Napa
Rector Reservoir	4,000	Rector Creek	State of California
Milliken Reservoir	2,000	Milliken Creek	City of Napa

Source: West Yost and Associates, 2005

Putah Creek/Lake Berryessa Watershed

East of the Napa River watershed is the Putah Creek watershed, which contains Lake Berryessa (see **Figure 4.11-1**). This region consists of several small valleys, including the Pope and Capell Valleys, surrounded by topography that is generally mountainous and steep. Elevations in the Lake Berryessa watershed are generally higher than in the Napa Valley. To the west of the Napa Valley, hills rise to an elevation of approximately 1,500 to 2,000 feet asl, forming a divide between the Napa Valley and the adjacent Putah Creek. Approximate elevation ranges for the smaller valleys are 575 to 700 feet asl for Pope Valley in the northwestern portion of the watershed, and 550 to 650 feet asl for Capell Valley just west of Lake Berryessa.

Putah Creek is the largest river in the Lake Berryessa basin. It originates in Lake County to the north, flows into Napa County and into Lake Berryessa, and flows out of the County at Lake Berryessa's outlet (Monticello Dam) along the eastern border where it eventually flows into the Sacramento River. Other notable tributaries in the drainage include Pope Creek, Capell Creek, and Eticuera Creek.

Lake Berryessa is the largest body of surface water in the County, with a storage capacity of 1.6 million acre-feet. It is controlled by Monticello Dam. Lake Berryessa spills at an elevation of 439.96 feet asl. Approximately 40 streams flow into Lake Berryessa, which has a total drainage area of

4 0 4 Miles N

FIGURE 4.11-1
MAJOR WATERSHEDS

PMC

576 square miles (mi2). The United States Bureau of Reclamation (USBOR) owns the dam, and the Solano Irrigation District operates it. The primary uses of the lake are as a water supply for the irrigation of agricultural lands and municipal and industrial users, power generation, and recreation.

Suisun Creek Watershed

The Suisun Creek watershed lies to the south of Lake Berryessa and the Putah Creek watershed, and contains Lake Curry and Wooden Valley (see **Figure 4.11-1**). Suisun Creek flows to the south and into Solano County, and only the upper portions of the watershed are located within Napa County. The valley elevations range from approximately 200 to 600 feet asl. To the north of the watershed, mountains rise to an elevation of approximately 2,000 to 2,500 feet asl, and to the east, mountains rise to an elevation of approximately 2,500 feet asl.

Lake Curry is a human-made reservoir created by the damming of Suisun Creek. Historically it has been a supply of water for municipal and industrial use in the City of Vallejo.

PRECIPITATION

Napa County has a Mediterranean climate, with distinct wet and dry seasons. Approximately 90 percent of the precipitation occurs between November and April, and precipitation varies significantly throughout the County, both in a north-south direction and with elevation. Storms approach the County both from the west, rising over the Mayacamas Mountains and moving into the Napa Valley and beyond, and from San Pablo and San Francisco Bay to the south, and moving northward up the valleys. **Figure 4.11-2** shows annual rainfall contours (isohyetal). In terms of general precipitation patterns, the figure indicates that rainfall distribution is strongly correlated with elevation. For example, average annual rainfall along a transect may range from the hills south of Calistoga (~45 in/yr), across the valley floor near Calistoga (~30 in/yr), and then up the hills north of Calistoga (more than 45 in/yr). A strong “rain shadow” effect is also observed in the County, whereby rainfall amounts decrease eastward because frontal storms arriving from the Pacific Coast lose moisture and saturation as they pass over progressive ridgelines to the east. Precipitation observed in the eastern area of the County towards Knoxville/Berryessa, averages less than 15 in/year compared to the moister western portion of the County.

Annual precipitation not only spatially across the County, but it also varies significantly from year to year, and deviations can be as high as 200 percent from the 85-yr average. In general, precipitation increases from south to north and with increasing elevation, and average annual precipitation varies by more than a factor of three throughout the County, from 22.5 to 75 in/yr. Precipitation is lowest in the southern portions of the County and in the vicinity of Lake Berryessa, at about 22.6 in/yr. Average annual precipitation in the City of Napa is on the order of 26.5 in/yr. Average annual precipitation is highest in the higher portions of the Mayacamas Mountains, the mountains north of Calistoga, and the mountains in the northern portion of the Lake Berryessa subarea (i.e., Knoxville area).

Snowfall is not uncommon at higher elevations. However, the vast majority of the precipitation occurs in the form of rain, and snow generally does not persist for more than a few days following a storm event except in the very highest areas.

STREAM NETWORK

Stream Morphology

In general, tributaries to major drainages form canyons in their steeper upstream reaches, where they flow over the more resistant bedrock of the mountainous areas. In terms of geomorphic form, County streams typically descend from steep headwater reaches (possibly through side valley canyons) onto alluvial fan surfaces, and then on to a valley floor setting (see **Figure 4.11-3**).

Stream Flow

Some of the upstream reaches of tributaries are seasonal (ephemeral or intermittent), and others are perennial; downstream reaches, especially of the larger streams, are generally perennial. In some areas, mountain streams drain into alluvial fan deposits and are perennial in upstream reaches and intermittent in downstream reaches, because water tables fall below the level of the streambed during the dry season due to the contrasting permeabilities of mountain bedrock and adjacent unconsolidated alluvial fan deposits.

Streamflows generally peak in January or February and are lowest from August through November (see **Figure 4.11-4**). Average and maximum stream flows are scaled with drainage area. During the period of record used for this evaluation (1999 to 2004), the peak flow events for the Napa River near St. Helena and near Napa are 3,858 and 11,733 cfs (Napa County, BDR Table 15-4, 2005). Using the methods outlined in U. S. Geological Survey's (USGS) Bulletin 17b of the Hydrology Subcommittee [1], these have a return frequency of 3 and 1.1 years, respectively.

FLOODING

The Mediterranean climate of the Napa County region (which can bring a sequence of mid-winter powerful storms) combined with the ridge-valley topography and drainage network, (which quickly delivers runoff from side valley tributaries) and a constricted river channel have historically resulted in flooding along the Napa River. In addition to these physical conditions, land use conditions are also fundamental to understanding flooding conditions in Napa County. Population and development pressures have increased the potential for flooding in the region. Development increases the amount of paved or impervious area (such as roofs, driveways, and parking lots, etc.), which can in turn increase runoff volume, runoff peak depth and runoff velocities. The overall effect is that increased development produces more runoff, even though the amount of rainfall remains constant. Also, increased urban development (both residential and commercial) can place houses and buildings in areas that naturally flood during certain times of the year. With increased runoff, the flooding increases and flood-prone areas are inundated for longer time periods. With residential or commercial structures now in places where this flooding occurs, the increased runoff leads to potential citizen health and safety concerns.

[1] Interagency Advisory Committee on Water Data, 1981, Guidelines for Determining Flood Flow Frequency: U. S. Geological Survey, Reston Virginia, Bulletin #17B of the Hydrology Subcommittee, 194 p.

LEGEND

Precipitation

- 0.0 - 15.0 in/yr
- 15.1 - 25.0 in/yr
- 25.1 - 35.0 in/yr
- 35.1 - 45.0 in/yr
- 45.1 - 75.0 in/yr

- Lakes
- Streams
- Major Roads

Source: Jones & Stokes, EDAW

Isohyetal Map

Napa County

1 inch = 22,000 feet

16,000 8,000 0 16,000 32,000 Feet

Horizontal Datum: NAD 83,
CA State Plane Coordinates, Zone II, feet
Source: Napa County, 2004; DHI 2005;
Jones & Stokes 2005

Disclaimer: This map was prepared for informational purposes only. No liability is assumed for the accuracy of the data delineated hereon.

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FIGURE 4.11-2
ISOHYETAL MAP

PMC

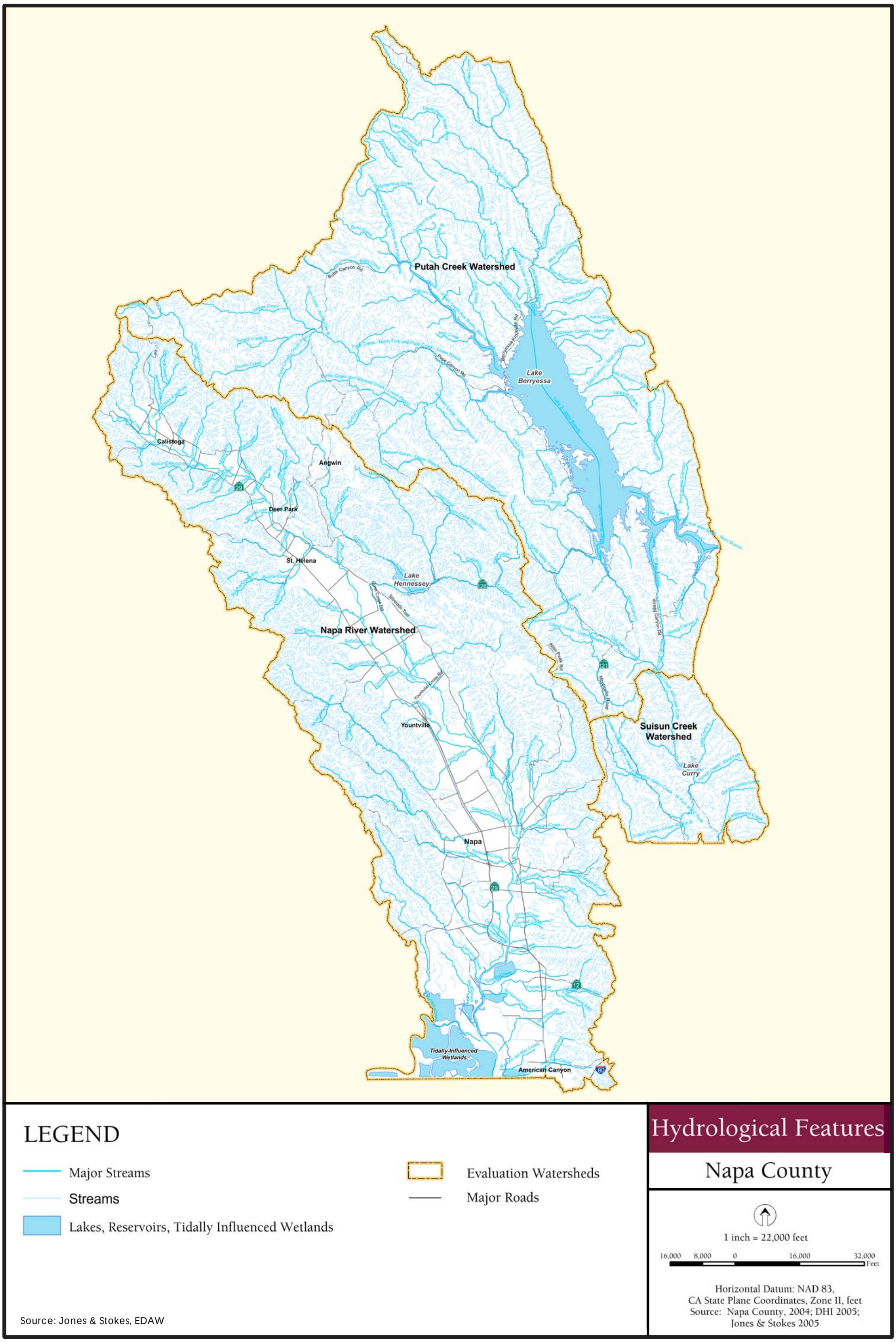

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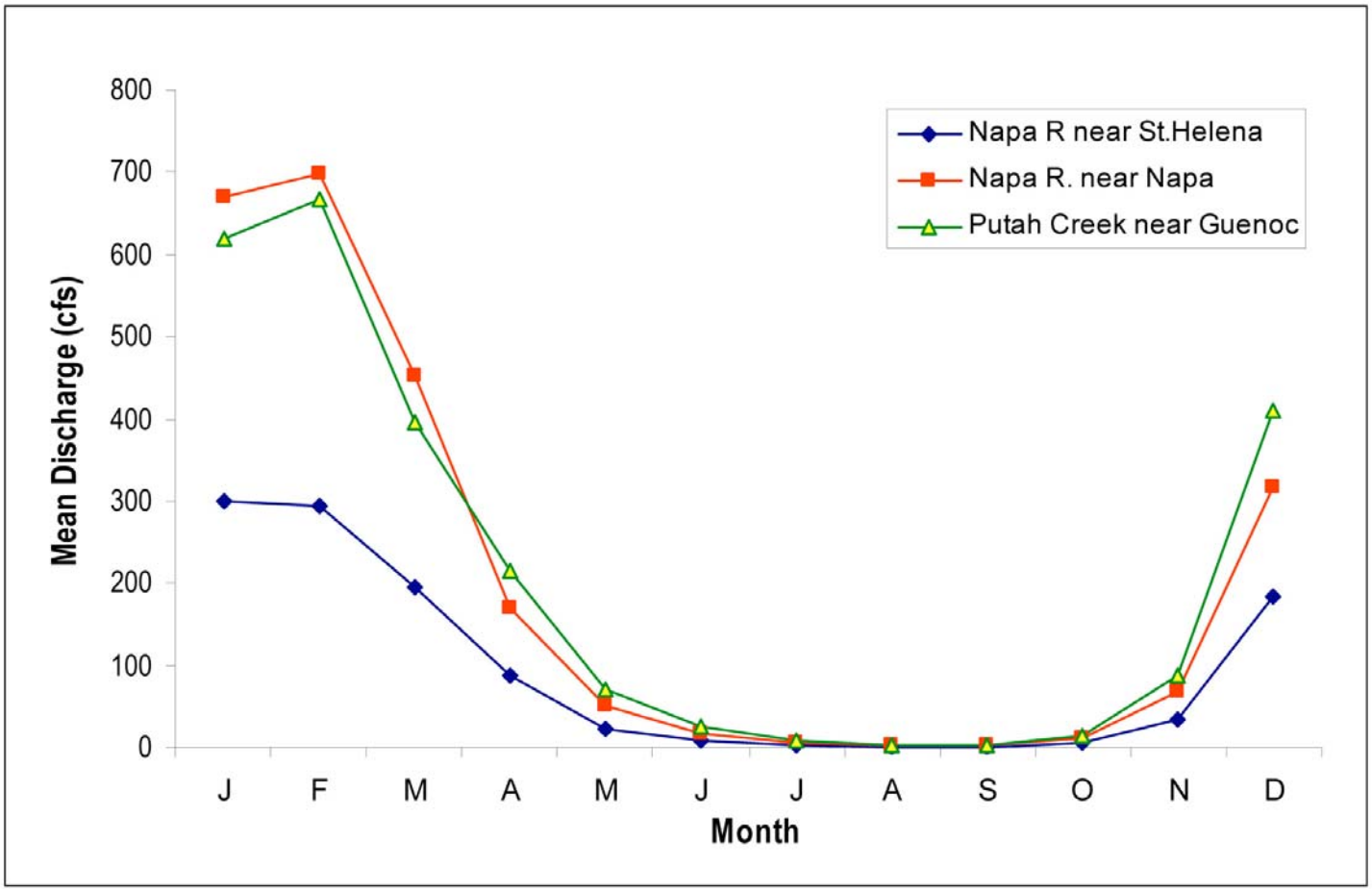
FIGURE 4.11-3
HYDROLOGICAL FEATURES

PMC



(USGS Stream Gages at Napa River near St. Helena [11456000], Napa River near Napa [11458000], and Putah Creek near Guenoc [11453500])

Source: Jones & Stokes, EDAW

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FIGURE 4.11-4
MONTHLY HYDROGRAPHS FOR NAPA RIVER AND PUTAH CREEK

PMC

The majority of the flooding within the County occurs within the Napa Valley floor (see **Figure 4.11-5**). The City of Napa and those areas surrounding the Napa-Sonoma Marshes are the most heavily affected; although Yountville, St. Helena, American Canyon and Calistoga all have flooding from the 100-year event within their boundaries. There are 2,500 properties in the floodplain and over 60 have made more than one flood damage claim to FEMA. The City of Napa is located at the confluence of Napa Creek and the Napa River, and where the Napa is tidally influenced by the San Pablo Bay estuary downstream. Tidal conditions are an important consideration in what conditions lead to flooding in the City of Napa, given the tidal effects on the Napa River. The City of Napa is the most flood prone populated area in Napa County and the fifth most flood prone community in California in terms of flood damage payments from FEMA. Areas subject to flooding in Napa are generally from Trancas Street in the north to Imola Avenue in the south, Coombs Street to the west and Silverado Trail to the east. Recently, the US Geological Survey has suggested that climate change due to green house gas emissions may lead to sea level rise and increased flooding in low lying areas in years to come.

Flood Programs

Flood control became a top priority for the City of Napa following the 1987 and 1995 floods. The City of Napa now participates in programs and conducts activities to reduce flood damages and insurance rates including: participation in the NFIP, elevation of homes with FEMA Hazard Mitigation Grant Funds, design of the Napa River/Napa Creek Flood Reduction Project, creation of an Emergency Plan, construction of drainage system improvement projects and monitoring rainfall and stream level gages to provide additional flood preparation time. The City has the "Citizen's Guide to Flooding and Flood Recovery" available and provides free sandbags and sand on the first Saturday of November through March.

In 1996, the Community Coalition, a group consisting of the Friends of the Napa River, Napa Valley Economic Development Corporation, Napa County Flood Control District and the U.S. Army Corps of Engineers invited residents, businesses, local government, and numerous resource agencies, together and established goals of 100-year flood protection, an environmentally restored, "living" Napa River, enhanced opportunities for economic development, a local financing plan that the community could support, and a plan that addressed the entire watershed Countywide. The Napa River Flood Protection Project has completed the following components on the Napa River:

- South Wetlands Opportunity Area (wetlands restoration)
- Terracing and East Side Trail (from Kennedy Park to Hospital Creek)
- Railroad Realignment (Kennedy Park to 8th Street)
- Maxwell Bridge Replacement
- Terracing (from Hospital Creek to 3rd Street)
- Third Street Bridge
- First Street Bridge over Napa Creek and Bypass
- Soscol Avenue-Oxbow Bypass Bridge

In addition to the City of Napa improvements, the City of St. Helena has also developed a flood protection project for the Napa River called the St. Helena Comprehensive Flood Protection Project. Project components include development of a floodplain terrace along the southern bank of the river to provide a wider area for passage of floodwaters, shoreline restoration (approximately 600 feet), construction of new levee (along and east of the alignment of Adams Street), removal of approximately 17 mobile homes, construction of a new setback floodwall as well as bank stabilization for the Vineyard Valley Mobile Home Park, storm water management features (detention basin, pumping facility, and storm drains), vegetation management, utility relocations/modifications and adaptive management. Current activities on this project have

land acquisition activities, engineering and design as well as efforts to receive state and federal funding.

Funds from FEMA and the Governor's OES are for use in elevating 25 conventional, single-family wood-frame homes in unincorporated areas of the County. A grant approved under the Hazard Mitigation Grant Program, which is administered by the Governor's OES, will fund the third phase of a pending effort to raise homes at least one foot above the base flood elevation, taking them out of reach of high-velocity water. Another purpose of the elevation project is to lessen soil erosion, undercutting and undermining, which will in turn decrease silt and other debris floating in the rushing waters of the Napa River.

WATER QUALITY

Surface Water

Impaired Waterbodies

Currently, the Napa River and its tributaries have been listed under Section 303(d) as water quality impaired for nutrients, pathogens, and sedimentation/siltation. The Putah Creek Watershed/Lake Berryessa is listed as water quality impaired for mercury. San Pablo Bay, into which the Napa River drains, has been listed as impaired for chlordane, DDT, diazinon, dieldrin, dioxins and furans, exotic species, mercury, nickel, PCBs, and selenium.

Sediment

Channel incision and bank erosion have been as a substantial contributor of sediment into the Napa River from the alluvial fan and valley areas (RWQCB, 2006). Incision rates vary substantially with location along the Napa River, although average rates of incision on the mainstream Napa River over the past four decades (0.5 cm/yr) is 50 times greater than natural background rates. Other processes that contribute to erosion/sedimentation issues in the County include mass wasting and sediment input to channels from colluvial stream bank, gullies, shallow landslides, and road crossing type erosive sources.

The June 30, 2006 RWQCB San Francisco Bay Region Napa River Sediment Total Maximum Daily Load Staff Report identified that more than half of the sediment delivered to waterways is from roads, erosion of Napa River and tributary bed and banks, vineyards and historic grazing activities. In terms of the influence of roads, Pacific Watershed Associates (PWA) (2003) evaluated the Carneros Creek, Dry Creek, and Sulfur Creek watersheds and found that about 20 percent of the road length is hydraulically connected to stream channels.

The construction of several large dams between 1924 and 1959 on major tributaries in the eastern Napa River Watershed and northern headwater areas of the Napa River has affected sediment transport processes into the main Napa River by reducing the delivery of the coarse load sediments to the river (Stillwater Sciences and Dietrich 2002). In addition to the larger dams, many smaller dams also intercept coarse sediment supply and contribute to this overall trapping of coarse material. Thirty percent of the watershed drains into dams, such that ponds and reservoirs behind these dams capture a significant fraction of sediment input to channels. The influence of dams was found to be prominent in Milliken Creek and much of the eastside of the Napa Watershed, where most of the sediment input was not delivered because of the many dams those areas drain into. In other tributaries (Carneros, Sulphur, and Ritchie Creeks), dams are much less prominent and therefore total sediment input should correspond approximately with total sediment yield at the confluence.

LEGEND

- Evaluation Areas
- Major Roads
- Streams

FEMA Flood Zones

- 100-Year Flood Zone
- 500-Year Flood Zone

Source: Jones & Stokes, EDAW

Flood Zones

Napa County

1 inch = 22,000 feet

16,000 8,000 0 16,000 32,000 Feet

Horizontal Datum: NAD 83,
CA State Plane Coordinates, Zone II, feet
Source: Napa County, 2004; EDAW, 2004

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FIGURE 4.11-5
FLOOD ZONES

PMC

Historically, the Napa River system was more typically a gravel bed river that over time has become increasingly dominated by finer sediments (RWQCB, 2006). The source for these finer sediments is found from a variety of land use, infrastructure, and in-stream erosion sediment sources. The role of dams in trapping sediment (predominantly course materials) has not significantly reduced the degree to which finer sediments are being delivered to the watershed. As a result of this fine sedimentation, habitats for three species that rely more on gravel substrate in the river (steelhead, Chinook salmon, and Californian freshwater shrimp) have been negatively affected through reduced gravel permeability (see Section 4.6, Fisheries, for further details regarding fishery resources in the County). The San Francisco Bay Regional Water Quality Control Board has adopted an amendment to the Basin Plan that includes a total maximum daily load (TMDL) for the Napa River calling for substantial reductions in the amount of fine sediment input from the watershed to improve the water quality and beneficial use of the river, including the spawning and rearing habitat for salmonid species.

Temperature

The Napa River exhibits naturally warm waters compared to rivers in the Pacific Northwest. Consequently, salmonids residing in the Napa River Watershed may have adapted to warmer conditions than those observed elsewhere in their population range. Temperature monitoring concluded that mainstem and tributary temperatures are elevated to a level, which can cause stress to salmonids, but not high enough to be acutely lethal. Elevated temperature conditions contribute to reduced habitat conditions for salmonids, particularly when combined with low summer base flows and aggraded channels. The issue of temperature and low summer flow conditions for the Napa River has been identified in the June 30, 2006 RWQCB San Francisco Bay Region Napa River Sediment Total Maximum Daily Load Staff Report. The reader is referred to Section 4.6 (Fisheries) regarding further discussion of habitat requirements of fisheries.

Nutrients

The Napa River is identified as impaired by nutrient loading according to Section 303(d) of the Clean Water Act, as discussed above in the Policy Considerations section. A study of potential sources of nutrients within the watershed identified numerous nutrient load contributors, including point sources such as wastewater treatment plants, and non-point sources such as septic system seepage, agricultural and urban runoff, and atmospheric deposition. As of the date of this document, the RWQCB has not established specific numeric nutrient targets for the Napa River Watershed. However, improved land management practices and upgraded sewage disposal systems would potentially reduce nutrient loads and therefore improve aquatic habitat in the watershed.

Pathogens

High concentrations of fecal bacteria have been observed in the Napa River since the 1960s. Consequently, the SFRWQCB identified the Napa River as impaired by excessive fecal bacteria according to Section 303(d) of the Clean Water Act. The following sources have been associated as contributors of significant pathogen loads in the watershed: faulty on-site sewage treatment systems (septic systems); failing sanitary sewer lines; municipal runoff; cattle grazing; confined animal facilities, municipal wastewater treatment facilities and wildlife.

The general trend in past monitoring efforts indicates that urban runoff and failing septic systems are the primary pathogen source during wet weather months, while failing sanitary sewer lines and septic tanks may constitute the primary pathogen sources during the dry season. The San Francisco Bay RWQCB adopted an amendment to the Water Quality Plan San Francisco Bay Basin (Basin Plan) that established the TMDL and numeric targets for pathogens as well as an implementation plan.

GROUNDWATER RESOURCES

Groundwater Supply and Principal Basins

The major aquifers of the County are the North Napa Valley Groundwater Basin (NNVB) with an estimated usable storage volume of approximately 190,000 acre-feet (ac-ft) and a safe yield of 22,500 ac-ft annually, and the Milliken-Sarco-Tulocay Basin (MST) with an estimated usable storage volume of approximately 200,000 ac-ft (an ac-ft can be visualized as water a foot deep covering an area about the size of a football field) and a safe yield of less than 5,400 ac-ft annually (Napa County Flood Control and Water Conservation District, 1991) . Smaller aquifers include the Carneros Groundwater Basin (CB) and small basins within the Putah Creek subbasin and the Lake Berryessa Basin (consisting of Pope and Capell Valleys). Storage estimates for many of these smaller basins do not exist; however, Napa County Flood Control and Water Conservation District (1991) estimates that the CB has a usable storage volume of less than 3,000 ac-ft and a safe yield of less than 300 acre-feet annually, while the Lake Berryessa Basin has an estimated usable storage of 7,700 acre-feet and a safe yield of less than 400 ac-ft annually. **Figure 4.11-6** shows the primary groundwater basins in Napa County.

Groundwater Recharge

Recharge to the alluvial aquifers occurs primarily by direct infiltration of precipitation and to a lesser extent by the application of applied water from irrigation and infiltration through the stream and lake beds. In the NNVB, average annual recharge between 1962 and 1989 was on the order of 26,800 ac-ft/ yr. Due to the dominance of precipitation as the mechanism for recharge, variations in annual recharge rates are strongly correlated with variations in annual precipitation.

Groundwater recharge in the tuffaceous volcanic rocks occurs primarily from infiltration through the stream and lake beds and subsurface inflows from outside the groundwater basins. Also contributing to the recharge but less significantly is the recharge associated with direct infiltration of precipitation and applied water from irrigation. In the MST Basin, annual recharge is on the order of 5,400 ac-ft/yr, with 3,050 ac-ft/yr derived from streambed infiltration, 2,100 ac-ft/yr derived from subsurface inflow from the Howell Mountains, and 250 ac-ft/yr derived from direct infiltration of precipitation.

In both the alluvial aquifers and tuffaceous volcanic aquifers, applied water from irrigation is a relatively minor component of the total recharge due to the dominance of vineyard growth as the primary agriculture in the County and the efficiency of the irrigation techniques used in vineyard cultivation.

Groundwater Basin Overview

This section provides a brief overview of the three largest groundwater basins in the County: North Napa Valley, Milliken-Sarco-Tulocay, and Carneros (see **Figure 4.11-6**) (Napa County, BDR 2005).

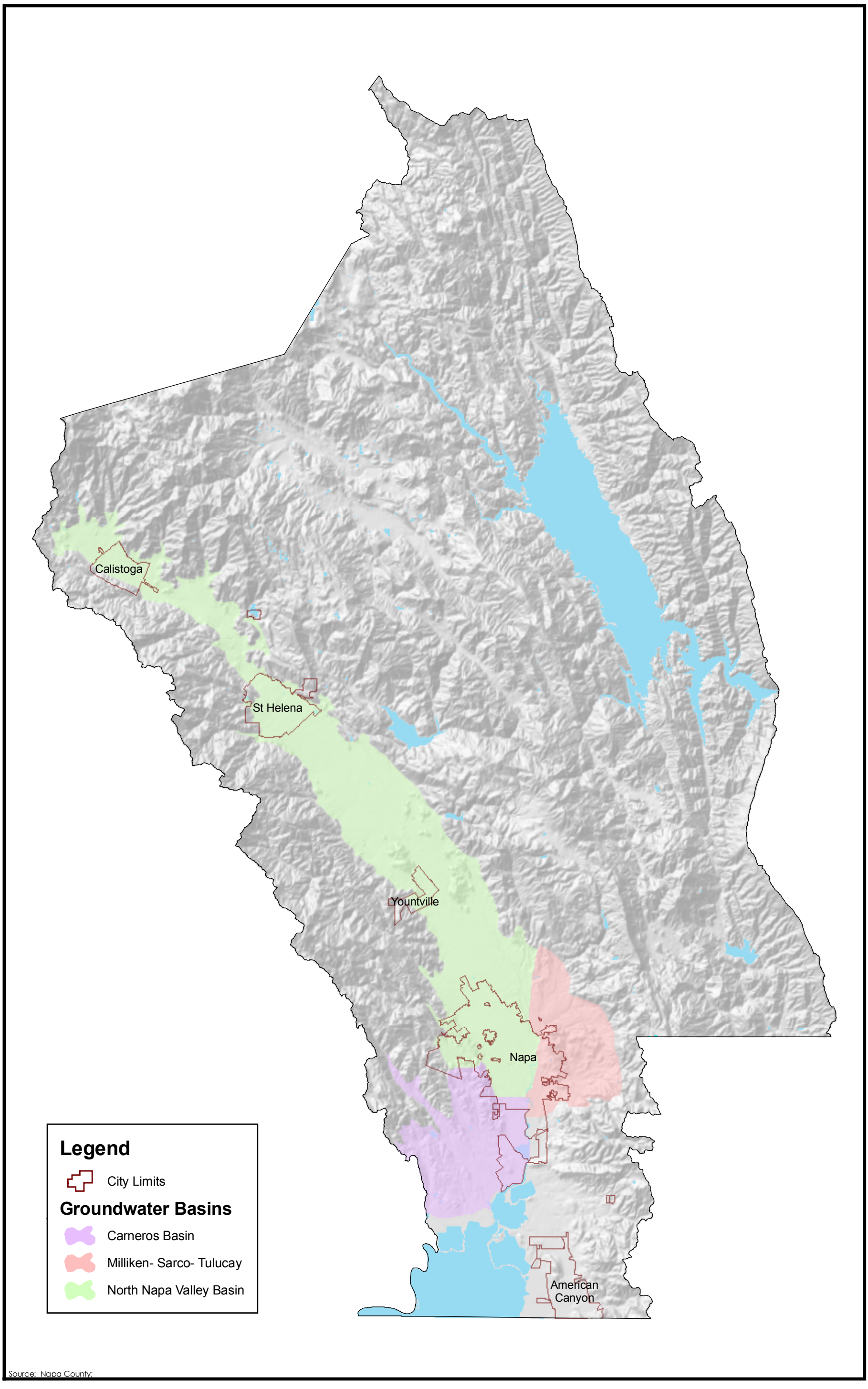

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FIGURE 4.11-6
THREE LARGEST GROUNDWATER BASINS IN NAPA COUNTY

PMC

North Napa Valley Basin

The largest groundwater basin in the County is the North Napa Valley Basin (NNVB). The NNVB extends from just north of the City of Napa up the valley floor to the northwestern end of the valley just north of the City of Calistoga covering and an area of approximately 60 square miles. By far the most productive aquifer in the basin occurs within the alluvial material, which can locally provide water to wells at rates in excess of 3,000 gallons per minute (gpm). This aquifer is an unconfined aquifer in most locations except locally where clay lenses lead to confined conditions. A tuffaceous member of the Sonoma Volcanics, which underlies the alluvium, composes an additional aquifer in the basin, and wells tapping this aquifer yield water at an average rate of 32 gpm. Groundwater in this aquifer occurs under both confined and unconfined conditions.

Groundwater in both the alluvial aquifer and the tuffaceous volcanic aquifer in the North Napa Valley Basin occurs at depths ranging from approximately 50 to 300 feet below land surface. Water-table elevation maps indicate groundwater flow in the basin occurs from the valley edges toward the valley axis, as well as southward toward San Pablo Bay. These general flow patterns are modified locally by faults along the valley floor; however, the only fault that has been documented to obstruct flow in the basin is the Soda Creek fault. Water-level data collected indicates that significant drawdowns have not occurred within the NNVB, and the aquifer has been generally in a state of dynamic equilibrium (moderate variation around a mean value) (West Yost & Associates, 2005).

Milliken-Sarco-Tulocay Basin

The MST Basin is the second largest groundwater basin in the County. It is located adjacent to the City of Napa along the eastern edge of the valley floor and covers an area of approximately 15 square miles. The area is distinct from the NNVB because of the high-yielding nature of the Sonoma Volcanics to the east of the Soda Creek fault. To the west of the fault, alluvium is the primary waterbearing material and to the east of the fault, the volcanics are the primary water-bearing material. Groundwater in the basin occurs primarily under confined conditions within tuffaceous units of the Sonoma Volcanics.

Water levels in the tuffaceous rocks of the Sonoma Volcanics in the MST Basin range from 10 to 500 feet below ground surface. Cones of depression are formed around the largest groundwater pumping centers in the basin, and the predominant directions of groundwater flow are from areas of recharge around the margins of the basin toward the various cones of depression (USGS, 1977). In contrast to the NNVB, water levels in the MST Basin have been gradually declining since at least the 1960s and probably since the early 1900s, when groundwater in many of the wells occurred under artesian conditions. Over the period between 1975 and 2001, groundwater levels declined by as much as 125 ft in many portions of the basin, while in other areas levels were relatively unchanged or even increased by as much as 50 ft. The observed declines in water levels are likely the result of groundwater pumping activities in the basin. In addition to these long-term trends in water levels, seasonal fluctuations in water levels by as much as 50 ft occur as a result of variable recharge rates, due to seasonal changes in streamflow and precipitation, variations in evapotranspiration rates, and differences in groundwater pumping rates. As a result of declining groundwater levels, the MST Basin is designated as groundwater deficient by the County and is subject to special controls under its Groundwater Ordinance.

Carneros Basin

The Carneros Basin (CB) is located in the southwestern portion of Napa County and very little hydrologic or hydrogeologic information is available for the region. The valley floor consists of alluvium and is underlain by Pleistocene Huichica Formation, which in turn is underlain by the Sonoma Volcanics. The alluvium in this area is generally very thin with much of its volume located above the saturated zone (Napa County Flood Control and Water Conservation District 1991). As a result, the Huichica Formation is the primary water-bearing material in the basin. No estimates of storage were found for the basin; however, lower well yields indicate that storage is probably much less than in the two previously described basins.

In the Carneros Basin, groundwater occurs primarily under unconfined conditions and at relatively shallow depths in the basin; however, no water-table maps were found for the basin, making it difficult to specify depths to water and predominant directions of groundwater flow.

Groundwater Quality

Groundwater is potentially important for maintaining base flows and low temperatures in the Napa County Rivers and tributaries. The detailed interaction of groundwater and surface water along the Napa County Rivers should not be separated from the basin scale hydrological impacts of groundwater resources exploitation and land use.

Groundwater in the Napa County watershed discharges to the river as a function of local, water level gradients between the aquifer system and the river. The river may only partially penetrate a multi layer aquifer system depending on variations in layer thicknesses and cross sections properties along the river reaches. Localized groundwater discharges to the stream are likely to affect the local stream temperature and a high degree of spatial distribution should be included.

The temperature of groundwater is in most cases approximately constant or exhibits a weak seasonal variation. Although possible it is neither feasible nor deemed necessary to simulate the energy balance for the aquifer system in order to derive groundwater temperature. A user defined global or distributed time series at basin scale or sub-basin scale may be assigned to estimate time varying groundwater heat fluxes to the river. The heat flux time series can be established from available measurements of groundwater temperature, from literature, and as part of calibration.

4.10.2 REGULATORY FRAMEWORK

FEDERAL

Federal Flood Insurance Program

Congress, alarmed by increasing costs of disaster relief, passed the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. The intent of these acts is to reduce the need for large publicly funded flood control structures and disaster relief by restricting development on floodplains.

The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program (NFIP) to provide subsidized flood insurance to communities that comply with FEMA regulations limiting development on floodplains. FEMA issues Flood Insurance Rate Maps (FIRMs) for communities participating in the NFIP. FIRMs delineate flood hazard zones in the community.

Executive Order 11988

Executive Order 11988 (*Floodplain Management*) addresses floodplain issues related to public safety, conservation, and economics. It generally requires federal agencies constructing, permitting, or funding a project in a floodplain to do the following.

- Avoid incompatible floodplain development.
- Be consistent with the standards and criteria of the NFIP.
- Restore and preserve natural and beneficial floodplain values.

U.S. Bureau of Reclamation

The U.S. Bureau of Reclamation (USBOR) built Monticello Dam on Putah Creek, which forms Lake Berryessa. The dam is now owned by USBOR and operated by the Solano Irrigation District, although USBOR is responsible for managing visitor services on the Lake.

Clean Water Act

The Clean Water Act (CWA) regulates the water quality of all discharges into waters of the United States including wetlands, perennial and intermittent stream channels. Section 401, Title 33, Section 1341 of the CWA sets forth water quality certification requirements for "any applicant applying for a federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters." Section 404, Title 33, Section 1344 of the CWA in part authorizes the U.S. Army Corps of Engineers to:

- Set requirements and standards pertaining to such discharges: subparagraph (e);
- Issue permits "for the discharge of dredged or fill material into the navigable waters at specified disposal sites": subparagraph (a);
- Specify the disposal sites for such permits: subparagraph (b);
- Deny or restrict the use of specified disposal sites if "the discharge of such materials into such area will have an unacceptable adverse effect on municipal water supplies and fishery areas": subparagraph (c);
- Specify type of and conditions for non-prohibited discharges: subparagraph (f);
- Provide for individual State or interstate compact administration of general permit programs: subparagraphs (g), (h), and (j);
- Withdraw approval of such State or interstate permit programs: subparagraph (i);
- Ensure public availability of permits and permit applications: subparagraph (o);
- Exempt certain Federal or State projects from regulation under this Section: subparagraph (r); and,
- Determine conditions and penalties for violation of permit conditions or limitations: subparagraph (s).

Section 401 certification is required prior to final issuance of Section 404 permits from the U.S. Army Corps of Engineers.

The California State Water Resources Control Board and RWQCBs that enforce State of California statutes are equivalent to or more stringent than the Federal statutes. RWQCBs are responsible for establishing water quality standards and objectives that protect the beneficial uses of various waters including Morrison Creek, and other creeks in the Planning Area. In the Planning Area the RWQCB is responsible for protecting surface and groundwaters from both point and non-point sources of pollution. Water quality objectives for all of the water bodies within the Planning Area were established by the RWQCB and are listed in its Basin Plan.

Total Maximum Daily Loads

Under CWA Section 303(d) and California's Porter-Cologne Water Quality Control Act of 1969 (discussed below), the State of California is required to establish beneficial uses of state waters and to adopt water quality standards to protect those beneficial uses. Section 303(d) establishes the Total Maximum Daily Load (TMDL) process to assist in guiding the application of state water quality standards, requiring the states to identify waters whose water quality is "impaired" (affected by the presence of pollutants or contaminants) and to establish a TMDL or the maximum quantity of a particular contaminant that a waterbody can assimilate without experiencing adverse effects on the beneficial use identified. TMDLs are generally stakeholder driven processes that involve investigation of sources and their loading (pollution input), make load allocations, and identify an implementation plan and schedule. Where stakeholder processes are not effective, TMDLs can be established by the RWQCBs or the EPA. TMDLs specific to Napa County are discussed in more detail above and below.

National Pollutant Discharge Elimination System

The County is a co-permittee on an MS4 municipal stormwater NPDES permit along with the cities of Napa, St. Helena, and Calistoga, and the town of Yountville. A SWMP in support of the County's stormwater management program was completed in 2003, which outlines the County's approach to compliance with the requirements of the NPDES permit and addresses the program areas required under the MS4 permit. It also includes a voluntary water quality monitoring program. The program is funded through a Joint Powers Authority administered by the Napa County Flood Control and Water Conservation District. Stormwater is also managed under Napa County Ordinance 1240, Stormwater Management and Discharge Control, administered by the Napa County Department of Public Works. (See also http://www.co.napa.ca.us/GOV/Departments/Dept Page.asp?DID=17500&LID=1098.)

STATE

Surface Water Rights

Surface water rights are administered through the State Water Resources Control Board (SWRCB). Two main types of water rights exist in California law: riparian and appropriative.

Riparian Rights

Riparian water rights are associated with property adjacent to a watercourse. Owners of such properties are allowed to use naturally flowing water from the watercourse (i.e., not including any artificial or augmented flows) for reasonable and beneficial uses. The riparian right only applies to use of water from the watercourse on the portion of the subject property that drains

to the watercourse in question, and riparian water rights cannot be stored or transferred off of this portion of the property. Lands severed from a riparian parcel (e.g., land subdivision) do not continue to have riparian rights.

No permit is required from the SWRCB to establish or maintain a riparian water right; however, a Statement of Diversion is required to be reported to the SWRCB. This statement provides the water right holder with documented standing in disagreements regarding priorities and supply cutbacks during a shortage.

Riparian rights are generally senior to appropriative rights (discussed below), and unlike an appropriative right, are not lost (forfeited) by non-use. Riparian right holders do not have priorities with respect to one another, and each holder has a right to a reasonable share of the total riparian water available.

Appropriative Rights

Appropriative rights are water rights granted for diversions (and transfers) of water to non-riparian land (lands not adjacent to a watercourse) for reasonable and beneficial uses, including storage. Appropriative rights are subject to a seniority system, commonly referred to as "first in time, first in right," where the appropriative right holder with the longest standing right has first priority to water in a shortage. Appropriative water rights must be perfected (legitimized), and non-use results in loss of the appropriated right. There are two types of appropriative rights: pre-1914 and post-1914 appropriative rights.

Pre-1914 Appropriative Rights. California's current permit system of appropriative water rights was established in 1914. Appropriative water rights established prior to 1914 are not subject to the permitting authority of the SWRCB, and hence do not need approvals from the SWRCB for transfers or changes in place or purpose of use. Changes in the point of diversion, however, remain subject to SWRCB approval.

Post-1914 Appropriative Rights. Since 1914, appropriative rights have been subject to the permitting authority of the state. Today, SWRCB issues and administers these permits, which specify the quantity, place, and purpose of use, as well as the point of diversion. SWRCB approval is required for any changes to the above, as well as for water transfers, and the agency may attach conditions to its permits and approvals to protect other water rights holders and public trust resources (e.g., fish and wildlife).

Groundwater Rights

Groundwater rights in California are similar to surface water rights (see Chapter 15, Surface Water Hydrology, of the BDR); however, no permit system or comprehensive regulatory method exists. The exception is groundwater deemed to be part of a subterranean stream or underflow that is hydraulically connected to a surface water body. In such cases, the source is classified as surface water and remains subject to the permitting authority of the State Water Resources Control Board (SWRCB) (discussed in detail in Chapter 15). Groundwater law is primarily expressed through previous legal decisions, and disputes among groundwater users are usually settled through judicial actions or adjudications. There are two main types of groundwater rights: overlying and appropriative.

Overlying Rights

Overlying rights apply to parcels that overlie a groundwater basin. Overlying rights are analogous to riparian rights for surface water. Overlying users do not have priorities with respect to one another, and each holder has a right to a reasonable share of the total groundwater supply available. Overlying rights may be active or dormant, and are generally senior to appropriative rights (defined below). Note that water devoted to public uses (e.g., municipal water supply systems) is considered in most cases to be an appropriative use, rather than an overlying use, regardless of the location of the water use with respect to the aquifer.

Appropriative Rights

Appropriative rights apply to groundwater extractions used on lands that do not overlie the aquifer in question. Appropriate rights are analogous to appropriative rights for surface water. Appropriative rights are protected by the construction and use of a well, and putting the pumped water to reasonable and beneficial use. These rights are subject to a seniority system, where the appropriative right holder with the longest standing right has first priority to groundwater in a condition of shortage.

Dam Safety and Operation

Dam safety in California is administered by the Department of Water Resources, Division of Safety of Dams (DSOD). DSOD reviews plans and specifications for the construction of new dams or for the enlargement, alteration, repair, or removal of existing dams, as well as performs inspections during dam construction and operation. A water rights permit from the SWRCB is required prior to filing an application to the DSOD to construct a dam.

Porter-Cologne Water Quality Control Act

The Porter-Cologne Water Quality Act governs the coordination and control of water quality in the state, and includes provisions relating to non-point source pollution. The California Coastal Commission, pursuant to the coastal act, specified duties regarding the federally approved California Coastal Management Program. This law requires that the State Water Resources Control Board, along with the California Coastal Commission, regional boards, and other appropriate state agencies and advisory groups, prepare a detailed program to implement the state's non-point source management plan on or before February 1, 2001. The law also requires that the state board, in consultation with the Commission and other agencies, submit copies of prescribed state and regional board reports containing information related to non-point source pollution, on or before August 1 of each year.

Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bay, and Estuaries of California

The State Implementation Program (SIP) (State Water Resources Control Board 2000) established new standards for a variety of toxic pollutants. This state policy for water quality control applies to discharges of toxic pollutants into California's inland surface waters, enclosed bays, and estuaries, subject to regulation under the Porter-Cologne Water Quality Control Act and the federal CWA. Such regulation may occur through the issuance of NPDES permits, the issuance or waiver of WDRs, or other regulatory approaches.

The goal of the SIP is to establish a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters in a manner that promotes statewide consistency. The

SIP is a tool to be used in conjunction with watershed management approaches and, where appropriate, the development of TMDLs to ensure that water quality standards are met and the beneficial uses are protected.

The SIP establishes implementation provisions for priority pollutant criteria promulgated by the EPA through the National Toxics Rule and the California Toxics Rule (CTR), and for priority pollutant objectives established by the RWQCBs in their respective basin plans. The state must use these criteria together with the state's existing water quality standards when controlling pollution in inland waters and enclosed bays and estuaries. California's RWQCBs are currently considering whether to include CTR standards in their Basin Plans as a streamlining measure.

Drinking Water Standards

Title 22 of the California Code of Regulations (CCR) outlines drinking water standards in the State of California. Maximum contaminant levels (MCLs) for various contaminants are identified, and are made enforceable regulatory standards under the federal Safe Drinking Water Act. MCL standards must be met by all public drinking water systems to which they apply. Primary MCLs can be found in 22 CCR Sections 64431–64444. Specific regulations for lead and copper are in 22 CCR Section 64670 et seq. Secondary MCLs that address the taste, odor, and appearance of drinking water are found in 22 CCR Section 64449.

Reclaimed Water Standards

Title 22 of the California Code of Regulations (CCR) outlines reclaimed water standards in the State of California, and reclaimed water is primarily regulated by the California Department of Health Services (DHS), in coordination with the RWQCBs.

DHS has produced The Purple Book, which contains California health laws related to reuse of disinfected tertiary recycled water. Disinfected tertiary recycled water is defined as filtered and subsequently disinfected wastewater that exhibits extremely low levels of coliform bacteria and turbidity. This publication identifies allowable uses for disinfected tertiary recycled water, as well as limitations and requirements for the use and control of recycled water.

Disinfected tertiary treated effluent may be used for groundwater recharge of domestic water supply aquifers by surface spreading provided the effluent is of a quality that fully protects human health at all times. For groundwater recharge projects, DHS make recommendations to the RWQCB based on the relevant aspects of the project, including effluent quality and quantity, spreading area operations, soil characteristics, hydrogeology, residence time, and distance to withdrawal.

As described below, Napa Sanitation District provides recycled water for various uses in the County during the dry season.

California Fish and Game Code Sections 1601-1607 (Lake or Streambed Alteration Agreement Program)

Under Sections 1601–1607 of the California Fish and Game Code, the California Department of Fish and Game (DFG) regulates projects that affect the flow, channel, or banks of rivers, streams, and lakes. Sections 1601 and 1603 require public agencies and private individuals, respectively, to notify and enter into a streambed or lakebed alteration agreement with DFG before beginning construction of a project that will have either of the following results.

- Divert, obstruct, or change the natural flow or the bed, channel, or bank of any river, stream, or lake.
- Use materials from a streambed.

Section 1601 contains addition prohibitions against the disposal or deposition of debris, waste, or other material containing crumbled, flaked, or ground pavement where it can pass into any river, stream, or lake.

Sections 1601–1607 may apply to any work undertaken within the 100-year floodplain of any body of water or its tributaries, including intermittent stream channels. In general, however, it is construed as applying to work within the active floodplain and/or associated riparian habitat of a wash, stream, or lake that provides benefit to fish and wildlife. Sections 1601–1607 typically do not apply to drainages that lack a defined bed and banks, such as swales, or to very small bodies of water and wetlands such as vernal pools.

Impaired Water Bodies in Napa County

The SWRCB, in compliance with the CWA, Section 303(d) has prepared a list of impaired water bodies in the State of California (State Water Resources Control Board 2003). As mentioned above, the Napa River and its tributaries have been listed as water quality impaired for nutrients, pathogens, and sedimentation/siltation. The Putah Creek Watershed/Lake Berryessa is listed as water quality impaired for mercury. San Pablo Bay, into which the Napa River drains, has been listed as impaired for chlordane, DDT, diazinon, dieldrin, dioxins and furans, exotic species, mercury, nickel, PCBs, and selenium. The TMDLs for the Napa River are currently under development. The San Francisco Bay Regional Water Quality Control Board has adopted an amendment to the Basin Plan that includes a total maximum daily load (TMDL) for the Napa River calling for substantial reductions in the amount of fine sediment input from the watershed to improve the water quality and beneficial use of the river, including the spawning and rearing habitat for salmonid species.

Napa River Nutrient TMDL

The San Francisco Bay RWQCB is in the process of developing a TMDL for nutrients in the Napa River basin. The process to date has involved use of a watershed-based scientific approach and study to assess the nature and degree of impairment and evaluate nutrient inputs and sources. The proposed TMDL would include amendment to the Basin Plan.

Napa River Pathogens TMDL

The San Francisco Bay RWQCB adopted an amendment to the Water Quality Plan San Francisco Bay Basin (Basin Plan) that established the TMDL and numeric targets for pathogens as well as an implementation plan in November 2006. This amendment established pollutant load allocations for pathogens (E. coli, fecal coliform and total coliform) as well as identified implementation measures for on-site sewage disposal systems, sanitary sewer systems, grazing lands, confined animal facilities, municipal runoff and municipal wastewater discharges as part of the implementation plan.

Napa River Sediment TMDL

The Napa River TMDL for sediment is on a parallel path with the TMDL for pathogens. A project report was released in June 2005 that identified pollutant sources, numeric targets, load

allocations, and an implementation plan (San Francisco Bay Regional Water Quality Control Board 2005b). The June 30, 2006 RWQCB San Francisco Bay Region Napa River Sediment Total Maximum Daily Load Staff Report provides the scientific basis of the TMDL, a framework for discussion of implementation actions that may be needed to resolve sediment impairment and enhance steelhead and salmon populations within the Napa River Watershed. In January 2007, the RWQCB adopted an amendment to the Basin Plan that includes a total maximum daily load (TMDL) for the Napa River.

LOCAL

Napa County Provisions

Napa County Conservation Regulations

Napa County conservation regulations (County Code Chapter 18.108) address erosion control and protection of the County's streams and waterways. The intent of these regulations is to protect lands from excessive soil loss and maintain or improve water quality of watercourses by minimizing soil erosion from earthmoving, land disturbing and grading activities. The following are key provisions of the conservation regulations.

Section 18.108.100 – Erosion Hazard Areas; Vegetation Preservation and Management

Discretionary permits, and in some cases administrative permits, for projects in the County's jurisdiction on slopes greater than 5 percent are subject to a number of conditions, requiring the preservation of existing vegetation wherever feasible and where necessary for the preservation of threatened plant or animal species; and in some cases, no removal of trees 6 inches or more in diameter at breast height without authorization and replacement; and re-vegetation of graded/disturbed areas.

Napa County Code 18.108.100 may require the following conditions when granting a discretionary permit for activities on slopes greater than 5 percent:

- Existing vegetation shall be preserved to the maximum extent feasible. Vegetation shall not be removed if necessary for erosion control or preservation of habitat for threatened or endangered species.

- An approved erosion control plan (ECPA) permit or grading permit is required for the grading associated with the removal of trees or tree stands measuring six inches in diameter (dbh) or larger. Replacement of removed protected trees located outside of the approved project boundary may be required. Trees to be avoided by project activities shall be protected through fencing or other methods during construction.

Section 18.108.025 – General Provisions, Intermittent/Perennial Streams

This section of the County code establishes stream setbacks for earthmoving activities and grading for all new developments, including agricultural and residential developments, and for replanting of existing vineyards when replanting occurs outside of the existing vineyard footprint and when the project would require a grading permit pursuant to the California Building Code.

Under Section 18.108.030 a stream means any of the following:

- A watercourse designated by a solid line or dash and three dots symbol on the largest scale of the United States Geological Survey maps most recently published, or any replacement to that symbol.

- Any watercourse which has a well-defined channel with a depth greater than 4 feet and banks steeper than 3:1 (horizontal to vertical bank ratio) and contains hydrophilic (i.e. water adapted) vegetation, riparian vegetation or woody vegetation including tree species.

- Those watercourses listed in Resolution No. 94-16 and incorporated herein by reference.

Setbacks included in the Code range from 35 to 150 feet and are dependent on the slope of the terrain parallel to the top of bank of the stream, with wider setbacks required on steeper slopes. Where the outboard dripline of upper canopy vegetation is located outside the setback required by the slope steepness, the setback will extend to the outboard dripline. Re-vegetation of portions of the streamside setbacks may be required as a part of an erosion control plan.

Section 18.108.027 – Sensitive Domestic Water Supply Drainages

This section of the County code requires the maintenance/preservation of 60% tree canopy cover and 40% of shrubby and herbaceous cover present as of 1993 as part of land uses involving ground disturbance in sensitive domestic water supply drainages.

Ground-disturbing activities in the County's Domestic Water Supply Drainages are only allowed to take place during the dry season, between April 1 and September 1 of each year. Installation of winterization measures may take place during other times of the year, but must be in place by September 15 of any given year.

Napa County's Domestic Water Supply Drainages include the entire watershed areas associated with the following reservoirs (not sure where these acreages came from, revised acreages are from most recent GIS drainage layer):

- Kimball Reservoir Drainage
- Rector Reservoir Drainage
- Milliken Reservoir Drainage
- Bell Canyon Reservoir Drainage
- Lake Hennessey Drainage including Friesen Lakes
- Lake Curry Drainage
- Lake Madigan Drainage

In these Sensitive Domestic Water Supply Drainages concentration of runoff will, wherever feasible, be avoided. Those drainage facilities and outfalls that unavoidably must be installed are required to be sized and designed to handle the runoff from a one-hundred-year storm event without failure or unintentional bypassing. If a project will increase delivery of sediment or other pollutants from a drainage into a public water supply (reservoir) by more than 1% on an individual project basis or by more than 10% on a cumulative basis, the project will not be approved until a public hearing on the matter has been held and a use permit has been issued. A geotechnical report specifying the depth and nature of the soils and bedrock present and the stability of the area potentially affected by the project or project runoff is required for any project located in a Sensitive Domestic Water Supply Drainage.

Section 18.108.070 – Erosion Hazard Areas–Use Requirements

This section of the code stipulates that uses permitted within erosion hazard areas, those portions of land having slopes over five percent (5%), must include temporary and/or permanent erosion control measures in conformance with the County's National Pollution Discharge Elimination System (NPDES) General Permit on file with the state (i.e., a suite of Best Management Practices to eliminate, control and or minimize sediment/soil particle detachment and transport). The section further requires erosion control plan approval for agricultural earthmoving activity on lands having slopes greater than 5%, and establishes grading deadlines (i.e., a winter shutdown period).

Additionally, this section, together with Chapter 18.108.100, limits the removal of vegetation in erosion hazard areas to only that necessary to accommodate the proposed project, sets conditions for the preservation and/or replacement of trees in excess of six inches in diameter, and requires projects to have no adverse affect on sensitive, rare, threatened of endangered plants or animal or their habitats as designated by state or federal agencies with jurisdiction, and mapped on the County's environmental sensitivity maps.

Section 18.108.075 – Requirements for Structural Erosion Control Measures

This section establishes erosion control requirements for structural developments (anything built or constructed on, above, or below the surface of the land), and requires the submission of Evidence of Erosion Control Measures, and the incorporation of such measures in all applicable building, grading, septic, or other required plans or plot plans submitted for County approval.

Section 18.108.135 – Oversight and Operation Requirements

Maintenance and monitoring is a requirement of any erosion control plan and is the ultimate responsibility of the property owner. Section 18.108.135 requires that maintenance and monitoring be implemented for any erosion control plan and includes the following components:

- Implementation of the ECP measures must be overseen by the preparer of the ECP.
- The property owner must provide weekly inspections of the control measures between October 1st and April 1st of each year, as well as during rainfall events, to assure the measures are installed properly and are effective in controlling offsite sediment transport, and to implement whatever actions are needed to keep them functioning properly.
- The property owner must implement a permanent, on-going self-monitoring program of the groundcover conditions and erosion control facility operations. The groundcover
- monitoring shall conform to the NRCS standards for determining rangeland conditions.
- The property owner must submit to the County an Annual Erosion Control Plan Operation Status Report that specifies the groundcover conditions and how the erosion control measures are operating. The report shall specify the proposed management and cultural measures to be used the following year to return or maintain the ground cover in optimal condition and any other remedial actions necessary to restore the disturbed areas in such a manner to minimize erosion and resultant sedimentation.

Specific actions are required under Napa County Code Section 18.108.135 in the event of existing or pending erosion control measure failures. These actions include:

- Issuance of notification to the County;
- Implementation of temporary measures to stabilize the situation;
- Modification of the temporary measures, if necessary, within 24-hours of receipt of County comment on the adequacy of temporary measures;
- Submit an engineered plan for measures needed to permanently correct the problem within 96 hours of the discovery;
- Submit a plan for clean-up of the damage done with and engineer's estimate of the cost of cleanup;
- Submit, if necessary, a modified plan and cost estimate for the problem within 48 hours of receipt of County comments on the adequacy of the plan;
- Pay the County the cost of review within 48 hours of request;
- Post a security in the amount of 100 percent of the total cost to correct the problem and cleanup the damage; and,
- Insure the final correction and cleanup plans are implemented within 96 hours of its approval.

Finally, to assure the erosion control measures are adequately in place, the County may perform annual inspections of the project site, after the first major storm event of each winter and until the project has been completed and stable for three years. During these inspections, County staff may require that remedial actions be implemented where non-functioning or ineffective measures are identified. Additionally, once the project has been deemed complete, random site inspections by County staff may also occur with the same consequences.

Chapter 16.04 – Floodplain Management

Floodplain management provisions regulate a variety of activities, including the alteration of natural floodplains, stream channels, and natural protective barriers, which help accommodate or channel floodwaters. Floodplain management provisions seek to preserve riparian vegetation to preserve fish and wildlife habitat; prevent or reduce stream-bank erosion; maintain cool water temperatures for fish; prevent or reduce siltation; and promote wise uses and conservation of woodland and wildlife resources of the county. All development activities within riparian zones (50 feet beyond the top of streambanks, or 100 feet beyond the top of the Napa River banks downstream of Zinfandel Lane) must be permitted. Development activities include substantial improvements to a structure. Section 16.04.750 sets restrictions on the type and amount of riparian vegetation that may be removed within the riparian zone, and prohibits locating structures within 10 feet of the top of the bank, as well as leaving slopes unprotected.

Groundwater Ordinance

The Napa County Board of Supervisors adopted a groundwater ordinance in 1996 (County Code Chapter 13.15), revised in 2003, to regulate the extraction, use, and preservation of the County's groundwater resources. Compliance with this ordinance applies to development of new water systems or improvements to an existing water system that may use groundwater. The ordinance contains specific requirements for agricultural land development or re-development activities located on parcels within groundwater deficient areas. The ordinance identifies issuance of groundwater permits based on three types of applications exempt, ministerial, and required and the process by which compliance with the ordinance is determined. Applications for a groundwater permit require identification of existing and future uses of any existing water system which is supplied by groundwater, potential alternative water sources, the number of existing and future connections, intent of groundwater use, and an assessment of the potential impacts to the affected groundwater basin. Because groundwater resources are highly valued in the County, further guidance for activities conducted within the MST groundwater deficient area have been developed, as detailed below.

Guidelines for Projects within the Milliken-Sarco-Tulocay Groundwater Deficient Area

The Milliken-Sarco-Tulocay area is a groundwater deficient area. Due to the sensitive nature of the MST groundwater basin, the County requires special consultation to determine the need for a groundwater permit. This particularly applies to construction projects, erosion control plans for new or expanded agricultural projects, and new or expanded wineries that intend to use groundwater from the MST basin. Depending on the governing authority (either the Environmental Management or Conservation Development and Planning Department), the appropriate department will determine which of the following three situations is applicable to the proposed project and its potential effect on the MST groundwater basin.

No groundwater permit is required. A groundwater permit would not be required if agricultural land development is less than or equal to a 0.25 acre, for additions or alterations to existing dwellings, or for swimming pools that are not filled with water from the MST.

A ministerial groundwater permit is required. Ministerial groundwater permits for new residential units and agricultural land re-development require compliance with water use conditions. For new residential units, the total amount of water used on the parcel must be less than 0.6 acre-feet per year (ac-ft/yr). Re-development of agricultural land must limit the total water use on the parcel to an average of 0.3 acre feet per acre per year calculated as an average over a three-year period, with no yearly use exceeding the total average by more than 15 percent. All water use must be reported to the Department of Public Works under both types of development where a ministerial groundwater permit is issued.

A groundwater permit is required. Groundwater permits are issued upon compliance with the "no net increase" and "fair share" standards. The "no net increase" standard encourages applicants to reduce their impact on the MST by giving up an existing groundwater use, changing practices to reduce consumption, or by importing water from outside the MST (only applies for agricultural activities). If the additional water required by the proposed use would not meet the "no net increase" standard, the Planning Department or applicant must conduct a California Environmental Quality Act (CEQA) review to assess the potential environmental impacts of the proposed use. Additionally, the proposed use must comply with the "fair share" standard that no more than 0.3 acre-feet (ac-ft) of groundwater per acre of land owned are used.

Napa County Flood Control and Water Conservation District

The Napa County Flood Control and Water Conservation District (NCFCWCD) is governed by a board of eleven elected officials: the five Napa County Supervisors; the Mayors of Napa, St. Helena, American Canyon, Yountville, and Calistoga; and one Napa City Council member. As mentioned above, the NCFCWCD's mission is the conservation and management of flood and storm waters to protect life and property; the maintenance of the County watershed using the highest level of environmentally sound practices; and the provision of coordinated planning for water supply needs of the community. Additionally, while the NCFCWCD is primarily charged with flood protection in the County, it also provides management and monitoring of groundwater, and assistance to the community in complying with NPDES requirements, and watershed maintenance activities among other services. (See also http://www.napaflooddistrict.org).

The NCFCWCD is the lead agency on the Napa River Flood Protection Project along a section of the Napa River and Napa Creek. The flood project is designed to protect the community from 100-year flooding. To date, numerous improvements have been completed and many more are in process, including several new bridges and levees in the City of Napa, channel widening and floodplain creation, and tidal wetland reclamation.

Napa Sanitation District

Napa Sanitation District (NSD) provides wastewater collection, treatment and disposal services to the residents and businesses in the City of Napa and surrounding unincorporated areas of Napa County. NSD is an independent local agency governed by three elected officials from the City of Napa and County, as well as two public appointees. It services 33,000 connections within approximately 23 square miles of service area, with a network of approximately 250 miles of underground sewer pipelines and six lift stations. Wastewater is treated at the Soscol Water Recycling Facility (SWRF), which provides secondary and tertiary biological physical-chemical treatment with a dry weather treatment design capacity of 15.4 million gallons per day (MGD).

NSD's NPDES permit allows discharge to the Napa River from November 1 through April 30 (the wet season period). From May 1 through October 31 (the dry season period), discharge to the Napa River is prohibited and wastewater is either stored in stabilization ponds or treated and beneficially reused for landscape irrigation in industrial parks, golf courses, pasturelands, and vineyards. (See also http://www.napasanitationdistrict.com/).

Solano Irrigation District

The Solano Irrigation District (SID) owns and operates the Monticello Hydroelectric Power Plant at Lake Berryessa, and holds contracts with USBOR to most of the water in the reservoir. Dam/power plant operations and other diversions therefore guide reservoir levels and downstream flows, subject to permit requirements.

Other Local Reservoir Operators and Water Purveyors

There are several locally managed and operated reservoirs in Napa County. Those reservoirs and their managing entities are listed below.

- Lake Hennessey and Milliken Reservoir, City of Napa.
- Friesen Lakes, Howell Mountain Water Company.
- Bell Canyon Reservoir, City of St. Helena.

- Rector Reservoir, Veterans Home of California, Plant Operations.
- Kimball Reservoir, City of Calistoga.
- Lake Curry and Lake Madigan, City of Vallejo.

4.10.3 IMPACTS AND MITIGATION MEASURES

STANDARDS OF SIGNIFICANCE

A hydrologic or water quality impact associated with the implementation of the proposed General Plan Update would be considered significant if it would result in any of the following actions (based on Appendix G of the CEQA Guidelines):

Water Quality

1) A violation of any water quality standard or waste discharge requirement;

2) A substantial alteration of the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion, siltation, and/or environmental harm on- or off –site. Alteration of drainage conditions associated with erosion would be considered substantial if changes in a waterway's flow velocities extends the existing duration of scour events. Scour events would include any peak flows and the duration above a 2-year storm or bankfull event.

3) Create or contribute runoff water that would provide substantial additional sources of polluted runoff. Changes in water quality would be considered substantial if there is a net increase in sediment, nutrients or pathogens in the Napa River or its associated tributaries, or there is a net increase in any other pollution source associated with an impaired waterway (under Section 303d of the Clean Water Act). In addition, changes in water quality would also be considered substantial if they were in conflict with the Basin Plan or the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bay, and Estuaries of California. (The reader is referred to Section 4.6, Fisheries, regarding the consideration of water quality impacts on fisheries.)

Groundwater Resources

1) A substantial depletion of groundwater supplies or substantial interference with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. Depletion of groundwater would be considered substantial if it resulted in a net increase in groundwater usage in the Milliken-Sarco-Tulocay groundwater basin or result in groundwater extraction that would exceed the amount of groundwater in storage over the long term (normal, dry and multiple dry years). (The reader is referred to Section 4.13, Public Services and Utilities, for further discussion of water supply impacts.)

2) Future groundwater production impacts to surface water conditions would be considered to be substantial if it is demonstrated that groundwater extraction would result in a loss of flow to surface waters (i.e., circumstances where a waterway is currently receiving flows from groundwater discharge) to the extent that it adversely affects existing biological resources (e.g., fisheries and riparian habitat) that are supported by such flows. (The reader is referred to Section 4.6, Fisheries, regarding the consideration of flow impacts on fisheries.)

Drainage and Flooding

1) Substantially increase the rate or amount of surface runoff in a manner that would result in flooding on- or off-site.

2) Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems.

3) Placement of 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.

4) Placement of structures within a 100-year flood hazard area that would impede or redirect flood flows.

5) Exposure of people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of a failure of a levee or dam;

The reader is referred to Section 4.10 (Geology and Soils) regarding impacts associated with tsunamis and seiches, as well as failures of levees or dams.

METHODOLOGY

This hydrology and water quality impact evaluation is based on several sources, including: analysis performed by Questa Engineering Corporation (see **Appendix I**); hydrologic modeling analysis performed by the Danish Hydraulics Institute (DHI) (see **Appendix H**); review of baseline topographic, hydrologic, groundwater, and water quality conditions (see Napa County BDR); and consideration of the Napa County General Plan Update, the RWQCB's ongoing TMDL process, and other available plans/data. This EIR provides a programmatic analysis of potential impacts resulting from implementation of the General Plan Update based on existing conditions and outlines measures to avoid, reduce, and mitigate where necessary potential environmental impacts.

This impact analysis is organized by four hydrologic categories: drainage, flooding, water quality and groundwater. Each impact category includes a description of the specific potential impacts, as well as avoidance and mitigation measures that can potentially reduce and mitigate potentially significant impacts.

The methodology used to evaluate impacts and design appropriate avoidance and mitigation measures followed a sequence of:

1) Establishing baseline understanding of hydrologic resources (see discussion above and associated source documents);

2) Identification of areas of impact associated with hydrologic resources of the County from implementation of the proposed General Plan Update Alternatives under evaluation in this DEIR (see Section 3.0, Project Description, for a description of the alternatives under evaluation);

3) Conducting a hydrologic modeling analysis to simulate conditions under current conditions and four hypothetical vineyard development scenarios developed to represent the future conditions that could occur under the General Plan Update Alternatives under evaluation and help identify the type and degree of potential impacts (see **Appendix H**);

4) Identification of BMPs and other measures that are typically applied under sub-basin and site-specific conditions for projects through implementation of Napa County Conservation Regulations (County Code Chapter 18.108) that have been demonstrated to avoid, reduce, and mitigate impacts suggested by the impacts description (Step 2 above) and the modeling information (Step 3 above) (see **Appendix I**);

5) Developing any necessary monitoring and/or performance standard requirements to ensure that the avoidance, reduction, and mitigation measures are adequately working and are mitigating impacts identified from implementation of the proposed General Plan Update; and.

6) Development of performance standards for the streamlined vineyard development process proposed under General Plan Update Alternatives B and C (see impact discussion below) that would allow a specific subset of vineyard projects that can demonstrate no significant effects to the environment to proceed ministerially (i.e. without CEQA review) in the future.

Step 3 of this sequence involved developing detailed surface water/groundwater, water quality, and sediment erosion models of Napa County. Baseline hydrologic models were developed and calibrated for the Napa County BDR using MIKE SHE, MIKE 11, the Load Calculator, and SEAGIS (DHI, 2002, 2005). These models are dynamically linked which enables representation of the integrated hydrologic system. These models provided a tool to simulate current and future water resource conditions and evaluate how hydrologic conditions may change under different land use conditions. For this impact analysis several additional modeling studies were conducted beyond the baseline described in the Napa County BDR to simulate project and alternatives conditions and evaluate their potential impacts (see **Appendix H**).

Step 4, the identification of appropriate Best Management Practices (BMPs) is a key step in the overall methodology. As such, it is important to recognize the role of several existing and standard BMP approaches that are used to mitigate potential vineyard development related impacts. It is also important to recognize that the spatial scale that the hydrologic modeling simulation occurs (further described below) is more coarse than the site-specific scales for which most BMPs are designed. As a result it is difficult to adequately simulate the mitigating effects of BMPs operating at site-specific scales within a modeling system that is comprehensive across the entire County. The scale at which the model has been developed prohibits the incorporation of site specific BMPs. Thus, the degree of impacts resulting from the modeling analysis are considered preliminary and not wholly representative of existing impact conditions as they do not consider the role of existing BMPs that are applied through compliance with the County's Conservation Regulations. According to the methodology as described in the sequence above, consideration of the avoidance, reduction, and mitigating qualities of BMPs was considered qualitatively following the modeling analysis to provide a more accurate and comprehensive description of impact conditions. Documented effectiveness of BMPs is provided in **Appendix I**.

Hydrologic Models and Four Land Use Scenarios

The MIKE SHE code is a physically based distributed hydrologic model that simulates the major flow components of the hydrologic cycle, including overland flow, unsaturated flow, evapotranspiration, and saturated flow. MIKE-11 is a dynamic one-dimensional hydraulic modeling tool used to analyze stream flows that can be integrated with the MIKE SHE surface-groundwater model to simulate the routing of runoff conditions (or groundwater return flows) through a stream network.

Two separate surface hydrology models were constructed: the Napa River model (Napa River watershed) and the Putah Creek/Lake Berryessa (Putah and Suisun Creek watersheds) model.

The MIKE SHE model grid cell resolution for both models is 250 meters (820 ft). This means that the overland flow, the unsaturated zone flow, and the evapotranspiration calculations are computed for every 250-meter cell. The larger watersheds were divided into evaluation areas to provide planning units that are of an appropriate scale for baseline and buildout scenario conditions. Evaluation areas included: Valley Floor, West Hills, East Hills, Carneros, MST, and American Canyon in the Napa River watershed. Other evaluation areas included the Berryessa and Suisun areas. The models also provide flow parameter results at stream discharge and groundwater observation points at eight gaging stations in Napa County waterways.

The modeling analysis evaluated four potential vineyard development scenarios, since vineyard development is the largest land use conversion (from undeveloped conditions) occurring in the unincorporated area of the County. It should be noted that these vineyard development scenarios are intended to evaluate potential County-wide water resource impacts from vineyard development by the year 2030 and are not predictions of precisely where vineyard development would occur under the proposed General Plan Update. Rather, these scenarios distribute the amount of vineyard development projected for each alternative in four different ways, capturing a range of possible distributions and outcomes by the year 2030. The amount of vineyard development projected was determined by reviewing the trend line from 1958 to the present, reviewing the type and acreage of recent and pending applications for erosion control plans, considering the accessibility and availability of suitable lands, and the likely influence of other factors over time such as land economics and global competition. The amount of vineyard development projected was not assumed to vary greatly based on the various General Plan Update Alternatives considered because physical and economic requirements associated with vineyard development would be essentially the same. (Alternatives B and C would offer a "streamlined" process for some environmentally superior projects, but the cost-savings associated with a faster review process would be incremental when compared to the overall cost of vineyard development in compliance with the environmental standards that would have to be met.) In terms of their geographic distribution, the scenarios described below were developed to simulate general types of potential land use development patterns and provide a basis to then evaluate impacts for the proposed General Plan Update. The four land use scenarios simulated by the modeling analysis are described below.

Modeling Scenario 1: 2030 Conditions based on 2050 Report

This scenario tests the effects of development of 10,000 new vineyard acres, with 75% designated within Napa River Basin and 25% in Berryessa and Suisun Basins (see Figure 1 of **Appendix H**). The distribution of vineyard development under this scenario is specifically based on future vineyard development assumed in the 2050 Napa Valley Water Resources Study (West Yost and Associates, 2005).

Modeling Scenario 2: 2030 Conditions Water Supply Watershed

This scenario tests the effects of concentrating development of 10,000 new vineyard acres within the County's municipal water supply watersheds. Napa River Basin municipal watersheds include: Hennessy, Rector, Milliken, and Bell. This has the effect of concentrating the majority of new vineyard development in the Eastern Hills watersheds (see Figure 2 of **Appendix H**).

Modeling Scenario 3: 2030 Conditions Including Adjacent Timberlands (max slope 30%)

This scenario tests the effects of development of 12,500 new vineyard acres with a concentration on timberlands (on slopes up to 30%) for conversion to vineyards. Timberlands are lands that include specific timber tree species or soils that can support timber tree species. This has the effect of concentrating the vineyards in the East and West Hills, as well as the Berryessa areas (see Figure 3 of **Appendix H**).

Modeling Scenario 4: 2030 Conditions including adjacent Timberlands (max slope 35%)

This scenario tests the effects of development of 15,000 new vineyard acres and included an increased slope limit of 35% for both prime soils and timberlands availability, although neither General Plan Update Alternative A, B or C would relax requirements on slopes of greater than 30%. (This feature is included in Alternative E, described later in this EIR.) It is important to note that additional developable land was assigned adjacent to new vineyard acres designated in Scenario 3 (see Figure 4 of **Appendix H**).

Figure 4.11-7 shows the total number of vineyards under current conditions and the total number and general distribution of acres assumed in each of the four vineyard development scenarios.

Figure 4.11-7
Total Vineyard Distribution by
Evaluation Area per Vineyard Layout Scenario

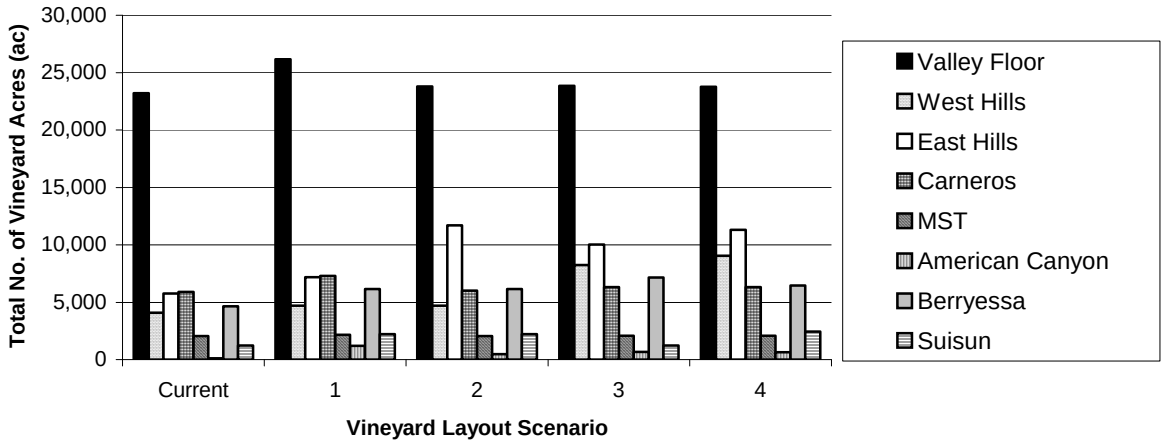
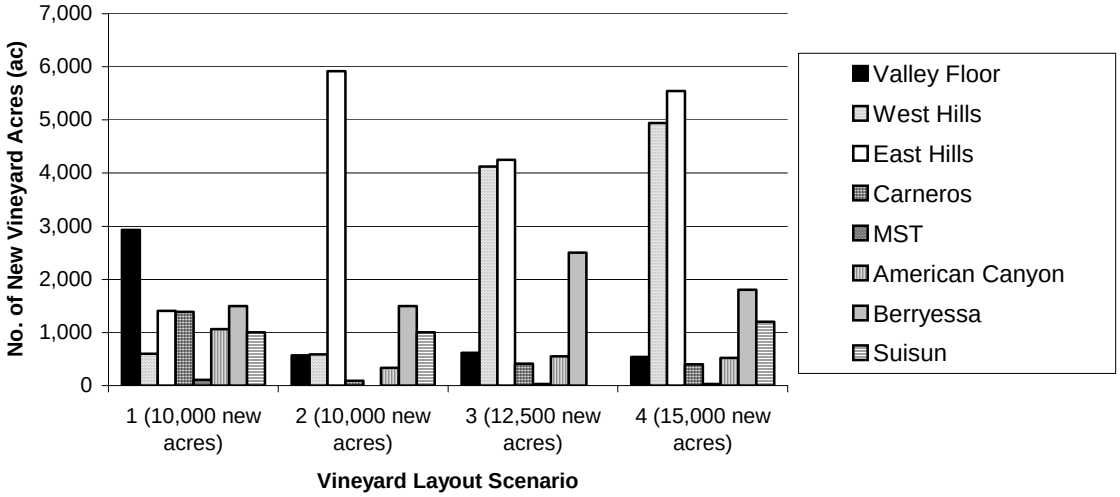


Figure 4.11-8 shows the distribution of the new vineyard parcels by evaluation area (see Figure 5 of **Appendix H**) per vineyard development scenario. Scenario 1 has the proposed vineyard development concentrated on the Valley Floor. In Scenario 2, the new vineyards were concentrated in the East Hills area, which encompasses a majority of the water supply watersheds. In Scenario 3, most of the new vineyards were distributed amongst the potentially productive soils and timberlands present in the West Hills, East Hills, and Berryessa evaluation areas. Scenario 4 extended the new vineyards onto steeper slopes in the West and East Hills and Suisun evaluation areas. It is important to note that vineyard buildouts, with the exception of the distribution specified by the 2050 report (Scenario 1), minimized vineyard development on the Valley Floor, Carneros and MST evaluations areas, areas that overlie more sensitive groundwater aquifers.

Figure 4.11-8
New Vineyard Distribution by
Evaluation Area per Vineyard Layout Scenario



Parcels with pending vineyard Erosion Control Plans (data supplied by Napa Country) were included first in the development of the new vineyards under these scenarios. The remaining acreage distribution was selected to match the target acreages for each scenario based on potential new vineyard areas provided by Napa County. The selection of new vineyard locations was to a large degree random but was developed to include locations that are most likely to be developed, such as acreages adjacent to existing vineyards and acreages located in close proximity to existing roads. Obviously, the vineyard locations used for the modeling scenarios are not intended or designed to describe site-specific impacts or conditions, but to provide an analysis of aggregated (County-wide and watershed-wide) impacts.

In addition to inputs regarding areas anticipated for vineyard development by year 2030, modeling also evaluated changes to water quantity, water balance, streamflows, groundwater levels and water quality based on historic hydrologic conditions (typical water year), drought conditions, 100-year flood event and the use of recycled water in the MST, American Canyon and Carneros evaluation areas.

Using the Models to Simulate Vineyard Development

The baseline, or existing conditions, scenario was run with recorded data for the evaluation period of June 1, 2002 through May 31, 2003. This period was selected to allow for an evaluation over the range of seasonal variations in flow conditions and because calibration data was most complete during this period. Antecedent conditions at the beginning of the evaluation period were set by running the model for six months prior to the start of the evaluation period on June 1, 2002. This scenario, run with the "Current Conditions", forms the baseline condition to which the four scenarios were compared. In addition, these scenarios were also modeled for drought conditions, utilization of recycled water (under Title 22 of the California Code of Regulations) in the Carneros, MST and American Canyon evaluation areas.

Below is a discussion of how the model inputs were changed to simulate vineyard development. Accordingly the changes to water quantity, water quality, and sediment erosion related to land use conversion to vineyards is described. As noted above, consideration of the mitigating

effects of BMPs is not easily accommodated directly in the modeling analysis due to differences in scale. The role of BMPs is also considered following the modeling analysis as described further below. For a more detailed presentation of the modeling analysis please see **Appendix H**.

Water Quantity

The four vineyard buildouts each resulted in varying land use coverages for the County; thus, various parameters in the models were adjusted in association with these changes in land use. These parameters include: Manning's roughness coefficient for overland flow, vegetation properties, rooting depth, and the crop coefficient. Additionally, the distribution of irrigation and groundwater pumping for irrigation purposes were adjusted to reflect the vineyard buildouts.

Water Quality

The Load Calculator was used to estimate the loads of nitrogen, phosphorus, and coliforms from non-point sources based on land use activity. Each land use type has an associated unit area load, and changes in land use affect the overall load from each basin. Converting forest, grassland and shrubland into vineyards increases the loads of nutrients. Non-point loading for nutrients and coliform bacteria was estimated according to the vineyard buildouts. The water quality constituents were routed through the stream network, and the cumulative impacts of the vineyard development were evaluated at the observation points for nitrogen, phosphorus, coliform bacteria and temperature. It should be noted that the fertilizer application rates applied to vineyards in the model were derived for Thompson seedless grapes. This grape variety typically uses more fertilizers than the wine grapes dominant in Napa County, which generally receive fertilizer input only 1 to 3 times a year. Also, application rates could be reduced by as much as one-half via the use of drip irrigation systems, which are the dominant irrigation method utilized in Napa County. Thus, the estimated nutrient loads identified in **Appendix H** likely overstate the actual nutrient loads derived from vineyards (see page 30 of **Appendix H**).

Sediment Erosion

The model uses a soil erosion calculation based on the Universal Soil Loss equation. The equation calculates soil erosion rates based on rainfall erosivity, soil erodibility, slope length and gradient, crop management, and cover factors. The only parameter that is assumed to vary with the vineyard buildouts is the "C" factor, a parameter describing crop management and vegetative cover. The "C" factor represents the ratio of soil loss under a given crop to soil loss produced from having no crop, i.e. bare soil. The higher the "C" factor, the higher the calculated soil loss.

For the vineyard development scenarios, the following three "C" different values were utilized for all vineyard development parcels under each of the four scenarios: 0.2 (which is considered a conservative factor that represents little or no use of BMPs, 0.088 and 0.046 (which represents typical cover crop BMP condition used in Napa County).

Estimated soil erosion was compared to the soil loss tolerance "T" value, which represents the soil loss tolerance for soils mapped and classified in the USDA National Resource Conservation Service soil survey. The "T" value is directly linked to the soil type and is expressed in units of tons/acres/year. The Napa County accepted range of soil loss is [T to (T+2)]. Results for sediment erosion rates were compared to this standard. The model provided estimated soil loss rates in tons/ac/year for each evaluation area, and area percentages of evaluation areas that exceeded the soil loss tolerance.

BMP Implementation

The models evaluated the impacts of the implementation of a cover crop over new vineyards by modifying existing crop coefficients to reflect the combination of vineyard and cover crop. This crop coefficient modification was done to simulate the current BMP of cover crop installation to minimize runoff from such land conversions. However, as described above, the model was unable to include other BMP's that are typically implemented in compliance with County conservation regulations (e.g., flow retention basins, buffer strips, and grassed lined swales [see **Appendix I**]). As a result of the model not including the mitigating effects of these other BMP measures that are currently in practice the model results are considered to generally overstate water quality and flow impacts of future vineyard development and short-term impacts to runoff and sediment production.

Thus as part of this impact analysis, a qualitative assessment of the application of BMPs for vineyard development related impacts has been conducted. Consideration of BMPs is Step 4 of the methodology sequence describe above. (**Table 4.11-2** summarizes BMPs typically used in Napa County). **Appendix I** provides a focused discussion and analysis of how the current County conservation regulations and RCD processes result in the application of BMPs to mitigate hydrologic impacts of projects. Appendix I also cites documentation on the effectiveness of BMPs in mitigating hydrologic impacts of vineyard development and provides examples of vineyard projects in the County where the effectiveness of BMPs to mitigate hydrologic impacts of vineyard has been demonstrated.

TABLE 4.11-2
BENEFICIAL MANAGEMENT PRACTICES APPLIED IN NAPA COUNTY*

Site Preparation	Cover Crop			Slope Protection	Runoff Control		Sediment & Nutrient Retention	Roadways
Chiseling & Subsoiling	Temporary (Tilled The Following Spring)		Fast Growing Grasses	Straw Mulch	Backsloped Terraces and Avenues		Straw Mulch	Waterbars
Land Reclamation			Legumes	Jute Netting	Cross-slope Diversions		Straw Wattles	Roadside Ditches
			Fertilizer and Soil Amendments, per analysis	Synthetic Erosion Control Blankets	Drop Inlets		Straw Bale Dikes	Ditch Turnouts
	Permanent	Tilled Annually	Fast Growing Grasses	Mulch	Underground Outlets (storm drains)		Silt Fences	Crushed Rock Mulch
			Legumes		Grassed Waterways		Sediment Basins	
			Fertilizer and Soil Amendments, per analysis		Armored Ditches		Outsloped Benches	
		Non-Tilled	Annuals (self-seeding)		Waterbars and Rolling Dips		Gravel Filters	
			Perennials, native and non-native		Energy Dissipaters	Rock Slope Protection	Vegetated Buffer Strips	
						Level Spreaders (earth, rock, or pipe)	Nutrient Management Planning	
							Integrated Pest Management	
						Attenuation Basins	Stream Setbacks	
					Underground Pipe with Drop Inlets			
					Flexible Pipe Drop			
					Diversion Ditch			
					Perforated Pipes			

**Napa County Resource Conservation District and Napa County Fish Friendly Farming Program*

PROJECT IMPACTS AND MITIGATION MEASURES

Water Quality

The water quality impact discussion is divided as follows:

- Nonpoint Source Pollution from Urban Runoff
- Soil Erosion and Sedimentation Related to Construction
- New Vineyard Development (Agricultural and Resource Uses)
- Consideration of the "streamlined" review process for vineyards proposed in General Plan Update Alternatives B and C, hereafter referred to as the "Proposed Vineyard Ministerial Program"

The reader is referred to Section 4.5 (Biological Resources) regarding habitat conversion impacts and Section 4.6 (Fisheries) regarding water quality impacts on fisheries.

Nonpoint Source Pollution from Urban Runoff

Impact 4.11.1 Residential, commercial, industrial, and public uses consistent with the proposed General Plan Update could introduce new and additional non-point source pollutants to downstream surface waters. (Less Than Significant – All Alternatives).

While many of the pollutants that have impaired the County's water bodies can be attributed to historical agricultural practices and land uses, runoff from urban development in the incorporated cities and unincorporated County areas has also contributed to water quality degradation. Continued impairment of water quality could potentially threaten or exceed adopted water quality standards and the beneficial uses of water bodies, as defined by the Basin Plan (including municipal water sources in the County). In some cases (e.g., depressed oxygen levels, high coliform levels, and sedimentation due to erosion) state and federal water quality standards are already exceeded in many areas of the County.

Development and maintenance of land uses such as residential, commercial, industrial, and public facilities (e.g., roads, schools, maintenance and corporation yards, water supply, and wastewater facilities) creates additional impervious surfaces and generates additional automobile use. Development allowed by the General Plan Update could also result in increased use of materials that can impair water quality, such as fertilizers and pesticides (e.g., for landscaping), construction chemicals (e.g., paint, solvents, cement, petroleum-based products), and toxic chemicals (e.g., for industrial uses or energy production). Water, typically as rainfall, moves over these impervious surfaces, where it picks up, carries away natural (e.g., sediment) and human-made pollutants (e.g., oil, pesticides, etc.) from paved or impervious surfaces, and deposits them into streams, rivers, wetlands, and eventually coastal waters. Runoff from these uses is one component of water pollution known as non-point source pollution (i.e., having many diffuse sources). The listing of the Napa River as impaired by nutrient loading has been primarily attributed to historic agricultural and roadway development and operation, yet extensive modeling of source loading identifies numerous contributors, including point sources such as wastewater treatment plants, and non-point sources such as septic system seepage, urban runoff, and atmospheric deposition ("Developing a Nutrient Management Plan for the Napa River Watershed," Wang et al., 2004).

Several different types of pollutants (including sediment, organic compounds, nutrients, trace metals, bacteria and viruses, and oil and grease compounds) are common in runoff from these uses. Sediment sources include roads and parking lots, as well as destabilized landscape areas, stream banks, unprotected slopes and denuded or disturbed areas. Sediment also transports pollutants such as trace metals, nutrients, and hydrocarbons that attach to soil particles. Organic compounds are derived from automotive fluids, pesticides, and herbicides. Nutrients include nitrogen, phosphorus, and other organic compounds that can be found in organic litter, fertilizers, food waste, sewage, and sediment. Sources of trace metals include motor vehicles, roofing and construction materials, and chemicals. Animal wastes, sanitary sewer overflow, and trash handling areas can contribute bacteria and viruses. Sources of oil and grease compounds include motor vehicles, food service establishments, and fueling stations.

As part of the County's compliance with the requirements of the NPDES stormwater permitting program, the County adopted Ordinance No. 1240 (Stormwater Management and Discharge Control) on June 22, 2004. The purpose of this ordinance is to protect water resources and improve water quality through the use of BMPs and meet the requirements of the Clean Water Act, Porter-Cologne Water Quality Act and the Basin Plan. Specifically, Section 16.28.100 requires the identification and use of BMPs to control the volume, rate and potential pollutant discharge from new development and redevelopment projects, existing businesses and other activity that may cause or contribute to stormwater pollution. The County currently accepts the California Stormwater Quality Association (CASQA) California Stormwater Best Management Practice Handbooks as effective standards for implementation and installation of stormwater pollution prevention measures, which provides detailed information on BMPs associated with use and design for maximum treatment effectiveness. The use of such BMPs for residential, commercial and recreational development have been demonstrated to effectively protect surface water quality. For example, the Lahontan development in Eastern Placer County (which consists of 436 single-family residential units, 18-hole golf course and supporting commercial uses and other active recreational features) has been designed with several similar BMP features used in Napa County (e.g., energy dissipaters and vegetated buffer strips) that have been determined effective in maintaining current water quality conditions associated with nitrogen, nitrite/nitrate, sulfate, total dissolved solids, chloride, iron, phosphorus, and boron based on over 6 years of water quality sampling (Placer County, 2004). Thus, compliance with Ordinance No. 1240 as well as County Conservation Regulations and County Code provisions associated with septic system design would ensure that surface water quality impacts from urban non-point sources would be **less than significant** and no further mitigation would be required.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

As identified in Section 3.0 (Project Description), this alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses in the unincorporated portion of the County. This development would contribute to the non-point pollution sources identified above. However, as described above, subsequent development would be subject to existing County Code provisions (e.g., Section 16.28.100) therefore, this impact is **less than significant**.

Alternative B

As identified in Section 3.0 (Project Description), this alternative would generally retain the existing land use designations under the current General Plan Land Use Map. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) as well as re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County. In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). This development would contribute to the non-point pollution sources identified above. However, as described above, subsequent development would be subject to existing County Code provisions (e.g., Section 16.28.100) and impacts to water quality are **less than significant**.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. As described above, subsequent development would be subject to existing County Code provisions (e.g., Section 16.28.100) and impacts to water quality are **less than significant**.

Mitigation Measures

None required.

Construction-Related Soil Erosion and Sedimentation

Impact 4.11.2 Land uses and development consistent with the proposed General Plan Update could result in increased soil erosion and sedimentation during construction activities, thereby degrading water quality in downstream waterways. (Significant and Mitigable – All Alternatives)

Construction of land uses allowed under the proposed General Plan Update could result in the construction of a wide range of uses, including residential, commercial and industrial buildings, public facilities, and agricultural-related uses (e.g., processing, support, and visitor-serving uses) amongst others. Erosion and sedimentation resulting from construction activities in the unincorporated parts of Napa County could represent a significant source of particulate pollution conveyed in storm water runoff. Grading and other earthmoving activities could alter drainage patterns and therefore have the potential to accelerate soil erosion well above natural background rates. Vegetative cover, which acts to stabilize the soil, would generally be removed from areas where earthwork and grading activities would occur during the construction.

Although the construction of most new structural (non-agricultural) development would generally occur on relatively gentle slopes surrounding existing community areas containing rural and urban development, the proposed General Plan Update would continue to allow development on hillside areas with moderate to high erosion hazards. Structural grading permits for projects with 5-15 percent slopes allow for "standard erosion control measures" proposed by the property owner, to be reviewed by the Building Inspection Division (as required under County Code [Ordinance 1240] as well as coverage under the state's General Construction Activity Storm Water Permit). Structural grading permits for projects on slopes over 15 percent require an erosion control plan application and plan submittal to be reviewed by the County as required under the County Conservation Regulations.

Generally, existing County development regulations require the preparation and implementation of erosion control plans for residential and commercial/industrial development. Even with the implementation of erosion control measures, development on moderate slopes (slopes between 15 and 25 percent) or on highly erosive soils is particularly susceptible to increased erosion and sedimentation, which has the potential to impair water quality. A high level of attention to the planning and implementation of erosion control measures would be required in these areas. Sediment could also accumulate at the inlets of downstream storm drain system, reducing the system's capacity to convey stormwater. Soil loss from erosion could generate costs to the public associated with the clean up and maintenance of storm drains, culverts, and open roadside ditches.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development could contribute to soil erosion from construction activities described above. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative B

This alternative would generally retain the existing land use designations under the current General Plan Land Use Map, similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) and re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element). This development could contribute to soil erosion from construction activities described above. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative would have similar infrastructure and trail/recreation provisions as Alternative B. This development could contribute to soil erosion from construction activities described above. This impact would be **significant and mitigable** with the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measures would apply to all three alternatives:

MM 4.11.2a The County shall provide a policy in the General Plan that requires continued implementation of Napa County Conservation Regulations (Chapter 18.108 of the County Code) and the Stormwater Management and Discharge Control Ordinance (Chapter 16.28 of the County Code) in order to mitigate surface water quality impacts consistent with and in compliance with applicable Basin Plans and Basin Plan amendments associated with implementation of the Napa River TMDL for sediment. Construction associated with subsequent projects and development activity in the County shall comply through the submittal of technical reports (e.g., erosion control plans and stormwater pollution prevention plans) that demonstrate mitigation of soil erosion impacts to either (at a minimum) pre-development conditions or in compliance with the Basin Plan requirements and are protective to municipal water supply watersheds prior to construction commencing. These technical reports shall meet the requirements of County Code and will provide detailed information regarding site-specific geologic, soil, and hydrologic conditions and how proposed BMPs will function under site-specific conditions.

MM 4.11.2b The County shall provide a policy in the General Plan that requires the establishment of water quality monitoring program(s) in order to track the effectiveness of temporary and permanent BMPs in the watersheds and implement corrective actions for identified water quality issues (in violation of Basin Plans and/or associated TMDLs) identified during monitoring.

Mitigation Measure MM 4.11.2a would ensure that current effective provisions of the County Code are continued to be implemented and demonstrate compliance with the Basin Plans and the Napa River TMDL for sediment. As documented in **Appendix I**, implementation of the County Conservation Regulations has resulted in technical demonstration of the effectiveness of the use of erosion control plans and their associated BMPs for controlling soil erosion (the reader is referred to Impact 4.11.1 regarding the effectiveness of the County Stormwater Management and Discharge Control Ordinance). Specifically, **Appendix I** identifies the details and effectiveness of the typical site preparation, cover crop, slope protection, runoff control, sediment retention and roadway BMPs commonly used in the County (see **Table 4.11-2** for a summary list of these BMPs and pages 2 through 30 of **Appendix I**). It should be noted that a component of the Napa River TMDL implementation measures includes continued compliance with County Conservation Regulations and Stormwater Management and Discharge Control

Ordinance. Mitigation Measure MM 4.11.2b would ensure that water quality monitoring occurs to identify and correct any water quality issues. Thus, implementation of these mitigation measures would ensure that construction soil erosion impacts are mitigated to **less than significant** for Alternatives A, B, and C.

Agricultural and Resource Uses

Impact 4.11.3 Continued agricultural and resource development (e.g., timber harvesting and mineral resources extraction) land uses under the proposed General Plan Update could result in an increase in sediment and nutrients in downstream waterways. (Significant and Mitigable – All Alternatives)

Agricultural production, and to a lesser extent, commercial timber harvesting and mineral resources extraction, are economically important land use activities in Napa County. Some agricultural practices, resource development, and associated land uses have historically impaired water quality and, on occasion, contributed to the violation of water quality standards in the County. (The June 30, 2006 RWQCB San Francisco Bay Region Napa River Sediment Total Maximum Daily Load Staff Report identified that more than half of the sediment delivered to waterways is from roads, erosion of Napa River and tributary bed and banks, vineyards and historic grazing activities.) Such practices and land use activities include vineyard operations, hay farming and grazing, fruit and vegetable production, some timber and hardwood harvesting (especially associated with land conversion), quarrying, and sand and gravel extraction.

Continued agricultural land uses under the proposed General Plan Update could potentially be a significant source of soil erosion and sedimentation of downstream waterways, especially when such land use activities occur on moderate to steep slopes or on highly erodible soils. It should be noted that this continued growth of agricultural uses (vineyards especially) in the County is expected to occur whether or not the Napa County General Plan is updated. These land use activities could also be sources of nutrients and contaminants from application of agro-chemicals used in agricultural operations (e.g., fertilizers and pesticides) containing nitrogen and phosphorous in agricultural runoff. These impacts are further addressed below under pollutant type.

Sediment

Hydrologic changes, such as increased runoff from agricultural land conversions on moderate to steep slopes, could also affect stream geomorphology and stream stability. This could result in accelerated stream bank and stream bed erosion and/or sediment accumulation leading to increased channel instability if several large conversion projects would occur within the same watershed over a short period of time (this issue was documented in the June 30, 2006 RWQCB San Francisco Bay Region Napa River Sediment Total Maximum Daily Load Staff Report). Cumulative hydrologic changes would be greatest when large portions of forested, oak woodland, or brushland-dominated watersheds and steeper slope conditions (up to 35% slopes) would be converted to cultivated crops or vineyards. Changes in peak runoff rates that modify the two-year channel-shaping flow, and changes in sediment supply (e.g., due to changes in land use activities) would further contribute to watershed instability. These hydrologic effects are often additive in watersheds that have a prior history of disturbance from rural development and intensive agricultural land uses, especially in watersheds that have a high percentage of hillside agricultural cultivation. In addition, new vineyard development, due to land use conversion, can present a potentially significant contribution of sediment in the County's waterways. Hillside vineyard development at some sites, especially at those underlain by soft bedrock and/or

where vineyards replace forest cover has also caused off-site channel enlargement (gully development) and associated shallow landslide failures. These impacts associated with changes in runoff flow conditions are further discussed under Impact 4.11.7 and 4.11.8 below.

In 1990, based on evidence of widespread erosion, concern regarding adverse impacts to fish habitat resulted in the listing of the Napa River as impaired by sedimentation. The primary impetus for listing was a concern regarding substantial decline since the 1940s in abundance and distribution of steelhead and salmon in the Napa River and its tributaries. As a result of the sediment impairment listing, the RWQCB has adopted an amendment to the Basin Plan and a total maximum daily load (TMDL). A TMDL involves development of a pollutant budget and a control plan to restore the health of a polluted water body. The TMDL also includes an implementation plan to achieve the TMDL and related habitat enhancement goals. The TMDL recommends numerous actions to reduce fine sediment inputs to Napa River and its tributaries, and related actions to protect or enhance baseflow, enhance habitat access for salmon and steelhead, and to enhance stream-riparian habitat complexity and stream temperatures. The TMDL found that total sediment delivery to channels associated with land use activities needed to be reduced by 50 percent from contemporary values (1994-2004) in order to meet the proposed numeric targets and allocations for sediment.

The watershed model (described above and in **Appendix H**) was used as a tool to better understand the nature of effects on hydrology and sediment conditions. Under the land use scenarios simulated, the model predicted increases in total sediment yield for all evaluation areas. Estimated soil erosion was compared to the soil loss tolerance, "T" value, which represents the soil loss tolerance for soils mapped and classified in the USDA Soil Conservation Service soil survey. The "T" value is directly linked to soil type and expressed in units of tons/acre/year. The predicted changes in land use, cover crop, and soil loss for all vineyard buildout scenarios result in potentially significant impacts to water quality due to sediment increases in County waterways. The model specifically noted substantial increases in soil loss under scenario 4 (which is associated with Alternative E) for the West Hills (4.2 to 5.8 percent increase over current conditions) and East Hills (1.7 to 2.8 percent increase over current conditions) evaluation areas (see Tables 22 through 24 in **Appendix H**).

The County currently addresses sediment impacts through the implementation of the County Conservation Regulations (Chapter 18.108 of the County Code), which requires the development of erosion control plans and involves the development of BMPs that mitigate this water quality impact. **Table 4.11-2** provides a summary of the BMPs commonly used in the County to mitigate water quality impacts. **Appendix I** provides details and effectiveness of these BMPs that address: (1) site preparation, (2) cover crop, (3) slope protection, (4) runoff control, (5) sediment retention, and (6) roadways (see pages 2 through 30 of **Appendix I**). These BMPs provide the following mitigation benefits (as documented in **Appendix I**):

- Trapping sediment through soil infiltration, vegetation capture (e.g., vegetated swales, vegetated buffer strips, setbacks from waterways and cover crop), structural capture (e.g., waddles, sediment basins and gravel filters).

- Stabilization of soils through land reclamation, use of cover crop and straw mulch, jute netting, and erosion control blankets.

- Runoff control to mitigate soil erosion and transport through the control of the concentration, velocity, energy and turbulence of drainage and sheet flows through the use of such measures as terraces, cross-slope diversions, energy dissipaters, grassed waterways, armored ditches, infiltration ditches and other such measures. In addition, the

requirements County Code Section 18.108.027(D) states that "concentration of runoff shall, wherever feasible, be avoided. Runoff shall instead be spread in small incremental doses into relatively flat buffer areas...." With this condition, sheet flow is encouraged, which in turn allows runoff within the vineyard area to also benefit from the cover crop ability to further trap sediment and chemicals that may be traveling through the vineyard area.

Appendix I provides details on several technical studies that have been completed in the County for pre- and post-vineyard conditions that demonstrates the effectiveness of BMPs from implementation of the County Conservation Regulations to mitigate sediment impacts. This has been demonstrated through hydrologic modeling of pre- and post-project conditions (e.g., TR-55 hydrologic analysis) and use of Universal Soil Loss Equation (USLE) calculations to conduct sediment yield analyses that factors in the use of BMPs such as cover crop. In addition to the technical information in **Appendix I**, the model results in **Appendix H** specifically identifies that increases in crop cover ("C" factors) are effective in reducing the extent of soil loss increases from vineyard development. Under a "C" factor of 0.088, future vineyard development would not exceed current soil loss projections in the Valley Floor evaluation area (under scenario 2), MST and American Canyon evaluation areas (all scenarios), and the Suisun evaluation area (under scenario 2). Under a "C" factor of 0.046, future vineyard development would not exceed current soil loss projections in the Valley Floor evaluation area (under scenario 2), Carneros, MST and American Canyon evaluation areas (all scenarios), and the Suisun evaluation area (under scenario 3) (see Tables 22 through 24 in **Appendix H**). Mitigation measures are identified below to ensure that potential sediment impacts are fully mitigated.

Nutrients and Other Potential Sources of Pollution

New vineyard development can also contribute to nutrient loading in the watershed as well as potential contamination from use of pesticides and herbicides. Fertilizer and other pollutants and irrigation water can potentially result in leaching and runoff of nutrients that migrate toward groundwater and surface water, adding excess nutrients in a watershed. Agricultural lands can introduce nutrients into waterways from both surface runoff and erosion during storms, from irrigation runoff, and through shallow groundwater flows. Agricultural nutrient sources include inorganic fertilizers, manure, organic amendments applied during cultivation, crop residues or plant debris, erosion of surficial soils, and soluble nutrients released during the decomposition and mineralization of plant litter. However, use of fertilizers in most vineyards in the County generally limited to application 1 to 3 times per year through the drip irrigation system thereby reducing the needed volume by applying fertilizers directly to the roots rather than broadcast spraying the entire vineyard area. Additionally, fertilizers are typically applied during the late spring and summer months when site surface runoff is at a minimum. The quantity of fertilizer application is typically based upon site specific soil testing and/or petiole analysis, and plant requirements. Soils are tested for nitrogen and phosphorus to determine when and how much fertilizer is needed. Applications typically equals uptake as vineyard managers/growers have to be careful not to over apply. Over application can result in undesirable qualities/characteristics/yields as well as result in a softening of plant tissues thereby leaving the vine susceptible to pest damage. This can in turn result in the need of additional pest controls that would have otherwise been unnecessary.

The model predicts increases in the contribution of total dissolved nitrogen and phosphorus from both Napa and Berryessa basins. All vineyard buildout scenarios, due to increased non-point loading of nutrients from land conversion, show increases (see **Table 4.11-3**). The modeling analysis included consideration of additional nitrogen and phosphorus loading associated with the potential of recycled water use, which identified minor increases in nitrogen concentrations

(approximately 1.5% increase) and phosphorus (less than 0.5% increase) (see **Appendix H**). However, it should be noted that the fertilizer application rates applied to vineyards in the model were derived for Thompson seedless grapes. This grape variety typically uses more fertilizers than the wine grapes dominant in Napa County, which generally receive fertilizer input only 1 to 3 times a year. Also, application rates could be reduced by as much as one-half via the use of drip irrigation systems, which are the dominant irrigation method utilized in Napa County. Thus, the estimated nutrient loads identified in **Appendix H** likely overstate the actual nutrient loads derived from vineyards (see page 30 of **Appendix H**).

TABLE 4.11-3
INCREASES IN NON-POINT LOADING OF TOTAL DISSOLVED NITROGEN AND PHOSPHORUS BY BASIN

Area		Increase in Non-point Load of Nitrogen-TDN				Increase in Non-point Load of Phosphorus-TDP			
		Vineyard Buildout Scenario				Vineyard Buildout Scenario			
		1	2	3	4	1	2	3	4
Napa Basin	Valley Floor, West hills, East hills, Carneros, MST, American Canyon	X	X	X	X	X	X	X	X
Berryessa Basin	Berryessa, Suisun	X	X	X	X	X	X	X	X

As noted above, the County addresses water quality impacts through the implementation of the County Conservation Regulations, which requires the development of erosion control plans and involves the development of BMPs that mitigate these potential water quality impacts. **Appendix I** provides details and effectiveness of BMPs typically used in the County (see **Table 4.11-2**). These BMPs provide the following mitigation benefits associated with nutrients, pesticides and other sources of pollutants:

- Trapping nutrients and other water quality pollutants through soil infiltration, vegetation capture (e.g., vegetated swales, vegetated buffer strips, and cover crop), structural capture (e.g., waddles, sediment basins and gravel filters).

- County Conservation Regulations Section 18.108.025 establishes setback requirements from intermittent and perennial waterways based on slope that range from 35 feet to 150 feet. The use setbacks allows for the trapping and filtering of nutrients and chemicals prior to contact with a waterway. The use of setbacks is a recommended water quality feature identified by the Fish Friendly Farming workbook as well as documented in Saintsbury Vineyard Erosion Control Permit Application Draft EIR (2006) and the Gallo Vineyards - Sun Lake Ranch Erosion Control Permit Application Initial Study and Mitigated Negative Declaration. The "Stream Setback Technical Memo (Jones and Stokes, 2002)" found that setbacks that range from 33 to 400 feet are effective in removing nutrients and fecal coliform from surface waters and preventing delivery to downstream waters. The "Conceptual Approach for Developing Nutrient TMDLs for San Francisco Bay Area Waterbodies" staff report from the RWQCB specifically notes setbacks as a likely nutrient management measure for the future TMDL.

- Runoff control through the control of the concentration, velocity, energy and turbulence of drainage and sheet flows through the use of such measures as terraces, cross-slope diversions, energy dissipaters, grassed waterways, armored ditches, infiltration ditches

and other such measures. These features have been identified as effective in removing petroleum hydrocarbons, total dissolved solids and nitrogen-based organic compounds. The requirements County Code Section 18.108.027(D) states that "concentration of runoff shall, wherever feasible, be avoided. Runoff shall instead be spread in small incremental doses into relatively flat buffer areas...." With this condition, sheet flow is encouraged, which in turn allows runoff within the vineyard area to also benefit from the cover crop ability to further trap chemicals that may be traveling through the vineyard area.

- Limited use of fertilizers and pesticides through vineyard site design and management, which includes application of fertilizers through the drip irrigation system thereby reducing the needed volume by applying fertilizers directly to the roots rather than broadcast spraying the entire vineyard area. The quantity of fertilizer application is typically based upon site specific soil testing and/or petiole analysis, and plant requirements. Soils are tested for nitrogen and phosphorus to determine when and how much fertilizer is needed. The "Conceptual Approach for Developing Nutrient TMDLs for San Francisco Bay Area Waterbodies" staff report from the RWQCB specifically notes management of fertilizers as a likely nutrient management measure for the future TMDL.

Appendix I provides details on several technical studies that have been completed in the County for pre- and post-vineyard conditions that demonstrates the effectiveness of BMPs from implementation of the County Conservation Regulations to mitigate water quality impacts. As noted under the discussion of the Mondavi Vineyard in **Appendix I**, water quality samples have been taken downstream of two existing vineyards in Napa County to determine the potential extent of vineyard water quality pollution (the samples were tested for organochlorine and organophosphorus pesticides, chlorinated herbicides, semi-volatile organic compounds, copper and sulfate). The results of this sampling found that the only contaminants detected were copper and sulfate, but that these results were well below background concentrations for soils in the Napa region.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

As identified in Section 3.0 (Project Description), this alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition to agricultural operations, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. As noted above, these activities would result in water quality impacts associated with soil erosion and other pollutants (e.g., nutrients, pesticides and herbicides). This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative B

Alternative B would include the same opportunity for agricultural and other resource extraction activities as Alternative A and would result in similar water quality impacts. These activities would result in water quality impacts associated with soil erosion and other pollutants (e.g., nutrients, pesticides and herbicides). This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Alternative C

Alternative C would include the same opportunity for agricultural and other resource extraction activities as Alternative A and would result in similar water quality impacts. This impact would be considered **significant and mitigable** and would require the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measures would apply to all three alternatives:

MM 4.11.3a The County shall provide a policy in the General Plan that requires post development conditions not to increase 2-, 10-, 50- and 100-year events above pre-development peak flow rates. Subsequent projects in the County shall comply through the submittal of technical reports (e.g., associated with compliance with the County Conservation Regulations [Chapter 18.108 of the County Code]) that demonstrates compliance with this requirement.

MM 4.11.3b The County shall provide a policy in the General Plan that requires continued implementation of Napa County Conservation Regulations (Chapter 18.108 of the County Code) in order to mitigate surface water quality impacts from land use activities consistent with and in compliance with applicable Basin Plans and Basin Plan amendments associated with implementation of the Napa River TMDL for sediment, pathogens and nutrients. Subsequent projects and development activity in the County shall comply through the submittal of technical reports (e.g., erosion control plans) that demonstrate mitigation of potential water quality impacts to either (at a minimum) pre-development conditions or in compliance with the Basin Plan requirements and are protective to municipal water supply watersheds prior to construction commencing. These technical reports shall meet the requirements of County Code and will provide detailed information regarding site-specific geologic, soil, and hydrologic conditions and how proposed vineyard site design and management (e.g., proposed layout of vineyard, setbacks from waterways, drainage system and use of drip irrigation to apply fertilizers) and BMPs will function under site-specific conditions and their projected effectiveness in addressing sediment, nutrient, pesticides and other sources of water quality pollution.

Implementation of Mitigation Measure MM 4.11.3a would ensure no increase scour events along waterways by requiring the retention of pre-development peak flow conditions when scour events occur. Mitigation Measure MM 4.11.3b would demonstrate that BMPs would ensure protection of current water quality conditions in compliance with applicable Basin Plans and TMDLs. Thus, implementation of mitigation measures MM 4.11.2a and b, MM 4.11.3a and b and MM 4.11.4 would reduce this impact to **less than significant**.

Water Quality Impacts Associated With Proposed Ministerial Process for Vineyard Development Projects

Impact 4.11.4 **Implementation of the proposed General Plan Update under Alternatives B and C could introduce new and additional non-point source pollutants to downstream surface waters. (Significant and Mitigable –Alternatives B and C).**

Under Alternatives B and C, the proposed General Plan Update would include policies resulting in modifications to the County's Conservation Regulations (County Code Chapter 18.108) to provide a ministerial process for environmentally superior vineyard development projects that would not require environmental review under CEQA. This process has been proposed in order to meet the proposed General Plan Update's policy provisions for the continued promotion of agricultural activities in the County that are protective of the environment. These projects would be required to go beyond current regulatory requirements and meet performance criteria demonstrating no significant adverse effects to the environment in order to qualify for the streamlined process. However, no such performance criteria have been developed as part of the preparation of the General Plan Update. This impact is considered **significant and mitigable** with the implementation of the mitigation measures below.

Mitigation Measures

The following mitigation measure would apply to Alternative B and C.

MM 4.11.4 The County shall include the following into the General Plan and/or County Code Chapter 18.108, which will allow new vineyard development projects meeting criteria below to participate in a streamlined permitting process. The permit process shall require that an erosion control plan be developed and implemented for all disturbed lands where new cultivation is proposed. This permit process will require only County determination of "completeness," and no discretionary review. Conditions for participation in this ministerial permit process are described below.

APPLICATION REQUIREMENTS

The following application requirements will be mandatory:

- Erosion control plan
- Geotechnical report
- Hydrologic report
- Water quality report
- Groundwater report
- Biological resources report
- Cultural resources report

These reports must demonstrate compliance with applicable Napa County Conservation Regulations and compliance with the conditions as described below. The specific detailed requirements for these submissions and the completeness determination process shall be defined by Napa County in a subsequent formal amendment to the Conservation Regulations.

Where the submitted application material does not demonstrate compliance with the conditions below, the application shall be denied. Where the submitted application material is incomplete, the County shall identify the information necessary to complete the application. Where the information submitted leaves uncertainty as to the ability of the project to comply with any one of the conditions below, and the applicant does not submit information that resolves the uncertainty, the application shall be denied.

PROJECT CONDITIONS

The following conditions must all be met, without exception, to qualify for a ministerial permit process:

A. Project Area

- The project footprint must be less than 15 acres; or
- The project must be less than 20 acre and include a net reduction of anthropogenic sedimentation by 50% (e.g. may include landslide repair/stabilization, restoration of roads or other legacy effects) or more per parcel.

B. Slope

- The project shall not occur or disturb in areas with a slope of 30 percent or greater.

C. Surface Hydrology

- The project and associated improvements (i.e., access roads, vineyard avenues, water supply developments and accessory uses) shall not result in any increase to peak flow discharges downstream of the project site or at the subbasin outlet. Peak discharges for 2-, 10-, 50-, 100- year recurrences under project conditions shall be compared to baseline (pre-project) conditions.

D. Groundwater Use

- The project shall not lower groundwater levels offsite and shall not be located in the MST.
- The project shall not result in any reduction in summer baseflow contributions to either the groundwater aquifer or receiving waters (creeks, ponds, etc.) downstream of the site.

E. Water Diversion/Water Transfers

- The project shall not require a new appropriative surface water diversion.
- The project shall not require water transfer between existing subbasin (post-project water allocations in subbasin must be unchanged from pre-project subbasin condition).

F. Soil Loss/Productivity

- The project shall not lead to an increase in soil loss.

G. Water Quality

- The project shall not result in an increase in downstream sedimentation.

- The project application shall specifically identify BMP measures intended to treat water quality pollutants associated with fertilizers, pesticides, herbicides, petroleum-based pollutants and other pollutants anticipated to occur. It shall be demonstrated that these BMPs will mitigate potential water quality impacts to either (at a minimum) pre-development conditions or in compliance with the Basin Plan requirements and are protective to municipal water supply watersheds prior to construction commencing.

H. Stream Setbacks

- All projects shall provide for stream setbacks in excess of those required by Napa County's Conservation Regulations.

- If the stream setback areas are currently disturbed/denuded, the entire width of the required setback area shall be restored/revegetated with native vegetation adjacent to the waterway so as to provide a continuous riparian corridor within the setback area.

I. Biological Resources

- A biological report prepared by a qualified biologist shall determine that none of following species or their habitat are found on the project site: special-status plant species (as defined in Table 4.5-1 in this DEIR); special-status mammals (other than bats), amphibian, reptile, or invertebrate species (as defined in Table 4.5-2 in this DEIR); threatened or endangered birds (as defined by Table 4.5-2); or threatened or endangered species not listed in DEIR Table 4.5-1 or 4.5-2 that may be subsequently listed as such under the California or federal Endangered Species Acts. If the biological report determines that non-listed special-status bird or bat species are present on the site, the requirements noted below for nesting bats and birds shall be followed.

- The project shall not require conversion or loss of any of the communities identified as "communities of limited distribution" or "sensitive natural communities" in the DEIR and BDR.

- The project shall not be located in core areas identified in adopted recovery plans for vernal pools, serpentine soil plants, and tiburon paintbrush or other core areas that may be identified by USFWS.

- The project shall not require fill in stream, wetland, or other waterbody within the jurisdiction of the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act, the California Department of Fish and Game under Section 1602 of the California Fish and Game Code, the Regional Water Quality Control Board under the Porter-Cologne Water Quality Control Act. (NOTE: The state permits noted herein are

discretionary and thus require CEQA compliance and thus projects that involve such permits are *in toto* no longer consider "ministerial".)

- The project shall maintain/preserve at least 60% of the tree canopy cover and 40% of the shrubby and herbaceous cover present as of 1993 as part of land uses. If sensitive natural communities (as defined by the BDR), other than communities of limited distribution, are found on the site, the on-site preservation to meet the 60/40 requirements shall be biased towards preservation of the sensitive natural communities over other communities that may be present. Habitat to be maintained/preserved shall be contiguous.

- The project proponent shall implement the following elements to avoid disturbance to the roosts of special-status bats during the breeding season:

  - For ground disturbing activities occurring during the breeding season (March l through August 31), a qualified bat biologist shall conduct preconstruction surveys of all potential bat breeding habitat within 200 feet of grading or earthmoving activities. If active roosts are identified during preconstruction surveys, a no-disturbance buffer acceptable in size to the California Department of Fish and Game (CDFG) would be created around active bat roosts during the breeding season. Preconstruction surveys shall be conducted no greater than 2 weeks prior to the commencement of any earthmoving activities and/or vegetation removal.

  - If preconstruction surveys indicate that roosts are inactive or potential habitat is unoccupied during the earthmoving period, no further mitigation is required. Trees and shrubs that have been determined to be unoccupied by special-status bats or that are located more than 200 feet from active roosts may be removed. This buffer may be modified in coordination with CDFG.

- The project proponent shall implement the following elements to avoid disturbing special-status bird nests:

  - For ground disturbing activities occurring during the breeding season (March 1 through July 31)[1], a qualified wildlife biologist shall conduct preconstruction surveys of all potential nesting habitat for birds within 500 feet of earthmoving activities. Preconstruction surveys shall be conducted no greater than 2 weeks prior to the commencement of any grading and vegetation removal.

  - If active bird nests are found during preconstruction surveys, a 500-foot no-disturbance buffer shall be created around active raptor nests during the breeding season or until it is determined that all young have fledged. A 250-foot buffer zone would be created around the nests of other special-status birds. These buffer zones are consistent with CDFG avoidance guidelines, however, they

may be modified in coordination with CDFG based on existing conditions at the project site.

- If preconstruction surveys indicate that nests are inactive or potential habitat is unoccupied during the construction period, no further mitigation is required. Trees and shrubs that have been determined to be unoccupied by special status birds or that are located 500 feet from active nests may be removed.

- All wildlife exclusion fencing on the parcel shall be limited to the vineyard block areas only to minimize the effect on wildlife movement. In cases where wildlife exclusion fencing exists on the parcel, such fencing shall be removed to reestablish adequate wildlife movement.

J. Cultural Resources

- A cultural resource report prepared by a qualified cultural resource specialist (as determined by Napa County) shall demonstrate that no significant cultural resources are present on the site and the potential to encounter buried cultural resources is low.

- "Significant cultural resources" are defined as those resources meeting the definition under CEQA as "significant" including, but not limited to resources considered eligible for the California Register of Historic Resources and the National Register of Historic Places.

- If a cultural resource is discovered during project construction or operation, the project applicant shall cease all activity within the vicinity of the resource, shall contact Napa County immediately, and shall apply for and obtain authorization for vineyard activity through the non-ministerial permit process applicable at the time, including any and all CEQA processing.

K. Construction timing

- All project staging and grading shall be conducted between April 1 and September 1.

- All best management practices shall be installed by September 30.

L. Monitoring

- Project applicants shall agree to allow field monitoring by Napa County (and their agents) of their vineyard and adjacent areas under their control in order to verify compliance with project conditions and to support ecosystem management goals in Napa County. Monitoring for assessment of baseline project conditions may occur prior to acceptance of project into ministerial permit process. Monitoring for project compliance with terms and conditions of the ministerial process may occur during construction or following construction.

- Project applications shall agree to monitor their ground water levels annually at the beginning and end of each water year (October 1st of one year and September 30th of the next) and provide the County with annual well logs documenting these on-site water levels for the duration of vineyard operations authorized by the ministerial permit.

M. Limitations

- A ministerial permit may only be used for one project per parcel.
- Applications for ministerial permits wherein subdivision of land in 2007 or after has been pursued for the sole purpose of qualifying multiple projects for ministerial permits shall be denied.
- Ministerial permits may not be used for any parcel wherein a discretionary vineyard project has been approved in 2007 or after.

N. Unique Circumstances

- Ministerial permits may not be used for projects that include any of the following unique circumstances:
  - The project is located in a designated Mineral Resource Area
  - The project includes any new visitor-serving uses (tasting rooms, etc.)

Effectiveness of the Above Mitigation Measure

Hydrology

Vineyard development projects that qualify for the ministerial permit process would not result in an increase in peak flow downstream, would not lower groundwater levels, and would not reduce summer baseflow. Projects would need to demonstrate how they would meet these standards, likely through the presentation of pre- and post-project water balances, hydrologic modeling, and/or well pump tests that would be presented in the required hydrologic and groundwater reports. Projects would be required to monitor their well water levels and provide the monitoring results to Napa County so that water use over the project lifetime can be monitored for compliance with the hydrologic standards in the permit process. Thus, ministerial vineyard projects would not have a significant impact on hydrology.

Water Quality

Vineyard development projects that qualify for the ministerial permit process would not occur on slopes greater than 30 percent, would not lead to an increase in soil loss, would not result in an increase in downstream sedimentation and would not substantially alter temperature, nutrient, or other water quality parameters downstream. As noted, above ministerial vineyard projects would not alter peak flows downstream and thus would avoid any sediment-related effects due to peak flow alteration. Further, all projects will comply with the stream setback requirements in the Conservation Regulations. The extensive scientific literature has demonstrated the water quality benefits of providing buffers along streams in terms of controlling off-site sedimentation, nutrient loading, stream temperatures, and attenuation of other constituent concentrations

(such as those of pesticides and herbicides) prior to entry into waterbodies. All projects will comply with the timing restrictions noted above, which avoids construction during the wet season and provides for the establishment of appropriate controls prior to the wet season.

In order to demonstrate compliance with these performance measures, the projects will have to be controlled through an erosion control plan that would need to contain many of the site preparation, cover crop, slope protection, runoff control, sediment retention, and roadway BMPs described in **Appendix I**. As described in **Appendix I**, these BMP measures have been shown to be effective for vineyard projects far larger than would be allowed under the ministerial permit process. Thus, ministerial vineyard projects would not have a significant impact on water quality.

Water Supply

Vineyard development projects that qualify for the ministerial permit process would not require new surface water diversions, would not require water transfer between sub-basins, would not lower groundwater levels off-site or be located in the MST, and would not reduce summer baseflow downstream. Thus, ministerial vineyard projects would not have a significant impact on water supply.

Biological and Fisheries Resources

Vineyard development projects that qualify for the ministerial permit process would not affect special-status species (other than potentially non-listed nesting bats and birds), would not affect core habitat for recovery of certain species, would not affect biotic communities of limited distribution, and would not require fill of streams, wetlands or waterbodies. Projects will preserve at least 60% of the tree canopy cover and 40% of the shrubby and herbaceous cover. Stream setbacks will be provided in accordance with the Conservation Regulations. Significant nesting impacts to non-listed special-status bird and bat species would be avoided through the use of timing and buffers for construction. Fencing would be limited to vineyard blocks, riparian corridors are preserved, vegetation cover is retained (through the 60/40 rule), and the project size is limited which avoid significant impacts to wildlife movement. The setbacks and the requirements above concerning avoidance of hydrologic and water quality effects would avoid direct impacts to streams and their associated aquatic resources/fisheries and would also avoid significant indirect impacts. Thus, ministerial vineyard projects would not have a significant impact on biological and fisheries resources.

Cultural Resources

Ministerial vineyard projects would not occur on sites with significant cultural resources as defined by CEQA and as demonstrated through the required cultural resource report. In the event of discovery of significant buried cultural resources not anticipated in the cultural resource report, projects will be required to cease all activity affecting such a resource and comply with the routine permit review and approval process. Thus, ministerial vineyard projects would not have a significant impact on cultural resources.

Thus, implementation of the above mitigation measures would reduce this impact for Alternative B and C to **less than significant**.

Groundwater Resources

The Groundwater impact discussion is divided as follows:

- Groundwater Level Decline and Overdraft
- Well Competition and Adverse Well Interference

Groundwater Level Decline and Overdraft

Impact 4.11.5 Continued land uses and development under the proposed General Plan Update would increase demand on groundwater supplies, and the associated increased well pumping could therefore result in the decline of groundwater level and accelerated overdraft. (Significant and Unavoidable – All Alternatives)

Groundwater is the primary water supply source for most of the County, including most agricultural water uses. Ultimately, the sustainability of groundwater supplies requires that the volume of water cumulatively drawn from an aquifer not exceed the volume of groundwater recharge. Typically this balance needs to occur over a period of years, recognizing the periodic drought conditions and years of abundant rainfall are a part of the normal California weather pattern. If a water balance is not achieved and maintained over the long term, groundwater levels will continue to drop, resulting in the need to lower pumps, deepen wells, or drill new wells. Over time, groundwater supplies could be further depleted and local aquifers may no longer be a dependable source of water. Existing and future land uses are and will continue to be highly dependent on individual groundwater wells, as are small mutual or independent water companies relying on this resource as their primary source of water supply.

The protection of major groundwater recharge areas, for both recharge ability and water quality, is an important management tool for the sustainability of groundwater resources. Some areas of the County contain soils with high clay content that have poor infiltration and recharge characteristics or are underlain by hard bedrock formations that do not contain sizable groundwater bodies. In such areas, the majority of groundwater recharge occurs along streams. However, significant portions of major recharge areas consist of permeable soils overlying important regional aquifers. Major recharge areas are typically located along valley floors; some are located in community areas where urban and suburban growth would occur. Urban development and the resultant increase in impervious cover over these recharge areas has historically reduced natural recharge opportunities in some areas. Implementation of the proposed General Plan Update would result in the construction of additional impervious surfaces, further reducing groundwater recharge.

Other important tools in groundwater management to achieve a long term sustainable system and basin balance include obtaining significant reductions in demand due to increased water conservation, and the replacement of some groundwater usage with an increased groundwater management program focus on using treated, recycled water and desalinized seawater. Although a well coordinated and largely voluntary program for agricultural water conservation also exists throughout most of the County, more could also be done to achieve increased agricultural water conservation through increased outreach, education, and coordination efforts by the County, and increased enforcement of existing agricultural water conservation regulations. This will require fully funding a water conservation program, and providing adequate staff resources.

Groundwater is typically the main water supply source to meet water demands in the unincorporated areas in Napa County. Vineyard acreages increased by approximately 18,800 acres from 1975 to 2003 or 675 acres per year within Napa County, and vineyard acreage has increased at a rate of approximately 1,675 acres per year from 1998 to 2003 (West Yost & Associates, 2005). Overall, groundwater levels throughout the valley currently appear to be stable (West Yost & Associates, 2005). The significant increase in irrigated vineyard acreage in the Napa Valley has had almost no effect on the groundwater basin, though there appears to be increased seasonal water level variations (seasonal spring to fall water level changes) probably caused by increased seasonal use of groundwater basin storage. However, in the southern portion of the valley, additional pumpage from the groundwater basin in this area (even seasonally) may allow saline groundwater to migrate and intrude into the higher quality groundwater supplies further northward in the Napa Valley (West Yost & Associates, 2005).

Vineyard development would increase irrigation requirements and have impacts on groundwater storage. Modeling results show most evaluation areas with decreases in groundwater discharge to the channel network (baseflow), while in the Berryessa and Suisun areas, baseflow increased (see **Appendix H**). In general, groundwater recharge and pumping both increased. The changes in groundwater recharge and groundwater pumping relative to current conditions indicate that although groundwater recharge generally increased, these increases would not keep pace with the associated increases in groundwater pumping and would result in changes in groundwater discharge to surface waters. Thus, the net effect of the vineyard development was a decline in water storage.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development would contribute to further demand for groundwater supply. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Alternative B

As identified in Section 3.0 (Project Description), this alternative would generally retain the existing land use designations under the current General Plan Land Use Map similar to Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development (such as within the unincorporated community of Angwin) as well as re-use of the Pacific Coast/Boca site and Napa Pipe site. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). However, Alternative B would include the extension of recycled water to Coombsville and Carneros for vineyard use, which would consist of approximately 2,000 acre-feet annually. This would reduce groundwater demands in these areas from vineyard development in year 2030. This development would contribute to further demand for groundwater supply. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Alternative C

Between the year 2005 and 2030, it is projected that there would be an additional 7,635 dwelling units and 12,990,000 square feet of non-residential uses in the unincorporated portion of the County under this alternative. Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). However, this Alternative also include the use of recycled water for vineyards Coombsville and Carneros similar to Alternative B. This development would contribute to further demand for groundwater supply. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measures would apply to all three alternatives:

MM 4.11.5a The County shall include a policy in the General Plan that requires the continued demonstration of adequate groundwater supply for new projects prior to approval of well and groundwater permits as well as protective provisions for the MST, Pope Valley, Chiles Valley, Capell Valley and Carneros groundwater basins set forth under County Code Chapter 13.12 (Wells) and 13.15 (Groundwater Conservation). This technical information shall be provided in combination with other County required application submittals (e.g., erosion control plan applications as required under County Code Chapter 18.108

MM 4.11.5b The County shall include a policy in the General Plan that requires that all projects located within identified areas of groundwater recharge to be designed to (at minimum) maintain a site's pre-development groundwater recharge potential. Implementation could include limitations on impervious surfaces, project design characteristics, water impoundments (retention/detention structures), use of permeable paving materials, bioswales, water gardens, and cisterns, and other measures to increase runoff retention, protect water quality, and enhance groundwater recharge.

MM 4.11.5c The County shall include a policy in the General Plan that requires the use of water conservation measures on urban development projects to improve water use efficiency and reduce overall water demand. Reduce potable water demand through conservation measures, including but not limited to, the following:

a) Work cooperatively with all water providers and developers to incorporate conservation measures into project designs (such as those recommended by the California Urban Water Conservation Council).

b) Coordinate with water providers to continue to develop and implement water drought contingency plans to assist citizens and businesses in reducing water use during periods of water shortages and emergencies.

c) Revise the County Code to include a Water-Efficient Landscape Ordinance to encourage, or as appropriate, require the use of water-efficient landscaping consistent with AB 325.

MM 4.11.5d The County shall include a policy in the General Plan that maximize the use of recycled water as an irrigation (non-potable) water source for vineyards, agricultural activities and other irrigation opportunities in the County.

MM 4.11.5e The County shall include a policy in the General Plan that requires pump tests or hydrogeologic studies be conducted for all new high-capacity wells, including high-capacity agricultural production wells, where there may be a potential to adversely affect existing adjacent domestic or water system wells. The County shall not allow the operation of any new wells for which pump tests or hydrogeologic studies show the potential for significant adverse well interference or substantial reductions in groundwater discharge to surface waters that would alter critical flows to sustain riparian habitat and fisheries. The County shall also not allow the drilling or operation of any new wells in known areas of saltwater intrusion until such time as a program has been approved and funded which will minimize or avoid expansion of salt water intrusion into useable groundwater supplies.

Due to uncertainty in the ability to achieve long-term sustainable groundwater supply for existing and new development, in the time required to establish and implement effective management actions, and in current knowledge regarding groundwater availability and sustainability of important aquifers, this would be a potentially significant impact. The mitigation measures identified above and MM 4.11.4 would partially reduce the significance of this impact; however, due to the uncertainty that surrounds future groundwater availability and anticipated groundwater demands documented in the 2050 Napa Valley Water Resources Study in Napa County (see **Appendix J**) and the length of time needed to implement the programs needed to bring groundwater into hydrologic balance, this impact would still be **significant and unavoidable** after mitigation for all alternatives.

Well Competition and Adverse Well Interference

Impact 4.11.6 Land uses and development associated with the proposed General Plan Update could result in an increase in the number of private wells in unincorporated areas of the County. Approval of wells in these areas could result in well interference impacts. (Significant and Mitigable – All Alternatives)

Groundwater wells in close proximity or adjacent to each other can be thought of as competing for the same groundwater resource, especially in areas where the availability of groundwater is limited, in areas of declining groundwater and overdraft conditions, and in areas of poorly producing aquifer materials, such as hard-rock aquifers. When a well is pumped, a portion of the aquifer around it is dewatered or lowered, creating what is known as a cone of depression. Adjacent wells with overlapping cones of depression may have problems getting water if water levels are lower than the well pumps. Where such competition is significant it may affect the performance and delivery of water to the adjacent well(s). This condition is referred to as well interference. Most well interference problems are localized and short in duration, but being without water is a major inconvenience and can cause damage to well pumps. In some instances, individual landowners are forced to deepen their wells or lower the pump to

accommodate the localized lowering of groundwater levels due to well interference. Over the long term, high-capacity wells can substantially lower groundwater levels locally, essentially extending the time duration of the cone of depression and enlarging its outward extent.

Potential adverse well interference effects can often be anticipated by a review of adjacent well logs and local hydrogeologic data. Where such interference is thought to be a potential concern, pump tests can be conducted on tests wells located in the vicinity of the proposed well, in which water levels in the pumping well and nearby wells are monitored and mathematically analyzed using well hydraulic principles to verify and determine the probable extent and significance of the effect, and to develop appropriate mitigation and management strategies.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

Alternative A would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses as well as between 10,000 and 12,500 acres of new vineyard development in the unincorporated portion of the County. This development would result in the development of new well facilities that could conflict with existing wells in operation. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would have similar development potential and associated well conflicts as Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). However, some of this development under Alternative B would likely be served by existing surface water sources (e.g., reuse of sites within and adjacent to the City of Napa). Similar to Alternative A, this development would result in the development of new well facilities that could conflict with pre-existing wells in operation. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Alternative C

This alternative would have similar development potential and associated well conflicts as Alternative A and B. However, Alternative C would see additional residential development potential by year 2030 (an additional 7,635 dwelling units) as well as expansion of rural and urban development areas associated with the community of Angwin and establishment of a new RUL for the City of American Canyon. However, some of this development under Alternative C would likely be served by existing surface water sources (e.g., reuse of sites within and adjacent to the City of Napa) Similar to Alternative A, this development would result in the development of new well facilities that could conflict with pre-existing wells in operation. This impact would be **significant** and would require the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.5e would require pump tests or hydrogeologic studies demonstrate no significant interference with existing wells. Thus, implementation of this mitigation measure and MM 4.11.4 would reduce this impact to **less than significant** for all alternatives.

Drainage

The Drainage discussion is divided into three impacts:

- Changes to Drainage Patterns Leading to Increased Runoff and Streambank Erosion
- Changes to Drainage Patterns Leading to Increased Runoff and Hillside Erosion
- Increased Flood Risk from Drainage System Alteration

Changes to Drainage Patterns Leading to Increased Runoff and Streambank Erosion

Impact 4.11.7 Land Use and development under the proposed General Plan Update would result in alterations to existing drainage patterns. Such changes would increase erosion, both in overland flow paths and in drainage swales and creeks. (Significant and Mitigable – All Alternatives)

Land uses and development under the proposed General Plan Update would result in a gradual increase in impervious cover, especially in urban areas and some of the rural areas. Typically, increases in impervious cover result in an increase in stormwater runoff, higher peak stream discharges, and decreased groundwater recharge. Minor increases in tributary flows can also exacerbate creek bank erosion and/or cause destabilizing channel incision by altering the two-year or channel-forming flow, to which most creeks adjust by processes such as channel widening and deepening. Bank instability and bank failure often results in drainage systems where the "channel-forming" flow has been substantially altered.

The magnitude of these effects depends on the size, shape, and nature of the project watershed, the total impervious surface in the watershed, the nature of the storm drain system, the natural geologic stability of the creek system, and the extent that the drainage system incorporates peak flow reduction methodologies (e.g., overland flow attenuation, on-site stormwater detention, etc.).

Alterations to drainage patterns during and following construction also have the potential to result in construction-related increased runoff and erosion problems. Existing County Code Section 18.108 lists provisions of the Conservation Regulations, which are intended to ensure the continued long-term viability of county agricultural resources by protecting County lands from excessive soil loss which if unprotected could threaten local water quality and quantity and lead ultimately to loss of economic productivity.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses under Alternative A. As noted above, new

vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition to agricultural operations, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. These activities would result in drainage impacts from the alteration of drainage patterns and features. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would have similar land use patterns as Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). Alternative B would include the same opportunity for agricultural and other resource extraction activities as Alternative A. In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in drainage impacts from the alteration of drainage patterns and features. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative C

Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). Alternative C would include the same opportunity for agricultural and other resource extraction activities as Alternative A. Alternative C would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in drainage impacts from the alteration of drainage patterns and features. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.3a and MM 4.11.3b would ensure no increase scour events along waterways by requiring the retention of pre-development peak flow conditions when scour events occur. Implementation of this mitigation measure would reduce this impact to **less than significant** for all alternatives.

Changes to Drainage Patterns Leading to Increased Runoff and Hillside Erosion

Impact 4.11.8 **Land Use and development under the proposed General Plan Update would result in alterations to existing upland drainage patterns. Such changes would increase erosion, both in overland flow paths and in drainage swales on hillsides. (Significant and Mitigable – All Alternatives)**

Subsequent rural, urban and vineyard development, other agricultural activities and resource extraction activities in the County could result in alterations to existing drainage patterns, increasing runoff and hillside erosion. Agricultural land use practices can also alter the infiltration properties of surface soils (sometimes beneficially) and can also have similar, but more often smaller, effects on the hydrologic cycle. Increased peak discharges resulting from changes in land use have the potential to degrade water quality by creating erosive velocities and higher bank shear stress, which can ultimately cause bank and bed erosion and/or sedimentation in drainages and streams.

Typically, upland watersheds with short, steep drainage pathways and watersheds with brushland and forest covers are more susceptible to adverse effects from alterations in runoff patterns than more gently sloping areas with grassland cover. In addition to urbanization, the conversion of forested and brushland hillside areas to cultivated crops can also significantly alter runoff and erosion (drainage patterns), altering watershed processes, especially in watersheds with unstable geology or highly erodible soils.

New vineyard development incorporates several land practices that can have potential impacts on increased runoff, including drainage diversions and vegetation removal. Typically, to reduce sediment erosion from hillsides, diversion ditches and drop inlets to underground pipes divert water from the slopes and concentrate flow. Conversion of land use to vineyards and other agricultural uses also can increase overland flow and reduce soil infiltration.

Conversion of existing land uses to vineyards was modeled for the impact analysis (see **Appendix H**). New vineyard development on selected parcels resulted in changes in cover crop coefficients in the model inputs. Key results from the watershed models that are pertinent for this impact include the contribution of overland flow to the channel network (i.e. runoff) for each evaluation area, and the maximum discharge, maximum depth, and maximum velocity flow parameters from each gaging station. **Tables 4.11-4** and **4.11-5** show where increases in channel runoff and maximum discharge occur throughout the watershed based on model results. Projected numeric increases in flow from modeling results are reported in **Appendix H**.

TABLE 4.11-4
VINEYARD DEVELOPMENT SCENARIOS AND INCREASES IN CHANNEL RUNOFF VOLUME BY EVALUATION AREA

Area	Vineyard Development Scenario			
	1	2	3	4
Valley Floor				
West Hills	X	X		
East Hills	X			
Carneros	X	X	X	X
MST				
American Canyon	X	X	X	X
Berryessa		X		
Suisun				

TABLE 4.11-5
VINEYARD DEVELOPMENT SCENARIOS AND INCREASES IN MAXIMUM DISCHARGE BY GAGING STATION

Area	Vineyard Development Scenario			
	1	2	3	4
Napa River @ St. Helena	X			
Napa River @ Napa	X	X	X	X
Napa River Below Conn Creek	X	X		
Napa River Below Carneros Creek				
Salvador Creek @ Junction w/ Napa R. (Valley Floor)	X	X	X	X
Canon Creek @ Junction w/ Bell Creek (Valley Floor)	X			
Wooden Valley Ck. @ Junction w/ Suisun Ck.	X			X
Pope Creek @ Junction w/ Lake Berryessa				

Generally, the greatest increases in runoff and maximum discharge occurred under Scenario 1 within the Carneros evaluation area and at the gaging station at the City of Napa on the Napa River. This was due to the vineyard buildout under Scenario 1 that concentrated new vineyards on the Valley Floor and Carneros evaluation areas. The conversion of valley floor to vineyards yielded increases in surface runoff, both from changes in cover crop and increased irrigation demands.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

Alternative A would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses under Alternative A. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres, which does not include growth of other agricultural activities. In addition to agricultural operations, other resource extraction activities (e.g., timber harvesting and mineral extraction) could also occur in the County by 2030. These activities would result in the alteration of drainage patterns from changes in overland flow conditions. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would have similar land use patterns as Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development. Between the year 2005 and 2030, it is projected that there would be an

additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). Alternative B would include the same opportunity for agricultural and other resource extraction activities as Alternative A. In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in the alteration of drainage patterns from changes in overland flow conditions. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative C

Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). Alternative C would include the same opportunity for agricultural and other resource extraction activities as Alternative A. Alternative C would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in drainage patterns and features from changes in overland flow conditions. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Mitigation Measures

Implementation of Mitigation Measure MM 4.11.3a and MM 4.11.3b would ensure no increase scour events along waterways by requiring the retention of pre-development peak flow conditions when scour events occur, while MM 4.11.2a would require demonstration that BMPs would mitigate soil erosion. Implementation of this mitigation measure would reduce this impact to **less than significant** for all alternatives.

Flooding

The Flooding impact discussion is divided as follows:

- Flood Risk from Drainage System Alteration
- Placing Housing or Structures in 100-Year Flood Hazard Areas
- New Vineyard Development and 100-Year Flooding

Flood Risk from Drainage System Alteration

Impact 4.11.9 **Land uses and development under the proposed General Plan Update would result in increases in stormwater runoff and peak discharge. Existing storm drain systems, including urban creeks and rivers, may be incapable of accommodating increased flows, potentially resulting in increased on- or off-site flooding. (Significant and Mitigable – All Alternatives)**

Land uses and development consistent with the proposed General Plan Update could increase runoff and result in adverse modifications to local and regional hydrology. While the majority of future urban development would be concentrated in the cities and existing urban and rural

areas, growth of agricultural, rural and urban uses in the unincorporated area of the County may necessitate the construction of new drainage facilities for stormwater conveyance and management systems on tributaries and watershed mainstreams. In areas where drainage infrastructure already exists, drainage systems may need to be enlarged or expanded to accommodate future growth, and provide suitable flood protection.

Unless properly planned and engineered, new development, local storm drainage modifications, stream channel alterations, and structural bank stabilization measures could potentially create significant localized flooding impacts, in some cases by moving the existing flooding and channel instability problems cross channel or downstream, or by changing the timing of peak flows and point of discharge of runoff.

As identified **Table 4.11-5**, generally, the most potentially significant flood risk impacts occurred under Scenario 1 within the Carneros evaluation area and at the gaging station at the City of Napa on the Napa River.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses under Alternative A. As noted above, new vineyard development by year 2030 under Alternative A is anticipated to range from 10,000 and 12,500 acres. These activities would result in the alteration of drainage conditions and features that could result in flooding impacts. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative B

This alternative would have similar land use patterns as Alternative A. However, this alternative would provide for additional growth within currently General Plan designated areas for rural and urban development. Between the year 2005 and 2030, it is projected that there would be an additional 3,885 dwelling units and 14,636,000 square feet of non-residential uses in the unincorporated portion of the County (as noted above, vineyard development would be the same as Alternative A). In addition to the proposed land use map, Alternative B would include roadway improvements (associated with the proposed General Plan Update Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in the alteration of drainage conditions and features that could result in flooding impacts. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Alternative C

Alternative C would involve some additional land use changes beyond Alternative B that would allow for additional development/redevelopment (e.g., redesignation of Napa Pipe and Pacific Coast/Boca sites, potential expansion of the rural and urban uses in Angwin and establishment of a new RUL for the City of American Canyon). Alternative C would include the same opportunity for agricultural and other resource extraction activities as Alternative A. Alternative C would include roadway improvements (associated with the proposed General Plan Update

Circulation Element), extension of recycled water to Coombsville and Carneros, as well as policy provisions for trails and public open space (proposed Recreation and Open Space Element Objectives ROS-1, ROS-2 and ROS-3). These activities would result in the alteration of drainage conditions and features that could result in flooding impacts. This impact would be considered **significant** and would require the implementation of mitigation measures identified below.

Mitigation Measures

The following mitigation measures would apply to all three alternatives:

MM 4.11.9 The County shall include a policy in the General Plan that requires that subsequent projects to include drainage improvements that ensure no new or increased flooding impacts on adjoining parcels or upstream and downstream areas.

Implementation of the above mitigation measure would ensure that subsequent land uses under the General Plan Update would not result in new or increased flood impacts. Thus, implementation of Mitigation Measure MM 4.11.9a as well as MM 4.11.3a and MM 4.11.4 would reduce this impact to **less than significant** for Alternatives A, B and C.

100-Year Flood Hazard Areas

Impact 4.11.10 Land uses and development under the proposed General Plan Update would allow continued development in 100-Year Flood Hazard Areas. (Less Than Significant – All Alternatives)

The proposed General Plan Update generally would continue to allow new development and redevelopment within unincorporated areas designated by FEMA as Special Flood Hazard Areas, consistent with the County Floodplain Management Ordinances and the Code of Federal Regulations for the National Flood Insurance Program. The current County Code does not allow development within a defined floodway (unless within footprint of existing structure or certified by registered engineer or architect to not result in any increase in base flood elevation), and does not allow development in the floodplain if the project would increase the base flood elevation by more than one foot, except in special cases. The current County Code requires residential structures built within a FEMA designated Special Flood Hazard Area to be elevated at least one foot above the elevation of the 100-year flood level to protect these structures from flood damage. Napa County and FEMA federal floodplain management guidelines and regulations allow placement of fill within the floodplain to raise building pads above the 100-year flood level as long as it is not within the floodway or the base flood elevation is not raised greater than 1 foot. New nonresidential buildings must either meet this criterion or provide an alternate method of flood proofing that is certified by a registered engineer and approved by the Department of Public Works.

Potential impacts specific to each of the three alternatives are further described below:

Alternative A

This alternative would retain the existing land use designations under the current General Plan Land Use Map as well as the policy guidance set forth under the existing General Plan. Between the year 2005 and 2030, it is projected that there would be an additional 2,235 dwelling units and 16,014,000 square feet of non-residential uses under Alternative A. As noted above, new development would be subject to the County Floodplain Management Ordinances and the

Code of Federal Regulations for the National Flood Insurance Program that ensures structures placed within the designated 100-year floodplain are designed to avoid flooding impacts. Thus, this impact would be **less than significant**.

Alternative B

While this alternative would have greater development potential than Alternative A, new development would be subject to the County Floodplain Management Ordinances and the Code of Federal Regulations for the National Flood Insurance Program that ensures structures placed within the designated 100-year floodplain are designed to avoid flooding impacts. Thus, this impact would be **less than significant**.

Alternative C

While this alternative would have greater development potential than Alternative A, new development would be subject to the County Floodplain Management Ordinances and the Code of Federal Regulations for the National Flood Insurance Program that ensures structures placed within the designated 100-year floodplain are designed to avoid flooding impacts. Thus, this impact would be **less than significant**.

Mitigation Measures

None required.

New Vineyard Development and 100-Year Flooding

Impact 4.11.11 New vineyard development could result in increased 100-year peak discharge rates and water surface elevations. (Significant and Mitigable – All Alternatives)

As described in the drainage Impacts above, conversion of existing land uses to new vineyard development, due to drainage diversions, changes to cover crop, and removal of vegetation, can produce greater overland runoff to the channel network. A 100-year flood is the level of flood water that would result from a storm with a 1-in-100 chance of occurring in any given year. Under 100-year flood conditions, new vineyard development could potentially increase maximum discharge rates and water surface elevations. The watershed models were run to examine the potential impacts of the 100-year flooding scenario on the vineyard development Scenario 1.

The flood scenario was implemented by determining average rainfall depths for the 100-yr 24-hour rainfall event for each of the 72 precipitation polygons used in the models based on the NOAA Atlas 2 data (NOAA, 2001). In this way, the spatial variability of precipitation used for simulating current conditions was preserved. Once the total rainfall depths were determined for each polygon, the rainfall was distributed over a 24-hr period using an SCS Type 1A rainfall distribution, which is the recommended distribution for this region (USDA, 1986).

It is important to note that the simulated impacts of the 100-yr flood event will vary based on the choice of antecedent conditions and that the conditions chosen are an attempt to be realistic and conservative in our evaluation of the impacts of the 100-yr flood. Although the spatial variability of precipitation included in the original models of current conditions was preserved in this analysis, the temporal variability of precipitation during the 100-year flood event is not accounted for; rather the precipitation is presumed to occur at the same time in all locations

within the model area. During a real storm event, temporal variability of precipitation would be expected. The 100-year flooding scenario was run only for a) current conditions and b) Scenario 1 vineyard development.

The 100-year flooding scenario yields the estimated peak 100-year peak discharge rate and water surface elevations for the gaging stations throughout the County. A significant increase in water surface elevation was defined as any increase over 0.5 feet.

TABLE 4.11-6
SIGNIFICANT INCREASES IN 100-YEAR PEAK DISCHARGE AND WATER SURFACE ELEVATION BY GAGING STATION

Area	Vineyard Development Scenario
	1
Napa River @ St. Helena	X
Napa River @ Napa	
Napa River Below Conn Creek	X
Napa River Below Carneros Creek	
Salvador Creek @ Junction w/ Napa R.	
Canon Creek @ Junction w/ Bell Creek	X
Wooden Valley Ck. @ Junction w/ Suisun Ck.	
Pope Creek @ Junction w/ Lake Berryessa	

Table 4.11-6 shows the gaging sites where flows and water surface elevations increased significantly—at two locations on the Napa River, and at Canon Creek's junction with Bell Creek, on the valley floor. This impact would be same for Alternatives A, B and C, given that anticipated vineyard development would be the same under these alternatives. This impact would be **significant and mitigable**.

Mitigation Measures

Implementation of the Mitigation Measure MM 4.11.9 would ensure that subsequent land uses under the General Plan Update would not result in new or increased flood impacts, while Mitigation Measure MM 4.11.3a and MM 4.11.4 would ensure no increase scour events along waterways by requiring the retention of pre-development peak flow conditions. Thus, implementation of these mitigation measures would reduce this impact to **less than significant** for Alternatives A, B and C.

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