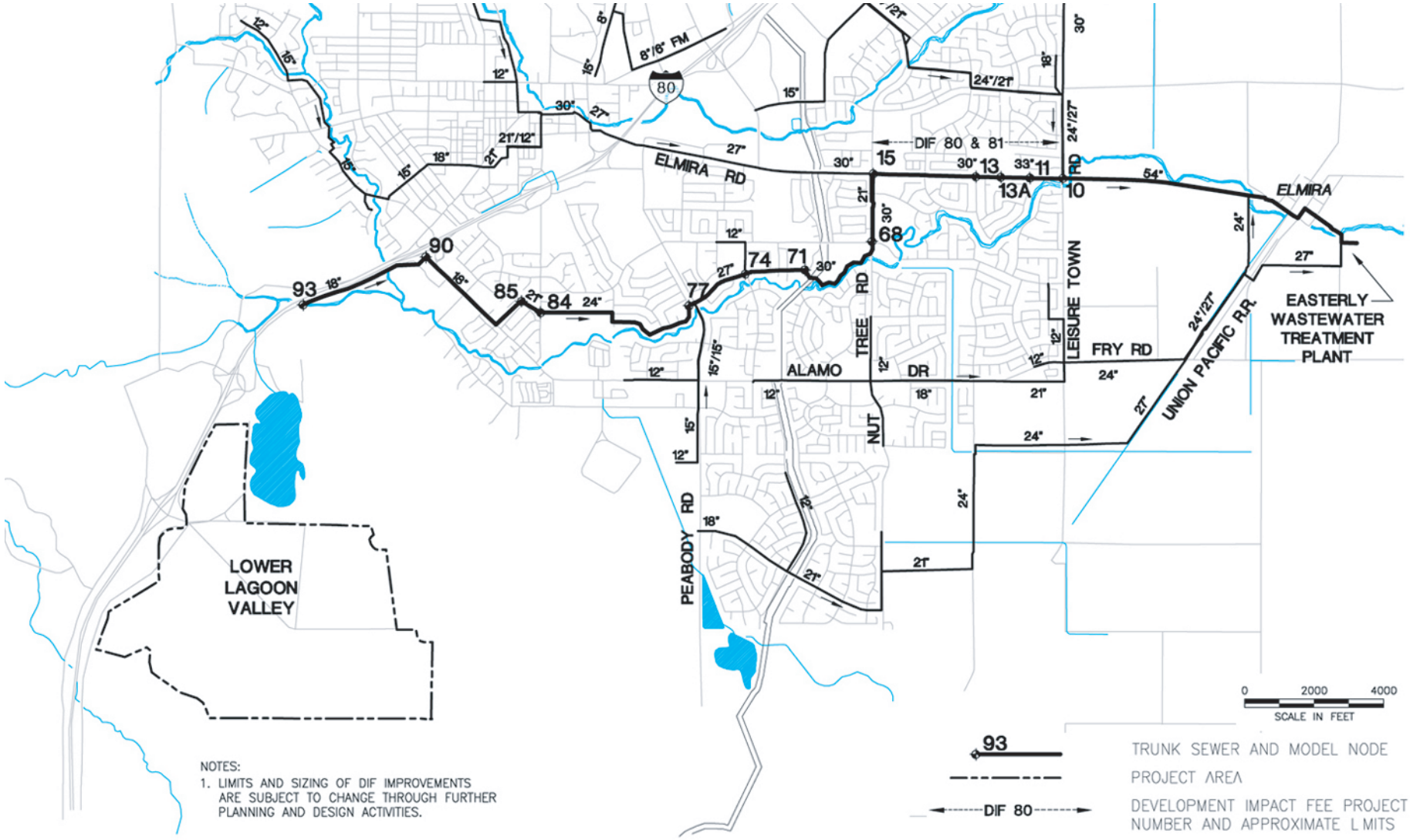


FIGURE **4.8-1**

Existing Downstream Trunk Sewers

Not to Scale

Source: EIP Associates, 2003

City of Vacaville

10794-00

wastewater treatment plant. A range of hills separates the project area from the City's existing sewer system.

Existing wastewater collection system facilities will convey flow from the new sewers constructed as part of the project to Easterly Wastewater Treatment Plant (WWTP). These existing sewers have been the subject of previous master planning and preliminary design analyses, which included preparation of a computer model.

Ongoing flow metering is used by the City of Vacaville to monitor flows in major trunk sewers. The City of Vacaville Utilities Division also periodically performs updated modeling and master planning of the entire collection system. These activities permit orderly planning of collection system upgrades necessary to accommodate growth, and help the City to identify excessive infiltration and inflow sources so pipeline and treatment capacity can be preserved.

Major sewer infrastructure projects downstream of the Proposed Project were previously identified using build-out land uses that incorporate development of the project area, and other areas of the City. These wastewater infrastructure projects are planned for funding under the Development Impact Fee (DIF) program. The funding source for these projects is connection fees paid by new development, and for some projects, sewer operation and maintenance charges or other project-specific funding mechanisms.

Two development impact fee (DIF) funded projects will provide additional capacity in the Elmira Road trunk sewer. These projects, sewer DIF 80 and 81, are shown on Figure 4.8-1. They will eventually be needed to accommodate General Plan build-out. Minor surcharging (less than two feet above the pipe crown and more than 12 feet below the rim elevation) was observed in the Elmira Road trunk sewer during the 2002/2003 wet season[1]. It is therefore apparent that portions of one or both of these improvements may be needed in the near future. An updated wastewater collection system model reflecting current land use planning is currently being prepared for the Utilities Division. The updated model will be used in conjunction with ongoing flow monitoring to determine the appropriate timing of these improvements and any others identified through the normal trunk sewer planning process.

A third improvement, DIF 54A, will divert a portion of the flow entering the Elmira Road Trunk Sewer just west of Elmira. This improvement is expected to significantly reduce any long-term capacity limitations in the Elmira trunk sewer.

Available information indicates no other improvement is needed to accommodate the project.

Wastewater Treatment Facilities

Wastewater from the project would be treated at the Easterly Wastewater Treatment Plant (WWTP), which was designed for an average flow capacity of 10 million gallons per day (mgd) and provides secondary treatment of the wastewater. Treated effluent is discharged to Old Alamo Creek, which is a tributary to the Sacramento-San Joaquin Delta. Waste solids are beneficially reused as alternative daily cover at a private nearby landfill, and the City has the option to apply solids as a soil amendment on City-owned agricultural lands. An expansion of the Easterly WWTP to a secondary treatment capacity of 15 mgd is currently under construction, with an anticipated completion date in 2004.

The average dry weather flow (ADWF) capacity specified in the discharge permit for Easterly WWTP is interpreted as a maximum monthly flow for the period from May through October.

There is no permit limit for the annual average flow, so the ADWF is used to define plant capacity. Flow is reported monthly. Therefore, the highest average flow for any given dry-weather month (May through October) is used as the measure of current plant flow. Over the past seven years, the flow recorded in May has been the maximum monthly dry weather flow. The average flow in May of 2002 was 7.8 mgd. Higher flows would have been expected due to increased infiltration and inflow in a year with more late spring rainfall, and growth occurring since May of 2002 would also increase the estimate of existing ADWF. The annual Infrastructure, Facilities and Services Status Report prepared by the City of Vacaville includes an estimate of ADWF with anticipated growth through the end of 2002 and an allowance for wet year flows. Based on that report, the predicted ADWF for existing conditions is 8.7 mgd.[2] An update of the Infrastructure, Facilities and Services Status Report anticipated in early 2004 is expected to include an estimate of current ADWF on the order of 9.1 mgd[3]. Therefore treatment plant flows are currently below the permitted average flow capacity of the existing plant.

Winter wet weather flow is also an important wastewater treatment plant and collection system capacity consideration. Typically, flow in a wastewater collection system is a combination of sanitary sewage and fresh water entering the system as infiltration and inflow. Infiltration and inflow are the result of groundwater entering the collection system from high water tables, leaking pipe joints, or damaged pipes and manholes; rainfall runoff from flooding fields and streets entering manhole tops; and drains improperly connected to the sanitary sewer. Infiltration and inflow can represent a significant portion of the flow in a wastewater collection and treatment system, especially during the rainy season. The capacity of the overall system must be adequate to contain peak sanitary flow plus peak infiltration and inflow. This flow condition is termed “peak wet weather flow” (PWWF).

The existing Easterly WWTP was designed for a daily peak wet weather flow capacity of 27 mgd. Historical peak hour flows have significantly exceeded this amount, but the plant has been able to accommodate the higher flows through short-term operational modifications by plant staff using redundant capacity and storage in the influent sewer. The expanded plant currently under construction is designed to provide treatment for an hourly PWWF of 55 mgd. Historical flows are summarized in Table 4.8-1.

4.8.2b REGULATORY SETTING

Federal

Federal Clean Water Act requirements governing wastewater collection, treatment, and discharge are defined under the National Pollutant Discharge Elimination System (NPDES). In California, the State Water Resources Control Board, through the Regional Water Quality Control Board – Central Valley Region (RWQCB), implements the NPDES program.

State

National Pollutant Discharge Elimination System Permit

Easterly WWTP is operated under an NPDES permit issued by the RWQCB. The permit, which is reissued every five years, specifies waste discharge and monitoring requirements to protect the water quality of downstream water bodies. Easterly WWTP was designed as a standard secondary treatment facility. The most recent NPDES permit, Order No. 5-01-044 (California Regional Water Quality Control Board, Central Valley Region, 2001), was adopted in May

TABLE 4.8-1

HISTORICAL WASTEWATER FLOWS AT EASTERLY WWTP (MGD) 1985-2002

Year	Maximum Month ADWF[a]	Hourly PDWF[b]	Daily PWWF[c]	Hourly PWWF
1985	8.40	15.1	--	--
1986	9.70	17.5	--	--
1987	7.70	13.9	--	--
1988	7.10	12.8	--	--
1989	7.54	13.6	--	--
1990	8.10	14.6	--	--
1991	7.10	12.8	--	--
1992	7.50	13.5	--	--
1993	8.60	15.5	--	--
1994	6.60	11.9	--	--
1995	7.25	13.1	25.4	28.0
1996	7.60	13.7	20.6	33.0
1997	7.24	13.0	23.4	43[d]
1998	7.76	14.0	14.0	41[d]
1999	7.57	13.6	13.6	26.3
2000	7.94	14.3	14.3	28.6
2001	7.99	14.4	12.5	24.3
2002	7.77	14.0	15.3	21.8

a ADWF= Average dry weather flow (Maximum monthly average flow, May through October). Some historical values are a 6 month average. After 1995, the maximum month ADWF has occurred in May.
b PDWF= Peak dry weather flow (hourly; estimated to be 1.8 x ADWF)
c PWWF= Peak wet weather flow
d Estimated (actual flow exceeded metering capabilities).
Source: City of Vacaville - Easterly Wastewater Treatment Plant Flow Records, 1985-2002

2001.[4] This new permit imposes unprecedented restrictions on the Easterly WWTP effluent water quality that would require significant levels of treatment that far exceed the capabilities of the expanded treatment plant.

The City has appealed the permit on the basis that many of the new requirements would provide no discernable benefit, at great cost. The City is obligated to comply with the permit under state and federal law, to the extent that the permit is upheld through this appeal process.

The NPDES Permit also requires the City to control infiltration and inflow of unpolluted rainwater and groundwater into the wastewater collection system to the extent that it adversely affects the conveyance system and the ability to provide adequate treatment (Provision F2 of the permit).[4]

Local

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable wastewater collection and treatment goals and policies.

Sewer Master Planning and City Design Standards

The City conducts periodic trunk sewer master planning activities. Through this work, certain planning standards have been applied, including methodologies for predicting wastewater flows and selecting pipeline diameters. These planning standards, in conjunction with the City's design standards govern how the required capacity and sizing of wastewater collection system facilities is determined.

4.8.2c IMPACTS AND MITIGATION MEASURES

Method of Analysis

The evaluation of impacts of the Proposed Project on wastewater facilities is described in a technical memorandum prepared for the City of Vacaville by West Yost & Associates (see Appendix G). A quantitative evaluation using previous computer modeling results of downstream collection system facilities with a projection of wastewater flow for the project area was used to assess flow and collection system capacity. Potential impacts during construction and operation of the facilities were described qualitatively.

Standards of Significance

For the purpose of this EIR, impacts to wastewater collection and treatment facilities are considered significant if the Proposed Project would:

- Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- Result in a determination by a wastewater treatment provider which serves or may serve the project that it does not have adequate capacity to serve the project's projected demand in addition to the provider's existing commitments;
- Result in wastewater flows which would exceed the existing capacity of wastewater collection facilities;
- Result in development which is not currently served by the trunk sewer system and require major trunk sewer extensions or alterations; or
- Result in new special treatment or handling requirements for treated wastewater effluent or residual wastewater biosolids.

Direct environmental impacts from construction of public utilities for the Proposed Project are analyzed in Chapter 4.2, Land Use, Chapter 4.6, Air Quality, Chapter 4.7, Noise, Chapter 4.12, Geology and Soils, Chapter 4.13, Hazards and Hazardous Materials, Chapter 4.14, Cultural Resources, and Chapter 4.15, Biological Resources.

Project Impacts and Mitigation Measures

4.8-1 Improvements to existing wastewater collection system facilities would be needed to accommodate projected Proposed Project flow.

Current development in Lagoon Valley is served by on-site wastewater disposal systems (septic tanks and leach fields). Existing residences in areas adjacent to the Proposed Project area

would continue to be served by on-site systems and not connected to the new collection system constructed as part of the project. Capacity would be provided in the collection system to accommodate the existing commercial occupants within the Specific Plan area that would remain after development of the project. A sewer stub would be provided to which a pipeline from the Lagoon Valley Park restrooms could be connected in the future, so a nominal flow allowance for the park is included in the wastewater flow projection.

Table 4.8-2 shows the land uses and wastewater flow generation factors used to project flows from the project and adjacent parcels. The projected ADWF is 0.63 mgd, and the projected hourly PWWF is 1.65 mgd. Table 4.8-2 also identifies certain adjacent parcels on which no development other than isolated rural residential development is anticipated and for which no capacity would be provided in the wastewater collection system.

In general, existing sewers have sufficient capacity to accommodate build-out of the project. Downstream trunk sewer capacity and previous modeling results are summarized in Table 4.8-3. Previous modeling was based on the City's land use database for existing conditions as of 2000, and build-out of the 1990 General Plan. The build-out model included development in the project area that generated average and peak flows greater than those projected for the Proposed Project. Table 4.8-3 includes a column showing "Adjusted PWWF", which reflects an estimate of the build-out Hourly PWWF in downstream pipelines with the project developed as currently proposed.

As shown in Table 4.8-3, flows predicted for current conditions exceed the gravity flow capacity in two segments of the downstream sewers. These two segments are located on Elmira Road and comprise approximately 25 percent of the distance between Nut Tree Road and Leisure Town Road. At build-out of the 1990 General Plan, predicted peak flows on Elmira Road from Nut Tree Road to Leisure Town Road are expected to exceed the gravity flow capacity of the pipeline. Modeled flows also exceed the capacity in this pipeline downstream of Leisure Town Road; however, other planned improvements are expected to relieve a portion of the excess flow before build-out is reached.

The City collects development impact fees for the purpose of funding trunk sewer improvements with city-wide benefit, including those identified downstream of the Proposed Project. Specific improvements are identified and scheduled by the City through periodic master planning and design activities.

Funding mechanisms for collection system improvements with citywide benefit have been established. The Proposed Project would pay applicable fees under these funding mechanisms. Therefore, the production of additional wastewater flow and the need for improvements to the existing downstream collection system is considered a ***less-than-significant impact***.

Mitigation Measure

4.8-1 *None required.*

4.8-2 The Proposed Project would increase flow to the Easterly Wastewater Treatment Plant.

TABLE 4.8-2

PROPOSED LAND USES AND WASTEWATER FLOW GENERATION

Proposed Development	I&I Area (acres)	Land Use			Flow Factor		ADWF (mgd)	I&I Flow (mgd) [a]	PWWF (mgd) [b, c]
		Quantity	Units	Category	Value	Units			
EXISTING DEVELOPMENT									
Area 1 – Commercial									
1A: CR (Blue Lagoon)	5.39	5.39	Acres	CS	1,900	gpd/acre	0.010	0.003	0.024
1B: CG (Almond)	6.74	6.74	Acres	CS	1,900	gpd/acre	0.013	0.003	0.030
1C: CG (Ranchotel)	9.23	9.23	Acres	CS	1,900	gpd/acre	0.018	0.005	0.042
Area 5 - LV Regional Park	0	388	Acres	PK	5,000	gpd [e]	0.005	--	0.011
Area 6 - Open Space/AH									
6A: OS East	0	385	Acres	AG/OS	0	gpd/acre	0.000	0.000	0.000
6B: AH Southeast	0	356	Acres	AG/OS	0	gpd/acre	0.000	0.000	0.000
6C: OS Southwest	0	325	Acres	AG/OS	0	gpd/acre	0.000	0.000	0.000
PROPOSED DEVELOPMENT									
Area 2 - Business Village [f]	89	89	Acres	BP	1,900	gpd/acre	0.169	0.045	0.401
Area 3 – Residential									
3A : Village I	123	540	Du	Residential	300	gpd/acre	0.162	0.062	0.403
Village Center (10,000 sf) [g]	0.77	0.77	Acres	CS	1,900	gpd/acre	0.001	0.000	0.003
K thru 6 School Site	12	600	students	ESC	30	gpd/student	0.018	0.006	0.044
3B: Village II	142	402	Du	Residential	300	gpd/acre	0.121	0.071	0.325
3C: Village III	222	365	Du	Residential	300	gpd/acre	0.110	0.111	0.342
3D: Community Homes	22.73	18	Du	Residential	300	gpd/acre	0.005	0.011	0.023
Area 4 – Golf Course	0.00	212	Acres	PR	0	gpd/acre	0.000	0.000	0.000
Golf Course Services (17,000 sf) [g]	1.3	1.3	Acres	CS	1,900	gpd/acre	0.002	0.001	0.006
Area 7 – Buffer									
7A: Nelson Road Berm	0	47	Acres	OS	0	gpd/acre	0.000	0.000	0.000
7B: Rivera Road Berm	0	6	Acres	OS	0	gpd/acre	0.000	0.000	0.000
						TOTAL PROJECTED FLOW	**0.634**	**0.317**	**1.65**

a Inflow/Infiltration (I&I) Factor = 500 (gpd/acre)
b Sanitary Flow Peaking Factor = 2.11 [d]
c Hourly Peak Wet Weather Flow (PWWF) = Average Dry Weather Flow (ADWF) x Peaking Factor + I&I Area x I&I Fact
d Based on modeling. This factor applies only at the downstream end of the collection system. The peaking factor in upstream sewers will tend to be higher. Where modeling has not been performed, a peaking factor of 2.5 should be used.
e Sanitary sewer service for limited restroom facilities. I&I is expected to be insignificant.
F Area 2 includes some neighborhood service commercial and a fire station
g Acreage of Village Center and Golf Course Club House/Maintenance Building (Golf Course Services) based on 0.3 FAR.

Land Use Legend: CS = Service Commercial, PK = Park, AG = Agricultural, OS = Open Space, BP = Business Village, ESC = Elementary School, PR = Private Recreation

Source: West Yost & Associates, January 2004

TABLE 4.8-3

DOWNSTREAM TRUNK SEWER CAPACITY

Pipeline Reach			Capacity mgd	Modeled PWWF [a], mgd		Adjusted PWWF [c]	Planned DIF Project
From Node	To Node	Length		2000 [b]	Buildout [b]		
93	90	3,744	4.41	0.053	2.34	1.75	--
90	85	3,793	3.61	0.347	2.76	2.16	--
85	84	758	5.13	0.725	3.14	2.54	--
84	77	5,513	7.33	2.49	5.07	4.48	--
77	74	1,755	8.1 [d]	5.89	8.10	7.51	--
74	71	2,110	9.0 [d]	6.78	8.97	8.38	--
71	68	2,562	9.3 [d]	7.07	9.26	8.67	--
68	15	1,610	12.6	7.35	9.55	8.97	--
15	13	3,035	14.8	12.8	**16.8**	**16.3**	80
13	13A	645	11.8	**13.0**	**17.0**	**16.4**	80
13A	11	1,050	14.3	13.1	**17.1**	**16.5**	80
11	10	860	12.9	**13.2**	**17.1**	**16.5**	81
10	EWWTP	9,537	40.1	24.5	**45.6**	**45.1**	[e], [f]

a Bold values indicate modeled flows that exceed gravity flow pipeline capacity.
b Based on modeling from 2000 and 2001 prepared for the Beelard Trunk Sewer preliminary design, which included a higher buildout flow than currently projected from the project area.
c Estimated flow in mgd based on proposed Lower Lagoon Valley project. To be refined through updated modeling in conjunction with periodic master planning.
d Based on preliminary design of Beelard Trunk Sewer. (Construction was recently completed.)
e DIF 54A and other future projects are expected to divert a portion of the modeled buildout PWWF from this pipeline reach.
f Modeled flow is based on land use plans that may not reflect the current proposals for the Rice-McMurtry area.
Source: West Yost & Associates, October 3, 2003

Completion of the Easterly Wastewater Treatment Plant expansion is anticipated prior to occupancy of the Proposed Project. The expansion is sized to accommodate growth throughout the City of Vacaville, including the project area, through 2012 or later.[5] The City collects development impact fees for the purpose of funding treatment plant improvements, including those necessary to accommodate the Proposed Project. Specific improvements are identified and scheduled by the City through periodic master planning and design activities. This is considered a ***less-than-significant impact.***

Mitigation Measure

4.8-2 *None required.*

4.8-3 The Proposed Project would result in the construction of a collection system to expand the existing wastewater treatment facility service area.

Both on-site and off-site facilities would be needed to collect wastewater from the project site and convey it to the existing wastewater collection system. The project area was previously identified as an area for which downstream flow metering should be installed if and when it develops.[6]

The project proponent identified two alternatives for off-site wastewater collection system facilities: “Option 1 - Pump Station”, and “Option 2 - Gravity Sewer”. The first option would convey flows over the hill that lies north of the project site by pumping, and the second would convey flows around the hill by gravity. The two options are further described in Appendix G.

The depth of the existing sewer at the proposed point of connection is approximately 10 feet.

Option 1 – Pump Station

Option 1 includes a pump station, force main and gravity sewer that would cross Laguna Creek in one location. The pump station would deliver flow to the top of the hill north of the project site via an 8-inch force main. A 12-inch gravity main would convey the flow downhill into an 18-inch gravity sewer. The gravity sewer would then cross Laguna Creek to the point of connection. Construction of the creek crossing would employ bore & jack or other suitable trenchless technology.

The proposed Option 1 off-site pipeline alignment follows an existing bicycle and pedestrian trail. Hillside earthwork would be required to widen portions of the trail in order to accommodate both the off-site sewer and a proposed water line within the width of the trail. Potential construction impacts related to biological considerations are addressed in Section 4.15. Potential construction impacts related to geology and soils are addressed in Section 4.12.

The pump station configuration and design would be consistent with other large (>1 mgd capacity) pump stations in Vacaville. Specific features and design considerations required for the Option 1 facilities are identified in Appendix G.

Option 2 - Gravity Sewer

Option 2 is a gravity flow option and involves two crossings of I-80 and two crossings of Laguna Creek. The alignment would require trenching through the developed fields near Peña Adobe. The first crossing would be made under the freeway and creek to the north of the Peña Adobe interchange. The pipeline would then cross under fields. Once the gravity sewer crosses Laguna Creek, it would be routed east to a second freeway crossing, and then southeast to the point of connection. Construction of the freeway and creek crossings would employ boring and jacking or another suitable trenchless technology (see Chapter 4.15, Biological Resources for construction impacts on creek crossings). Specific features and design considerations required for the Option 2 facilities are identified in Appendix G.

The need to expand wastewater collection infrastructure to the Proposed Project area is considered a ***significant impact***.

Mitigation Measures

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level.*

4.8-3 (a) *The Applicant shall include in the project improvements on-site and off-site wastewater collection system facilities within the project area designed in accordance with current City standards.*

(b) *The Applicant shall fully fund the design and construction of on-site and off-site wastewater collection system facilities necessary to convey flow to the existing wastewater collection system. The off-site facilities shall be as described for either Option 1 or Option 2, including special odor control, corrosion control, and other measures required by the City and outlined in Appendix G.*

(c) *The City shall determine which off-site facility alternative (Option 1 or Option 2) is preferred, based on consideration of life-cycle costs and potential non-monetary impacts.*

(d) *The City shall require permanent flow metering equipment with telemetry, either at the pump station (under Option 1), or on the proposed gravity sewer near the point of connection to the existing wastewater collection system (Option 2).*

(e) *If a pump station is included in the off-site facilities, the Applicant shall establish a major maintenance reserve fund to fully fund future major pump station replacement and rehabilitation projects.*

4.8.3 ELECTRICITY AND NATURAL GAS

4.8.3a ENVIRONMENTAL SETTING

Electricity and natural gas service for the City of Vacaville is provided by the Pacific Gas and Electric Company (PG&E). PG&E provides natural gas and electric service to the City through underground and aboveground transmission and distribution facilities.

New distribution facilities are constructed within easements on private property. However, in some instances, new facilities are constructed in existing streets to increase capacity. Locations of distribution facilities depend upon how and when an area develops.[7] The existing electrical facilities in the Proposed Project area consist of a 21 kilovolt (kV) distribution circuit located within the northerly boundaries.

There are no existing natural gas facilities in the Proposed Project site.

4.8.3b REGULATORY SETTING

Federal

The Federal Energy Regulatory Commission duties include the regulation of the transmission and sale of electricity in interstate commerce, licensing of hydroelectric projects, and oversight of related environmental matters.

State

In 1996, State legislation was enacted which restructured California's electricity market. In accordance with Assembly Bill (AB) 1890, the generation of electricity is open to competition, but the transmission and distribution remain a regulated monopoly. The utilities are required to purchase all their electricity needs from the wholesale market. The goal of the legislation was to open the state's energy market to competition, with the expectation that competition would drive down the cost of electricity. Basically, the legislation gave the customers of investor-owned utilities, such as PG&E, the ability to choose who provides their electric energy, much the same way they can choose long distance telephone companies.

The State experienced a number of problems at the same time the electricity industry was restructured. Many power plants were sold to privately owned, out-of-state energy companies. The demand for electricity grew faster than expected during the 1990s due to a number of factors. These include the rapid growth in the State's economy, the spread of computer

technology, the lack of new power plants constructed since the mid 1980s, the lack of widespread conservation due to relatively low electricity costs to consumers, and the State's population growth. California's population increased 13 percent between 1990 and 2000. The State produces only part of the electricity needs. In 2002, California produced 76.9 percent of the electricity it used.[8] The rest must be bought from other western states. At the same time, the west, in particular the northwest, experienced dramatic growth, which reduced the amount of energy available from that area which led to the need for rolling blackouts and exorbitant costs of electricity.

Because most power plants in California are powered by natural gas, the cost of making electricity increased during this same time due to dramatic increases in the price of natural gas during 2000. In January 2001, some utilities, including PG&E, began to experience financial problems.

Public Utilities Commission

The California Public Utilities Commission (PUC) sets forth specific “tariffs” (rules) that relate to the design, installation, and management of California’s public utilities. Decision #77187 and #78500 state that the undergrounding of utilities is mandatory if developable lots are less than three acres in size. Decision #81620 states that lots over three acres in size (large lot subdivision) are not required to underground utilities and can go overhead. To request an exemption from complying with these rules or tariffs, a formal waiver from the PUC must be obtained.

CPUC Decision 95-08-038 contains the rules for the planning and construction of new transmission facilities, distribution facilities and substations. The Decision requires permits for the construction of certain power line facilities or substations if the voltages would exceed 50 kV or the substation would require the acquisition of land or an increase in voltage rating above 50 kV. Distribution lines and substations with voltages less than 50 kV do not need to comply with this Decision; however, the utility must obtain any non-discretionary local permits required for the construction and operation of these projects. CEQA compliance is required for construction of facilities constructed in accordance with the decision.

Title 20 and Title 24, California Code of Regulations (CCR)

New buildings constructed in California must comply with the standards contained in Title 20, Energy Building Regulations, and Title 24, Energy Conservation Standards, of the CCR. Title 20 contains the statutes relating to power plant siting certification. Title 24 (AB 970) contains the energy efficiency standards to residential and nonresidential buildings based on a state mandate to reduce California's energy demand.

Warren-Alquist Energy Resources Conservation and Development Act

The State Energy Commission regulates energy resources by encouraging, developing and coordinating research and development into energy supply and demand problems to reduce the rate of growth of energy consumption (Warren-Alquist Energy Resources Conservation and Development Act Government Code section 25000 et seq.).

Local

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable energy utility goals and policies.

Pacific Gas and Electric

Gas Rule 15 provides guidelines for the extension of gas distribution mains necessary to furnish permanent services to customers. It outlines responsibilities for installation and extension allowances, as well as financial contributions by project applicants. Gas Rule 16 applies to PG&E's service facilities that extend from PG&E's distribution main facilities to service delivery points, and the service-related equipment required of project on the project site to receive gas service. It discusses metering facilities, distribution main extensions, service connections, and responsibilities for new service extensions.

4.8.3c IMPACTS AND MITIGATION MEASURES

Methods of Analysis

The assessment of electricity and natural gas service is a qualitative review of services available to the project site and a determination of whether they are adequate to serve the needs of the Proposed Project. Standard generation rates were used for the projected electrical and natural gas demand.

The electrical demand projected to build out in 2010 for the Proposed Project is as follows (see Table 4.8-4):

- Residential: 3,554 kiloWatt (kW) per year, and
- Commercial/Business-Professional: 6,810 kW per year.[9]

TABLE 4.8-4

ANNUAL ELECTRICAL DEMAND

Land Use Category	Number of Units or Square Feet	Electrical Demand Factor per Year	Estimated Electrical Demand (kW) per Year
Residential	1,325 units	2.6823 kW per unit	3,554
Commercial/Business-Professional	1,077,000[1] square feet	0.0063 kW per square feet	6,785
Total Demand			**10,339**

[1] Includes: 1,050,000 sf business village use (including 50,000 sf neighborhood commercial and 5,000 sf fire station); 10,000 sf village commercial; and 17,000 sf golf course support uses.
Source: Michael Gunby, Land Project Analyst, PG&E, written communication, August 8, 2003; EIP Associates 2003.

At full build out, the Proposed Project is anticipated to produce roughly the following demands for natural gas (see Table 4.8-5):

TABLE 4.8-5

HOURLY NATURAL GAS DEMAND

Land Use Category	Number of Units or Square Feet	Natural Gas Demand Factor per Hour	Estimated Natural Gas Demand (Therms) per Hour
Residential	1,325 units	0.3547 Therms per dwelling unit	470
Commercial/Business-Professional	1,077,000[1] square feet	0.0002 Therms per square feet	215
Total Demand			**685**

Source: Michael Gunby, Land Project Analyst, PG&E, written communication, August 8, 2003; EIP Associates 2003.
[1] Includes: 1,050,000 sf business village use (including 50,000 sf neighborhood commercial and 5,000 sf fire station); 10,000 sf village commercial; and 17,000 sf golf course support uses.

- Residential: 470 Therms per hour, and
- Commercial/Business-Professional: 180 Therms per hour.[10]

Standards of Significance

For the purpose of this EIR, impacts associated with increased demand for electricity or natural gas are considered significant if the Proposed Project would:

- Generate a demand for electricity or natural gas that exceeds the existing or planned natural gas supply or transmission facilities.

Direct environmental impacts from construction of public utilities for the Proposed Project are analyzed in the appropriate sections of Chapter 4 including Section 4.3, Parks and Recreation, Section 4.6, Air Quality, Section 4.7, Noise, Section 4.12, Geology and Soils, Section 4.13, Hazards and Hazardous Materials, Section 4.14, Cultural Resources, and Section 4.15, Biological Resources.

Project-Specific Impacts and Mitigation Measures

4.8-4 Development of the Proposed Project would increase the demand for electricity and could result in the need for additional distribution infrastructure.

The total projected electrical demand for the Proposed Project at build out, including residential, commercial and utility infrastructure, would be 10,339 kW per year (see Table 4.8-4). Power to meet Proposed Project demand would be supplied to PG&E from the Western Power Grid.[11] As described in the project description, the existing 21 kV distribution circuit located along the Specific Plan's northern boundary would be adequate to meet project demand.

The ability of PG&E to provide its services concurrently with each project is evaluated during a development review process. The input facilitates a detailed review of all projects by service purveyors to assess the potential demands for utility services on a project-by-project basis. Developers are required to obtain approval from PG&E for the construction of the needed infrastructure. Consistent with the proposed Specific Plan and PG& E requirements, the City and the applicant would work with PG&E to locate transmission line corridors to distribute electricity to project uses from the distribution circuit. Consistent with General Plan Policy 5.1-I11, the utility distribution lines would be constructed underground within street and trail right-of–ways.

Because adequate capacity exists to meet project demands and because the siting and construction of on-site distribution utility infrastructure would be consistent with PG&E requirements, the extension of infrastructure to meet anticipated electrical demand for the Proposed Project would be considered ***less than significant.***

Mitigation Measure

4.8-4 *None required*.

4.8-5 Development of the Proposed Project would increase the demand for natural gas, and could result in the need for additional distribution infrastructure.

The total projected natural gas demand for the Proposed Project at build out would be 685 therms per hour (see Table 4.8-5). PG&E has adequate supply of natural gas to serve the project site.[12] To accommodate anticipated demand, a new 8-inch diameter distribution main (approximately 8,000 linear feet) would be constructed in paved right-of-way to connect with existing facilities within the Nelson Road right-of-way approximately 1,000 feet south of Laurel Creek in Fairfield. The existing Fairfield distribution system is adequate to serve the entire load projected for the Proposed Project.[13] Smaller diameter gas distribution mains would radiate out from the 8-inch main, supplying natural gas to the service lines serving each parcel.[14]

Because adequate capacity exists to meet project demands and because the siting and construction of on-site distribution utility infrastructure would be consistent with PG&E requirements, the extension of infrastructure to meet anticipated natural gas demand for the Proposed Project would be considered ***less than significant***.

Mitigation Measure

4.8-5 *None required*.

4.8.4 CABLE TELEVISION

4.8.4a ENVIRONMENTAL SETTING

Comcast Cablevision provides cable television service within the City of Vacaville. The cable company is privately owned and operated. The existing development review process for project proposals includes a review and comment opportunity for privately owned utility companies such as Comcast Cablevision. This review and comment opportunity allows service purveyors to assess potential future demands for utility services and the existing access to potential development sites on a project-by-project basis.

Funding for cable service is collected through company billings and developer fees applied to the extension of infrastructure to new development.

4.8.4b REGULATORY SETTING

<u>Federal and State</u>

There are no specific federal or state regulations pertaining to the provision of cable television service.

Local

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable utility infrastructure goals and policies.

4.8.4c IMPACTS AND MITIGATION MEASURES

Methods of Analysis

For this analysis, each dwelling unit is anticipated to require one cable connection. One cable connection is anticipated per each gross acre of non-residential developed (business village and golf course) uses.

Standards of Significance

For the purposes of this EIR, a significant impact would occur if development proposed in the Proposed Project could:

- Generate a demand for cable television service that requires extension of related facilities in a manner that could adversely affect the environment.

Direct environmental impacts from construction of public utilities for the Proposed Project are analyzed in the appropriate sections of Chapter 4 including Section 4.3, Parks and Recreation, Section 4.6, Air Quality, Section 4.7, Noise, Section 4.12, Geology and Soils, Section 4.13, Hazards and Hazardous Materials, Section 4.14, Cultural Resources, and Section 4.15, Biological Resources.

Project-Specific Impacts and Mitigation Measures

4.8-6 Development of the Proposed Project would increase the demand for cable television and result in the need for additional distribution infrastructure.

The development of the Proposed Project area would create an increased demand for cable television service. A total of approximately 1,628 connections would be required (1,325 residential and 303 non-residential). As stated above, service connections would be provided by Comcast Cable and would be funded through developer fees and future customer billings. Consistent with the proposed Specific Plan, the City and the applicant would work with Comcast Cable to locate utility line corridors to install cable service lines to project uses. The cable service distribution lines would be constructed underground within street and trail right-of–ways. Because the installation of cable service distribution infrastructure would be consistent with City requirements, the extension of infrastructure to meet anticipated cable television service demand for the Proposed Project would be considered ***less than significant***.

Mitigation Measures

4.8-6 *None required*.

ENDNOTES

1. West Yost & Associates, *2003 Annual Data Report – City of Vacaville Infiltration and Inflow Program*, June 24, 2003.

2. City of Vacaville, *Infrastructure, Facilities and Services Status Report*, 2003.

3. West Yost & Associates, personal communication, Jeff Pelz, December 2003.

4. California Regional Water Quality Control Board, Central Valley Region, *Order No. 5-01-044 NPDES No. CA0077691: Waste Discharge Requirements for City of Vacaville Easterly Waste Water Treatment Plant, Elmira, Solano County,* March 15, 2001.

5. West Yost & Associates, *Project Report, Easterly Wastewater Treatment Plant Renovation & Expansion Facilities Plan,* July 7, 1998.

6. West Yost & Associates, *City of Vacaville 2000 Sanitary Sewer Flow Metering Master Plan (Draft),* May 5, 2000.

7. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, p.3, written letter dated August 8, 2003.

8. California Energy Commission website, http://www.energy.ca.gov/html/energysources.html accessed August 5, 2003.

9. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, written communication, p.1, August 8, 2003.

10. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, written communication, p.2, August 8, 2003.

11. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, oral communication on October 7, 2003.

12. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, oral communication on October 7, 2003.

13. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, written communication, December 15, 2003.

14. Michael Gunby, Land Project Analyst, Pacific Gas & Electric Company, p.2, written letter dated August 8, 2003.

4.9 PUBLIC SERVICES

4.9 PUBLIC SERVICES

4.9.1 INTRODUCTION

This section of the EIR describes public services provided in the City of Vacaville, including police protection, fire protection, schools, and solid waste disposal. The section will describe the existing services and evaluate potential increases in service demands resulting from future development of the Proposed Project.

Information contained in this section is based on a review of existing documentation, including the Vacaville General Plan, Volume One: Plan Policies (Adopted August 1990; Amended November 1999), and a site visit conducted in July 2003.

Comments received in response to the NOP (see Appendix B) for this project expressed concern about adequate access to the project area for fire and police vehicles, and the costs associated with building added fire and/or police facilities to serve the project site, and whether construction of these facilities would result in any significant environmental impacts.

4.9.2 POLICE AND FIRE PROTECTION SERVICES

4.9.2a ENVIRONMENTAL SETTING

Police Protection Services

The Vacaville Police Department (Police Department) is a full-service police protection department providing patrol, prevention, and investigative services. The Police Department is staffed by 108 sworn officers, 67 full-time non-sworn staff (dispatchers, records assistants, office staff, social service staff) and 40 part-time non-sworn staff. The Police Department currently has 45 patrol cars.[1] The Vacaville Police Department has one main police station, which was built in 1956, expanded in 1984, and is scheduled for replacement by a new facility to start construction in 2004. This station is located at 630 Merchant Street in Vacaville, at the main City Hall campus.

The Vacaville Police Department also has a number of satellite offices. The Police Department has its Family Investigative Response Services Team (FIRST) at 312 Cernon Street (all family-related crimes such as domestic violence, child abuse and elder abuse are sent to that office). The Police Department's Property and Evidence office is off-site in the industrial area on Allison Parkway. The Police Department's Crime Prevention Office is in a storefront on Rocky Hill Road, while its volunteer and crossing guard programs are in a satellite office in Leisure Town. The Police Department's Youth Services section has offices at both of the current high schools and both middle schools in Vacaville.

The distance of the main police station is located approximately 3 to 4 miles from the Specific Plan area. This main station would serve the Proposed Project with primary police services, including police dispatch, meeting place for public safety issues, and the City's Emergency Operations Center for disasters.[2]

Total calls for patrol service within the City of Vacaville were approximately 43,858 in 2002.[3] The Police Department's calls for service rose by 24 percent in 2002 versus the previous year.[4] These calls are categorized as either priority 1, 2, 3, or 4, and are defined as follows:

Priority One: These are emergency, life threatening or otherwise urgent calls that require an immediate response, such as an armed robbery or violent crime in progress. In 2002, there were approximately 4,373 priority 1 calls.[5]

Priority Two: Calls which do not require an urgent response for threatened life or property, but a response is needed as soon as possible, such as burglaries with no suspects on the scene or verbal disturbances which could escalate to violence. In 2002, there were approximately 20,896 priority 2 calls.[6]

Priority Three: All calls in which a delayed response is permissible, such as minor thefts with no suspects or traffic problems which do not present any hazard. In 2002, there were approximately 15,597 priority 3 calls.[7]

Priority Four: Calls that are considered to be of a very low priority, such as animal lost and found, parking complaints, and private property towing. In 2002, there were approximately 2,992 priority 4 calls.[8]

The City of Vacaville Police Department wishes to maintain a patrol officer staffing level such that each officer handles no more than 700 calls for services per officer per year (700 CFS/Officer/Year). In 2002, the Department's actual result was at 1,000 CFS/Officer/Year due to staffing constraints and call volume increases.[9]

Fire Protection Services

The City of Vacaville Fire Department (Fire Department) currently includes four fire stations within the City: Station Number 71 at 111 South Orchard Avenue; Station Number 72 located at 2001 Ulatis Drive, Station Number 73 located at 650 Eubanks Court, and Station Number 74 located at 1850 Alamo Drive.[10]

The Fire Department provides four different types of services, including fire suppression, emergency medical service, emergency response (including non-medical rescue, hazardous material spills, and public assistance calls), and non-emergency services such as plan checks, inspections, public education, and fire prevention programs. The State Fire Marshal has shifted responsibility for mandatory fire inspections of buildings to local officials. This has resulted in increased demands on the non-emergency services division of the Fire Department. This trend is expected to continue in the future as development continues, increasing the need for building inspection review.

The Fire Department currently has 82 employees with 80 full-time and two part-time. The Fire Department is a full service department with 24 hour a day, 7 day a week, 365 day a year service. The Fire Department has 69 personnel assigned to shifts, with 23 assigned to each shift, and a minimum staffing of 19 personnel per day.[11] The Fire Department's standard performance goal is to reach critical calls for service within seven minutes 90 percent of the time.[12] Although the Fire Department currently meets this goal in most areas of the City, with

project implementation current facilities and staffing would not result in achieving this goal in the Proposed Project area.[13]

The Fire Department is currently able to dispatch three engines, one truck, one medic unit, and one Battalion Chief to reported incidents. All engines are Class A pumpers capable of pumping 1,500 gallons per minute.[14]

The Fire Department has an automatic/mutual aid response agreements with the neighboring fire departments of Dixon, Fairfield, and the Vacaville Fire Protection District. However, the Vacaville Fire Protection District, unlike the City's fire department, is a volunteer resource and it is not staffed 24 hours a day, seven days a week. Also, both the Dixon and Fairfield stations are too far away to be "first responders", and they only help with second alarm or specialty incidents when multiple units over a longer period of time are needed.[15]

There are large areas of open grassland areas surrounding the City of Vacaville. This condition intensifies the fire hazard potential due to the interaction between urban uses and open grassland. The Fire Department has brush and grass units to handle such wild land fires.

4.9.2b REGULATORY SETTING

Federal

There are no federal regulations that pertain to the provision of police and fire services relevant to this project.

State

There are no state regulations that pertain to the provision of police and fire services relevant to this project.

Local

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable public service goals and policies.

Land Use And Development Code

In January 2003, the City of Vacaville City Council initiated an amendment to the Land Use & Development Code to incorporate development standards for residential development located adjacent to open lands where wildfire is a threat. The purpose of these standards will be to increase protection of life and property from wildfire hazards, through the development of fire buffer ones, building construction standards and other measures to increase fire protection.

4.9.2c IMPACTS AND MITIGATION MEASURES

Methods of Analysis

Police Protection

The Police Department has a goal to maintain current levels of service such that each officer handles no more than 700 calls for service (CFS)/Officer/Year. In order to achieve level of service goals, the Police Department requires a ratio of 1.2 sworn officers per 1,000 residents. The Proposed Project would result in 3,750 new residents. Based on the goal of 1.2 sworn officers per 1,000 residents, the Proposed Project would generate the need for approximately 3.6 officers plus support staff.

Fire Protection

To maintain current levels of service called for by the Fire Department (to reach critical calls for service within seven minutes 90 percent of the time), the Proposed Project would require an additional fire station staffed and equipped, including a minimum of one engine, a wild land unit (specializing in combating fires in grassland areas), one medic unit, and a three-person crew.

Standards of Significance

For the purposes of this EIR, police protection and fire protection services impacts are considered significant if the Proposed Project would:

- Exceed adopted standards or response times; or
- Exceed capacity of existing or planned fire protection services and facilities.

Project-Specific Impacts and Mitigation Measures

4.9-1 The Proposed Project would increase the demand for police protection services, and could exceed adopted service standards or response times.

The Police Department's performance goals/measures focus on outcomes and not on the number of officers per a given number of population. However, the department does use a ratio of 1.2 sworn officers per 1,000 residents as a goal. The Police Department measures calls per officer per year assigned to field duty (target is a maximum of 700 calls per year), crime clearance rates (goal of 70 percent violent crime clearance rate), a traffic enforcement index of 35 (accidents versus citations issued) and response times to high and moderate priority calls.[16]

The Proposed Project would generate the need for 3.6 sworn officers plus support staff based on the department's ratio of 1.2 sworn officers per 1,000 residents in order to maintain the Police Department's goal of a maximum of 700 calls per year per police officer.[17] The support necessary would be one to two Community Service Officers, one investigator, one dispatcher and one records assistant. Much of the Proposed Project would be a gated residential community, which could reduce incidence of on-site burglaries. However, the law enforcement needs of the residents would be similar to the population at large.[18]

The Police Department has infrastructure requirements to support the additional 3.4 officers including up to four police cars, plus one Community Service Officer vehicle, radios, computers,

and training costs.[19] In addition, special events at the golf course, increased use at the Lagoon Valley Regional Park, and increased population and commercial/office space, could result in the need for an added field supervisor (sergeant) by May 2006.[20]

Consistent with the Specific Plan, the Proposed Project would include provisions for a police sub-station in the proposed fire station. The proposed development agreement would incorporate funding mechanisms designed to fund ongoing police services to ensure those services are consistent with standards and performance measures for the City. Such funding could include interim measures to be determined by the Police Chief, such as adding staff and equipment necessary to provide police services to the Specific Plan area while it is under development. The Specific Plan also includes provisions for funding of a park ranger position, supported by the proposed park maintenance district.

The Proposed Project will be designed taking into consideration public safety including but not limited to night lighting in public areas. The Police Department's Crime Prevention Division will be consulted during the design process to help determine appropriate public safety features. Because the proposed project would result in an increased demand for police protection services that could exceed adopted service standards or response times, this is considered a ***potentially significant impact***.

Mitigation Measures

Implementation of the following mitigation measures would reduce this impact to a *less-than-significant level*.

4.9-1 (a) *The City shall require the integration of design features to maximize public safety service impacts for public safety features added to the Proposed Project (gates, lighting, etc.) The recommended features shall be developed in consultation with the Vacaville Police Department Crime Prevention Division.*

(b) *Prior to approval of tentative maps or design reviews, the City shall ensure that adopted features are incorporated into final project designs.*

4.9-2 The Proposed Project would increase the demand for fire protection services that could exceed the capacity of existing or planned services and facilities.

Development of Proposed Project uses (residential, commercial, business village, school, recreation) would increase the demand for fire protection services from the City of Vacaville Fire Department. The Fire Department's goal is to reach an emergency situation within seven minutes from notification. Currently, the Specific Plan area falls outside of the seven-minute response time zones of existing City Fire Department stations[21], and it is unlikely that an effective firefighting force could arrive within an acceptable time to confine a fire to its area of origin (i.e., back-up units). In addition, there are no immediate, nearby mutual aid entities to provide timely aid. The Specific Plan area is only accessible from existing fire stations via I-80 (which can become very congested depending on the time of day). Because much of the proposed residential development would be adjacent to hillside open space grassland areas, adequate access and firebreaks would be required for fire protection equipment, as well as residential sprinklers in areas beyond the Fire Department's concentrated response zone as determined by the Fire Chief's review of plan layouts.

Therefore, based on the Fire Department's current response time goals, and the relative distance of the Proposed Project from the nearest existing fire station, an additional staffed fire station is needed to provide adequate fire service to the Specific Plan area.

Consistent with the 2003 Standards of Response study, the Specific Plan includes the construction and operation of a new fire station in the development area of the Specific Plan area. Based on the Fire Department's 2003 Standards of Coverage Study and related computer modeling, the City would finalize the location of the new fire station as part of the Tentative Map approval, but it is anticipated and planned for the Business Village area. Construction of the station would begin prior to the approval of the 200th and completed prior to the 400th residential building permit or equivalent dwelling unit. The Specific Plan and development approvals would establish an appropriate funding mechanism (Community Service District, developer financing, etc) to cover the cost of construction, equipping and on-going operation for the proposed fire station.

Prior to completion and operation of the station, an Interim Fire Protection Plan would be developed that could include such interim steps as: installation of traffic control features to improve response time from existing fire stations; additional temporary staffing; locating temporary equipment and staff in the Specific Plan area; or other equally effective measures as determined by the Fire Chief. A mitigation fee program for the first 400 dwelling units or the equivalent is proposed as part of the implementation steps for the Specific Plan in order to fund this interim protection plan.

Because the development area is surrounded by hillside grassland and there is a risk of exposure to wildland fires, the Specific Plan includes Permanent Fire Protection Standards that would include, at a minimum: emergency vehicle ingress/egress routes and procedures; use of non-combustible construction materials and setback requirements for structures adjoining open space areas; fire breaks, including managed vegetative buffers with fire resistive landscaping; and long-term maintenance programs for the buffer areas between the development area and open space areas. In addition, all structures over 5,000 sf and certain homes adjacent to open space areas would be required to install sprinklers.

Because the Proposed Project would include the construction and operation of a new fire station, including operating costs, and would also include the development and implementation of Interim and Permanent Fire Protection programs, the impact on fire protection service as a result of the Proposed Project would be ***less than significant***.

Mitigation Measure

4.9-2 *None required*.

4.9.3 SCHOOLS

4.9.3a ENVIRONMENTAL SETTING

Public school services in the City of Vacaville are provided by three school districts, with a fourth serving areas adjacent to the City limits. These districts include: Travis Unified School District (TUSD), Vacaville Unified School District (VUSD), Fairfield-Suisun Unified School District (FSUSD), and Dixon Unified School District (DUSD). The Specific Plan area is split between the VUSD and FSUSD.[22] The VUSD serves the area north of Lagoon Valley Road, and the FSUSD serves the area south of Lagoon Valley Road (see Figure 4.9-1).

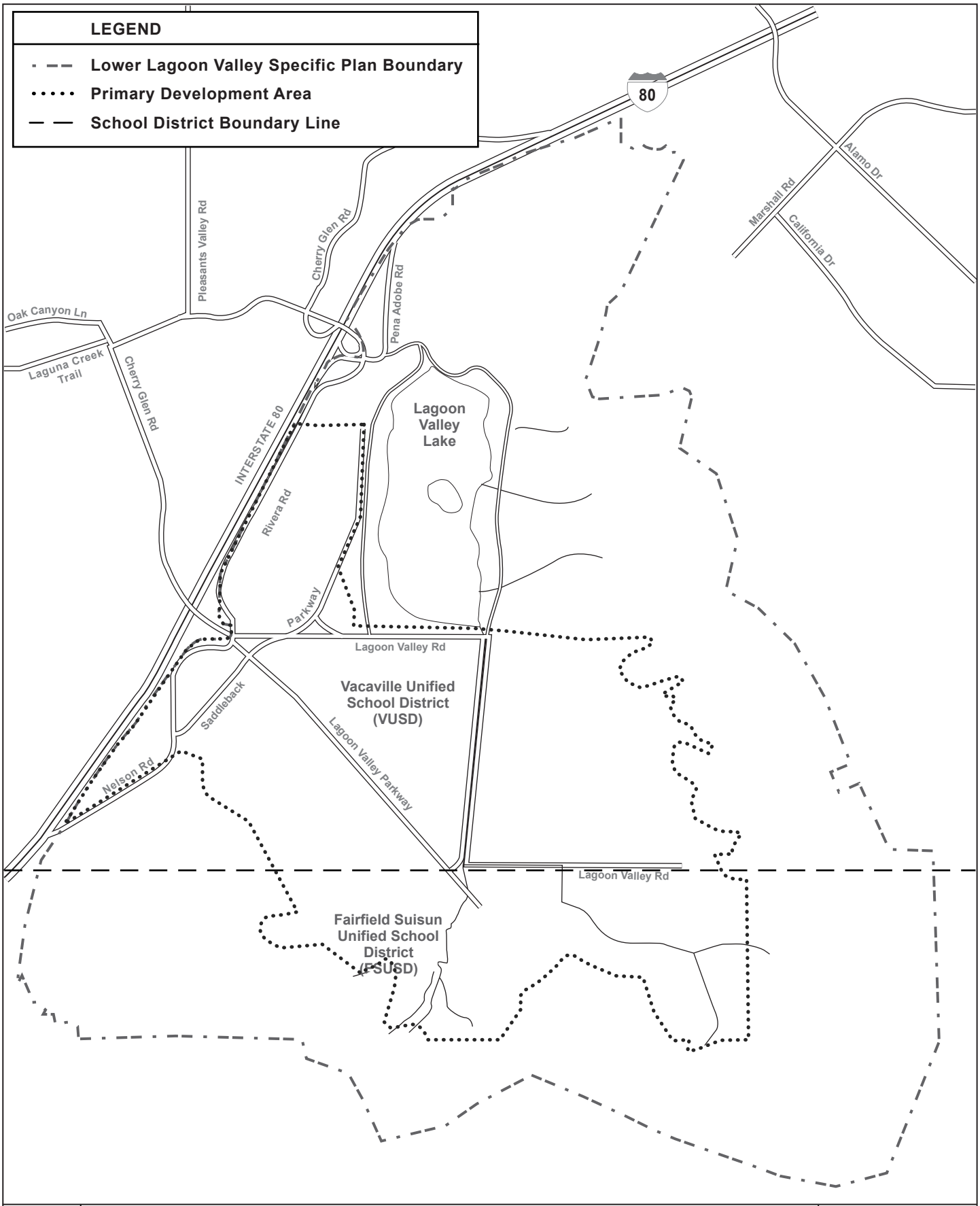


FIGURE **4.9-1**

School District Boundaries

Not to Scale

10794-00

Source: EIP Associates, 2003

City of Vacaville

Vacaville Unified School District

As with many school districts throughout California, school districts within the City of Vacaville have experienced difficulty securing funding to accommodate new students generated by development. Although intended as temporary, the use of portable classrooms (modified trailers) has become a solution to classroom overcrowding. The VUSD has a number of portable classrooms at every school. District wide, of 657 total classrooms and other program rooms, 266 or 40 percent are leased or owned portables and trailers. The other 391 classrooms or 60 percent are permanent rooms.[23] The VUSD has recently closed two small elementary schools (300 enrollment each) because of State budget cuts.[24]

The schools that could serve the project site include: Elm Elementary School, 129 Elm Street (K-6); Jepson Middle School, 580 Elder Street (7th-8th grades); and Vacaville High School, 100 Monte Vista Avenue (9th-12th grades).[25] Elm Elementary School is the nearest school facility to the Proposed Project site. Student enrollment estimates for each school are shown in Table 4.9-1.

The VUSD assesses $2.05 per square foot for new residential development, and $0.33 per square foot of new commercial/industrial and senior housing development. However, this does not provide full costs for school facilities required as a result of new development. The full recommended fee, as approved by the VUSD in the July 2000 Developer Fee Justification Report, is $10,800 per new single-family dwelling unit and $3,936 per new multi-family unit. According to VUSD, any fee lower than that amount does not provide adequate funding for school facility impacts from new residential development. The school district encourages developers to sign voluntary agreements for the full funding amount.[26]

TABLE 4.9-1

VACAVILLE UNIFIED SCHOOL DISTRICT SCHOOL CAPACITY AND ENROLLMENT

School	Total Students[1]	Capacity[2]
Elm Elementary School	402	418
Jepson Middle School	1,110	1,155
Vacaville High School	1,997	2,004

Notes:
1. Enrollment as of October 2002.
2. Includes portable classroom capacity as well.
Source: Leigh Coop, Director of Facilities, Vacaville Unified School District, August 2003.

Fairfield-Suisun Unified School District

Many FSUSD facilities are at or over capacity, and are on a multi-track year round schedule. Approximately half of the District's classrooms are portable. The District is currently looking at capacity and looking to build three new elementary schools in the coming years.

The existing FSUSD schools that would serve the Proposed Project site are Laurel Creek Elementary (K-6), 2900 Gulf Drive, Fairfield; Dover Middle School (7-8), 301 East Alaska Avenue, Fairfield; and Fairfield High School (9-12), 205 East Atlantic Avenue; Fairfield. Student enrollment estimates for each school are shown in Table 4.9-2.

TABLE 4.9-2

FAIRFIELD-SUISUN UNIFIED SCHOOL DISTRICT SCHOOL CAPACITY AND ENROLLMENT

School	Total Students	Capacity
Laurel Creek Elementary School	889	738
Dover Middle School	895	844
Fairfield High School	2,683	2,732

Source: Fairfield-Suisun Unified School District 5 Year Facility Master Plan, July 2002.

4.9.3b REGULATORY SETTING

Federal

There are no specific federal regulations pertaining to school facilities.

State

Funding for new school construction is provided through State and local revenue sources. However, due to the passage of Proposition 1A in November 1998, Senate Bill (SB) 50 (Chapter 407, Statutes of 1998) was enacted to change the way school district can levy developer fees. SB 50 enables the district to collect a fee that is equal to the Stirling fee. Where justified, SB 50 allows the district to collect additional fees in an amount that would approximate 50 percent of the cost of additional facilities. The collection of the 50 percent mitigation fees is based on the assumption that the State School Facility funding program remains intact and that State funds are still available for partial funding of new school facilities. If the funds are not available, Districts may collect up to 100 percent mitigation fees under certain circumstances. Also, a statewide formula also determines the required 20 percent local contribution or “match” to State funds for the renovation of older schools.

In addition to the use of developer fees that are applicable citywide, school districts may acquire funds to provide school services in specific areas through the creation of a Community Facilities District. The Mello-Roos Community Facilities Act of 1982 allows the City Council to create such a district with a two-thirds vote by area landowners, and may authorize a special tax and sell bonds to meet service costs. School districts may also initiate formation of a Community Facilities District.[27]

Local

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable public service goals and policies.

4.9.3c SCHOOL ANALYSIS

The impact of increased enrollment on school districts, in and of itself, is not an impact under CEQA. However, the physical environmental impacts of that increased enrollment – the construction of the proposed school - including the increased traffic, and associated air quality and noise impacts is evaluated in the appropriate sections of this EIR. Therefore, the discussion that follows is for informational purposes only.

As described above, the Specific Plan area falls within the boundaries of both the VUSD and the FSUSD. As shown in Table 4.9-1, in the VUSD: Elm Elementary School has a remaining capacity of 16 students; Jepson Middle School has a remaining capacity of 45 students; and Vacaville High School has a remaining capacity of 7 students. As shown in Table 4.9-2, in the FSUSD: Laurel Creek Elementary School is over capacity by 151 students; Dover Middle School is over capacity by 51 students; and Fairfield High School has a remaining capacity of 49 students.

Table 4.9-3 identifies the number of students generated within the VUSD and FSUSD boundaries based on District student generation rates. As shown in Table 4.9-3, approximately 910 of the total 1,325 dwelling units proposed fall under the jurisdiction of the VUSD. Based on the VUSD generation factors, the Proposed Project would generate a total of 357 K-6 students, 111 middle school students and 194 high school students. Therefore, the existing capacity at Elm Elementary School, Jepson Middle School and Vacaville High School would be exceeded by project demand.

TABLE 4.9-3

STUDENT ENROLLMENT ESTIMATES (UNDER CURRENT SCHOOL DISTRICT BOUNDARIES)

School District	Residential Units	Yield Rate			Students			Total
		K-6	7-8	9-12	K-6	7-8	9-12	
Vacaville Unified School District	910	0.392	0.122	0.213	357	111	194	
Total VUSD								**662**
Fairfield-Suisun Unified School District	414	0.289	0.085	0.131	120	35	54	
Total FSUSD								**209**

Sources: Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, December 4, 2003. Rob Pierce, Director of Facilities, Fairfield-Suisun Unified School District, written communication, August 7, 2003.

As shown in Table 4.9-3, approximately 414 of the total 1,325 dwelling units proposed currently fall under the jurisdiction of the FSUSD. Using FSUSD generation factors, the Proposed Project would generate approximately 120 K-6 grade students, 35 7-8-grade students, and 54 9-12 grade students. Therefore, the existing capacity at Laurel Creek Elementary School, Dover Middle School and Fairfield High School would be exceeded by project demand.

The project proposes construction of an approximately 10 to 12-acre school site located in Village I. The school would be either a K-6 public school (accommodating 600 students) or a K-8 private school (accommodating 300 students). If a public school were developed, then approximately six acres of the school site would be designated for neighborhood park and used by the public on a joint-use basis. The proposed school site is currently located in the VUSD.

The VUSD and the FSUSD are currently in discussions to move the VUSD boundaries to include the entire Specific Plan area. If an agreement to move the VUSD boundaries is

approved, then the Proposed Project would include the land improvements and dedication of the 10 to 12 acres and the VUSD would construct a 600 student K-6 public school. As shown in Table 4.9-4, student generation rates if the entire Specific Plan area is located in the VUSD boundaries include 499 K-6 grade students, 153 7-8-grade students, and 267 9-12 grade students. The proposed 600 student K-6 public school would accommodate Proposed Project demand. However, the demand for 7-8 and 9-12 students would exceed the capacity of existing VUSD facilities.

TABLE 4.9-4

STUDENT ENROLLMENT ESTIMATES (UNDER PROPOSED DISTRICT BOUNDARIES)

School District	Residential Units	Yield Rate			Students			Total
		K-6	7-8	9-12	K-6	7-8	9-12	
Vacaville Unified School District	1,325							
	1,225 single-family	0.392	0.122	0.213	480	149	263	890
	100 multi-family	0.191	0.036	0.059	19	4	6	29
Total VUSD					**499**	**153**	**267**	**919**

Sources: Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, December 4, 2003.

If an agreement to move the boundaries cannot be reached, then the Proposed Project would include the construction a 300 student K-8 private school on the 10 to 12-acre site. Only a portion of the 461 K-6 and 140 1-8 grade students generated by the project by residences located in both school district boundaries could be met by the proposed private school. The remaining K-8 and 9-12 students would attend district schools and would likely exceed capacity of those existing facilities.

Increased need for classroom space could be accommodated by the acquisition of additional portables at the affected schools, or through the use of already constructed District buildings as schools.[28] School fees would be collected to fund construction of new schools, as required and allowed by State law.

As noted above, the Vacaville Unified School District encourages developers to provide school impact fees at the level identified by the District as a full cost mitigation fee. The Draft Specific Plan and preliminary Development Agreement points require that development within the Specific Plan area make a financial contribution for educational services/facilities. The proposed contribution level is equivalent to the VUSD's recommended full cost facility fee of $10,800/ residential unit. Under the proposed policies contained in the Specific Plan and as proposed for the Development Agreement, this funding would be directed to the VUSD and/or used for the construction of the public school, if a public school is eventually approved for the Specific Plan area. If no school district boundary change is enacted for the Specific Plan area, the Specific Plan requires that a private school be constructed in the residential development area. Under this scenario, the developer would still be obligated to pay State required school fees to each of the two districts, thus mitigating impacts of development on the two districts, as required by State law. The fund balance from the proposed educational services/facilities contribution required by the Specific Plan would then be used by the master developer to ensure construction of the private school.

4.9.4 SOLID WASTE

4.9.4a ENVIRONMENTAL SETTING

Solid Waste Disposal

Vacaville Sanitary Service, a private company, contracts with the City to provide solid waste disposal services.[29] Solid waste within the City is hauled to the B&J Landfill, located in Vacaville.[30] The B&J Landfill is a Class II landfill, and has a permitted site area of 640 acres.[31] The existing permitted disposal area for the site is 256 acres.[32] This landfill is anticipated to have capacity through the year 2070.[33]

The useful life of the landfill could be extended through recycling efforts. In January 1992, the City adopted the Source Reduction and Recycling Element of the General Plan. This Element establishes programs that aim to divert solid waste sent to the landfill, and thus lengthen the landfill's life. The City offers both residential curbside recyclable and green waste collection. The City reported a diversion rate of 56 percent in 2000.[34] This was in accordance with the City's General Plan, specifically Guiding Policy 5.1-G6, which requires that a minimum of 50 percent of the waste stream from the landfill be diverted by the year 2000.

In addition, the permitted disposal area within the landfill could be expanded. The landfill is currently permitted to receive up to 2,400 tons per day of solid waste.[35] B&J Landfill has a permitted capacity of 28,240,000 cubic yards. As of June 2001 the remaining capacity was 23,198,067 cubic yards. In 2000, the landfill received approximately 82,205.2 of total tons of solid waste from the City.[36] For that same period (2000), total household waste disposal amounted to 50,245 tons. The resident daily disposal (lbs./resident/day) was 3.2 for that year.[37] Total business waste disposal was 33,497 tons in 2000, and the employee daily disposal (lbs./employee/day) was 9.4 in 2000.[38] This generation rate takes into account the City's waste disposal programs and methods to divert solid waste expected to reduce the waste stream to the landfill by at least 50 percent, such solid waste reduction being in accordance with General Plan Policy 5.1-G6.[39]

The B&J Landfill currently accepts non-hazardous solid waste, sludge (biosolids), ash, waste containing asbestos, tires, agricultural waste, mixed municipal waste, and construction waste.[40]

4.9.4b REGULATORY SETTING

Federal

Title 40 of the Code of Federal Regulations (CFR), Part 258 (Resource Conservation and Recovery Act RCRA, Subtitle D) contains regulations for municipal solid waste landfills and requires states to implement their own permitting programs incorporating the federal landfill criteria. The federal regulations address the location, operation, design, groundwater monitoring, and closure of landfills.

Federal requirements for disposal of biosolids are set forth in Title 40 Part 503 of the CFR.

State

Assembly Bill 939

The federal regulations are enacted by the California Public Resource Code Sections 40000 et seq. (California Integrated Waste Management Act). The State agency charged with the permitting of solid waste facilities is the California Integrated Waste Management Board.

Assembly Bill 939 (AB 939) (Public Resources Code 41780) is designed to increase landfill life and conserve other resources through increased source reduction and recycling. AB 939 requires cities and counties to prepare Solid Waste Management Plans to implement AB 939's goals, particularly to divert approximately 50 percent of solid waste from landfills. AB 939 requires households to use and maintain green waste bins. AB 939 also requires cities and counties to prepare Source Reduction and Recycling Elements. This element is to develop programs to achieve the landfill diversion goals, stimulate local recycling in manufacturing and stimulate the purchase of recycled products.

Local

City of Vacaville General Plan Policies

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable public service goals and policies.

4.9.4c IMPACTS AND MITIGATION MEASURES

Methods of Analysis

The analysis of solid waste service impacts is based upon consideration of the estimated amount of solid waste anticipated to be generated by the project and information from the California Integrated Waste Management Board.

The following generation rates are used to determine the solid waste generation for the Proposed Project. These generation rates already take waste reduction into account.[41]

- Residential: 3.2 lbs/resident/day
- Non-residential: 1.0 lbs/100 sf/day

The amount of waste generated is then compared to the annual or daily tonnage intake of the landfill.

This generation rate takes into account the City's waste disposal programs and methods to divert solid waste expected to reduce the waste stream to the landfill by at least 50 percent, such solid waste reduction being in accordance with General Plan Policy 5.1-G6.[42] Multiplied by the approximately 3,750 residents that the Proposed Project's planned 1,325 residential units is anticipated to bring, this would be the equivalent generation of approximately six tons of solid waste per day for the residential land use.

For the proposed non-residential land use, a current solid waste generation factor of 1.0 lbs/100 sf/day is used. It has been proposed that the Lower Lagoon Valley site is to contain

approximately 1,100,000 sf of non-residential usage.[43] Assuming a generation rate of 1 lb/100 sf/day for the buildable area, this would produce approximately 4.9 tons of solid waste per day from this portion of the Proposed Project. As shown in Table 4.9-5, the Proposed Project would generate a total of 10.9 tons of solid waste per day.

TABLE 4.9-5

ESTIMATED SOLID WASTE GENERATION

Land Use	Generation Rate	Number of Residents/Employees/SF	Total (tons/day)
Residential	3.2 lbs/resident/day	3,750	6
Non-Residential	1.0 lb/100 sf/day	1,100,000	4.9
Project Total			**10.9**

Source: California Integrated Waste Management Board.

The analysis of solid waste generation associated building construction and site preparation activities will be qualitative in nature; the exact generation levels are unknown at this time.

Standards of Significance

For the purpose of this EIR, impacts associated with solid waste are considered significant if implementation of the Proposed Project would:

- Generate enough solid waste to exceed landfill capacity or substantially shorten life of the landfill

Project Specific Impacts and Mitigation Measures

4.9-3 The residential and non-residential land uses in the Proposed Project would increase the volume of solid waste accepted at the B&J Landfill.

The Proposed Project is estimated to add approximately 3,750 new residents to the B&J Landfill service area. The population, including business uses, is expected to generate approximately 10.9 tons of solid waste per day, assuming continuation of the solid waste and recycling recovery programs and methods now in use by the City.

The B&J Landfill currently has a permitted site area of 640 acres and the existing permitted disposal area for the site is 256 acres. The landfill is currently permitted to receive up to 2,400 tons per day of solid waste. The Proposed Project would contribute up to 10.9 tons per day or 3,979 tons per year. As discussed in the Setting section, the landfill is anticipated to have capacity through the year 2070, including capacity to serve this project.[44]

In addition, the Proposed Project would generate grass clippings from the proposed golf course, which would require transportation and separation for waste diversion purposes. Although no quantitative factors have been defined to quantify the amount of green waste that would be generated, the total impact would be considered to be substantial given the acreage of the golf course. However, Vacaville Sanitary Service would be required by the City to extend its existing source reduction programs to include the project site, therefore, the increase in lawn clippings from the proposed golf course would not result in a significant impact. The Proposed Project could result in increased use of facilities at Lagoon Valley Regional Park. However, the park is

currently used and it is unlikely that any increased use would result in additional solid waste production that would exceed landfill capacity. Therefore, the Proposed Project would not generate enough solid waste to exceed landfill capacity or substantially shorten the life of the landfill. Therefore, this is considered a ***less-than-significant impact***.

Mitigation Measure

4.9-3 *None required*.

ENDNOTES

1. Police Chief Bob Harrison, Vacaville Police Department, written communication, June 13, 2003.

2. Police Chief Bob Harrison, Vacaville Police Department, written communication, September 22, 2003.

3. Chris Schaub, Crime Analyst, Supervisor, Crime Analysis Section, Vacaville Police Department, written communication, June 20, 2003.

4. Police Chief Bob Harrison, Vacaville Police Department, written communication, June 13, 2003.

5. Chris Schaub, Crime Analyst, Supervisor, Crime Analysis Section, Vacaville Police Department, written communication, June 20, 2003.

6. Chris Schaub, Crime Analyst, Supervisor, Crime Analysis Section, Vacaville Police Department, written communication, June 20, 2003.

7. Chris Schaub, Crime Analyst, Supervisor, Crime Analysis Section, Vacaville Police Department, written communication, June 20, 2003.

8. Chris Schaub, Crime Analyst, Supervisor, Crime Analysis Section, Vacaville Police Department, written communication, June 20, 2003.

9. Police Chief Bob Harrison, Vacaville Police Department, written communication, June 13, 2003.

10. Staci Kendricks, Management Analyst II, City of Vacaville Fire Department, verbal communication, September 24, 2003.

11. Fire Chief Frank Moore, Vacaville Fire Department, written communication, June 13, 2003.

12. Fire Chief Frank Moore, Vacaville Fire Department, written communication, June 13, 2003; revised on December 1, 2003 per Fred Buderi and Fire Department comments.

13. *City of Vacaville, Standards of Response Cover Study (Volume 2),* Draft Report, pp. 3-4, Maps 3 and 4, July 11, 2003.

14. Fire Chief Frank Moore, Vacaville Fire Department, written communication, June 13, 2003.

15. *City of Vacaville, Standards of Response Cover Study (Volume 1),* Draft Report, p. 26, July 11, 2003.

16. Police Chief Bob Harrison, Vacaville Police Department, written communication, August 5, 2003.

17. Police Chief Bob Harrison, Vacaville Police Department, written communication, August 5, 2003.

18. Police Chief Bob Harrison, Vacaville Police Department, written communication, August 1, 2003.

19. Police Chief Bob Harrison, Vacaville Police Department, written communication, August 5, 2003.

20. Police Chief Bob Harrison, Vacaville Police Department, written communication, August 1, 2003.

21. *City of Vacaville, Standards of Response Cover Study (Volume 2),* Draft Report, Map 3, p.3, July 11, 2003; revised on December 1, 2003 per Fred Buderi and Fire Department comments.

22. Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, June 12, 2003.

23. Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, June 12, 2003.

24. Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, June 12, 2003.

25. Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, June 24, 2003.

26. Leigh Coop, Director of Facilities, Vacaville Unified School District, written communication, June 24, 2003.

27. *Vacaville General Plan*, Volume One: Plan Policies, p. 15, Adopted August 1990; Amended November 1999.

28. Rob Pierce, Director of Facilities, Fairfield-Suisun Unified School District, written communication, August 7, 2003.

29. Lori Peat, Associate Planner, City of Vacaville, personal communication, June 10, 2003.

30. Lori Peat, Associate Planner, City of Vacaville, personal communication, June 10, 2003.

31. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

32. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

33. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

34. http://www.ciwmb.ca.gov/Profiles, accessed on June 20, 2003.

35. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

36. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

37. http://www.ciwmb.ca.gov/Profiles, accessed on June 20, 2003.

38. http://www.ciwmb.ca.gov/Profiles, accessed on June 20, 2003.

39. John Sitts, Profiles Coordination Supervisor for www.ciwmb.ca.gov/Profiles/, verbal communication, September 23, 2003.

40. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

41. John Sitts, Profiles Coordination Supervisor for www.ciwmb.ca.gov/Profiles/, verbal communication, September 23, 2003.

42. John Sitts, Profiles Coordination Supervisor for www.ciwmb.ca.gov/Profiles/, verbal communication, September 23, 2003.

43. *City of Vacaville, Standards of Response Cover Study (Volume 1),* Draft Report, p. 3, July 11, 2003.

44. http://www.ciwmb.ca.gov/Profiles, accessed on June 17, 2003.

4.10 WATER SUPPLY

4.10 WATER SUPPLY

4.10.1 INTRODUCTION

This section evaluates impacts from the Proposed Project to the existing water distribution and water supply provided by the City. The section will describe the existing water distribution and supply system, evaluate potential increases in water demand, and recommend means by which any significant impacts may be reduced to a level of insignificance.

The water supply analysis presented here is a summary of the *Water Supply Investigation for Lower Lagoon Valley Technical Memorandum* (January 2004) as prepared by Nolte Associates. This investigation represents an analysis of potential impacts of serving the Proposed Project on the overall water supply and distribution system for the City of Vacaville. Recommended supply and distribution system improvements are identified, including non-potable water system components managed by the Solano Irrigation District (SID). The water supply investigation consists of a discussion of existing water supply and distribution system components, an analysis of Proposed Project impacts, and a summary of recommended facilities to mitigate impacts to the potable water and non-potable water systems.

The following issues (with associated response) were raised in the NOP comment letters (see Appendix B) with regard to the water supply and distribution system:

- What will happen to the underground reservoir that currently supplies water to the Hines nursery?
  The existing underground reservoir is owned and operated by the Solano Irrigation District (SID) and will continue to provide non-potable water service to existing users within the Proposed Project area.
- How must the existing non-potable water system be studied to ensure capacity for the Proposed Project?
  The total non-potable water demand is discussed in this analysis as well.
- How the Proposed Project will affect the total water supply during prolonged drought periods versus prolonged drought water availability?
  A thorough discussion of the total water demand versus water supply under various conditions is discussed in this analysis.
- How groundwater salinity limits will be considered when planning groundwater wells in the vicinity of the Proposed Project?
  The City does not have any plans to drill and construct new potable groundwater wells in the vicinity of the Proposed Project.
- How will the City ensure enough water supply for the planned growth?
  The City has prepared a water supply assessment report which includes all the planned growth (Rice McMurtry, Southtown, and Lower Lagoon Valley). Portions of this report are referenced in this analysis.

4.10.2 ENVIRONMENTAL SETTING

This section contains a description of the existing and planned groundwater, surface water, and water conveyance and supply facilities. The water utility system is a self-supporting City enterprise. The water utility is responsible for operation, maintenance, and repair of the City's water treatment and distribution system, as well as water quality and recycled water distribution. Vacaville's water utility system was purchased from Pacific Gas and Electric (PG&E) Company in 1959 by issuing voter-approved water revenue bonds. Since purchasing the system, the City has systematically improved and upgraded this infrastructure.

Surface Water Sources

The Vacaville water system consists of surface water treatment facilities, wells, pumping facilities, distribution and transmission pipelines, and storage reservoirs. The system receives water from several sources, including Solano Project water from the Lake Berryessa reservoir, State Water Project water from the North Bay Aqueduct (NBA) through the North Bay Regional (NBR) Water Treatment Plant (WTP), and groundwater from local City wells. Within Vacaville's water entitlements, the percentage of water used from each supply source varies due to conjunctive use. If any one source has limited water availability or poor water quality, use from other sources can increase. Likewise, if unscheduled water becomes available, it can be utilized to the City's advantage.

Surface water from Lake Berryessa is provided by contract between the U.S. Bureau of Reclamation (BR) and the Solano County Water Agency (SCWA), delivered by the SID. This water is treated at either the NBR WTP or at the City's 10 million gallons per day (mgd) Diatomaceous Earth (DE) Filter Water Treatment Plant (WTP), in which the treated water flows into a ground-level chlorine contact basin.

Wells 1, 6, and 13 also supply water directly to this contact basin. From the contact basin, a booster pump station (Treated Water Pump Station) lifts the water into the distribution system. The remaining wells (2, 3, 5, 7, 8, 9, 14, and De Mello) supply water directly to the distribution system. A new production well (15) now drilled will be equipped and brought into production in 2004. De Mello, a low-capacity well, was brought into production in March 2003 to provide fresh water at a distribution system "dead-end" located on the outskirts of town. The locations of the existing City wells and DE WTP are shown in Figure 4.10-1.

The NBR WTP provides a capacity of 13.0 mgd for Vacaville and supplies water directly to the City's distribution system. The NBR WTP draws water from the Sacramento River Delta via the NBA, as well as Solano Project water from the Putah South Canal. The location of the NBA and Putah South Canal can be seen in Figure 4.10-2.

Surface Water Transmission Facilities and Entitlements

The City has three separate sources for surface water. Each source has a different level of reliability. This section describes the City's surface water sources.

Solano Project/SID Agreement

The Solano Project was constructed by the Bureau of Reclamation (BR) in 1958. The water rights permits for the Solano Project are held by the BR in trust for the Solano water users. The water rights permits further state that when the permits are converted to a license, the license

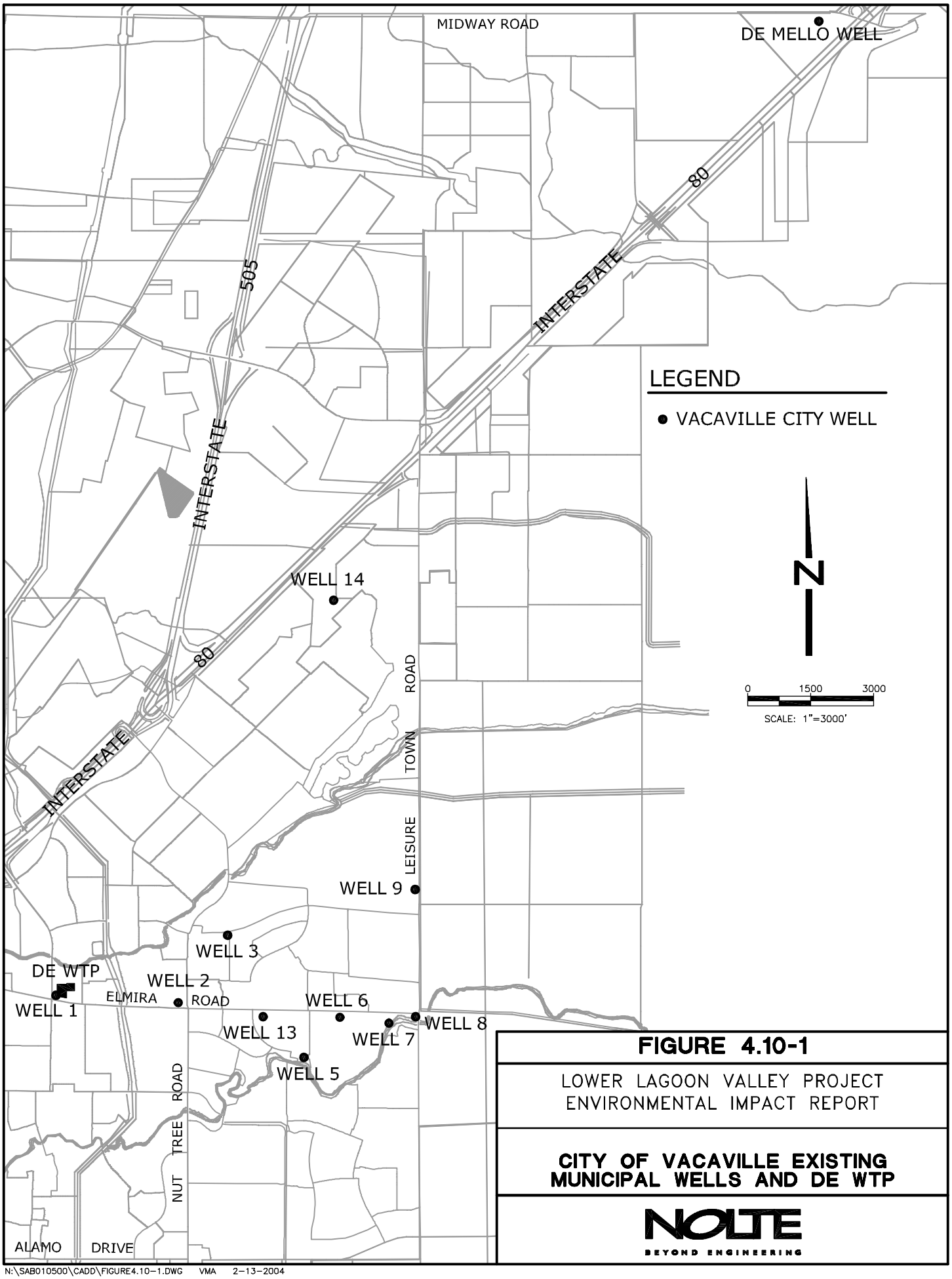


FIGURE 4.10-1

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

CITY OF VACAVILLE EXISTING MUNICIPAL WELLS AND DE WTP

NOLTE
BEYOND ENGINEERING

N:\SAB010500\CADD\FIGURE4.10-1.DWG VMA 2-13-2004

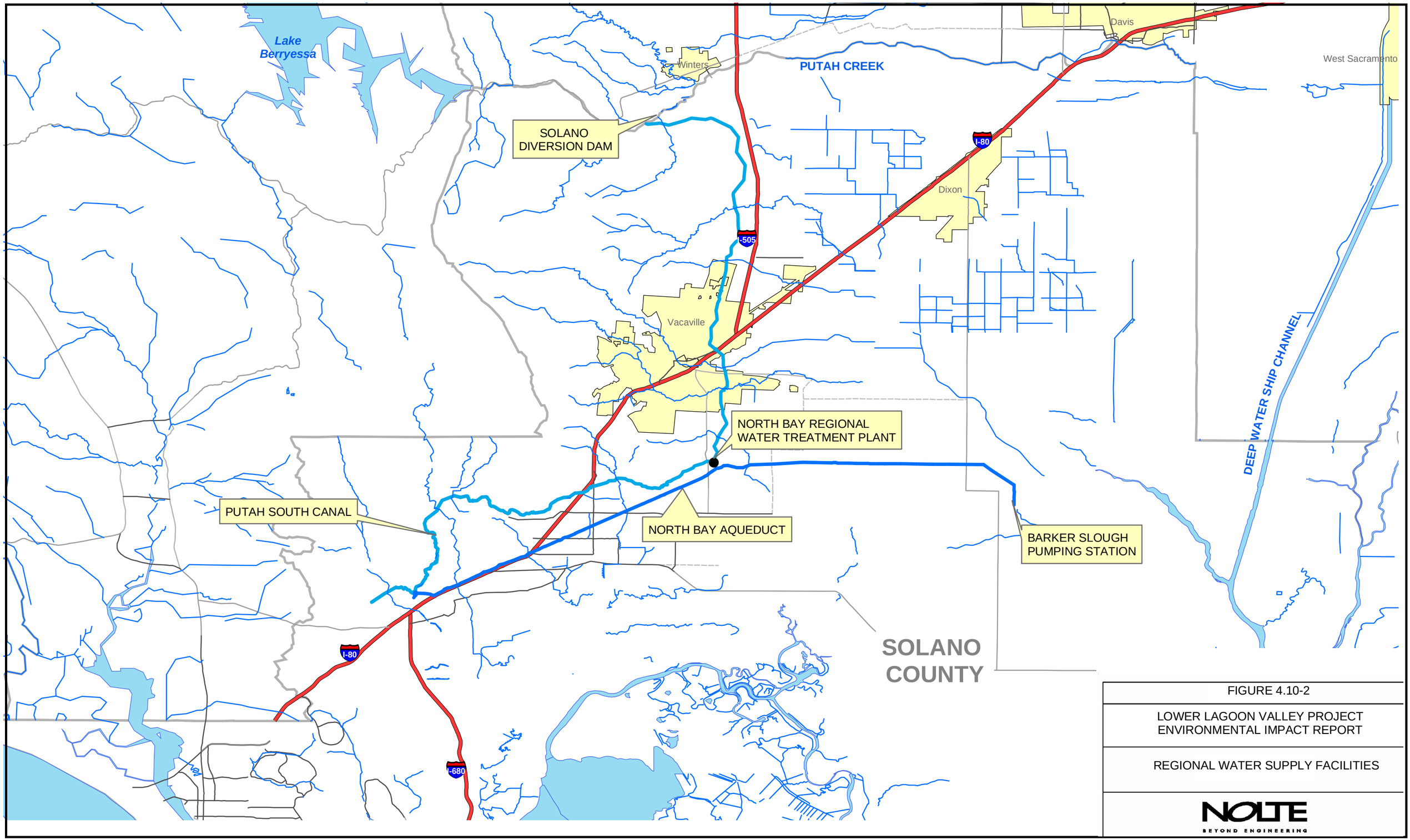


FIGURE 4.10-2

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

REGIONAL WATER SUPPLY FACILITIES

NOLTE
BEYOND ENGINEERING

N://sab010500/CADD/vicinity.mxd CYY 01-22-04

will be issued in the name of the Solano water users. Unlike most federal water projects, the water rights to the Solano Project "belong" to the Solano water users. The main feature of the Solano Project is Monticello Dam, which provides for storage of 1.6 million ac-ft of water in Lake Berryessa. Water from Lake Berryessa is diverted through the Putah Diversion Dam to the 32-mile Putah South Canal, which transports water to the eight SCWA-member unit contractors for Solano Project water.

SCWA has entered into agreements with cities, districts, and state agencies to provide water from the Solano Project. The Solano Project contracting agencies are: Fairfield, Suisun City, Vacaville, Vallejo, SID, Maine Prairie Water District, University of California at Davis, and California State Prison - Solano. The annual entitlement for each agency is described in Table 4.10-1.

TABLE 4.10-1

SUMMARY OF SOLANO PROJECT WATER CONTRACTS

Agency	Annual Entitlement (ac-ft/yr)
Fairfield	9,200
Suisun City	1,600
Vacaville	5,750
Vallejo	14,600
SID	141,000
Maine Prairie Water District	15,000
UC Davis	4,000
California State Prison – Solano	1,200
Project Operation Loss (average estimated)	15,000
Total	207,350

Solano County Water Agency, *SCWA Briefing Book*, January 2002.

The contracts with the public entities that use Solano Project water provide for the sale and distribution of water made available by the BR each year. The BR is contractually committed to delivering the full contract amount of water supply from the Solano Project unless the water supply does not physically exist (e.g. an empty reservoir). All Solano Project contractors, whether they are municipal or agricultural, are impacted by water supply reductions on an equal basis.

In addition to its entitlement from SCWA, Vacaville entered into a 1995 Master Water Agreement with SID, pursuant to which Vacaville receives an increasing supply from SID through the year 2016 and constant supply thereafter until the year 2045. A summary of the annual water schedule of SID water available to Vacaville is contained in Table 4.10-2.

State Water Project

Vacaville receives water allocations from the State Water Project (SWP) through the SCWA and water from a Year 2000 purchase agreement from Kern County Water Agency (KCWA). Surface water received pursuant to these agreements is delivered through the North Bay Aqueduct (NBA), a SWP facility. The City supply from the State Water Project is 6,100 ac-ft/yr, while KCWA Agreement water totals 2,878 ac-ft/yr. The Solano County branch of the NBA was

TABLE 4.10-2

ANNUAL WATER SCHEDULE FOR THE SID WATER AGREEMENT

Year	Annual Entitlement (ac-ft/yr)	Year	Annual Entitlement (ac-ft/yr)
2001	2,500	2009	3,000
2002	2,500	2010	8,000
2003	2,500	2011	8,000
2004	2,500	2012	9,000
2005	3,000	2013	9,000
2006	3,000	2014	10,000
2007	3,000	2015	10,000
2008	3,000	2016 through 2045	10,050

Nolte Associates, Inc., *2000 Urban Water Management Plan Update*, December 2001.

completed in 1988. The North Bay Aqueduct is 28 miles long starting from Barker Slough in the Delta and ending in Napa County. The location of the NBA can be seen in Figure 4.10-2. The California Department of Water Resources (DWR) is the owner and operator of the NBA.

The water supply for the NBA is less reliable than the Solano Project. Supply from the NBA comes from the State Water Project which provides water to a total of 29 contractors. Because the NBA is part of the entire State Water Project, any shortages occurring in the State Water Project impact the NBA.

There are currently seven agencies with NBA water allocations including Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo. The water entitlement amounts in each agency contract for State Water Project water increase annually somewhat in proportion to the SCWA's contract with DWR. Member units using the NBA and their allocations are described in Table 4.10-3. Shortages during dry years are proportional to their share of the overall contract with DWR.

TABLE 4.10-3

STATE WATER PROJECT ALLOCATION TO SOLANO COUNTY CITIES SERVED BY THE NORTH BAY AQUEDUCT

City	Annual Entitlement (ac-ft/yr)
Benicia	17,200
Dixon	0
Fairfield	14,678
Rio Vista	0
Suisun City	1,300
Vacaville	8,978
Vallejo	5,600
Total	47,756

Solano County Water Agency, *SCWA Briefing Book*, January 2002.

Settlement Water (DWR Agreement)

Settlement water consists of surface water from the Sacramento River and Sacramento-San Joaquin Delta Estuary. Settlement water is diverted under water rights held by DWR, but is not considered State Water Project (SWP) water. The water is made available by DWR in

settlement of area-of-origin water right applications by the cities of Fairfield, Benicia, and Vacaville. The Settlement Agreements provides an entitlement to each of these three cities as shown in Table 4.10-4 which is based on critical dry year deliveries.

TABLE 4.10-4

SUMMARY OF SETTLEMENT WATER FOR THE CITIES OF FAIRFIELD, BENICIA, AND VACAVILLE

City	Annual Entitlement (ac-ft/yr)
Fairfield	11,800
Benicia	10,500
Vacaville	9,320
Total	31,620

Solano County Water Agency, *SCWA Briefing Book*, January 2002.

Groundwater Supply

Another source of supply for the City is groundwater. Currently, groundwater is provided through 11 wells, ten of which withdraw water from the deep aquifer in the basal zone of the Tehama Formation. Historic groundwater pumping is summarized in Table 4.10-5. Most City wells are located in the Elmira well field. However, new wells are being sited further north, near Interstate 80 (I-80). These wells are planned regardless of whether the Proposed Project proceeds. Currently, approximately 6,600 ac-ft/yr are withdrawn. Vacaville continues to explore well field expansion as a means of maintaining adequate water supply.

TABLE 4.10-5

HISTORIC GROUNDWATER PUMPING FOR THE CITY OF VACAVILLE

Year	ac-ft/yr		Year	ac-ft/yr
1968	2,862		1986	5,829
1969	3,046		1987	6.267
1970	2,871		1988	5,420
1971	3,198		1989	6,073
1972	3,255		1990	5,626
1973	3,125		1991	5,447
1974	3,316		1992	5,531
1975	3,970		1993	4,395
1976	4,965		1994	3,892
1977	5,076		1995	3,885
1978	5,707		1996	3,230
1979	6,236		1997	3,386
1980	7,043		1998	3,905
1981	7,740		1999	4,096
1982	7,684		2000	5,141
1983	8,156		2001	6,211
1984	6,063		2002	6,638
1985	5,853			

Nolte Associates, Inc., *City of Vacaville 2000 Annual Water Report*, August 2003.

Recycled Water Supply

In 2003, the City completed a Recycled Water Master Plan. Preliminary planning estimates indicate tertiary treated recycled water available for delivery, with the appropriate infrastructure in place, by 2015. Potential irrigation customers have been identified and a stakeholder's workshop was held in July 2003 to review preliminary planning with affected community members. At present, delivery estimates for 2015 total 1,175 ac-ft/yr. Knowing that this drought-proof resource will require user contracts and possible retrofit costs on the user's behalf, for planning purposes 75 percent of the total delivery figure or 880 ac ft/yr is assumed for the purposes of this environmental analysis.[1]

Summary of Water Supply Sources

For the City at buildout, the total water supply available from groundwater, surface water, and recycled water will be 42,978 ac-ft/yr. A summary of the respective supply sources previously discussed is presented in Table 4.10-6

TABLE 4.10-6

CITY OF VACAVILLE
TOTAL WATER SUPPLY AT BUILDOUT

Sources of Supply		Entitlement (ac-ft/yr)
Solano Project		
	Vacaville Entitlement (Table 4.10-1)	5,750
	SID Agreement (Table 4.10-2)	10,050
State Water Project		
	Vacaville Entitlement	6,100
	KCWA Agreement	2,878
	Settlement Water (Table 4.10-4)	9,320
Groundwater Pumping[2]		8,000
Recycled Water		880
Total		42,978

Water Production and Distribution Facilities

This section contains a description of the water production facilities, including surface water treatment plants and wells, along with water distribution facilities.

Potable Water Production Facilities

Potable water production facilities include wells and surface water treatment plants (see Figure 4.10-1). Regional water supply facilities are shown in Figure 4.10-2. A summary of the existing and near-term water production facilities available to the City is presented in Table 4.10-7. For reference, near-term is defined as the initial 5 year period (Year 2008). As noted earlier, the City participates in two water treatment facilities: (1) the DE WTP; and, (2) the NBR WTP. The City owns 11 municipal groundwater wells generally located along the Elmira Road corridor, east of I-80 and west of Leisure Town Road. Water from Wells 1, 6, and 13 are chlorinated at the DE WTP and then pumped to the City distribution system. The remaining wells (2, 3, 5, 7, 8, 9, and 14) supply water directly to the distribution system. A low capacity well (0.22 mgd)

TABLE 4.10-7

CITY OF VACAVILLE SUMMARY OF WATER PRODUCTION FACILITIES

Production Facility		Capacity (mgd)
Existing Potable Water Wells		
	Well 1	0.33
	Well 2	1.58
	Well 3	2.20
	Well 5	1.87
	Well 6	1.64
	Well 7	1.60
	Well 8	2.20
	Well 9	2.02
	Well 13	2.00
	Well 14	2.50
	De Mello Well	0.22
	Subtotal – Existing Wells	18.16
Near-Term Potable Water Wells		
	Well 15 (expected on-line in 2004)	2.50
	Well 16 (expected on-line in 2005)	2.50
	Well 17 (expected on-line in 2007)	2.50
	Subtotal – Near-Term Wells	7.50
All Wells (Existing and Near-Term)		25.66
	Les 5.0 mgd from Wells	-5.00
	Subtotal – Wells Maximum Production Capacity	20.66
Existing Water Treatment Plants		
	DE Plant	6.89
	NBR Plant (City of Vacaville Allocation)	13.00
	Subtotal – Existing WTP Maximum Production Capacity	19.89
Total Maximum Production Capacity		40.55
Firm Production Capacity		36.49

City of Vacaville

located at the intersection of Midway Road and I-80, the De Mello Well, was brought into production in March 2003 to provide fresh water at a distribution system “dead-end” located on the outskirts of town. The well was designed to provide re-circulation and improve water quality at the existing water main in the area (currently a long dead-end water main from Leisure Town Road to Midway Road and I-80).

The City has plans to replace or rehabilitate existing wells and to construct three new wells in the near-term to more fully develop the groundwater supply. A new well (Well 15), located near the intersection of Vaca Valley Parkway and Leisure Town Road, is currently being equipped and is expected to be in service in 2004. Similar plans are underway for Wells 16 and 17.

Potable Water Distribution System Facilities

Existing and planned water distribution system facilities are described below.

Existing

The City's potable water distribution system consists of one main pressure zone (main zone) plus several higher elevation pressure zones (upper pressure zones) in various areas of the City. The main pressure zone serves pad elevations up to 222 feet. All of the water production facilities are located within the main zone. The main zone currently has four water storage reservoirs and each upper pressure zone has one (or two) water storage reservoir(s) for a combined capacity of 13.8 million gallons (MG).

The nearest reservoirs to the Proposed Project are the Butcher Road Reservoirs. The Butcher Reservoirs are part of the City's main zone. The City's existing reservoir locations and upper pressure zones are illustrated in Figure 4.10-3.

Reservoirs are required to provide operational, fire, and emergency storage. The water mains in the existing water distribution system form a network throughout the City. Large-diameter water transmission mains form the backbone of the system and convey water from the water production facilities to the major sectors of the City. The largest water transmission mains are 30 inches in size. One 30-inch water transmission main originates at the NBR WTP and follows Peabody Road northward to Elmira Road. At Elmira Road, this water transmission main joins with another 30-inch water transmission main that ties into the DE WTP. The next largest water transmission main in the system is a 24-inch water transmission main that originates at the intersection of Peabody Road and Elmira Road and extends north on Browns Valley Road to provide service to the northern sectors of the City. The 24-inch water transmission main extends from Browns Valley Road to Vaca Valley Parkway. Elsewhere, the distribution system has several 18-inch water transmission mains and many 12-inch and smaller water distribution mains. Existing water transmission and distribution (12-inch and larger) mains in the vicinity of the Proposed Project are shown in Figure 4.10-4.

Currently, areas near the Lower Lagoon Valley area are served by a single 8-inch water line which originates at the Butcher Road Reservoirs and extends to the north end of the valley. This existing water main from the main zone will not be sufficient to provide adequate water distribution to the Proposed Project.

Planned

Specific onsite water system improvements to serve the Proposed Project were not included in the *1990 Water System Master Plan*[3] for the City. However, onsite and offsite transmission main improvements were identified in the City's 1992 *Development Impact Fee Study* (DIF).[4] When development in this area occurs, major water system infrastructure will be needed from the perimeter of the existing system to and throughout the Lower Lagoon Valley area. Furthermore, the water demand from these developments will necessitate augmenting the pipelines in the existing system. Such improvements will likely include a new transmission main beginning at Peabody Road and Alamo Drive that then follows Alamo Drive to the southside of Interstate 80 and may extend to Buck Avenue. Figure 4.10-5 presents the planned potable water distribution system facilities in the vicinity of the Proposed Project. The proposed improvements were identified previously in the City's *DIF Study*. A description of each of the scheduled improvements depicted in Figure 4.10-5 is provided below.

- **DIF 10 – Alamo Drive Pipeline – Peabody to I-80**: A new pipeline within the main zone will be required to allow water to be withdrawn from the main zone at the Butcher Reservoirs for the Lower Lagoon Valley area. This pipeline will originate at Peabody

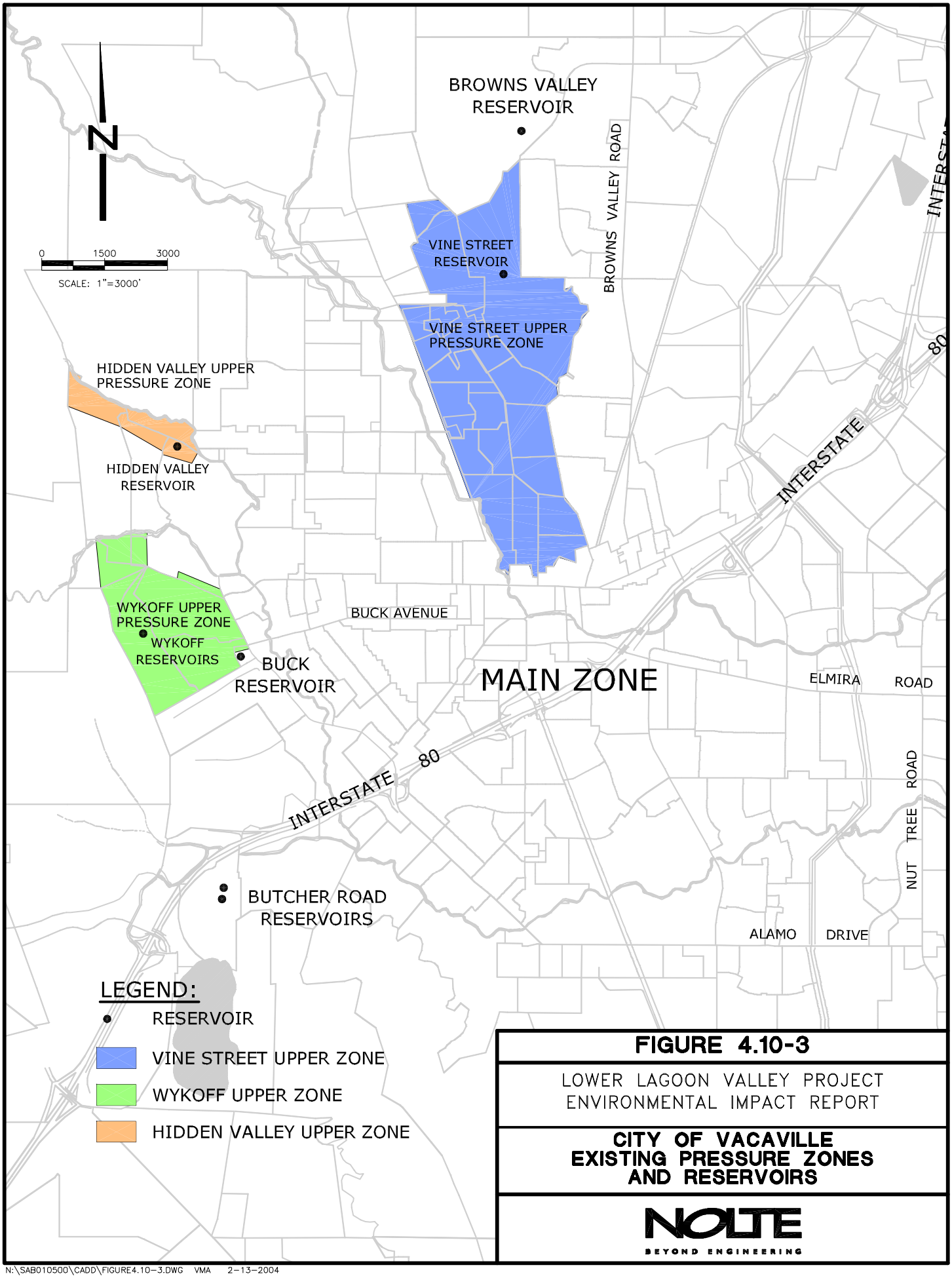


FIGURE 4.10-3

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

CITY OF VACAVILLE
EXISTING PRESSURE ZONES AND RESERVOIRS

NOLTE
BEYOND ENGINEERING

N:\SAB010500\CADD\FIGURE4.10-3.DWG VMA 2-13-2004

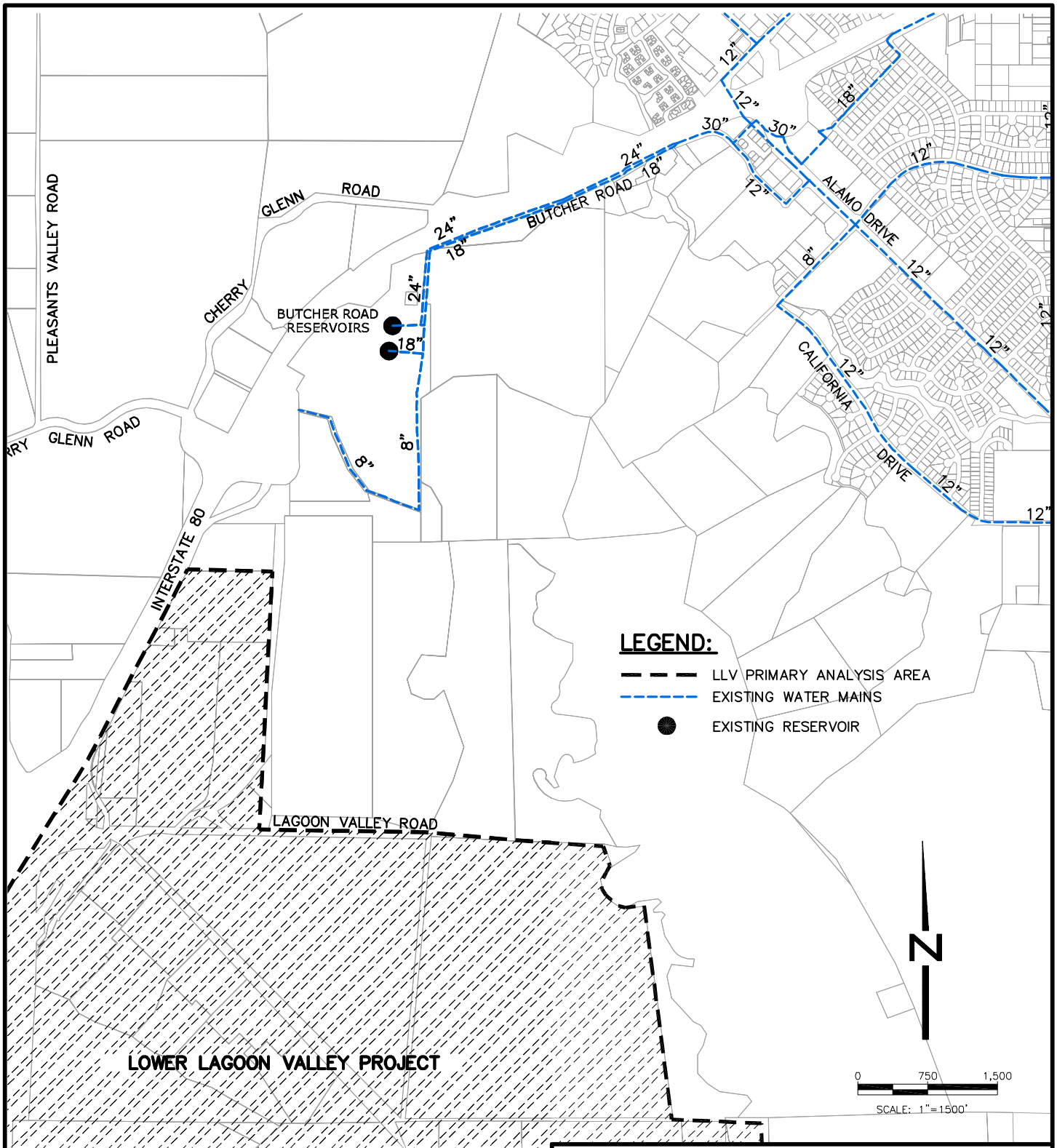


FIGURE 4.10-4

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

EXISTING WATER MAINS NEAR LOWER LAGOON VALLEY

NOLTE
BEYOND ENGINEERING

N:\SAB010500\CADD\FIGURE4.10-4.DWG VMA 2-13-2004

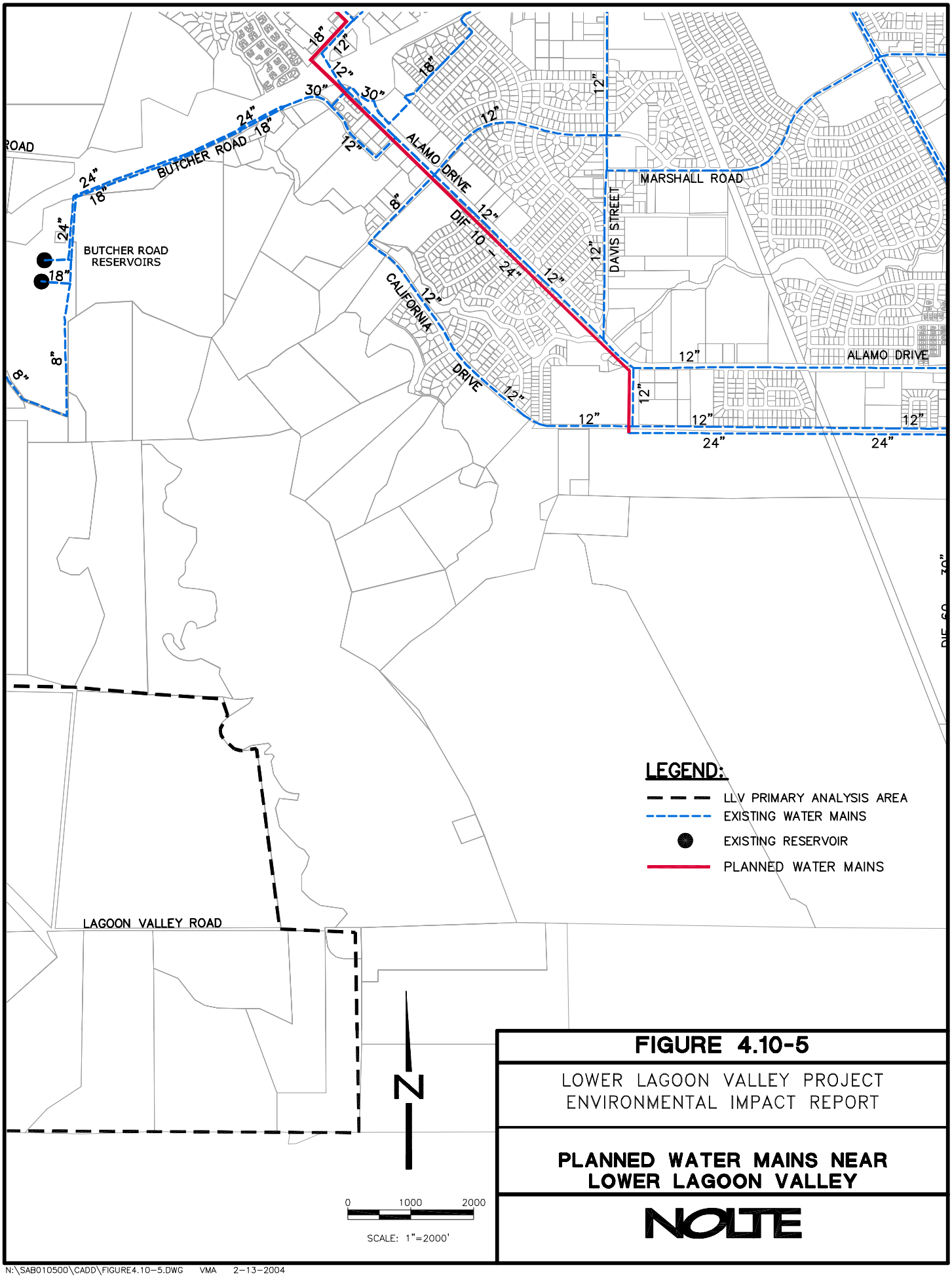


FIGURE 4.10-5

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

PLANNED WATER MAINS NEAR LOWER LAGOON VALLEY

NOLTE

N:\SAB010500\CADD\FIGURE4.10-5.DWG VMA 2-13-2004

Road and California Drive and run west on California Drive, north on Davis Street, and northwest on Alamo Drive to the south side of I-80. An 18-inch pipeline is proposed if only the Lower Lagoon Valley development is considered. However to accommodate future development and provide a stronger link between storage and distribution facilities, a larger 24-inch pipeline is recommended. This pipeline was scheduled for 1992 but the lack of development in Lower Lagoon Valley has deferred the need for this improvement. A portion of this improvement from Peabody Road to Alamo Lane (along California Drive) was installed in the year 2000. This improvement will be funded by development impact fees.

- **DIF 60 – Peabody Road Pipeline**: When the City's allocation in the NBR WTP increases beyond 13.00 mgd, a parallel pipeline from the NBR WTP is proposed from the NBR WTP to California Drive. The pipeline will include 36-inch and 30-inch segments parallel to the existing 30-inch and 24-inch pipeline from the NBR WTP. This improvement project will be funded by development impact fees.

Non-Potable Water Distribution System Facilities

Existing

Currently, non-potable water for the Lower Lagoon Valley area (for irrigation uses in Lagoon Valley Regional Park and the Hines Nursery) is supplied by SID. The existing non-potable water system includes the Paradise Valley Pumping Plant with a capacity of 6,200 gpm, located near the intersection of the Putah South Canal and Grover Avenue in the City of Fairfield[5]. The supply for this pump station is the Putah South Canal and the water is pumped to a 600,000 gallon non-potable water storage reservoir (Paradise Valley Tank). The pump station, reservoir and non-potable piping network serve the irrigation demand from the Hines Nursery, Paradise Valley Golf Course, Lagoon Valley Regional Park, and other park/landscape and agricultural uses. The pipeline from the Paradise Valley Tank is 18-inch for approximately 1,800 feet before reducing to 12-inch for approximately 1,700 feet ending at the existing Hines Nursery turnout. The design capacity of this pipeline is 1,500 gpm. A schematic representation of the existing non-potable water distribution system is presented in Figure 4.10-6. Service to the existing Hines nursery and Lagoon Valley Regional Park must be maintained during construction of this project. As the project grows, the Hines Nursery will be relocated and no longer need service.

City-Wide Storage Considerations

The *Water System Master Plan* for the City specifies requirements for total water storage in the City's distribution system. As noted previously, there are three components to total storage: operational, emergency, and fire. Operational and emergency storage are established as 25 percent and 50 percent of maximum day demand, respectively. Storage for fire fighting purposes is based upon a demand of 4,500 gpm sustained for 4 hours. This is the highest fire flow requirement (industrial, commercial, and high density residential land uses) described in the *Water System Master Plan*.

As presented in the City of Vacaville, *Infrastructure, Facilities and Services, Status Report 2003 Update*[6], Table 4.10-8 summarizes the total system storage requirements for the City based on the actual maximum day demand in 2001-2003 and the projected maximum day demand in 2004-2007. The current shortfall in planned water storage is about 5.2 MG. The City Council has authorized design of a new 5.1 MG capacity reservoir (McMurtry Reservoir) within the Rice

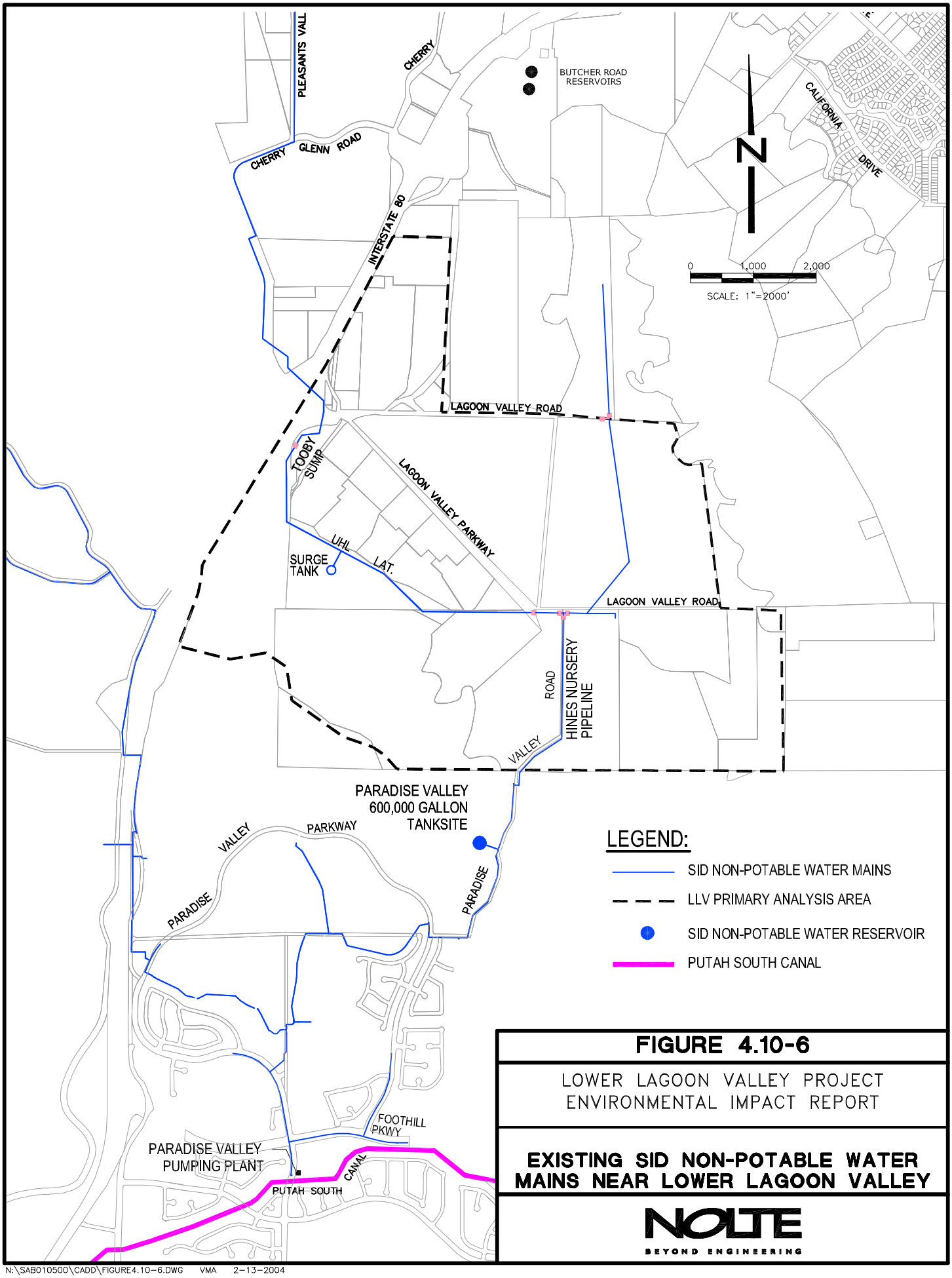


FIGURE 4.10-6

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

EXISTING SID NON-POTABLE WATER MAINS NEAR LOWER LAGOON VALLEY

NOLTE
BEYOND ENGINEERING

N:\SAB010500\CADD\FIGURE4.10-6.DWG VMA 2-13-2004

TABLE 4.10-8

CITY OF VACAVILLE PROJECTED WATER STORAGE REQUIREMENTS

Year	Max Day Demand[a] (mgd)	Water Storage Requirements				Existing Storage[e] (MG)	Total Shortfall[f] (MG
		Operational Storage[b] (MG)	Fire Storage[c] (MG)	Emergency Storage[d] (MG)	Total Requirement (MG)		
2001	26.1	6.5	1.1	10.0	17.6	13.8	3.8
2002	27.4	6.9	1.1	10.6	18.6	13.8	4.8
2003	28.0	7.0	1.1	10.9	19.0	13.8	5.2
2004	29.7	7.4	1.1	11.8	20.3	13.8	6.5
2005	31.4	7.9	1.1	12.6	21.6	13.8	7.8
2006[g]	33.1	8.3	1.1	13.5	22.9	18.9	4.0
2007[h]	34.8	8.7	1.1	14.3	24.1	22.6	1.5

[a] Based on actual maximum day demand for year 2001-2003. Subsequent future demands are projected at an increase of 1.7 mgd/year.
[b] Operational storage is estimated at 25% of the maximum day demand.
[c] Fire storage is estimated at 4,500 gpm for 240 minutes (4 hours).
[d] Emergency storage assumes a 12 hour loss of power, or approximately 50% of maximum day demand. As a mitigating factor, however the DE WTP has backup power for half its capacity (5 MGD) and Well 8 has backup power for its full capacity (2.0 MGD). Assuming the DE WTP can produce water for 10 hours out of the 12 hour loss of power period results in a total production of 2.1 MG. Similarly, Well 8 operating for 12 hours can produce a total of 1 MG of water. Thus, the total available production during the 12 hour loss of power period is (2.1 MG from the DE WTP and 1.0 MG from Well 8) 3.1 MG. Therefore, the emergency storage requirement is actually 50% of maximum day minus 3.1 MG.
[e] Includes the total capacities of all existing City water storage reservoirs.
[f] Total Shortfall is estimated as the difference between the total storage requirement and existing storage.
[g] Existing storage is increased by 5.1 MG in 2006 with the planned completion of the McMurtry Reservoir.
[h] Total storage is increased by 3.68 MG in 2007 with the planned completion of the Lower Lagoon Valley reservoirs (2.9 MG- Zone 2 and 0.25 MG-Zone 3) and the Rice McMurtry upper zone reservoir (0.53 MG-Zone 2).

McMurtry project area. The construction of the McMurtry Reservoir will help eliminate the current storage deficit. With time, however, additional storage will be necessary as detailed in Table 4.10-8. The City is currently evaluating sites for additional storage beyond the McMurtry Reservoir.

4.10.3 REGULATORY SETTING

Federal

There are no federal regulations pertaining to water supply for the Proposed Project.

State

Senate Bills (SB) 610 and 221

As of January 1, 2002, cities/counties are required to determine the adequacy of water supply identified for Proposed Projects. Senate Bill 610 applies to various projects including residential, commercial, industrial, hotels, and mixed use, as defined in Section 10912 of the California Water Code. Verification of water supply sufficiency is provided through the preparation of a Water Supply Assessment, compiled by the water purveyor or city/county. Senate Bill 221 only applies to a proposed development associated with residential developments of 500 dwelling units or more and requires the preparation of a Water Verification, also provided by the water purveyor or city/county. This legislation prohibits the approval of a project without written confirmation that the water supply will be available prior to completion of project construction. The Project will be required to comply with the provisions of SB 610/SB 221. A Water Supply Assessment Report (WSAR) has been prepared for Lower Lagoon Valley, Southtown, and Rice McMurtry development projects to meet this requirement.[7]

Assembly Bill (AB) 3030

In 1992, the Groundwater Management Act was established as part of the California Water Code (Section 10750, et seq.). The Groundwater Management Act was enacted as Assembly Bill (AB) 3030 that requires local agencies which provide water to a service area overlying a groundwater basin to adopt and implement a groundwater management plan for that basin. In 1993, the City of Vacaville voted to adopt a resolution to draft a Groundwater Management Plan. The purpose of the plan is to help the City of Vacaville maintain a usable and reliable groundwater supply. The City of Vacaville Groundwater Management Plan was adopted in February 28, 1995. The plan is currently being updated, however it provides a program of monitoring groundwater levels, production and quality. The plan also includes the development of policies with specific detail on well construction and spacing based on review of geologic and monitoring data. The plan will continue to generate annual reports on the status of groundwater management by the City of Vacaville.

Local

1995 Master Water Agreement With Solano Irrigation District

The 1995 Master Water Agreement (MWA) between the City and Solano Irrigation District (SID) defines constraints on the City's ability to annex and provide municipal services to certain lands. The Specific Plan area is within the area designated for urban services.

City of Vacaville

City of Vacaville Water Master Planning and Design Standards

The City conducts periodic water master planning activities. Through this work, certain planning standards have been applied, including methodologies for estimating water demands and verifying water main sizing. These planning standards, in conjunction with the City's design standards govern how the required capacity and sizing of water system facilities is determined.

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable water supplies goals and policies.

City of Vacaville Urban Water Management Plan

The Urban Water Management Planning Act was established in 1983 and was most recently amended in 2000. The Act requires urban water suppliers, such as the City of Vacaville, to prepare a management plan of its current and future water sources so as to continue to provide its customers with an adequate and reliable water supply. The Urban Water Management Plan (UWMP) describes the projected uses for all water resources within an agency to meet the goal of managing water supplies for their highest and best uses. The City of Vacaville adopted its latest UWMP in December 2001.

Urban Water Management Plans must be updated every five years, and the next update is due in 2005.

4.10.4 IMPACTS AND MITIGATION MEASURES

Method of Analysis

The technical memorandum, included as Appendix H, prepared for this Proposed Project consists of a water supply investigation representing an analysis of the potential impacts of serving the Proposed Project on the City's overall water supply and water distribution system. Recommended supply and distribution system improvements were identified and computer simulations were conducted using the water distribution system network model.

To determine potential impacts, water demands were estimated for the Proposed Project along with other proposed developments. Total water demands were then compared to available water supply. The results of the technical memorandum are presented as follows.

Water Demand

The water demand factors currently used by the City for planning purposes are presented in Table 4.10-9. Based on historical experience, water demand factors vary when analyzing future developments as compared to existing development. As a result, two sets of water demand factors are used by the City for planning purposes. A summary of the water demand factors for potable and irrigation demands for existing and future development is presented in Table 4.10-9.

Water demands are divided into potable and non-potable components. All of the non-potable water demand for the Proposed Project will be supplied by SID. Each demand is analyzed below.

Potable

A summary of the total potable water demand for the Proposed Project is presented in Table 4.10-10. The water demand estimate is based on land use totals (dwelling units and acreage) from the Specific Plan and the water demand factors summarized in Table 4.10-9. As summarized in Table 4.10-10, the total potable water demand requirements for the Proposed Project and existing development are estimated at 0.94 mgd (1,055 ac-ft/yr).

SID Non-Potable

Non-potable water from SID must be used to irrigate the proposed golf course and landscaping within the school, business village, park areas, arterial landscaping, commercial land uses, and the existing Lagoon Valley Regional Park. Irrigation areas and estimated irrigation demand based on the factors described above for the Proposed Project are summarized in Table 4.10-11.

Water Supply

Total water supply for the City must meet or exceed the total water demand estimated for the City including all proposed citywide development projects. The total water demand estimated for the City at Year 2025 including the Proposed Project as well as Southtown and Rice McMurtry was compared to the total water supply for the City.

TABLE 4.10-9

CITY OF VACAVILLE
SUMMARY OF WATER DEMAND FACTORS
EXISTING AND FUTURE DEVELOPMENT

Land Use	Designation	Unit	Existing Development		Future Development	
			Potable gpd/unit	Irrigation gpd/unit	Potable gpd/unit	Irrigation gpd/unit
Residential Low Medium Density[a]	RLMD	du	340	0	420	0
Residential Low Density[a]	RLD	du	380	0	520	0
Residential Estates[a]	RE	du	680	0	600	0
Rural Residential	RR	du	850	0	1000	0
Residential Medium Density	RMD	du	300	0	350	0
Residential High Density	RHD	du	260	0	300	0
Residential Urban High Density	RUHD	du	210	0	250	0
Manufactured Homes	MH	du	260	0	300	0
Retirement Residential	RetRes	du	300	0	350	0
Office	O	ac	1,000	500	1,600	450
Business Village	BP	ac	1,000	400	1,600	450
Industrial	IND	ac	1,200	400	2,000	450
Retail Sales	RS	ac	1,000	400	1,600	450
Downtown	D	ac	3,900	100	3,900	100
Commercial Highway[a]	CH	ac	1,700	400	4,750	450
Commercial Service	CS	ac	1,000	400	1,600	450
Public	P	ac	1,000	400	1,600	450
Park	PK	ac	0	1300	0	2,100
Park Regional	PR	ac	100	1500	170	2,500
Elementary School	ESC	stu/ac	25	900	30	1,500
High School	HSC	stu/ac	35	900	40	1,500
Open Space	OS	ac	0	0	0	0
Hospital	HOS	ac	1,400	500	2,300	450
Agricultural	AG	ac	0	0	0	0

West Yost & Associates, Water and Sewer Planning Factors Reconciliation –Final Draft, April 1994.
[a] Future development demand factors determined by actual metering information obtained from the City of Vacaville, August 2003.

Service Area Requirements

The design criteria contained in the City's *Water System Master Plan* state that the maximum range of elevations in any new service area should be 100 ft. This criterion was used to evaluate the need for additional upper pressure zones within the Proposed Project.

Standards of Significance

For the purpose of this EIR, impacts are considered to be significant if the following could result from implementation of the Proposed Project:

- demand that exceeds supply of existing and planned entitlements and resources, resulting in the need for other new or expanded resources; or
- increased demand for water treatment and distribution facilities, resulting in the need for new or expanded facilities.

TABLE 4.10-10

LOWER LAGOON VALLEY PROJECT
SUMMARY OF ESTIMATED TOTAL (POTABLE AND NON-POTABLE) WATER DEMANDS

Land Use		Designation	Quantity	unit	Demand Factor		Estimated Water Demand			
					Potable gpd/unit	Irrigation gpd/unit	Potable (gpd)	Irrigation (gpd)	Total gpd)	Total (ac-ft/yr)
EXISTING DEVELOPMENT										
1A	Commercial Recreation	CS	5.4	ac	1,600	450	8,640	2,430	11,070	12
1B	Commercial Highway	CH	6.8	ac	4,750	450	32,300	3,060	35,360	40
1C	Commercial Highway	CH	9.2	ac	4,750	450	43,700	4,140	47,840	54
Area 5 – LLV Regional Park		PK	40	ac	0	1,300	0	52,000	52,000	58
6A	Open Space East	OS	385	ac	0	0	0	0	0	0
6B	AH Southeast	AG	356	ac	0	0	0	0	0	0
6C	Open Space Southwest	OS	325	ac	0	0	0	0	0	0
PROPOSED DEVELOPMENT										
2A	Business Village	BP	85.2	ac	1,600	450	136,320	38,3400	174,660	196
2B	Fire Station	PM	1.0	ac	1,600	450	1,600	450	2,050	2
2C	Town Center	CS	3.8	ac	1,600	450	6,080	1,710	7,790	9
3A	Village I	RLD	517	du	520	0	268,840	0	268,840	301
	School – students	ESC	600	stu	30	0	18,000	0	18,000	20
	School – acres	ESC	11	ac	0	1,500	0	16,500	16,500	18
	Village Center	RS	2.0	ac	1,600	450	3,200	900	4,100	5
3B	Village II	RLD	380	du	520	0	197,600	0	197,600	221
	Park “spine”	PK	5.0	ac	0	2,100	0	10,500	10,500	12
3C	Village III	RLD	410	du	520	0	213,200	0	213,200	239
	Parks	PK	5.0	ac	0	2,100	0	10,500	10,500	12
3D	Community Homes	RLD	18	du	520	0	9,360	0	9,360	11
	Arterial Landscape	CS	26.0	ac	0	450	0	11,700	11,700	13
4A	Golf Course	PK	211.7	ac	0	2,100	0	444,570	444,570	498
4B	Club House	CS	0.8	ac	1,600	450	1,280	360	1,640	2
4C	Maintenance Facility	CS	0.5	ac	1,600	450	800	225	1,025	1
7A	Nelson Road Berm	OS	47.0	ac	0	0	0	0	0	0
7B	Rivera Road Berm	PK	6.0	ac	0	2,100	0	12,600	12,600	14
Total Demands – Lower Lagoon Valley							940,920	609,985	1,550,905	1,738

Source: Nolte Associates

TABLE 4.10-11

LOWER LAGOON VALLEY PROJECT
SUMMARY OF PROJECTED NON-POTABLE WATER DEMANDS TO BE SUPPLIED BY SID

Land Use	Designation	Quantity	Units	Demand Factor, gpd/unit	Estimated Demand	
					gpd	ac-ft/yr
EXISTING DEVELOPMENT						
1A Commercial Recreation	CS	5.4	ac	450	2,430	3
1B/1C Commercial Highway	CH	16.0	ac	450	7,200	8
Area 5 – LLV Regional Park	PK	40.0	ac	1,300	444,570	58
Area 6 – Open Space	OS	710.0	ac	0	0	0
Area 6 – Agricultural Hillside	AH	356.0	ac	0	0	0
PROPOSED DEVELOPMENT						
2A – Business Village	BP	85.2	ac	450	38,430	42
2B – Fire Station	PM	1.0	ac	450	450	1
2C – Town Center	CS	3.8	ac	450	1,710	2
3A – Village I School/Park	ESC	11.0	ac	1,500	16,500	18
3A – Village I Village Center	RS	2.0	ac	450	900	1
3B – Village II Park "spine"	PK	5.0	ac	450	10,500	12
3C – Village III Parks	PK	5.0	ac	450	10,500	12
Arterial Landscape	CS	26.0	ac	450	11,700	13
Golf Course	PK	211.7	ac	2,100	444,570	498
Club House	CS	0.8	ac	450	360	0.5
Maintenance Facility	CS	0.5	ac	450	225	0.5
7A – Nelson Road Berm	OS	47.0	ac	0	0	0
7B – Rivera Road Berm	PK	6.0	ac	2,100	12,600	14
Total – Lower Lagoon Valley Area Non-Potable Demand					**609,985**	**683**

Source: Nolte Associates, Inc.

Project Impacts and Mitigation Measures

4.10-1 Development of the Proposed Project would increase the demand for water.

Development of the Proposed Project including existing commercial development and proposed residential, commercial, business village, golf course, and school land uses would require water. Table 4.10-10 summarized demand by land use type for the existing development and the Proposed Project. In 2025, the total water demand for the existing commercial development and Proposed Project is estimated to be 1,738 ac-ft/yr. This total includes 1,055 ac-ft/yr of potable water to be supplied by the City, and 683 ac-ft/yr of non-potable water to be supplied by SID (see Tables 4.10-10 and 4.10-11).

The existing City average day water demand is estimated at approximately 17,524 ac-ft/yr (or 15.6 mgd) based on 2003 monthly water production (including projection for December 2003) as reported by the City. Including the Proposed Project, the water demand would increase to about 19,262 ac-ft/yr (or 17.2 mgd). The City 2025 water demand (including the Proposed Project) would increase to about 31,331 ac-ft/yr (or 28.0 mgd) as shown in Table 4.10-12.

An analysis of available water supplies was prepared as part of an *SB 610 Water Supply Assessment Report* for the City. As summarized in Table 4.10-13, the 2005 available normal year water supply for the City is 33,060 ac-ft/yr. In Year 2025, normal water supply for Vacaville is approximately 41,990 ac-ft/yr, while the estimated normal water demand (including the Proposed Project) is approximately 31,331 ac-ft/yr. As shown in Table 4.10-13, sufficiency of water supply can be demonstrated under a variety of delivery conditions.

TABLE 4.10-12

CITY OF VACAVILLE SUMMARY OF YEAR 2025 ANNUAL WATER DEMAND

Item	Demand (ac-ft/yr)
Existing City 2003	17,524
Lower Lagoon Valley (Potable)	1,055
Lower Lagoon Valley (Non-Potable)	683
Southtown	831
Rice McMurtry	194
Other Future Development in City	11,044
Total	31,331

Nolte Associates, Inc.

TABLE 4.10-13

CITY OF VACAVILLE
SUMMARY OF PROJECTED WATER DEMAND VERSUS SUPPLY DURING NORMAL, SINGLE DRY AND MULTIPLE DRY YEARS

	Normal Year (ac-ft/yr)		Single Dry Year (ac-ft/yr)		Multiple Dry Years (ac-ft/yr)	
Year	Projected Demand	Available Supply	Projected Demand	Available Supply	Projected Demand	Available Supply
2005	18,780	33,060	16,902	32,216	15,024	29,990
2010	21,917	38,560	19,726	37,816	17,533	36,290
2015	25,055	41,440	22,549	40,696	20,043	39,170
2020	28,193	41,990	25,374	41,346	22,554	39,820
2025	31,331	41,990	28,197	41,346	25,065	39,820

Nolte Associates, Inc.

As indicated in Table 4.10-13, existing and estimated Year 2025 water supply would be sufficient to meet the water demand (including the Proposed Project) and no new surface or groundwater supplies beyond the planned water sources would be needed to supply the Proposed Project water demand. Timing of the planned water sources has not yet been established and is considered a ***significant impact***.

Mitigation Measure

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level*.

4.10-1 *The City shall use actual demand and production data accompanied with periodic water distribution system modeling (through the City of Vacaville Infrastructure, Facilities and Services Status Report Update, Master Plan update, and as needed) to determine when planned water sources should be brought on-line.*

4.10-2 Development of the Proposed Project would require main zone water distribution system improvements.

To service the existing development, planned future development, and the Proposed Project with an adequate water supply, the previously described DIF 10 project would be required to strengthen the existing water transmission main network. Based on computer model

simulations, adding a high demand booster pump station near the existing Butcher Reservoirs to serve the Proposed Project would impact filling operations at the existing Butcher Road Reservoirs within the main zone if DIF 10 is not included. The DIF 10 project provides the additional transmission capacity necessary from the main zone transmission water mains in Peabody Road and Alamo Drive to Butcher Road. The computer modeling was conducted at near-term conditions (Year 2008) with an estimated main zone maximum day demand of 36.3 mgd. The impact to the filling operations at the existing Butcher Reservoirs if DIF 10 is not included is considered a ***significant impact***.

Mitigation Measure

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level*.

4.10-2 *The City shall complete the modeling necessary to confirm the size and length of the needed Alamo Drive Pipeline (DIF 10). The Zone 2 booster pump station must be in service before water can be provided to customers. Therefore, the City shall complete construction of the required main zone DIF 10 project concurrent with the booster pump station completion (see Figure 4.10-7).*

4.10-3 Development of the Proposed Project would require on-site potable water distribution system improvements.

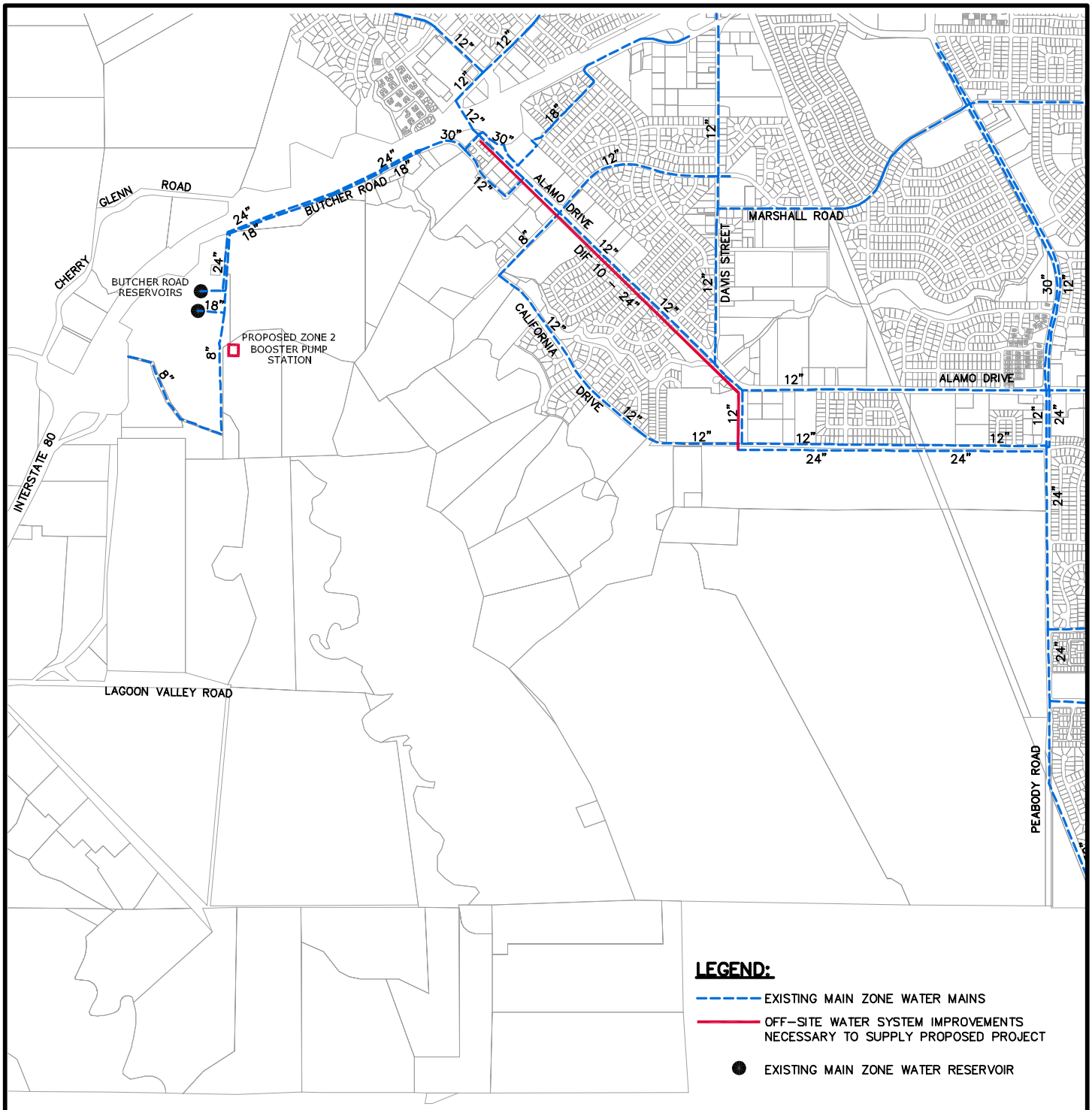
Pad elevations for residential and commercial developments within the Proposed Project would range from 210 ft to 350 ft. The design criteria contained in the City's *Water System Master Plan* state that the maximum range of elevations in any new service area should be 100 ft. Therefore, two new upper service zones (Zone 2 and Zone 3) would be required to serve all planned development within the Proposed Project as well as the existing development. Zone 2 would provide on-site potable water service to development between elevations 210 ft and 310 ft including the existing development at elevation 210 ft. Zone 2 would serve all of the developed land in Lower Lagoon Valley below elevation 310 ft. Zone 3 would serve elevations higher than 310 ft.

Configuring Zone 2 and Zone 3 as a single pressure zone and incorporating pressure reducing valves has been proposed and is technically possible. However, this concept has several drawbacks as discussed below.

- Pumping to a higher elevation and then reducing the pressure for most of the service area would result in wasted pumping energy.
- The pressure reducing stations must be well maintained to prevent failure and possible over pressurization of the lower system.
- Compatibility with any future water system facilities in the Lower Lagoon Valley would be limited.
- Current City of Vacaville design standards do not allow this type of configuration for upper pressure zones.

Considering these factors, two pressure zones are recommended for the Proposed Project. For each zone, specific performance criteria are as follows:

1. Within a street, only distribution system piping for one service zone may be constructed.



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0 1000 2000

SCALE: 1"=2000'

FIGURE 4.10-7

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

OFF-SITE WATER SYSTEM IMPROVEMENTS FOR LOWER LAGOON VALLEY

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N:\SAB010500\CADD\FIGURE4.10-7.DWG VMA 2-13-2004

2. All water mains shall be looped such that no dead-end exceeds 600 ft in length.

3. Water will be delivered under average day and maximum day demand conditions at a residual pressure ranging from 35 to 88 psi.

4. Water will be delivered under maximum day plus fire flow demands at a minimum residual pressure of 20 psi.

5. Storage capacity in upper service zone reservoir(s) would be determined in accordance with the City's *Water System Master Plan* criteria.

Zone 2

To supply the new upper Zone 2, a water storage tank, a booster pump station (near the Butcher Reservoirs), and a supply pipeline from the main zone to the booster pump station must be constructed. The pump station may be sited near the Butcher Reservoirs. Location of the booster pump station along the northerly perimeter of the service area would facilitate water circulation through the new upper zone while minimizing dead-ends.

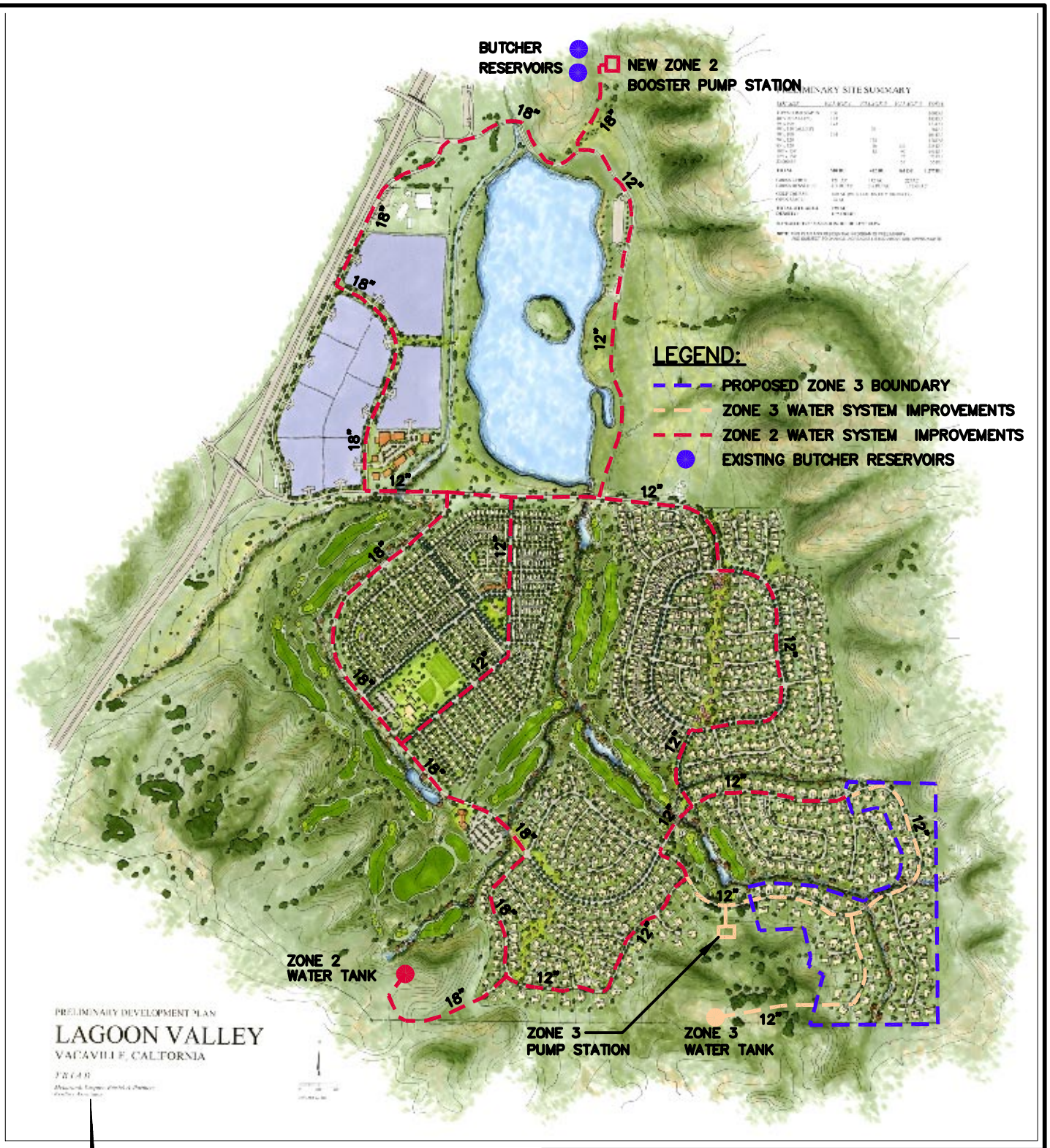
The water storage tank would have a nominal capacity of approximately 2.9 MG. The total storage includes fire storage, operational storage, and emergency storage. A summary of the storage components is presented in Table 4.10-14. Fire storage includes satisfying a worst-case condition of a 4,500 gpm fire demand for a total of four hours. Operational storage is defined as 25 percent of the maximum day demand. Emergency storage is defined as 75 percent of the maximum day demand. The location of the tank is proposed to be southwest of the Village III development as shown in Figure 4.10-8. A tank siting study would be required to establish final construction details for the partially buried reinforced concrete storage tank. Major pipelines in the system would include 18-inch, 12-inch, and 8-inch water mains. Proposed pipe sizes and alignments are depicted in Figure 4.10-8. The Zone 2 booster pump station firm capacity would be approximately 2,690 gpm to ensure the water storage reservoir is filled in a period of 18 hours. Operationally, the booster pump station will draw water from the main zone water mains near the Butcher Reservoirs and convey water to the new reservoir via an 18-inch water transmission main and a 12-inch/18-inch water main loop within the proposed development streets.

TABLE 4.10-14

LOWER LAGOON VALLEY PROJECT
SUMMARY OF STORAGE COMPONENTS FOR PROPOSED ZONE 2 TANK

Maximum Day Demand[a] (mgd)	Water Storage Requirements (MG)			
	Operational Storage	Fire Storage	Emergency Storage	Total Requirement
1.82	0.46	1.08	1.36	2.9

Nolte Associates, Inc.
[a] Max Day Demand = 2 x average day "potable" demand for the LLV Zone 2 (940,920 gpd less 67 RLD units at 520 gpd/unit).
[b] Operational storage is estimated as 25% of the maximum day demand.
[c] Fire storage = 4,500 gpm for 240 minutes (4 hours).
[d] Emergency storage is estimate as 75% of the maximum day demand.



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0 650 1300

SCALE: 1"=1300'

FIGURE 4.10-8

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

PROPOSED WATER SYSTEM IMPROVEMENTS FOR ZONE 2 AND ZONE 3

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N:\SAB010500\CADD\FIGURE4.10-8.DWG VMA 2-13-2004

The proposed water tank location is identified in the Specific Plan. For final siting details, a pump station and reservoir siting study would be necessary and must be conducted to identify the best suited location for these facilities. Based on service area elevation range, the water storage tank would be located above the service area and the base should be at approximately 380-390 ft. Siting studies would also identify how the piping should be configured to maintain water quality and reservoir turnover.

Zone 3

The developable land above elevation 310 ft is generally located in the southeast residential portion of Village III. Therefore, Zone 3 would be limited to this region. Specifically, it is assumed that approximately 67 low density residential dwelling units above elevation 310 ft proposed for Village III would be served by the Zone 3 water system. These units have an average day water demand of 34,840 gpd. It is possible that the Zone 3 boundary can be set below the 310 ft elevation so that distribution system piping is routed properly for looping while avoiding two water mains for separate upper zones in the same street. In general it would be limited to residential development so that the higher fire flows associated with commercial development need not be provided in Zone 3.

Within the Zone 3 water system, two alternatives are possible to serve elevations higher than 310 ft. The first alternative is to provide elevated storage above the service area, a pumping station to transfer water from Zone 2 to Zone 3, and distribution system pipelines. With this alternative, fire and emergency storage would be provided in the reservoir creating a very reliable system. The reservoir would have a nominal capacity of approximately 0.25 MG. A summary of the storage components is presented in Table 4.10-15. The total storage is calculated including fire storage, emergency storage, and operational storage. Fire storage includes the worst-case condition of a 1,500 gpm fire flow for a total of 2 hours. The firm pump station capacity would be approximately 230 gpm to fill the proposed reservoir in a period of 18 hours.

TABLE 4.10-15

LOWER LAGOON VALLEY PROJECT
SUMMARY OF STORAGE COMPONENTS FOR PROPOSED ZONE 3 TANK

Maximum Day Demand[a] (mgd)	Water Storage Requirements (MG)			
	Operational Storage	Fire Storage	Emergency Storage	Total Requirement
0.07	0.0175	0.18	0.0525	0.25

Nolte Associates, Inc.
[a] Assume approximately 67 units above 310 ft elevation within Village III development at 520 gpd/unit. Total average day demand is 0.035 mgd. Maximum day demand is 2 times the average day demand.
[b] Operational storage is estimated as 25% of the maximum day demand.
[c] Fire storage = 1,500 gpm for 120 minutes (2 hours).
[d] Emergency storage is estimate as 75% of the maximum day demand.

The second alternative proposed by the project proponent does not include elevated storage. It is considered less reliable especially in a hillside development adjacent to open space. With this option, a hydropneumatic tank system would be provided to allow the pumps to cycle ON and OFF. The firm pump station capacity would be approximately 1,630 gpm. Fire and emergency water requirements would be dependent upon the pump station, so emergency power at the site would be required. This alternative does not provide redundancy for electrical or mechanical equipment failures. This alternative does not meet City standards and will not be accepted.

The planned location for the Zone 3 tank is shown in the Specific Plan. As for Zone 2, for final siting details it would be necessary to conduct a service area master plan and reservoir/booster pump station siting study to determine the feasibility of alternative reservoir sites and optimum locations for these new facilities based on final subdivision designs.

The Zone 3 distribution system must avoid long dead-end water mains greater than 600 ft to provide adequate water quality and satisfy City standards. The water main layout proposed by the project proponent for Zone 3 does not meet these criteria. One solution would be to revise the Zone 3 boundary and incorporate more residential dwelling units from Village III to ensure a closed loop system. The required service area master plan and siting study would address this issue.

As described above, development of the Proposed Project would require the creation of an upper pressure zone because the proposed development is above the service elevations for the existing main zone. This upper pressure zone (Zone 2) would include a booster pump station and storage tank to serve elevations from 210 to 310 ft. Above 310 feet an additional pressure zone (Zone 3) would be required. The need for additional upper pressure zones to serve the Proposed Project is considered a ***significant impact***.

Mitigation Measure

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level*.

4.10-3 (a) *Creation of an upper zone (Zone 2) to serve the existing development and part of the Proposed Project (elevation range from approximately 210 to 310 feet). The water distribution system for this new upper pressure zone (Zone 2) will include a 2,690 gpm booster pump station and a 2.9 MG partially buried concrete storage reservoir. Prior to approval of the Final Master Map, project proponent must deposit with the City adequate funds for the City to predesign, design and construct the reservoir and booster pump station required for this upper zone (Zone 2).*

(b) *Creation of a second upper zone (Zone 3) to serve the remainder of the Proposed Project (elevation approximately 310 to 350 feet). The water distribution system for this upper pressure zone (Zone 3) will include a 230 gpm booster pump station and a 0.25 MG partially buried concrete water storage tank. Project proponent must deposit with the City adequate funds for predesign, design, and construction of the needed facilities, no less than three years before they are needed.*

(c) *Conduct a water service area master plan and pump station/reservoir siting study to determine the specific limits of the Zone 2 and Zone 3 service area boundaries as well as the optimum location for the booster pump stations and water storage reservoirs. (Service area master plan and water modeling simulations are City responsibility and must be initiated prior to the approval of the Final Master Map).*

(d) *Project proponent shall dedicate adequate space within the development to the City for the construction of the Zone 3 booster pump station. It is assumed that the Zone 2 booster pump station can be properly located within open space near*

the existing Butcher Road Reservoirs. If not, additional adequate space shall be required. The parcel(s) could be in open space areas or a separate accessible location and shall be dedicated at the time of approval of the first Final Map, tentative map, or area map for the Proposed Project.

(e) *Project proponent shall dedicate the proposed reservoir sites and access roads as identified by the water service area master plan and siting study. The sites shall be dedicated to the City for construction of the upper zone(s) partially buried concrete water storage reservoirs. The property shall be dedicated with the Final Master Map, first tentative map, or area map for the Proposed Project.*

4.10-4 Development of the Proposed Project would require on-site non-potable water distribution system improvements.

The existing SID non-potable irrigation water system in the Lower Lagoon Valley area was evaluated in the *Lagoon Valley Draft Environmental Impact Report Facilities Plan Potable and Irrigation Water System*[8]. This earlier analysis of the Proposed Project included a golf course which represents the highest non-potable irrigation water demand. As such, the existing system is anticipated to be adequate to supply current project requirements. The Lagoon Valley Regional Park will require on-going non-potable service currently supplied by the existing Hines Nursery pipeline. The Hines Nursery will eventually be relocated, but will require on-going non-potable service until it is relocated and/or houses are built. The estimated maximum hour non-potable flow for the proposed Lower Lagoon Valley project is approximately 1,314 gpm. The capacity of the existing Hines Pipeline (1,500 gpm) should be capable of meeting the peak irrigation demands for the Proposed Project.[9] At a minimum, local and on-site improvements will be required to provide adequate non-potable water service from the existing SID system and is considered a ***significant impact***

Mitigation Measure

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level*.

4.10-4 *The Proposed Project shall include local and on-site non-potable system improvements as depicted in Figure 4.10-9.*

- *8-inch non-potable water main loop through the proposed business village and around the existing Lagoon Valley Regional Park.*
- *12-inch non-potable water main connected to existing Hines Nursery Pipeline and extended through Village III and golf course club house.*
- *8-inch non-potable water main extended from the 12-inch non-potable water main through Village I and connected to the 8-inch non-potable water main loop described above.*

These improvements must be designed and constructed according to SID requirements. Provisions shall be included to ensure non-potable water service to the existing users is maintained throughout construction of the necessary improvements. Additional improvements to the existing non-potable water distribution system may be required after SID reviews the proposed improvements.

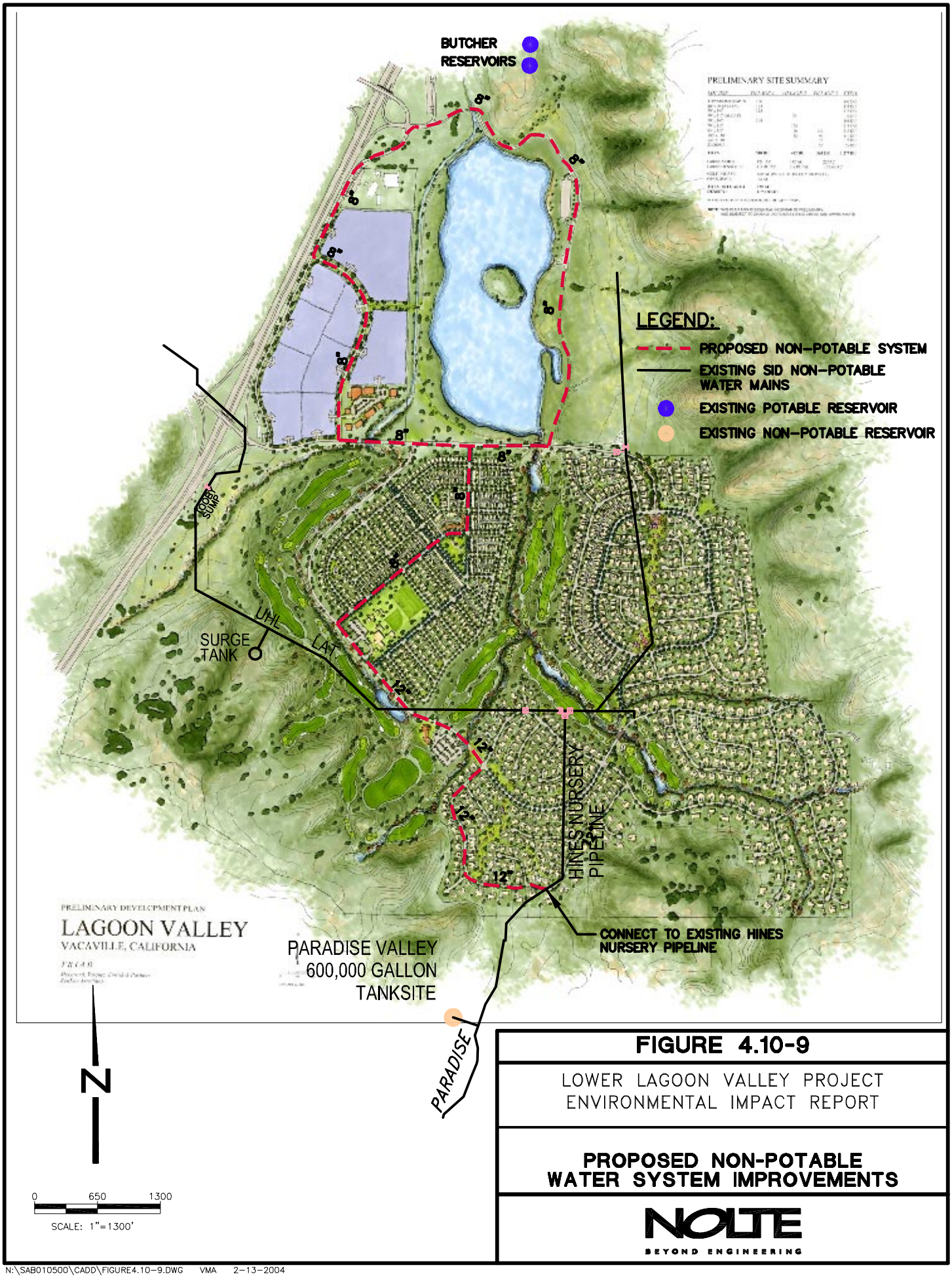

FIGURE 4.10-9

LOWER LAGOON VALLEY PROJECT
ENVIRONMENTAL IMPACT REPORT

PROPOSED NON-POTABLE WATER SYSTEM IMPROVEMENTS

NOLTE
BEYOND ENGINEERING

N:\SAB010500\CADD\FIGURE4.10-9.DWG VMA 2-13-2004

ENDNOTES

1. Carollo Engineers, City of Vacaville Recycled Water Master Plan (Draft), July 2003.

2. Luhdorff and Scalmanini, Consulting Engineers, SB 610 Water Supply Assessment Ground-Water Source Sufficiency, Administrative Draft 2, July 2003.

3. Nolte Associates, Inc., Water System Master Plan, City of Vacaville, May 1990.

4. City of Vacaville, Development Impact Fee Study, February 1992.

5. Summers Engineering, Inc., ”Lower Lagoon Valley Project” letter from Roger Reynolds, to Jim Daniels, Solano Irrigation District, September 23, 2003.

6. City of Vacaville, Infrastructure, Facilities and Services, Status Report 2003 Update, January 2003.

7. Nolte Associates, Inc., SB610 Water Supply Assessment Report for Lagoon Valley, Southtown, and Rice McMurtry, September 2003.

8. West Yost & Associates, Lagoon Valley Draft Environmental Impact Report Facilities Plan Potable and Irrigation Water Systems, April 1990.

9. Summers Engineering, Inc., “Lower Lagoon Valley Project” letter from Roger Reynolds, to Jim Daniels, Solano Irrigation District, September 23, 2003.

4.11 HYDROLOGY, DRAINAGE, AND WATER QUALITY

4.11 HYDROLOGY, DRAINAGE, AND WATER QUALITY

4.11.1 INTRODUCTION

This section addresses the impacts of developing the Proposed Project on the drainage, flooding, and water quality of the project site and surrounding water resources.

The following issues were raised in the NOP comment letters (see Appendix B): increased stormwater runoff and capacity of existing systems to accommodate increased flows; effect of urban runoff on Lagoon Valley Lake water quality; existing flooding conditions; and effect of potential dredging of Lagoon Valley Lake. All of the issues raised in the NOP comment letters have been addressed.

4.11.2 ENVIRONMENTAL SETTING

Surface Water Resources

The Proposed Project site is located in the lower southwest area of the 150 square mile Ulatis Creek Watershed. Mountains and flat alluvial valleys characterize the terrain of the Ulatis Creek Watershed. The Vaca Mountains are part of the Coast Ranges and lie along the western border of the watershed. The English Hills lie east of the Vaca Mountains, separated by the Vaca Valley. The remainder of the watershed is characterized by flat terrain, which gradually slopes to the southeast.

The Ulatis Creek Watershed is drained by a series of major stream courses that discharge into the Cache Slough and ultimately into the Sacramento River. The major stream courses, which drain to the Cache Slough, include Alamo Creek, Ulatis Creek, Horse Creek, Gibson Canyon Creek, Sweeny Creek, and McCune Creek. The location of the project site and the major stream courses within the City of Vacaville are illustrated on Figure 4.11-1.

The project site lies within the Lower Lagoon Valley watershed. This watershed is about four square miles and is a tributary to Laguna Creek, which is a tributary to Alamo Creek. Runoff from the Lower Lagoon Valley watershed ultimately discharges into the Sacramento River.

Topography and Soils

The topography of the project site is flat and slopes gradually to the northwest, with slopes ranging from about two to five percent. The Laguna Creek watershed lies within a valley with runoff ultimately draining to the Cherry Glen/I-80 area and then draining to the east and discharging into Alamo Creek. The topography within the Laguna Creek watershed varies from steep to flat. Soils in the watershed range from shallow loams overlaying sandstone bedrock in the mountainous area to moderately deep layers of sands, silts, and clays in the valley floor. The majority of soils in the Vaca Mountains and English Hills consist of Maymen-Los Gatos loam, Millsholm loam, and Dibble-Los Osos loam. These soils range in permeability from moderate to high, with very high erosion potential. Soils in the Vaca Valley floor and into the

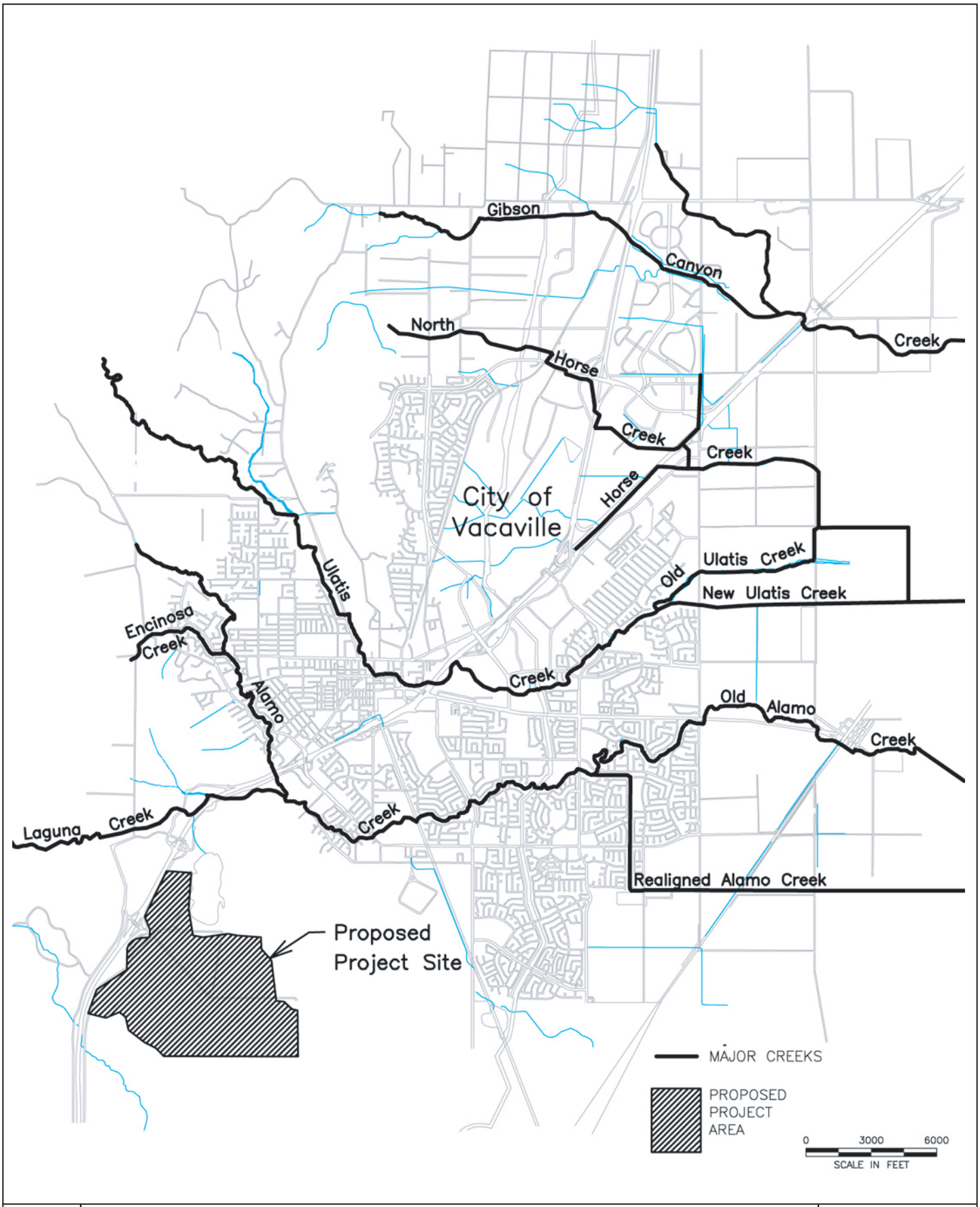

FIGURE **4.11-1**

Major Regional Drainage Features

10794-00

***Source*:** West Yost & Associates, 2004

City of Vacaville

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Sacramento Valley consist of Brentwood clay loam, Altamont clay, Capay clay and silty clay loams, which have permeabilities in the moderate to low range.[1]

A majority of the project site consists of Hydrologic Soil Groups C and D, which have very low permeability and very high runoff rates. There is an area west of the lake that consists of Group B, which has moderate to low permeability with moderate runoff rates.[2]

Climatic Conditions and Precipitation

Climatic conditions for the area are consistent with the temperature conditions predominant in the Sacramento Valley. The summers are hot and dry, and the winters are cool and moist. Average monthly temperatures range from lows in the 40s and highs in the 50s during the winter months, to lows in the 60s and highs in the 100s during the summer months.

The predominant rainfall season is from November through April, with the heaviest storms of record occurring from December through February. Spatial rainfall distribution over the Vacaville area consists of higher intensities and volumes in the upper elevations of the Vaca Mountains and lower intensities and volumes to the east. Mean annual precipitation varies from 45 inches along the ridgeline of the Vaca Mountains to 23 inches in the flat southeastern portions of the watershed near Elmira. The mean annual precipitation for the project area is about 28 inches.[3]

The total precipitation depth within the project area for the 10-year, 24-hour design storm is 4.8 inches, and 6.7 inches for the 100-year, 24-hour design storm.[4]

100-Year Floodplain

The 1997 revised Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the City of Vacaville shows that approximately 75 acres of the area proposed for development in the Specific Plan area is within the FEMA 100-year floodplain (see Figure 4.11-2).[5] The 1997 FEMA Flood Insurance Study limited the detailed creek and floodplain analysis to the Lagoon Valley Lake outfall. As a result, the FEMA 100-year floodplain upstream of the lake outfall is based on incomplete data. Consequently, the FEMA 100-year floodplain is only approximate upstream of the of the Lagoon Valley Lake outfall.

The impact of the FEMA 100-year floodplain on the Specific Plan area and surrounding areas is evaluated in Impact 4.11-2.

Drainage

Regional Drainage

The major stream courses, which flow through the City of Vacaville, are generally in their natural state and alignment. Under existing conditions, channel capacities are exceeded in isolated locations and localized flooding occurs during moderate storm events. In the 1960s, some reaches of the creeks located within the City were modified by the U.S. Soil Conservation Service (SCS–now the Nature Resource Conservation Service) to provide a 10-year level of protection and maintain a minimum freeboard of 1.5 to 3.5 feet (with the exception of the few reaches along Horse Creek and Ulatis Creek that were designed for a 50-year level of protection). However, under current conditions many of the modified channels do not have

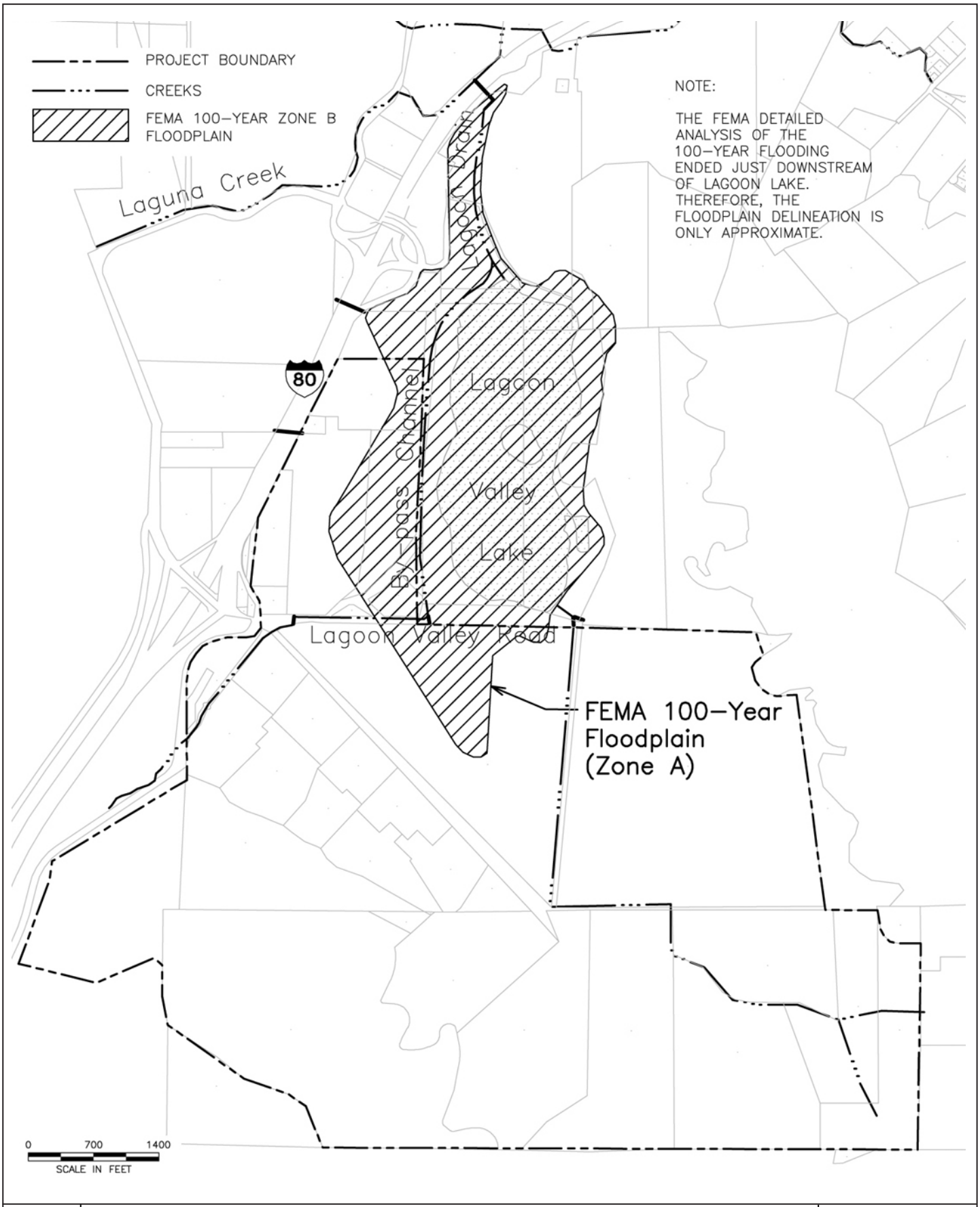

FIGURE **4.11-2**

100-Year Floodplain

***Source*:** West Yost & Associates, 2004

City of Vacaville

10794-00

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capacity to convey the estimated 10-year peak flows. The channel modifications consisted of realigning and widening along Ulatis, Lower Old Alamo, Horse, Gibson Canyon, Sweeney, and McCune creeks; the channel modifications generally extended from the eastern City limits to the Cache Slough. The Alamo Creek channel modification begins just downstream of Nut Tree Road. Other improvements included stabilization structures on Ulatis, Alamo, and Horse creeks; and levees along lower Ulatis Creek and Lower Old Alamo Creek.

A majority of the natural streams in the City are maintained by the adjacent property owners to the channel centerline. The City maintains only the channel reaches they have access to, keeping the channel flowlines free from debris and vegetation. The Solano County Water Agency (SCWA) is responsible for the on-going maintenance of the modified channels.

On-Site Drainage

The project site is within the Lower Lagoon Valley watershed, which is a tributary to Laguna Creek. A majority of the runoff in Laguna Creek is from the area upstream of I-80 (the area west and north of I-80). The Lower Lagoon Valley watershed consists mostly of the area east and south of I-80, with about 400 acres from the west of I-80.

The existing land uses include grazing, open space, parkland, commercial, and agricultural (Hines Nursery). The project site and existing drainage facilities area shown on Figure 4.11-3. Existing drainage facilities consist of creeks and drainage ditches with culverts generally conveying runoff from the surround subsheds to either the Lagoon Valley Lake or a bypass channel located just west of the lake. The majority of the project site drains by overland flow to a few defined creeks and drainage ditches. The ground slope varies from relatively steep in the surrounding hills to an average slope in the valley of about 20 feet per 1,000 feet.

The runoff from the Lower Lagoon Valley watershed area is conveyed to Laguna Creek via the Lagoon Drain and a box culvert under I-80 south of the Cherry Glen Road. About 1,500 acres drain directly to the Lagoon Valley Lake and about 1,100 acres bypass the lake in a channel constructed along the west side of the lake. The bypass channel was constructed to convey runoff that could not drain into the lake because the high water levels in the lake and the berm along the western side of the lake is higher than the existing ground surface west of the lake. Runoff from the west of I-80 crosses I-80 via two sets of culverts; a 3-foot by 6-foot box culvert south of the Cherry Glen freeway exit, and twin 36-inch culverts north of the Lagoon Valley Road freeway exit. Runoff from west of I-80 discharges into the bypass channel. The discharge from the lake and bypass channel combine at the confluence with the Lagoon Drain, flow then continues north to the confluence with Laguna Creek.

During moderate storm events the bypass channel and the Lagoon Drainage experience ponding and overflows causing flooding. One of the reasons for the flooding is obstruction in the Lagoon Drain, which limits the discharge from the lake and the bypass channel. The City of Vacaville is in the process of implementing improvements to remove the obstructions in the Lagoon Drain.

Lagoon Valley Lake is one of the major drainage features in the Lower Lagoon Valley watershed. The lake was constructed in the early 1980s and covers an area of about 105 acres. The western and southern boundaries of the lake are created by an earthen berm (dam), with the top of the berm at an elevation of 217.5 feet (NVGD 29). The lake discharges through a spillway and low flow outlet located on the north side of the lake. The crest of the spillway is at elevation 213 feet (NVGD 29). The average depth of the lake is about six to seven feet.

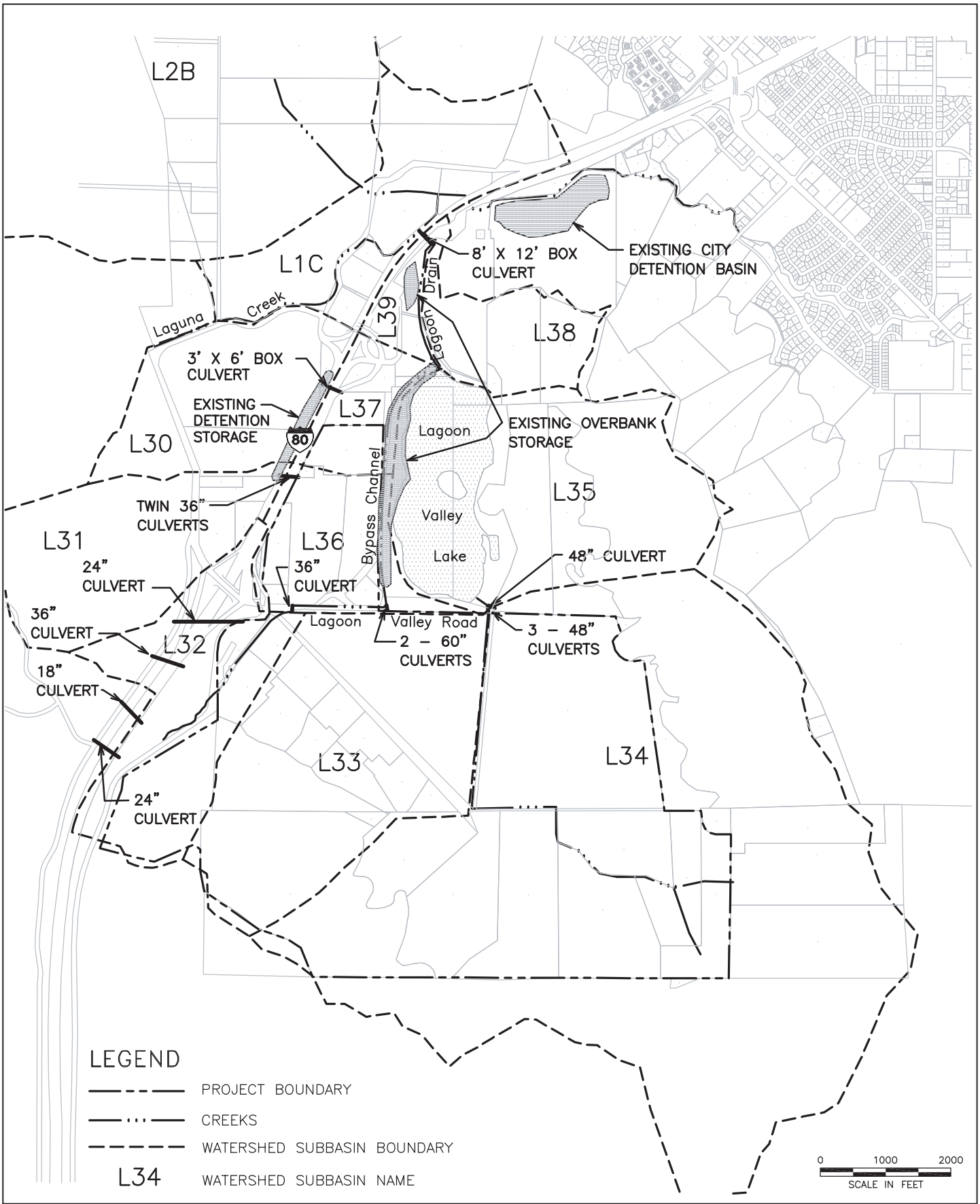

FIGURE **4.11-3**

Existing Drainage Features

10794-00

Source: West Yost & Associates, 2004

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According to the *Lagoon Valley Lake Management Plan*, about three feet of sediment accumulation has occurred in the lake since its construction in the early 80s.[6] Although sediment deposition is a normal occurrence in a man-made lake, the deposition has significantly reduced the storage volume in the lake.

The earthen dam at Lagoon Valley Lake is under the jurisdiction of the California Division of Safety of Dams (DSOD).[7] The DSOD performs periodic inspections of the structure to evaluate physical integrity. The earthen dam is generally in good condition with no evidence of significant erosion or destabilization. However, DSOD noted some items that should be addressed by the City to help maintain the integrity of the dam. These include: vegetation on the west side of the berm has the potential to undermine the dam berm through the growth of roots and by creating locations for rodent burrows; the dam may be over-topped during storm events in excess of the 100-year storm, which could increase erosion potential; and constrictions in Lagoon Drain caused by an existing rock ledge and vegetation that could impede design flows. The *Lagoon Valley Lake Proposed Management Plan* identifies specific management actions to address these issues.[8] Maintenance activities on the dam and the Lagoon Drain will be on-going regardless of the status of the Proposed Project.

Surface Water Quality

The Sacramento River is classified as having numerous beneficial uses, including municipal water supply, agriculture, recreation, and fisheries. Water quality within the river is classified as "good" to "impaired" in the reach from Red Bluff to the Delta. Upstream water management and use can affect the quality of water in the river. Regulation of stream flows by the federal and state flood control and storage facilities reduce high water flows and increases summer and fall flows, substantially lessening water quality variations. Extensive irrigated agriculture in upstream reaches of the river tends to degrade water quality. During the spring and fall, irrigation return flows are discharged to drainage canals that flow into the river. During the winter, local runoff also flows over agriculture lands, increasing the turbidity in the river and introducing herbicides and pesticides. The Sacramento River has historically been highly turbid and naturally carries high sediment loads. During peak regional storm events, the river's total sediment load can increase by several times its average levels.[9]

Local Water Quality

Water quality data are not available for most of the creeks in Vacaville. Upstream of the farmlands in the Putah Plan, Alamo Creek typically contains less than 200 parts per million total dissolved solids (TDS). Downstream of farmlands, Alamo Creek typically contains 300 to 400 ppm TDS.[10]

Water quality within the watershed is primarily characterized by surrounding land uses. In the Proposed Project area, the water quality of the Lagoon Valley Lake is influenced by both the sediment-laden runoff from the surrounding hills, and nutrient-laden flows from the Hines Nursery located southeast of the lake. Downstream of the Proposed Project site, water quality in the existing watercourses is dominated by urban land uses. Possible constituents associated with urban land uses, the surrounding hill sides, and the nursery include: sediment, heavy metals, petroleum hydrocarbons, fertilizers, and pesticides.

The water quality of Lagoon Valley Lake has deteriorated over the past several years. The impaired water quality results from sedimentation, excessive nutrient loading, and waterfowl fecal loadings. The primary source of the nutrient loading is the Hines Nursery, located just

south the Lagoon Valley Lake. The primary source of the high levels of fecal coliform bacteria is domestic waterfowl. Lagoon Valley Lake has lost much of its usability for recreation and for native wildlife habitat because of decreased water quality. A study of lake water quality was performed in 1999, and the results and recommendations for improvement compiled in the City of Vacaville *Proposed Lower Lagoon Valley Lake Management Plan* ("*Lake Management Plan"*). The plan, which was approved for implementation in 1999 and in 2002, along with a Conditional Use Permit for the park, is intended to complement the City's regional park master plan by providing short- and long-term options for enhancing and managing the lake to ensure it remains a natural, scenic, and recreational amenity.[11] The Lake Management Plan was evaluated with the Mitigated Negative Declaration (MND) for the park master plan.

Urban Runoff Quality

Constituents found in urban runoff vary during a storm event, from event to event within a given area, and from area to area within a given watershed. Variances can be the result of differences in rainfall intensity and occurrence, geographic features, and the land use of the area, as well as vehicle traffic and the percentage of impervious surface. Furthermore, sediment runoff from construction sites without adequate erosion control measures can contribute sediments, pesticides, fertilizers, and other pollutants to receiving waters.

In the Vacaville area, the natural weather pattern consists of a long dry period from May to October, and a wet season from November to April. During the seasonal dry period, pollutants contributed by vehicle exhaust, vehicle and tire wear, spills, and atmospheric fallout accumulates within the watershed. Precipitation during the early portion of the wet season displaces these pollutants into the storm water runoff that can result in elevated pollutant concentrations in the initial wet weather runoff.

Concentrations of heavy metals present in dry weather runoff (runoff during the dry season generated by landscape irrigation, street washing, etc.) are typically higher than concentrations measured in wet weather runoff (runoff generated during the rainy season primarily by precipitation). Some sources of dry weather runoff constituent pollutants include commercial and domestic irrigation, general wash-off, groundwater infiltration, and illegal discharges.

Groundwater Resources

Regional Conditions

The Vacaville area overlies portions of two Department of Water Resources (DWR)-designated groundwater basins – the northwestern portion of the Solano Subbasin of the Sacramento Valley Basin, which comprises most of the area, and a small portion of the Suisun-Fairfield Valley Basin. The English Hills fault, approximately 3.5 miles east of the Specific Plan area, generally divides the Solano Subbasin into eastern and western regions with regard to groundwater resources and development. The English Hills fault appears to act as at least a partial barrier to groundwater flow. Groundwater used for municipal uses in the eastern part of Vacaville is the basal (bottom) of the Tehama Formation, where most of the groundwater development occurs. West of the English fault (which includes the Specific Plan area), there is little groundwater development due to the absence of the Tehama Formation and the presence of pre-Tehama deposits. These latter units generally have poor quality water and low yields.

Aquifers overlying the basal zone (the Quaternary alluvium and upper and middle zones of the Tehama Formation) are affected by year-to-year changes in precipitation and have also shown significant water level trends in response to changed sources of supply and pumping.

Most of the groundwater recharge in the basin occurs east of the English Hills and to the north where the Tehama Formation is exposed. A significant portion of this recharge is the result of leakage from the overlying Quaternary alluvium and upper zone of the Tehama Formation and its outcrops.

Specific Plan Area

Groundwater is present as shallow as 4 feet beneath the surface to at least 29 feet, depending on location. Groundwater conditions are expected to vary depending on factors such as weather, time of year, and irrigation practices.[12] Groundwater conditions in the Specific Plan area are also affected by Lagoon Valley Lake. The static groundwater table is relatively deep; however, perched groundwater is present at shallow depths due to seepage from the lake. There is generally some water in the Bypass Channel west of the lake and in Lagoon Drain downstream of the lake due to seepage from the lake. Perched groundwater is also present at shallow depths in the low-elevation lands west of the lake.[13]

Soils underlying the Specific Plan area exhibit low infiltration potential and high runoff characteristics; therefore, groundwater recharge potential is low and the Specific Plan area is identified as such in City planning documents.

As discussed in more detail in Section 4.12, Hazards and Human Health, elevated levels of nitrates in the groundwater and on the Hines property have been reported. The extent of nitrate is not known, and further investigation of groundwater contamination at the Hines property has been recommended but not yet implemented. However, no groundwater wells are proposed at the project site to serve future land uses.

4.11.3 REGULATORY SETTING

<u>Federal</u>

Environmental Protection Agency (EPA) Storm Water Discharge Permitting Regulations

The Clean Water Act (CWA) prohibits the discharge of pollutants to navigable waters from a point source unless authorized by a National Pollutant Discharge Elimination System (NPDES) permit. With respect to urban pollutants in stormwater discharge, the CWA is currently implementing Phase II permits. Phase II requires municipalities with a population under 100,000 to obtain permit coverage (previously permit coverage was only required for municipalities of population greater than 100,000). Consequently, the City is in the process of developing and implementing a storm water quality management plan. Additional information regarding this permit is discussed under the “State” subheading, below.

FEMA Floodplain Regulations

The National Flood Insurance Act of 1968 made flood insurance available to property owners who are within communities that participated in the National Flood Insurance Program (NFIP). Communities are required to adopt minimum floodplain management regulations established by FEMA to be included in the NFIP. The minimum requirement are set forth in 44 Code of

Federal Regulations Part 60. The City's Floodplain Management Code outlines the requirements for construction within a designated 100-year floodplain or areas prone to flooding.

State

NPDES Permit

Any construction activity that disturbs one acre or more of land must obtain a Construction Activities Storm Water General Permit (General Permit). The project applicant must prepare and submit a Notice of Intent (NOI) and develop and implement a Storm Water Pollution Prevention Plan (SWPPP) prior to the beginning of construction activities. The NOI, General Permit, and SWPPP are administered and enforced by the Regional Water Quality Control Board (RWQCB).[14]

NPDES Phase II Program

Discharges of urban runoff in Vacaville are regulated under NPDES Phase II requirements through promulgation of the recently adopted regulations applicable to smaller dischargers. Under Phase II, the City must develop and submit a Storm Water Management Plan (SWMP) describing the City's program. Fully implemented Phase II programs must be in place by the end of the first permit term, typically five years.

The State Water Resources Control Board (SWRCB) was required to issue general permits for the NPDES Phase II-regulated jurisdictions by December 8, 2002, and operators of Phase II jurisdictions were required to obtain permit coverage by March 10, 2003. On January 28, 2003, U.S. Court of Appeals for the Ninth Circuit published an opinion (decision) remanding three aspects of the Phase II Rule concerning the issuance of Notice of Intent (NOIs) under the rule's general permitting scheme (*Environmental Defense Center v. U.S. Environmental Protection Agency*). As a result of this decision, the SWRCB decided to delay issuance of the State permit. The new submittal date for permit applications for automatically designated traditional MS4 such as the City of Vacaville was August 8, 2003.[15] The components of the SWMP will become effective when the State issues the permits.

The City of Vacaville has begun developing a program to implement the Phase II requirements. At this time no specific ordinance has been passed to reflect the implementation of the Phase II stormwater regulations, but the City has informed developers that review of current development projects will be reviewed for compliance with stormwater regulations and Best Management Practices (BMPs) listed therein.

Post-construction measures would require the City to implement structural and non-structural BMPs that would mimic pre-development quantity and quality runoff conditions from new development and redevelopment areas. Structural BMPs include engineered features that provide some treatment, such as vegetated drainage ways, detention infiltration ponds, constructed wetlands, inlet filters, or vortex type sand/oil separators. A BMP may be City wide, watershed wide, or site-specific. Non-structural BMPs are typically non-engineered management measures such as administrative and education programs focused on pollution prevention and source control. Under Phase II, development would be required to incorporate structural BMPs appropriate to the type of development and land uses in the project site, taking into account local and regional drainage and water quality considerations.

The SWMP must identify the activities to implement the following six minimum control measures required under the Phase II General Permit: public outreach, public involvement, illicit discharge detection and elimination, construction site runoff, new development and redevelopment, and municipal operations. Some typical types of outreach may include a stormwater hotline, website, storm drain stenciling, and other programs. Public meetings and presentations, volunteer water quality monitoring groups, and community cleanup days are some of the elements of the public involvement component.

Construction Dewatering

Clean or relatively pollutant-free construction-generated wastewater that poses little or no threat to water quality may be discharged directly to surface water under certain conditions. In addition to the State General Construction Activity Permit, the Central Valley RWQCB has also adopted a general NPDES permit for short-term discharges of small volumes of wastewater from certain construction-related activities. Permit conditions for the discharge of these types of wastewaters to surface water are specified in Waste Discharge Requirements General Order for Dewatering and Other Low-Threat Discharges to Surface Waters, Order No. 5-00-175, NPDES No. CAG995001. Discharges may be covered by the permit provided they are (1) either four months or less in duration, or (2) the average dry weather discharge does not exceed 0.25 million gallons per day. Construction dewatering, well development water, pump/well testing, and miscellaneous dewatering/low-threat discharges are among the types of discharges that may be covered by the permit. The general permit also specifies standards for testing, monitoring and reporting, receiving water limitations, and discharge prohibitions.

Dam Safety

The State Division of Safety of Dams has specific requirements pertaining to dam operation, including inspections and implementation of corrective actions to correct deficiencies. The California Government Code requires contingency plans for dam failure and evacuation. Incorporated cities are responsible for preparing plans for State-designated dams affecting incorporated city areas. The plans should be updated every two years and submitted to the State Office of Emergency Services for review and comment.

Local

The Solano County General Plan, Health and Safety Element, contains the following flood control policy that is applicable to the Proposed Project:

- The County and Cities should implement those flood control and drainage improvement recommendations included in locally-formulated plans and should give due consideration to those recommendations made by the Corps and the California Reclamation Board, which do not conflict with locally adopted open space and conservation policies regarding natural water course preservation.

City of Vacaville

General Plan

Consistency of the Proposed Project with relevant City of Vacaville General Plan goals and policies is presented in Appendix C. As shown in Appendix C, the Proposed Project is consistent with applicable hydrology and water quality goals and policies.

In addition to the General Plan goals and policies presented in Appendix C, the following General Plan policy is required specifically for the Proposed Project:

Policy 2.3-I 14	*Detention of floodwater shall provide for all lost floodwater storage and incremental increases in runoff, and total retention shall reduce downtown flows during peak-storm conditions to not more than 90 percent of existing conditions.*

Floodplain Management

The City of Vacaville has adopted a Floodplain Management Ordinance (Section 14.08 of the Municipal Code) that contains the following requirements that are relevant to the Proposed Project:

Section 14.18.228.010 (C.1)	*Residential construction, new or substantial improvement, shall have the lowest floor, including basement, in Zone A, elevated to or above the base flood elevation. Upon the completion of the structure, the elevation of the lowest floor shall be certified by a registered professional engineer or surveyor, and verified by the community building inspector to be properly elevated.*
Section 14.18.228.010 (C.2)	*Nonresidential construction, new or substantial improvement, shall either be elevated to conform with Section 14.18.228.010 C.1 or be floodproofed below the elevation recommended under Section 14.18.228.010 C.1 so that the structure is watertight with wall substantially impermeable to the passage of water; have structural components capable of resisting hydrostatic and hydrodynamic loads and effects of buoyancy; and certified by a registered engineer or architect that the standards of this section are satisfied.*
Section 14.18.228.030	*(A) All preliminary subdivision proposals shall identify the special flood hazard area and the elevation of the base flood.* *(B) All subdivision plans will provide the elevation of the proposed structure(s) and pad(s). If the site is filled above the base flood elevation, the lowest floor and pad elevations shall be certified by a registered professional engineer or surveyor.* *(C) All subdivision proposals shall be consistent with the need to minimize flood damage.* *(D) All subdivision proposals shall have public utilities and facilities located and constructed to minimize flood damage.* *(E) All subdivisions shall provide adequate drainage to reduce exposure to flood hazards.*
Section 14.18.228.060	*Located within areas of special flood hazard are areas designated as floodways. Encroachments within the designated floodways shall be prohibited; including fill, new construction, substantial improvement, and other new development unless certification by a registered professional engineer is provided demonstrating that encroachments shall not result in any increase in the base flood elevation during the occurrence of the base flood discharge.*

4.11.4 IMPACTS AND MITIGATION MEASURES

Method of Analysis

The Proposed Project changes the land use in the project area from vacant or rural residential/nursery to single family residential and commercial/business village. The changes in land use will cause a change in the runoff from a storm event through changes in infiltration of incident rainfall and concentration of runoff into efficient conveyance facilities such as gutters

and pipes. For example, more impervious area from a change in land use results in higher runoff that flows faster in gutters and drain pipes than as overland flow from undeveloped land.

The Proposed Project has been evaluated through the use of a hydrologic computer model using the HEC-1 computer program. The computer model methodology is consistent with the approach used in the City's Draft Strom Drainage Master Plan study, except that the rainfall data was updated based on the rainfall data contained in the Solano County Water Agency Hydrology Manual. The analysis is based on approximate assumed acreages for the different land uses in the Proposed Project area.

Impacts on water quality were evaluated qualitatively by comparing constituent loading in receiving waters contributed by existing versus future land uses and assessing the increase in flows to the receiving waters. Impacts related to dam failure inundation and flooding from earthquake-induced seiche activity were also qualitatively evaluated based on existing documentation and a review of the locations of the land uses proposed in the Specific Plan relative to Lagoon Valley Lake.

Please see Section 4.8, Public Utilities – Water Supply, for a discussion of impacts related to groundwater use.

Standards of Significance

For the purpose of this EIR, impacts to storm drainage and water quality are considered significant if the Proposed Project would:

- Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.
- Violate any water quality standards, waste discharge requirements, or otherwise substantially degrade water quality.
- Interfere substantially with groundwater recharge.
- Substantially alter the existing drainage pattern in a manner that would either result in substantial erosion or siltation on- or off-site.
- Increase the rate or amount of surface runoff resulting in flooding on- or off-site.
- Create or contribute runoff that would exceed the capacity of existing or planned storm water drainage systems.
- Place within a 100-year flood hazard area structures that would impede or redirect flood flows.
- Expose people or structures to a significant risk of loss, injury or death involving flooding.

Project Impacts and Mitigation Measures

4.11-1 Development of the Proposed Project would produce increased peak runoff flows from the project area, which could exceed the capacity of downstream drainage facilities and increase the downstream flooding hazard.

The residential and business village portions of the Specific Plan area are primarily undeveloped. Development of buildings, roadways, parking lots, and landscape hardscaping in these areas would increase the amount of impervious surfaces over that which currently exists, and it would alter natural drainage patterns across the project area. The rate and amount of stormwater runoff would change as a result of these improvements. Runoff generated from development of

the Proposed Project would produce higher stormwater peak flows than peak flows from the existing undeveloped conditions. The results of the HEC-1 model analysis indicated that the peak flows would be about 1.5 times higher than the peak flows under the existing conditions.

The Lagoon Drain channel does not have sufficient capacity to convey the 100-year design flows. As a result, a backwater condition is created, which results in over topping of the Lagoon Drain and the Bypass channel. This causes frequent flooding of the Pena Adobe Park and the Ranchotel area during moderate storm events.

The Specific Plan includes construction of detention basins and related drainage facilities to mitigate for the increase in runoff resulting from development of the Specific Plan area and to reduce the 10- and 100-year peak flows from the watershed to 90 percent of existing peak flow at the I-80 box culvert (located at the north end of the valley). Preliminary analysis using HEC-1 methodology indicates that the total detention storage necessary to reduce the 10- and 100-year peak flow to 90 percent of existing flows is between 110 and 135 acre-feet. Of this amount, only 40 to 60 acre-feet are required to mitigate for the increased runoff resulting from the development the Proposed Project area. Figure 4.11-4 shows the approximate location of the proposed detention basins.

The estimated 100-year peak flow for the Lower Lagoon Valley watershed is about 2,600 cfs, which includes the existing detention within Lagoon Lake; however, this flow does not include the overbank storage that occurs adjacent to the bypass channel and the Lagoon Drain. The box culvert under I-80 has a capacity of about 1,400 cfs. Nevertheless, the capacity of the bypass channel and the Lagoon Drain is less than 1,400 cfs. Consequently, during the moderate to large storm events these channels overtop resulting in flooding in the valley. The overbank losses and resulting flooding reduce the peak flow in the bypass channel and the Lagoon Drain. As a result, the estimated existing peak flow at the I-80 box culvert is about 1,280 cfs. Therefore, the required 100-year peak flow at the I-80 culvert is 1,150 cfs in order to reduce the 100-year peak flow to 90 percent of existing flows.

The Lagoon Drain, as discussed previously, does not have sufficient capacity to convey the 100-year design flows. This results from a restriction in the channel created by a rock ledge. To increase the capacity of the Lagoon Drain the addition of up to two 72-inch bypass pipes is proposed to direct flow around the channel restriction. The proposed bypass pipes would lower the water surface elevation in the Lagoon Drain and subsequently the bypass channel west of Lagoon Lake. The lower water surface elevation would significantly reduce flooding in the Lower Lagoon Valley.

The business village area would be raised to approximately one foot above the estimated 100-year water level in the bypass channel. The proposed residential area immediately south of the lake would be approximately four feet higher than the estimated 100-year water surface elevation in Lagoon Lake.

The proposed storm drainage conveyance system is anticipated to generally consist of catch basins, manholes, and gravity flow pipes within the project site. The runoff collected within the proposed residential development (the area south of Lagoon Valley Lake) would be routed to the proposed golf course. As the runoff is conveyed through the golf course, the flows would pass through several small detention basins. The detention basins would attenuate the 10- and 100-year peak flows prior to discharge into the bypass channel or Lagoon Valley Lake. The runoff collected within a portion of the proposed Business Village development area would be

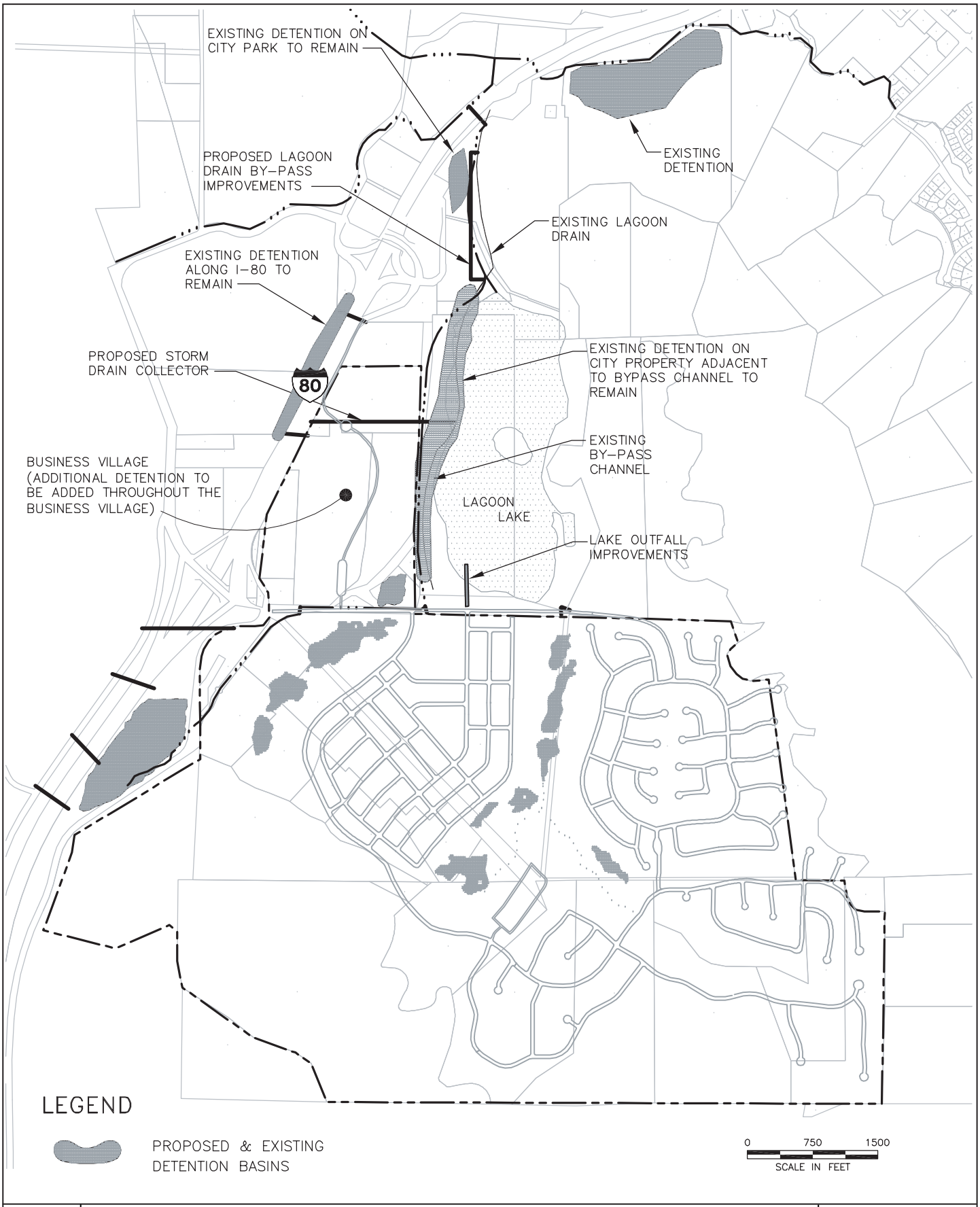

FIGURE **4.11-4**

Proposed On-Site Drainage Facilities

10794-00

***Source*:** West Yost & Associates, 2004

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EIP ASSOCIATES

routed to an on-site detention basin prior to discharging into the Bypass Channel. An additional detention basin would be constructed within the City's open space area adjacent to I-80.

Stormwater runoff would be collected on streets and in pipe systems that would concentrate and convey the runoff more efficiently. The storm drain pipelines would be designed to convey the 10-year peak flows in accordance with City design standards and would generally follow the proposed street alignments, and open channels would be designed to convey the 100-year peak flows with freeboard.

The Proposed Project increases and reroutes surface runoff, which could increase the potential for on-site flooding. A preliminary drainage study has been prepared by the project proponent (*Lower Lagoon Valley Storm Drainage Study,* see Appendix I), which provides a conceptual plan that identifies the approximate storage requirements to reduce the 10- and 100-year peak flows within the Lower Lagoon Valley to 90 percent of existing flows. The Specific Plan contains policies regarding the location, type, and implementation of a drainage master plan. A Master Drainage Plan that identifies specific improvements consistent with Implementing Policy 9.2-I4 of the General Plan has not been developed, but will be required as part of more detailed engineering studies that will be prepared during the tentative map process. The Master Drainage Plan shall completed and approved prior to approval of the first Tentative Map. This is considered a ***potentially significant impact.***

Mitigation Measures

Implementation of the following mitigation measures would reduce this impact to a *less-than-significant level.*

4.11-1 (a) *A Storm Drain Master Plan (SDMP) shall be prepared by a registered civil engineer that identifies specific design improvements that would mitigate for the increased runoff resulting from development of the Proposed Project. The SDMP shall demonstrate that the proposed drainage facilities adequately convey the design runoff and that the increased runoff will be mitigated through implementation of the proposed drainage facilities (see Figure 4.11-4). The SDMP shall be completed prior to approval of the first Tentative Map, and shall include the following:*

- *Maps showing the location of existing and proposed drainage facilities, the watershed boundaries, location of analysis points, and overland release paths;*
- *Preliminary pipe sizes and/or typical channel geometry with hydraulic grade lines, invert, and proposed ground elevations at analysis points;*
- *Design flows (10- and 100-year) at key analysis points;*
- *Preliminary grading plan and layout of proposed detention basins;*
- *Stage, storage, and discharge information for detention basins for selected design storms;*
- *Description of storage requirements, operation, and maintenance of detention facilities; and*
- *Description and analysis of any necessary water quality features.*

(b) *The project applicant shall include drainage improvements and detention basins designed to accommodate 10- and 100-year flows. Detention facilities shall be adequate to limit discharges from the Lower Lagoon Valley watershed such that the 10- and 100-year peak flows are reduced to 90 percent of the estimated*

existing peak flows. The detention facilities shall be designed to the City's Design Standards and will include provisions to ensure draining during high flows in the main channels and to prevent increased flows downstream due to the occurrence of simultaneous peak flows from upstream. All necessary detention storage shall be accommodated within the project site.

(c) *The Proposed Project shall be designed such that the building pads are raised and overland flows can be safely conveyed through the project site to an existing receiving channel (such as the Bypass channel or Lagoon Valley Lake), to the proposed golf course, and/or to the proposed detention facilities.*

Preparation of a site-specific drainage plan prior to Tentative Map approval would ensure that the Proposed Project includes a sufficient number of detention features that are appropriately located and sized to reduce stormwater peak flows to meet City requirements for development in the watershed. This would reduce the risk of flooding and would ensure consistency with General Plan policies, thus reducing this impact to a *less-than-significant* level.

4.11-2 The northern portion of the proposed residential development and most of the proposed business village development is within the FEMA 100-year floodplain.

The Proposed Project would develop residential and business village land uses within the 100-year floodplain as defined by FEMA for Laguna Creek (see Figure 4.11-2). The detailed FEMA analysis of the floodplain within the Lower Lagoon Valley was limited to the Lagoon Drain downstream of Lagoon Valley Lake. As a result, the delineation of the 100-year floodplain indicated on the FEMA FIRM maps is only approximate. Development of proposed land uses in the floodplain could expose people and property to increased risk of flooding. In addition, development of structures within the floodplain could impede or redirect flood flows, such that additional areas could be inundated.

The Specific Plan includes construction of several detention basins and related drainage facilities that would reduce the water surface elevations within the Lower Lagoon watershed, thus decrease the potential for flooding. In addition, the business village area will be raised to approximately one foot above the estimated 100-year water levels in the bypass channel. The residential area will be approximately four feet higher than the estimated 100-year water surface elevation in Lagoon Lake.

The Specific Plan includes policies that establish standards for the design of the development with regard to removing lands from the 100-year FEMA floodplain. Further detailed studies would need to be performed to further define the 100-year floodplain. The project applicant would need to submit the new floodplain study and request a Flood Insurance Rate Map revision from FEMA to reflect the new floodplain conditions. Until the 100-year floodplain is verified and/or modified so that it does not affect the proposed development, there is a risk of exposure to flooding during the 100-year storm event. This is considered a ***potentially significant impact***.

Development in the 100-year floodplain must comply with the regulatory requirements established by FEMA and the City of Vacaville. In general, these requirements ensure the Proposed Project would not increase flooding downstream of the Proposed Project or create flooding hazards within the project boundaries.

Mitigation Measures

Implementation of the following mitigation measures would reduce this impact to a *less-than-significant level.*

4.11-2 (a) *Prior to the first residential Final Map and commercial building permit, a detailed floodplain study for the proposed residential and commercial projects shall be conducted by a registered civil engineer to determine the boundaries of the 100-year floodplain within the Lower Lagoon Valley.*

(b) *Prior to issuance of the first building permit, the floodplain study shall be submitted to and approved by FEMA in accordance with all FEMA requirements for the floodplain map revision process.*

(c) *Until a revised floodplain map is adopted, prior to any development within the 100-year floodplain as currently designated by the City of Vacaville FIRM, the City shall require as a condition of building permit issuance that the Proposed Project complies with the City's Floodplain Management ordinance for residential and non-residential floodproofing. When the revised floodplain map is adopted, any areas in the revised floodplain shall comply with the City's Floodplain Management Ordinance.*

Implementation of Mitigation Measure 4.11-2(a) through (c) would ensure consistency with City General Plan floodplain policies and ordinances, which are designed to reduce the risks associated with 100-year flood hazard. Implementation of Mitigation Measures 4.11-1(a) and (b) would provide updated mapping to delineate areas subject to 100-year flood hazard. Until the revised map is adopted, Mitigation Measure 4.11-1(c) would ensure lowest floors of residential structures are elevated to or above the base flood elevation and non-residential structures are elevated or floodproofed, are able to withstand flood forces, and would not impede flood waters.

4.11-3 Increased rates of surface runoff generated by the project development or dewatering for construction activities could result in sedimentation and increased levels of urban contaminants, which could affect receiving water quality.

<u>Construction</u>

Construction activities could expose bare soil and potentially generate other water quality pollutants that could be exposed to rainfall and subsequent erosion caused by surface runoff. Construction activities involving soil disturbance, excavation, utility trenching, cutting/filling, stockpiling, and grading activities could result in increased erosion and sedimentation in surface waters. Construction materials such as asphalt, concrete, and equipment fluids could be exposed to rainfall and subsequent surface runoff. If precautions are not taken to contain contaminants, construction could produce contaminated storm water runoff (nonpoint source pollution), a potential major contributor to the degradation of water quality. If dewatering is used in areas where shallow groundwater is present, discharge of sediment-laden water could affect nearby drainages as a result of construction site runoff or direct discharge into nearby drainageways. This is considered a ***potentially significant impact.***

Any construction in the State of California on one acre or more requires preparation of a SWPPP to comply with the requirements of the SWRCB NPDES General Permit. The best management practices identified in the SWPPP would help mitigate for the impact of construction activities on storm water quality. Recent amendments to the General Permit also require water quality monitoring. Construction activities (e.g., excavation and trenching) in areas where shallow groundwater is present and groundwater extraction is necessary for construction would be subject to the RWQCB construction dewatering permit requirements, which would help minimize the potential for discharging sediment-laden groundwater into surface water drainages.

Project Occupancy

The water quality of Lagoon Valley Lake has deteriorated over the past several years. The impaired water quality results from sedimentation, excessive nutrient loading, and waterfowl fecal loadings. The primary source of the nutrient loading is the Hines Nursery, located just south the Lagoon Valley Lake. The primary source of the high levels of fecal coliform bacteria is domestic waterfowl.[16]

As discussed in Impact 4.11-1, implementation of the Proposed Project would increase the peak flow stormwater runoff rates compared to existing conditions. The conversion of agricultural uses to urban land uses would be expected to increase the concentration of contaminants associated with urban areas in the runoff. Activities that could increase the types or quantities of non-naturally occurring pollutants in stormwater runoff due to project development could include motor vehicle operations, littering, careless material storage and handling, and pavement wear. Pollutants typically associated with urban uses, such as those that could be developed as a result of the Proposed Project, could include oil and grease, coliform bacteria, petroleum hydrocarbons (gas and diesel fuels), nitrogen, phosphorus, heavy metals such as lead, copper, and zinc. Pesticides, herbicides, and other landscape maintenance products typically used in landscaping activities could also be present. As a result, the Proposed Project could adversely impact the water quality of Lagoon Valley Lake and the Bypass Channel through contaminants typically contained in urban runoff.

The project proponent anticipates using vegetative swales within portions of the residential development and through the proposed golf course to provide on-site runoff treatment. In areas where vegetative swales are not feasible, treatment control devices, such as Vortex-type separators, would be used to treat storm water. All stormwater flows from the residential development would be routed to the golf course and through a series of vegetative swales and wet ponds to provide further treatment. It is anticipated that the Proposed Project would improve the current Lagoon Valley Lake water quality through both the elimination the nutrient load from the Hines Nursery and the proposed water quality improvements planned as part of the project.

However, because the City's SWMP has not yet been approved, and the specific BMPs that would be used to reduce pollutant loading, and their locations have not been identified, this impact is considered ***potentially significant.***

Mitigation Measures

Implementation of the following mitigation measures would reduce this impact to a *less-than-significant level.*

4.11-3 (a) *A SWPPP shall be prepared to address water quality impacts associated with construction of project facilities and roadways prior to the start of construction. The project applicant shall incorporate into the construction contract specifications the requirement that all contractors comply with and implement the provisions of the SWPPP. The objectives of the SWPPP are to identify pollutant sources that could affect the quality of stormwater discharge, to implement control practices to reduce pollutants in stormwater discharges, and to protect receiving water quality.*

The City shall require preparation of a SWPPP Plan for construction activities, and shall comply with requirements adopted by the SWRCB that are shown to be necessary to mitigate project specific and cumulative water quality impacts of runoff.

(b) *Prior to adoption, the City shall ensure the Specific Plan includes policies directing that a comprehensive stormwater quality management plan for the proposed residential, golf course, and business village be prepared by a registered civil engineer or registered professional hydrologist for approval by the City prior to approval of local improvements plans. The management plan shall be designed to protect water resources from water quality impacts of runoff generated by the project to the maximum extent practicable, identifying construction and programmatic Best Management Practices (BMPs) as required to achieve this goal.*

(c) *Project Conditions of Approval shall specify that appropriate BMPs be incorporated into project design to reduce urban pollutants in runoff, consistent with goals and standards established under federal and State non-point source discharge NPDES regulations and Basin Plan water quality objectives. To maximize effectiveness, the selected BMPs shall be based on finalized site-specific hydrologic conditions, with consideration for the types and locations of development. Mechanisms to maintain the BMPs shall be identified in the Conditions of Approval for individual projects.*

(d) *Stormwater runoff BMPs selected from the CASQA (California Storm Water Best Management Practices Handbook, 2003), the Bay Area Stormwater Management Agencies Association Start at the Source-Design Guidance Manual, or similar documents shall be identified prior to final design approval. Typical BMPs that could be used shall include, but are not limited to, the following: dry extended detention basins, wet detention basins (permanent pools), grassy swales and vegetated channels, oil/grease separators, vortex type separators, catch basin inserts, or other equally effective measures. Other BMPs shall include, but would not be limited to, administrative controls such as signage at inlets to prevent illicit discharges into storm drains, street sweeping, public education, and household hazardous waste disposal programs. BMPs shall identify mechanisms for routine maintenance and repair of BMPs.*

(e) *If the City's NPDES Phase II program is not approved prior to occupancy of the Proposed Project, a water quality testing program shall be developed by a qualified professional and implemented by the project applicant to sample and analyze for urban runoff pollutants at upstream and downstream locations from the Proposed Project to determine whether pollutants (if any) detected*

downstream originated from the plan area. If a statistically significant increase in urban pollutants is identified that are determined to have originated in the Proposed Project, additional controls shall be implemented and monitored to correct the problem.

(f) *If the City's NPDES Phase II program SWMP is approved prior to approval of improvement plans the BMPs identified in the program shall be implemented for Proposed Project. If BMPs are identified prior to the NPDES Phase II program that would provide an additional level of water quality protection, their use shall be continued.*

Implementation of Mitigation Measure 4.11-3(a) through (f) would ensure BMPs specific to construction activities and land uses in the Proposed Project are included in project design and are monitored for their effectiveness in reducing urban pollutants in runoff so that Basin Plan objectives and water quality standards are not violated, and to ensure consistency with NPDES Phase II requirements. This would reduce potential water quality effects from construction activities and urban runoff to a *less-than-significant* level.

4.11-4 Runoff from the surrounding hillsides contains sediment that could plug drainage facilities, resulting in increased maintenance and increasing the potential for flooding within the Proposed Project.

According to recent studies, the sediment load in runoff that drains to Lagoon Valley Lake results from erosion of the upper watershed. The erosion is caused by unstable channels, over-grazing, and possible erosion of existing trails and fire roads.[17] Since completion of the current configuration of the Lagoon Valley Lake in the late 1970s, the lake has been slowly filling with sediment. Recent studies undertaken by the City of Vacaville have estimated that over three feet of sediment has accumulated at the bottom of the lake. The sediment accumulation has resulted in loss of several hundred acre-feet of potential detention storage, promotes excess algae and aquatic growth, and has depleted the fisheries.[18]

Sediment-laden runoff also increases storm drain facility maintenance. If the sediment loadings are significant, then there is the potential for failure of the storm drain system to convey the design storm, ultimately resulting in flooding within the project. This is considered a ***potentially significant impact***.

Mitigation Measure

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level*.

4.11-4 *A comprehensive erosion control management plan shall be prepared by a registered civil engineer, registered geotechnical engineer, or registered geologist for approval by the City prior to submittal of local improvements plans. The management plan shall be designed to reduce sediment entering the Proposed Project, develop a maintenance plan for the proposed drainage facilities and/or erosion control measures, and protect the water quality of Lagoon Valley Lake.*

The reduction of sediment entering project drainage facilities would help maintain adequate capacity for stormwater management and would protect water quality. Possible erosion control measures include construction of sediment basins upstream of the Proposed Project,

development of a grazing management plan, and stabilization of existing drainage courses upstream of the project.[19]

4.11-5 The Proposed Project could be subject to flooding from dam failure inundation.

The DSOD has indicated that the earthen dam on the west and south side of the Lagoon Valley Lake is in good condition. Although there have been no problems in the past, this does not rule out the possibility that dam failure could occur. Failure of an earthen dam generally occurs when it is overtopped with water. This potential flooding scenario could inundate some of the areas adjacent to the lake, although the specific areas have not been determined. This flooding, if it were to happen, would most likely be gradual, however, as the topography surrounding the lake is relatively flat. This is considered a ***potentially significant impact***.

Mitigation Measures

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level.*

4.11-5 *Prior to Tentative Map approval, the results of a dam failure inundation study shall be used to identify measures to protect locations that could be affected in the event of failure of the earthen dam at Lagoon Valley Lake. The finish floor elevations of buildings within the Specific Plan area shall be above the 100-year water surface elevation in Lagoon Valley Lake. Additional measures could include, but would not be limited to, periodic inspections, ensuring structures that could be affected are floodproofed, and an emergency notification/response plan.*

Implementation of Mitigation Measure 4.11-5 would ensure that a dam failure inundation study is prepared prior to the development of occupied land uses to determine locations that could be flooded in the event of earthen dam failure, and that measures to protect people and property are in place in the event of dam failure-related flooding.

4.11-6 Occupied uses adjacent to Lagoon Valley Lake could be subject to seiche activity in the event of a large earthquake.

Earthquake-induced seiches are periodic oscillations of water levels in enclosed bodies of water, such as lakes, reservoirs, basins, etc. Development of the Proposed Project would result in the development of a business village and residential areas adjacent to Lagoon Valley Lake. As discussed in greater detail in Section 4.11, Geology and Soils, the preliminary geotechnical report indicated that, although there are no historical records of a seiche occurring in or adjacent to the project site, it does not preclude the possibility of one occurring. The amplitude (height) of a seiche can range from a few inches to several feet. The duration of the wave activity (period) of a seiche can range from a few minutes to a few hours, depending on the size and shape of the basin of water. Water from a seiche could overtop the sides of the lake, resulting in localized flooding that could affect nearby development. This is considered a ***potentially significant impact***.

Mitigation Measures

Implementation of the following mitigation measure would reduce this impact to a *less-than-significant level.*

4.11-6 *Prior to Tentative Map approval, the results of a site-specific geotechnical study using an appropriate and industry-accepted model shall be used to identify the extent to which the project site could be affected by seiche hazard from Lagoon Valley Lake. If overtopping could occur, the study shall identify the extent of flooding and depth of flood water. The City shall ensure through the permit review process that recommendations for floodproofing potentially affected structures or increasing the freeboard and/or storage capacity of Lagoon Valley Lake are incorporated into project design prior to issuance of building permits for affected locations.*

The results of a site-specific investigation that takes into account local seismic conditions and basin conditions would predict the likelihood and potential severity of a seiche and the need, if any, for mitigation, which would be achieved through Mitigation Measure 4.11-6.

4.11-7 Development of the Proposed Project could alter groundwater recharge conditions.

An increase in impervious surfaces can affect groundwater recharge by limiting infiltration of rain water and applied (irrigation) water. However, groundwater recharge potential at the project site would not be substantially affected by project development because infiltration is limited under existing conditions due to underlying soil types and there is minimal irrigation. Further, the project site has not been identified as a significant recharge source. Therefore, direct groundwater recharge impacts would be ***less than significant***.

Mitigation Measures

4.11-7 *None required.*

ENDNOTES

1. United States Department of Agriculture Soil Conservation Service, *Soil Survey of Solano County, California*, May 1977.

2. United States Department of Agriculture Soil Conservation Service, *Soil Survey of Solano County, California*, May 1977, Map 21.

3. West Yost & Associates, *Solano County Water Agency Hydrology Manual*, June 1999, Figure 2-2.

4. West Yost & Associates, *Solano County Water Agency Hydrology Manual*, June 1999, Table 3-4B.

5. FEMA Flood Insurance Rate Map, *City of Vacaville, California, Solano County*, January 17, 1997, Panel 060373-0013 C & 060373-0011 C.

6. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan*, October 13, 1999.

7. The California Division of Safety of Dams (DSOD) regulates dams that are at least 25 feet high or impound more than 50 acre-feet of water.

8. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan*, October 13, 1999, pp. 78 through 79.

9. City of West Sacramento, *City of West Sacramento General Plan, Background Report*, May 3, 1990.

10. City of Vacaville, *Easterly WWTP Expansion Project Draft EIR* (SCH #97062009), October 1997, p. 4.3-10.

11. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan*, October 13, 1999, pp. v through viii.

12. ENGEO Incorporated, *Preliminary Geotechnical Exploration, Lagoon Valley, Vacaville, California*, 2003, p.10.

13. City of Vacaville, Lagoon Valley Draft EIR, August 1990, p.4-38.

14. State Water Resources Control Board – Water Quality, Storm Water Program – Construction Frequently Asked Questions, SWRCB website (http://www.swrcb.ca.gov/stormwtr/constfaq.html), accessed June 23, 2003.

15. State Water Resources Control Board, Phase II Small Municipal Separate Storm Sewer (MS4) Program, SWRCB website, accessed February 11, 2003.

16. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan,* October 13, 1999, p. viii.

17. LSA Associates, Inc., *Watershed Restoration Plan – Lagoon Valley Lake,* June 1, 2003, p. 2.

18. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan,* October 13, 1999, p.42-43.

19. LSA Associates, Inc., *City of Vacaville Proposed Lagoon Valley Lake Management Plan,* October 13, 1999, p. 54-58.

4.12 GEOLOGY AND SOILS

4.12 GEOLOGY AND SOILS

4.12.1 INTRODUCTION

This section describes the geologic and soils characteristics of the Lower Lagoon Valley Specific Plan area and evaluates the extent to which implementation of the Proposed Project could affect or be affected by seismic hazards (such as groundshaking and liquefaction), soil characteristics (such as expansive soils), unstable slopes, and erosion. Applicable State and local regulations governing building construction and development where areas are subject to geologic hazards are included in the discussion. Two site-specific geotechnical reports were conducted for the Proposed Project and are referenced in this section: *Preliminary Geotechnical Exploration, Lagoon Valley, Vacaville, California*, July 25, 2003, and *Preliminary Geotechnical Exploration, Commercial Development, Lagoon Valley, Vacaville, California*, August 14, 2003, both prepared by ENGEO Incorporated. The reports are available for review at City of Vacaville, Community Development Department, Planning Division, 650 Merchant Street, Vacaville, California.

Comments received in response to the NOP (included in Appendix B) for this project expressed concern about development on the Lagoon Valley fault and potential seismic hazards, potential landslide hazard, and erosion. These issues are specifically addressed this section.

4.12.2 ENVIRONMENTAL SETTING

Topography

The Specific Plan area is located in Lagoon Valley in western Solano County (see Figure 3-1). Lagoon Valley has a north-south orientation and is surrounded by the Los Puntos range to the east and the Vaca Mountain range to the west. The Specific Plan area is in the southern portion of Lagoon Valley and is bordered on the west by Interstate 80 (I-80) and on the east and south by low-lying hills that range in height from approximately 400 to 900 feet above mean sea level (+400 to +900 feet msl). Generally, the central portion of Specific Plan area is flat and gently sloped downward to the north toward the lake. However, the project boundary along the west, south, and east is higher in elevation than the rest of the Specific Plan area, and includes the adjacent surrounding foothills.

Geology

Regional Geology

The Specific Plan area is located in the Great Valley geomorphic province, which is bounded on the west by the Coast Ranges and on the east by the Sierra Nevada.[1] This region is underlain by unconsolidated and semi-consolidated sedimentary alluvium formed by erosion of the two mountain ranges during the Mesozoic and Cenozoic eras. These two eras, which spanned approximately the last 250 million years, included alternating periods of mountain formation, volcanic activity, erosion and deposition that created the existing landforms.

Western Solano County consists of hilly to very steep mountainous uplands of the Coast Ranges, which grade down eastward to the lower elevations in the flatter areas of the Sacramento Valley. These flatter areas are comprised of low alluvial plains and fans, as well as flooded basins.

Local Geology

Bedrock surrounding the Specific Plan area and Specific Plan area on the west, south, and east consists of Cretaceous-age Guinda Formation. This bedrock formation generally consists of calcareous sandstone with interbedded siltstone, which is present at depths below 15 feet. The geologic structure at the site is the result of past tectonic uplift and faulting, followed by deposition of alluvium. The majority of the flat-lying portion of the Specific Plan area is alluvium, which consists of inter-layered silty clay, silts, clayey sand and clayey gravel, with minor lenses of sand.[2] Geologic units at the Specific Plan area are shown in Figure 4.12-1.

Groundwater is present as shallow as four feet beneath ground surface to at least 29 feet, depending on location. Groundwater conditions are expected to vary depending on factors such as weather, time of year, and irrigation practices.[3]

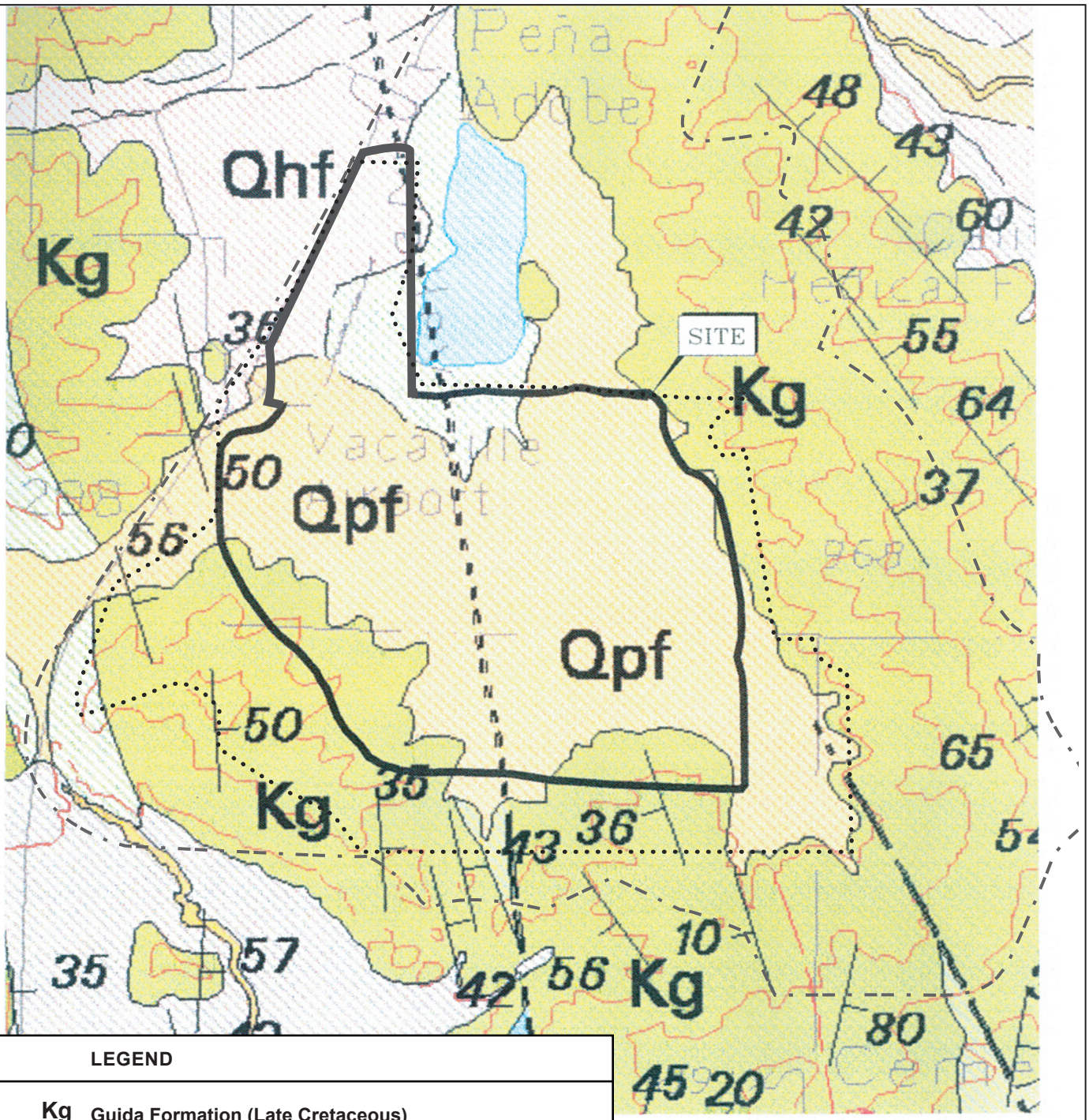
Earthquakes and Seismic Hazards

Earthquakes are caused by the release of stored energy that can rupture brittle earth materials at or near the surface of Earth. The rupture surface along which the ground is displaced is called a fault plane. The expression of this displacement on the ground surface is called a fault trace or fault line. Historically, the relative size of an earthquake was measured in magnitude (M) on the Richter Scale. The Richter Scale[4] measures the amplitude of seismic waves recorded by a seismograph. More recently, the "size" of an earthquake (i.e., the amount of energy released) has been expressed in terms of Moment Magnitude (M_w).[5] The Moment Magnitude conveys a more precise numerical indication of earthquake size, particularly for earthquakes above Richter magnitude 7.5. Earthquake intensity is measured on the Modified Mercalli Intensity Scale (MMI)[6], which measures the severity of an earthquake by the way it is felt and responded to by humans, and by the amount of damage it does to buildings and structures.

Regional Faults and Historic Seismicity

The distribution, recurrence, and intensity of earthquakes over time defines the seismicity of a region. The City of Vacaville, Solano County, and the rest of the Bay Area, are in one of the most active seismic regions in the United States. Each year, low- and moderate-magnitude earthquakes occur within or near the Bay Area. The major fault zones of the San Andreas fault system are the sources of all these earthquakes, and are expected to be the sources of most future earthquakes in the area.[7]

The San Andreas fault system is approximately 44 miles wide in the Bay Area.[8] The principal active faults, on which there is evidence of displacement during Holocene time (the last 11,000 years), include the San Andreas, San Gregorio, Hayward, Rodgers Creek, West Napa, Calaveras, Concord, and Green Valley faults.[9] Figure 4.12-2 shows the approximate position of the major fault zones, the general distribution of the major groups of rock units, and the location of the Specific Plan area in relation to these features. Table 4.12-1 contains the estimated maximum parameters for earthquakes on known major faults in the region. Other faults that exist in the vicinity of the City of Vacaville are pre-Quaternary in origin, generally being related



LEGEND

Kg	Guida Formation (Late Cretaceous)
Qha	Alluvium (Holocene)
Qhf	Alluvial Fan Deposit (Holocene)
Qpf	Alluvial Fan Deposits (Pleistocene)
	Fault-Dashed Where Approximately Located
	Short Dashed Where Inferred, Dotted
?.....	Where Concealed, Queried Where Location Is Uncertain
	Lower Lagoon Valley Specific Plan Boundary
	Development Area

0 MILE .5
0 KILOMETER 1

FIGURE **4.12-1**
Regional Geology

10794-00

Source: ENGEO, Inc.

City of Vacaville

EIP ASSOCIATES