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PRELIMINARY ENGINEERING REPORT
CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

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PRELIMINARY ENGINEERING REPORT
CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

TABLE OF CONTENTS

CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

TABLE OF CONTENTS (CONT'D)

CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

LIST OF TABLES

CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

LIST OF TABLES (CONT'D)

CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

LIST OF EXHIBITS

CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

LIST OF EXHIBITS (CONT'D)

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PRELIMINARY ENGINEERING REPORT
CITY OF PLYMOUTH
TREATED WATER PIPELINE PROJECT

I. INTRODUCTION

The City of Plymouth, with a population of approximately 1070 persons and approximately 400 households, is located in northern Amador County. Water service is provided to the Amador County Fairgrounds and to mobile home park, commercial and multifamily uses in addition to single family residences. Based on criteria developed with the Amador Water Agency, there are currently 536 equivalent single family residential (or ESFR) water services now served by the City of Plymouth. The City provides both water supply and wastewater treatment services for its residents. The Amador Water Agency is currently under contract to the City of Plymouth to assist with the operation and maintenance of these facilities. Water is now supplied to the City from municipal wells and from the Arroyo Ditch, a 17-mile long, mostly unlined, earthen canal which diverts water from the Cosumnes River. In the late 1980's the Arroyo Ditch was purchased from Amador County. Since that time the City has been responsible for ditch operation and maintenance. Due to lack of personnel and operating budget, routine maintenance of Arroyo Ditch has not occurred. As a result, the ditch is periodically out of service, even when water supply from the Cosumnes River is available. Existing ditch conditions are described in Section III of this Preliminary Engineering Report (PER). Considerations for improving the reliability of the Arroyo Ditch supply source are discussed in Section V.

In 1987, the unreliability of the Arroyo Ditch water supply system caused the State Department of Health Services to issue a building moratorium in Plymouth. To improve water supply, the City drilled and developed a new water supply well. With this additional water supply source the State modified the moratorium to allow a limited number of building permits. In 2004, one of the three operating wells was removed from service during peak demand periods because groundwater levels dropped below the pump intake level. A second well has high turbidity levels which have also been attributed to decreasing groundwater levels. In recent years several private wells in the Plymouth area have also been removed from service due to decreasing groundwater levels. Existing municipal supply wells are described in Section III of this report. Due to the long term unreliability of area groundwater resources the State Department of Health Services has limited firm yields to 25% of long term pump test results. Municipal wells pump tested at 400 gpm, for example, were assigned a firm yield of 100 gpm. Long term water supply alternatives based on groundwater resources are not considered in this report.

The purpose of this Preliminary Engineering Report (PER) is to describe the existing City of Plymouth water supply conditions, to evaluate alternative sources of supply and to recommend a preferred water supply project. Preliminary project design and environmental review services are being financed through a Community

Development Block Grant (CDBG) obtained from the State Department of Housing and Community Development (HCD). It is proposed that project construction be financed, in large part, from grants and loans obtained from the United States Department of Agriculture (USDA), Rural Utilities Service (RUS) Programs. This PER is prepared in conformance with USDA guidelines for RUS-financed water systems.

BACKGROUND

In response to the State imposed moratorium the City has previously evaluated alternatives to improve their water supply facilities. In 1990 the City, together with the Amador Water Agency, authorized "A Study of Water Supply for the City of Plymouth" (David Willer). In that report a number of supply alternatives were considered including an 800 acre–foot capacity and an 860 acre-foot capacity raw water reservoir. In 2000, the City obtained funding to construct a 1500 acre-foot reservoir in the Shenandoah Valley. Based on the 1990 study the cost to construct a 1500 acre-foot capacity reservoir was estimated at approximately $3.5 million. Delays associated with obtaining the U. S. Army Corps of Engineers 404 Permit together with environmental costs and rapidly increasing land prices caused this reservoir project to increase in cost some three times more than the1990 estimated cost. As further described in Section V of this PER, the raw water reservoir project has become unaffordable and the USACOE 404 Permit has still not been obtained.

It is now proposed that water supply be provided to the City of Plymouth with the construction of a treated water pipeline that would connect the Amador Water Agency (AWA) Water Treatment Plant at Tanner Reservoir with the existing City of Plymouth treated water storage tank located on Fiddletown Road. The distance between these facilities is approximately 11 miles. There is adequate hydraulic gradient between the Tanner Water Treatment Plant, constructed at elevation 1710, and the Plymouth treated water storage tank, operating at elevation 1280, to deliver the projected demands without pumping. As further described in Section III and Section V of this report, the Amador Water Agency now serves the communities of Sutter Creek, Amador City and Drytown with transmission mains from the Tanner Water Treatment Plant. It is proposed that portions of these existing transmission mains also serve extension of the Tanner Water Treatment Plant service to the City of Plymouth. With completion of the Amador Transmission Main from Lake Tabeaud to the Tanner Water Treatment Plant, the Agency will have adequate raw water supply to also serve the City of Plymouth. The costs, benefits and environmental considerations of alternative treated water pipelines connecting the existing Tanner Water Treatment Plant with the existing Plymouth water storage tank are described and evaluated in this study. The Plymouth pipeline alternatives are compared to other water supply alternatives including improvements to the Arroyo Ditch and the Shenandoah Valley raw water reservoir project.

PURPOSE

In this PER water supply conditions, project alternatives and a specific course of action are presented from an engineering perspective. The City of Plymouth is conducting environmental review of the Plymouth Pipeline Project concurrently with this engineering planning. In this PER environmental issues, considered as part of the engineering planning, are identified. The potential environmental significance of pipeline project alternatives and of the recommended project and the mitigation measures proposed to reduce levels of significance are introduced in the "Notice of Preparation, Plymouth Pipeline Project (City of Plymouth, Planning Partners, June 2005). The environmental document prepared for this project shall complete the environmental review pursuant to both the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) and shall permit consideration for funding of the project by the UDSA Rural Utilities Service.

Consistent with USDA Rural Utilities Services Bulletin 1780-2, project alternatives, findings, recommendation and conclusions for the Plymouth Pipeline Project are presented in this PER as follows:

I. INTRODUCTION
II. SUMMARY FINDINGS AND RECOMMENDATIONS
III. PROJECT PLANNING AREA AND EXISTING FACILITIES
IV. PROJECT NEED
V. PROJECT ALTERNATIVES
VI. EVALUATION OF PROJECT ALTERNATIVES
VII. PROJECT RECOMMENDATIONS

APPROACH AND STUDY SCOPE

For the purpose of this study and to facilitate the project description and the evaluation of alternatives, the Plymouth Pipeline Project is divided into the following segments:

Segment 1. New Water Transmission Main from Tanner Reservoir to Connection to Existing Amador Water Agency Water Distribution System in Sutter Creek

Based on preliminary design by The Amador Water Agency an 18-inch water main has been suggested for this segment of the Plymouth Pipeline Project. This new water main would be constructed parallel to existing Amador Water Agency (AWA) water main improvements on the south side of the Sutter Creek waterway and then connect to existing AWA transmission mains on the north side of the Sutter Creek waterway. For the purpose of this study the size and capacity of the new water main is evaluated. The WaterCAD water distribution modeling software developed by Haested Methods is used to analyze proposed improvements and existing Amador Water Agency

transmission mains. Using this software, the capacity of the new transmission main to improve the existing Amador Water Agency water service and to serve the projected demands for the City of Plymouth is determined. These findings are included in Section V. Water distribution, velocity and pressure maps and printouts generated by the network modeling are appended to this report. As described in Section V alternative pipeline alignments, sizes and Sutter Creek crossings for Project Segment 1 are evaluated in this study.

Segment 2. Existing Amador Water Agency Water Mains, Broad Street and Eureka Street to Sutter Creek – Amador Road

Based on preliminary studies it was determined that existing AWA water transmission mains located on the north side of the Sutter Creek waterway are adequate to meet the existing plus projected City of Plymouth water demands provided that these existing mains are connected to the new water transmission main described in Segment I. Existing AWA water transmission mains which would be used to transmit Plymouth water demands are located between Eureka Street and Sutter Creek-Amador Road and include 10-inch and 12-inch diameter mains within Broad Street, Main Street and Spanish Street. As discussed for Segment I this preliminary determination is tested using the Haested WaterCAD Network model. The capacity and performance of the existing Sutter Creek distribution mains were verified, as part of this study, by comparing actual fire hydrant flows and pressure test results with hydrant flow and pressure determinations developed from the network model. Results of these determinations are presented in Section V of this PER and are included in the Technical Appendices.

Segment 3. New Transmission Main and Water Storage Tank Constructed at Elevation 1640, North of Sutter Creek

The Amador Water Agency has previously determined that a water storage tank constructed on the north side of the City of Sutter Creek with a base elevation of approximately 1640 could be filled, by gravity, from the existing storage reservoir located at the Tanner Water Treatment Plant. At this location and elevation a water storage facility could be filled during low demand hours and then be available for supply during high demand periods. A water storage tank at this elevation and location would serve peak hour and fire flow demands in Sutter Creek, Amador City and Drytown and help attenuate peak demands from the City of Plymouth. A 1.5 million gallon capacity tank and combination tank draw / tank fill line are evaluated as part of this study. Findings and recommendations are included in Section V. The tank fill / tank draw main would connect to the existing AWA main located in Sutter Creek-Amador Road.

Segment 4. Existing Amador Water Agency Transmission Main, Sutter Creek Water Storage Tank to Amador City Pressure Regulating Station

This segment includes continued use of the existing 10-inch diameter water main located between Sutter Creek-Amador Road and the existing Amador City Pressure Regulating Station. Downstream of the Pressure Regulating Station is an 8-inch

diameter main constructed to Amador Creek Road. Alternatives evaluated in this report include continued use of all, or portions, of the 6,800 foot section of 10-inch main and continued use of all, or portions, of the 1,800 feet of 8-inch main. Alternatives include pressure adjustments at the existing Amador City Pressure Regulating Station and the construction of a parallel main from the high pressure side of the pressure regulating station across Amador Creek to Amador Creek Road. Network Analysis results with existing plus projected Plymouth water demands are presented in Section V of this study.

Segment 5. New Water Main, Amador Creek Road to New Chicago Road

Alternatives evaluated for this segment include:

- A new 10-inch or a new 12-inch diameter main constructed parallel to the existing 6-inch diameter main now placed in East School Street and Bunker Hill Road with extension of a new main to New Chicago Road.

- A new 12-inch diameter main to replace the existing 6-inch diameter main placed in East School Street and Bunker Hill Road with extension to New Chicago Road.

- A new 10-inch and 12-inch diameter pipe placed in Amador Creek Road and Turner Road to New Chicago Road.

The costs, benefits and environmental considerations of each of the Segment 5 pipeline alternatives are described in Section V of this report. This segment includes approximately 10,000 feet of new water mains. Pressures and capacities available with each alternative are discussed in this study.

Segment 6. New Water Main, New Chicago Road to City of Plymouth Water Treatment Plant

For Segment 6 three alternative pipeline alignments were evaluated. As further described in Section V these alignments are designated as the "Matulich" Alternative, the "Evitt" Alternative and the "Gansberg" Alternative. The costs, benefits and environmental considerations of each of the Segment 6 pipeline alternatives are described in Section V of this report. In general, the pipeline alignments evaluated in Segment 6 follow existing ranch roads, vineyard roads or access roads. This segment includes approximately 22,000 feet of new pipeline.

As further described herein The Plymouth Pipeline project alternatives have been evaluated using aerial photographs, assessors maps, final maps, right-of-way maps, City of Plymouth records and reports and Amador Water Agency records and reports. Each alternative pipeline alignment and proposed water storage tank site has been investigated on foot and by vehicle. Alignments across private property have been

evaluated with property owners. Alignments along existing rights-of-way have been reviewed with the City of Plymouth, Caltrans, the City of Sutter Creek, the City of Amador City and Amador County.

Initial surveys and field investigations of each alternative were conducted with biologists, plant specialists, cultural experts and historical consultants. Subsequent and more detailed field investigations were then conducted for each of the primary alternatives. During field investigations, adjustments in alignments and project scope were proposed to avoid significant vegetation, potential habitat for special status species, low lying areas that could be designated as wetlands and obvious historic features (abandoned mines, abandoned building foundations, rockwalls and the like). With project development and design, adjustments will continue to be made to mitigate project impacts and to facilitate the project.

The scope of the Plymouth Treated Water Project and the Project Segments summarized herein are shown in **Exhibit 1-1**.

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II. SUMMARY FINDINGS AND RECOMMENDATIONS

The purpose of this project is to provide the City of Plymouth with a reliable supply of treated water to meet both current and projected 20 year demands. Extension of the Amador Water Agency's existing treated water system from the Tanner Water Treatment Plant to the existing City of Plymouth Water Storage Tank is recommended.

A summary of the recommended Plymouth Treated Water Pipeline Project is as follows:

- A new 12-inch diameter main, approximately 8300 feet in length is recommended for Pipeline Segment 1. Crossing of the Sutter Creek waterway with the new pipeline attached to a new pedestrian bridge is proposed. Alignment Alternative 1-3 (Gold Dust Trail) is proposed for Pipeline Segment 1.

- Existing Amador Water Agency mains within Segment 2 are adequate to serve the existing plus projected demands of the City of Plymouth. No new pipeline improvements are proposed in Segment 2.

- A new 12-inch diameter main, approximately 3000 feet in length is recommended for Pipeline Segment 3. Pipeline Segment 3 includes a 1.5 million gallon capacity, above ground, steel water storage tank to be constructed with a base elevation of 1640.

- In Segment 4 a new 12-inch diameter water main is recommended to parallel the existing 8-inch Amador City Main from the Amador City Regulating Station to Amador Creek Road, a distance of approximately 1800 feet. The existing 6800 feet of 10-inch main between Segment 3 and the new 12-inch main is adequate to serve projected year 2025 project demands.

- A new 12-inch diameter main is recommended for Pipeline Segment 5, approximately 10,800 feet in length. Alignment 5-1 along Amador Creek Road, East School Street, Bunker Hill Road and New Chicago Road is recommended.

- A new 12-inch diameter main is recommended for Pipeline Segment 6, approximately 20,375 feet in length. Alignment 6-2, the Evitt Alternative, is recommended

- Additional demands in the Plymouth Service Area beyond those projected for the 2025 maximum day conditions could require a new (parallel or replacement) water main in Segment 4 between Sutter Creek Amador Road and the Amador City Pressure Regulating Station.

- If new development occurs along Pipeline Segment 6 an additional water storage tank constructed along this segment may be required.

The estimated cost of the Plymouth Pipeline Project is $7,830,075. Cost estimates are based on year 2006 construction. First year, operation and maintenance costs are estimated at $468,865. The recommended first year operating budget, including reserve funds, is $488,865.

The recommended Plymouth Pipeline Project is compared in this PER to the previously proposed Shenandoah Valley Storage Reservoir Alternative and to improvements to the Arroyo Ditch.

- The initial costs estimated for the Plymouth Pipeline Project are lower than the initial costs estimated for the other project alternatives considered.

- The annual costs estimated for the Plymouth Pipeline Project are lower than the annual costs estimated for the other project alternatives considered.

- The Plymouth Pipeline Project can more reliably meet current and projected maximum day demands than the other project alternatives considered.

- The constructability of the Plymouth Pipeline Project is superior to the other project alternatives considered.

- The capacity of the Plymouth Pipeline Project is superior to the other project alternatives considered.

- The Plymouth Pipeline Project includes features that will allow expansion and additional capacity.

- With replacement of the Amador Canal with the Amador Transmission Main, the Plymouth Pipeline Project would not rely on open ditches for raw water conveyance. This improvement would result in a safer and more secure water system than the other project alternatives considered.

The Amador Water Agency has designed, and is prepared to construct, the Amador Transmission Main. Without the reliability and superior conveyance capacity provided by the Amador Transmission Main, service to the City of Plymouth from Tanner Water Treatment Plant is not possible.

The capacity of the existing Tanner Water Treatment Plant is approximately 5.2 MGD. Maximum day demands are currently 4.6 MGD. To serve both the City of Plymouth and increased maximum demands from Sutter Creek, Amador City and Drytown projected for the end of the 20 year Project planning period will require as much as 4.6 MGD of additional treated water delivered from the Tanner Water Treatment Plant. The City of Plymouth would pay initial participation fees of approximately $1,340,000 to "buy" plant capacity and to help pay their share of

treatment plant expansion. Hook up fees for new services within the City of Plymouth will also include payment for treatment plant capacity.

Extension of Amador Water Agency service to the City of Plymouth will require execution of a Memorandum of Understanding (MOU) between the City and Water Agency. Based on preliminary drafts of this MOU the City of Plymouth's share of the Plymouth Pipeline Project costs are estimated at $4,654,595.

The City has applied for a $3,000,000 RUS Grant and a $500,000 CDBG Grant to help reduce the City's share of the Plymouth Pipeline Project costs.

The first year monthly water service rates for a Plymouth single family residence are estimated at $65.64. This compares with current average monthly charges of approximately $60.00. Annual costs, revenues and monthly service costs are estimates prepared for this PER. Project cost sharing, commodity charges, meter charges and participation fees will be formalized with execution of the MOU between the City of Plymouth and the Water Agency. With these factors determined, the City will initiate a more formal rate study and hook up fee schedule. Public workshops and public meetings will be held to discuss findings and recommendations of this rate study.

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III. PROJECT PLANNING AREA AND EXISTING FACILITIES

LOCATION

The Project area is located in Northern Amador County, California. The Project area extends from the City of Sutter Creek on the south to the City of Plymouth on the north. The existing and proposed water transmission mains of this project would, in general, be placed within existing paved roadways, ranch roads, vineyard roads and access roads. Pipeline alignment alternatives are located east of State Route 49. The Project would begin at the Tanner Water Treatment Plant located on Ridge Road, Sutter Creek and terminate at The Plymouth Water Treatment Plant located on Fiddletown Road, Plymouth. The planning area for Project Segments 1, 2 and 3 is presented in **Exhibit 3-1** and includes the southern portion of the Project within and near the City of Sutter Creek. The southern portion of the Project planning area includes Tanner Reservoir, the Sutter Creek crossing and the new water storage tank proposed at or above elevation 1,640.

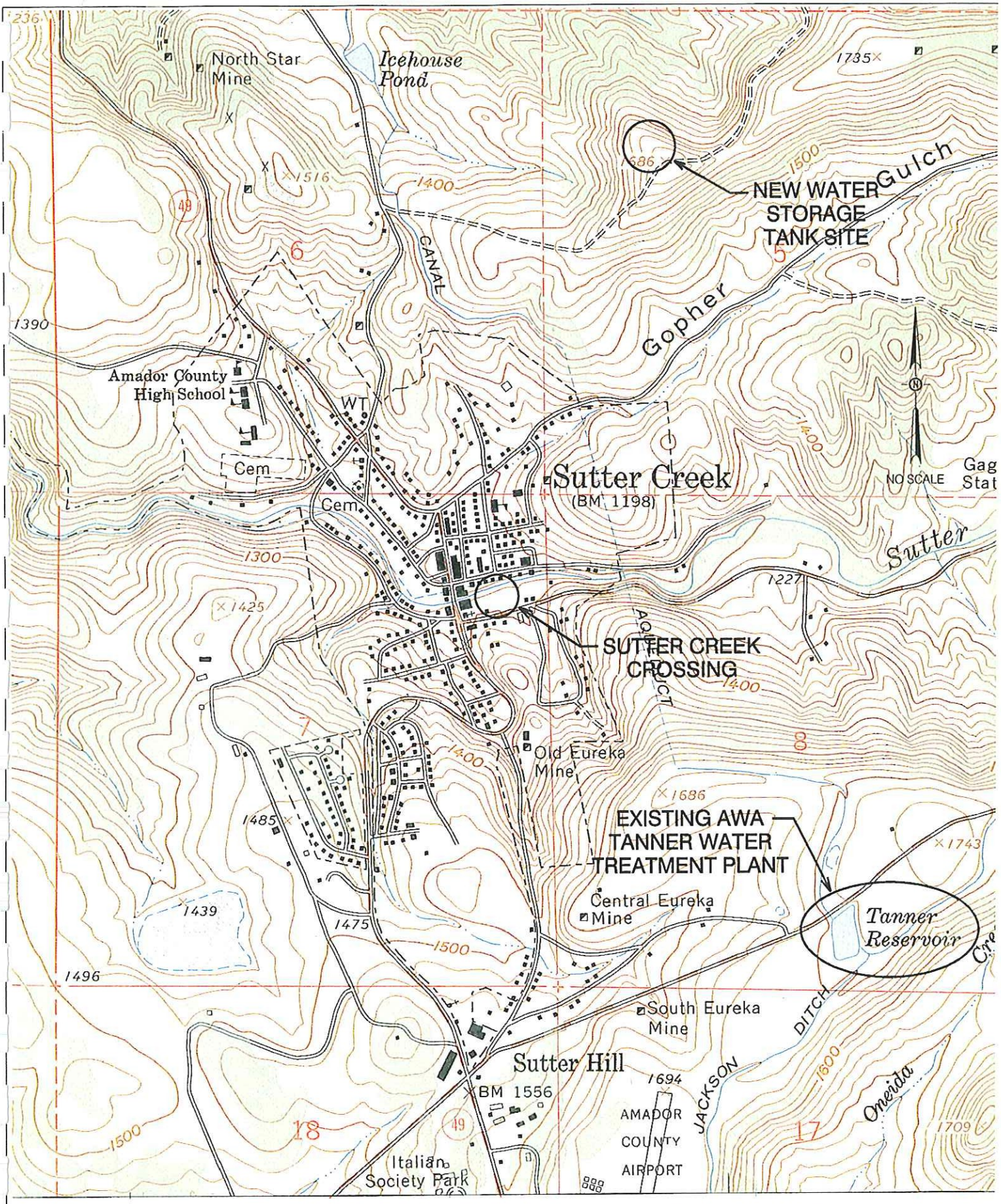
The planning area for Project Segments 4, 5 and 6 is presented in **Exhibits 3-2** and includes the central and northern portions of the Project. This planning area includes Amador City, Drytown and the City of Plymouth. The central and northern portions of the Project planning area also includes the Amador Creek crossing, Rancheria Creek crossing, the Dry Creek crossing and the Plymouth Water Treatment Plant.

EXISTING SITE CONDITIONS

The Project is to be constructed on the western slopes of the Sierra Nevada. Project elevations range from approximately 800 feet to 1,710 feet. Existing site conditions are characterized by rolling terrain, oak savannah and chaparral vegetation. As further detailed herein pipeline alignments, in general, follow or parallel existing paved roads, gravel roads or graded dirt roadways. Where proposed pipelines do not follow existing roadways alignments are proposed in areas used for cattle grazing and vineyards.

In accordance with Amador Water Agency Improvement Standards the proposed pipeline would be placed with a minimum of 3 feet of cover. The proposed pipeline trench would typically be excavated in gravelly loam, rocky silty loam and very rocky loam. Surface soils are typically 12 to 30 inches. Natural habitats include blue oak woodland, blue oak savannah, non–native grasslands, riparian corridors and creek channels.

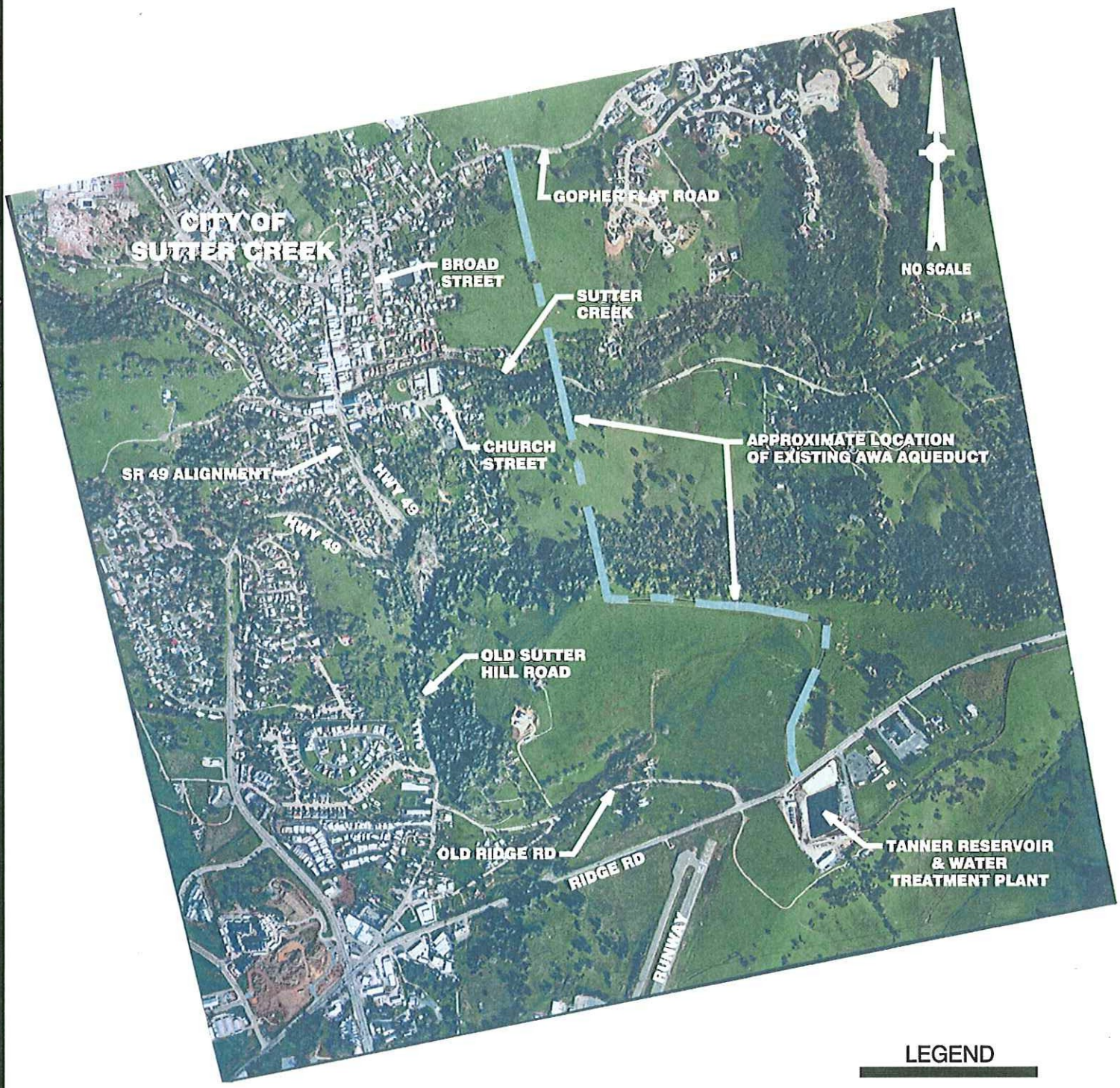
Overviews of existing Project Conditions are available from aerial photographs. An aerial photograph of the southern Project Segments; Project Segments 1, 2 and 3 is presented in **Exhibit 3-3**. An aerial photograph of the tank site proposed north of Sutter Creek is presented in **Exhibit 3-4.** Segments 4, 5 and 6 from Amador City to the City of Plymouth are shown in the aerial photograph, **Exhibit 3-5**.



PLYMOUTH PIPELINE PROJECT

PROJECT PLANNING AREA
PROJECT SEGMENTS 1, 2 & 3

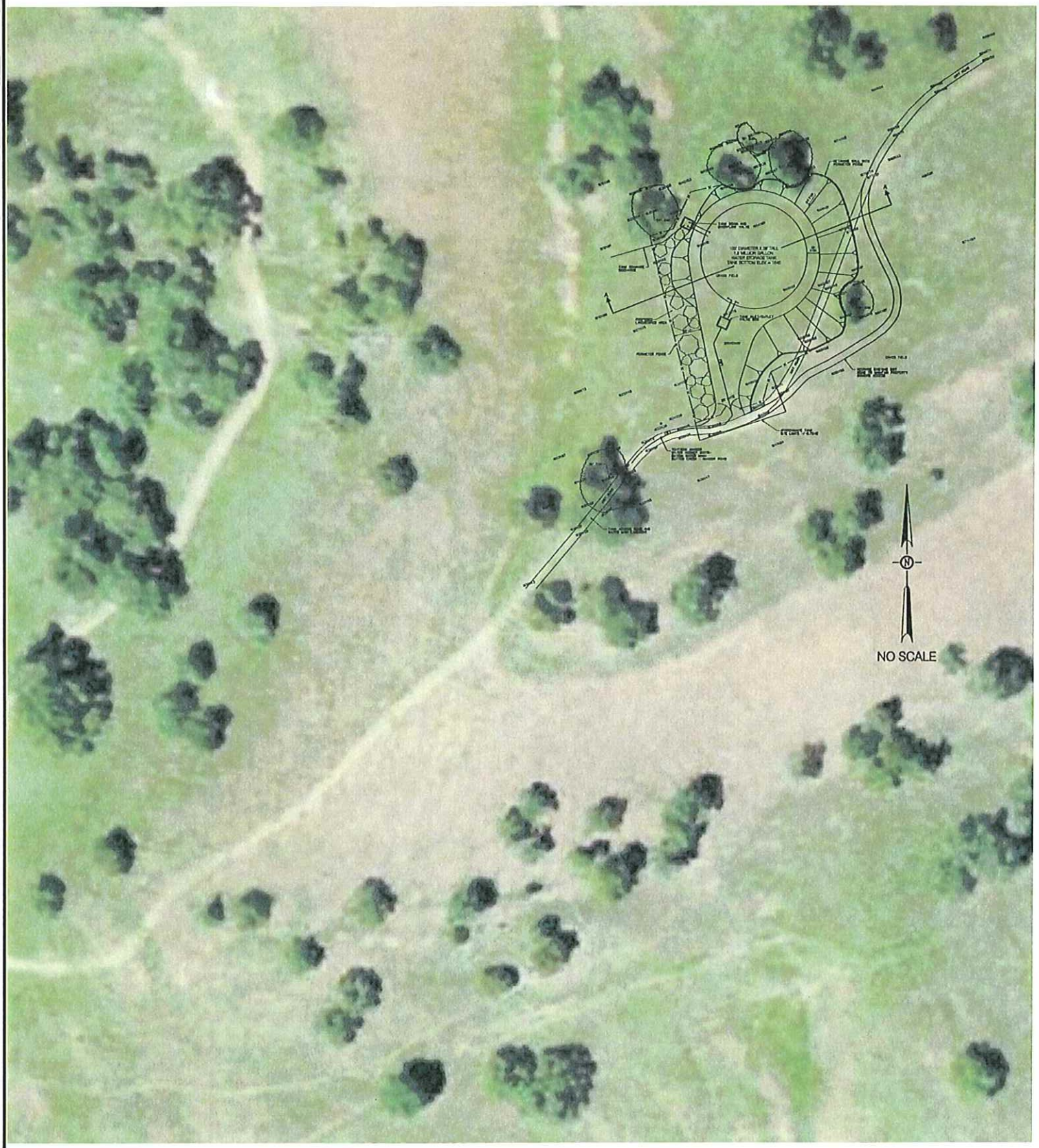
EXHIBIT 3-1



PLYMOUTH PIPELINE PROJECT

EXISTING CONDITIONS
PROJECT SEGMENTS 1 & 2

EXHIBIT 3-3



PLYMOUTH PIPELINE PROJECT

PROPOSED TANK SITE
PROJECT SEGMENT 3

EXHIBIT 3-4

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EXISTING RESOURCES

Agricultural Resources

Alternate Plymouth Pipeline alignments are located within the cities of Sutter Creek, Amador City and Plymouth. In the unincorporated Amador County areas the pipeline would traverse varied terrain along and through pastures and vineyards. No other developed agricultural uses are located in the immediate project vicinity. The vineyard pipeline alignment alternatives are limited to vineyard roadways and access roads. No significant vineyard resources would, therefore, be removed with construction of the proposed pipeline.

Where project alignments traverse existing pastures the proposed placement is, typically, limited to existing ranch roads and farm roads. Pipeline planning areas located outside of existing ranch roads and tracks are primarily brush and grass covered slopes with no developed agricultural facilities and limited agricultural resources. According to the Amador Area Soils Survey (USDA, 1993) the soils within the areas of the proposed pipeline alignments are primarily suitable for cattle grazing. Because the proposed alignment would not result in the conversion of agricultural properties or conflict with existing agricultural uses, the project is expected to have less than a significant impact on agricultural resources.

Biological Resources

The pipeline planning area includes a variety of biological habitats including blue oak woodland, blue oak savannah, non-native grasslands, riparian corridors and creek channels. Whenever possible alternative alignments have been selected along existing paved and unpaved roadways and away from significant vegetation. Whenever possible pipeline routes are proposed outside of the drip line of native oak trees and are planned to avoid large diameter non-native tree species.

The Project planning area does include potentially sensitive wildlife and plant species, including Foothill Yellow-legged Frog, Loggerhead Strike, White-Tailed Kite, Swainson's Hawk and Elderberry Beetle. Specialists in foothill area biological resources have reviewed the project alignments in the field. While suitable habitat is available along the Project pipeline alignments for these special status species none were observed during the field research conducted for this Preliminary Engineering Report.

Stream Crossings

The proposed pipeline will cross Sutter Creek, Amador Creek, Rancheria Creek and Dry Creek. Northern Amador County is arid during the summer months and, typically, Rancheria Creek and Dry Creek "go dry" in the summer. Depending on rainfall

and runoff conditions, Sutter Creek and Amador Creek are often reduced to very low flows during summer months.

Alternative creek crossings are described in Section V. The pipeline placed across Sutter Creek will likely be an aerial crossing and would not result in fill placed within jurisdictional limits. To cross Amador Creek and Dry Creek it is likely that the pipeline will be trenched and backfilled during dry stream periods. Construction of these crossings could result in fill within jurisdictional limits of the U.S. Army Corps of Engineers and approval to construct these crossings, even during dry stream periods, will require a Clean Water Act Section 404 Permit from the Corps.

The Rancheria Creek crossing will likely be accomplished by suspending the pipeline on the downstream side of the bridge constructed at the Bunker Hill Road or Turner Road crossing.

A California Department of Fish and Game Stream Alteration Agreement, pursuant to Section 1600 of the California Fish and Game Code, will be required for the Sutter Creek, Amador Creek, Rancheria Creek and Dry Creek crossings to ensure that the placement of the proposed Plymouth Pipeline either under or over these waterways does not adversely impact biological resources.

Cultural and Historical Resources

The proposed pipeline crosses areas known to contain both historic and prehistoric resources. Resources include areas and facilities utilized by Native Americans. Project areas near stream crossings and within riparian corridors are potentially very sensitive. Because there is a potential for sensitive cultural resources within the Project area studies were initiated in Spring 2005 and will continue through EIR preparation, Project design and construction to identify cultural and historic resources along alternative pipeline routes and to avoid or minimize the potential for adverse effects through appropriate pipeline alignment selection and mitigation. Cultural and historical studies conducted for this project will be detailed in the Project Environmental Documents. Cultural and historic resource findings will be coordinated with the State Historic Preservation Office.

The communities of Sutter Creek, Amador City, Drytown and Plymouth were initially established during the Gold Rush era. Sutter Creek was named after John Sutter who arrived in the area in 1848. After the initial gold rush of placer miners, settlements in the areas were on the verge of disappearing when rich quartz deposits were discovered in 1851. Some of the most active and deep quartz mines in the Gold County are located in the Project planning area. These include the Central Eureka, Old Eureka, Little Amador, Keystone, Bunker Hill, Fremont, Lincoln, Wildmar, Kennedy, Monterey and Hayward mines which, together, produced millions of dollars in gold. The limits of these prominent mines are well established and alternative pipeline routes are not proposed within the immediate limits of these historic resources. There are,

however numerous quartz "diggings" scattered throughout the project area. While these small mines have long been abandoned they do represent an important part of California's past. The pipeline routes selected for evaluation avoid, to the maximum extent possible, small mines and mine tailings. Historical consultants who are part of the Project team have identified the location of mining sites found during field reviews. The location and identification of these sites has been coordinated with the State Historic Preservation Office.

Fires in the 1860's, 1870's and 1880's took turns destroying many of the early structures located in the Project area. There remain, however, numerous Project area buildings which are over 100 years old. Many of these are located in Central Sutter Creek. This area includes Pipeline Segment 2 of the proposed Project. In general, existing water mains within this segment are to be used to convey water to Plymouth. The project impact on historic structures will be minimized with use of these existing mains. Alternative routes for Pipeline Segment 1 (Tanner Reservoir to Eureka Street in Sutter Creek) have been considered to specifically avoid historic building sites. The project team includes gold rush era historic consultants who will continue to provide guidance in mitigating Project impacts on historic buildings located in the Project area.

SERVICE AREA CHARACTERISTICS AND GROWTH TRENDS

City of Plymouth Water Demands

The City of Plymouth currently provides water service to approximately 1,070 residents. Service is also provided to the Amador County Fairgrounds, commercial, multifamily, institutional and mobile home park uses. As detailed in the Technical Appendices prepared for this PER, the City now provides water service to the equivalent of 536 single family residences. Previous study of the City's water demand characteristics (ECO:LOGIC, 2003) determined that the average daily per capita water demand in Plymouth was 315 gpd/person. For a household with 2.5 persons the average daily water demand per Plymouth household was estimated at 788 gpd/unit (or 788 gpd/ESFR). This compares well with "typical" single family residential demands standards of 250 gallons per capita per day (250 gpcd) and 3 persons per household equivalent to 750 gpd/ESFR. For water system planning purposes, an average daily demand rate of 0.5 gpm/ESFR is often used. On a daily basis this rate translates to 720 gpd/ESFR. In the 1996 Water Supply Report prepared by German Engineering for the Plymouth Reservoir Project an average annual demand of 0.6 ac-ft/ESFR was determined as the single family residential "design standard" for water use in the City of Plymouth. On an average daily basis this design standard is equivalent to 535 gpd/ESFR.

City of Plymouth Water Treatment Plant production records available for the past 3 years were evaluated. During this period, the Water Treatment Plant produced an annual average daily flow of approximately 300,000 gallons per day. Dividing this average daily production by the number of ESFR's results in an average demand of 560

gpd/ESFR. This demand takes into account losses in the system which occurs between the treatment plant and Plymouth customers. If the Plymouth Water Treatment Plant is replaced with a treated water main extended from the Amador Water Agency's system, losses in the Plymouth distribution system must in still be considered in the determination of design demands.

For the purpose of this study an average demand of approximately 550 gallons per ESFR is estimated for Plymouth. This value compares with previous Plymouth determinations and previous water studies by KASL Consulting Engineers for water supply and water treatment projects in Calaveras County (La Contenta, Valley Springs, Copper Cove) and in Placer County (Georgetown Divide Public Utility District).

While the determination of average day water demands is important in the understanding of system characteristics, maximum day demand criteria typically control water supply and water treatment plant designs. Water supply pipelines and water treatment plants should be designed to meet maximum day demand conditions. Water storage tanks attenuate peak hour demands and provide fire flows. Water distribution systems should be designed to deliver maximum day demands at minimum allowable pressures (typically 35 or 40 psi) and should deliver maximum day plus fire flows while maintaining at least a 20 psi pressure residual in the water system network.

Maximum day demand factors for the City Plymouth can be estimated based on maximum day water treatment plant filtration records. Over the past 3 years maximum day demands at the Plymouth Water Treatment Plant have typically been measured at 550,000 to 695,000 gallons per day. Using 670,000 gallons per day as a maximum day design average is equivalent to approximately 1,250 gpd/ESFR for the existing Plymouth Service area. When compared to the average daily demand of 550 gpd/ESFR, this maximum day demand rate is approximately 2.3 times the estimated average day demand rate. Maximum day "multipliers" between 2 and 2.5 applied to average day water demand rates are typically used in the planning and design of water supply and water treatment facilities. The Amador Water Agency applies a 2.0 factor to average day demands in their determination of maximum day rates. In previous water supply and water treatment plant projects for foothill communities KASL Consulting Engineers has used maximum day multipliers in the range of 2.2 to 2.5.

A fire flow of 750 gpm per hydrant is used in this study to test system performance under maximum day plus fire flow demands. Typically, two hydrants, each producing 750 gpm, is assumed to simulate fire flow demands. A 1,500 gpm fire flow rate is consistent with City of Plymouth and Amador Water Agency Standards.

City of Plymouth Growth Projections

In 2003 the City Planner under contract to the City of Plymouth estimated the 20 year growth rate for the community at 4% per year. This growth rate is consistent with projections included in the City's General Plan Circulation Element. Because of ongoing building restrictions within the City growth rate projections cannot be based on

recent, City of Plymouth, growth trends. Between 1987 (the beginning of the building restriction period) and 1996, for example, there were only 19 building permits issued within the City. This "growth" translates to less than a 1% per year increase.

Using a 4% per year growth rate and a 20 year planning period, the 20 year (2025) service population for the City of Plymouth is estimated at 2,350 persons. The 2025 ESFR projection is estimated at 1,065. In determining the 2025 total, a 4% annual increase in single family residential, commercial, office, industrial and multifamily uses was assumed. The 4% growth rate was not applied to the Amador County Fairgrounds or the 49'er mobile home park. The 1,065 ESFR projected for 2025 represents a 529 ESFR increase over existing demands.

In **Table 3-1** is summarized the existing and the 20 year projected service water demand criteria for the City of Plymouth used in this PER. It is assumed that the projected 20 year average day and maximum day demand rates per ESFR are comparable to existing Plymouth demands.

TABLE 3 - 1

EXISTING AND PROJECTED SERVICE AREA AND WATER DEMAND CHARACTERISTICS CITY OF PLYMOUTH

Existing Service Area Demands			20 year Projected Service Area Demands		
ESFR	Avg. Day Demands (550 gpd/ESFR)	Max.Day Demands (1,250 gpd/ESFR)	ESFR	Avg. Day Demands (550 gpd/ESFR)	Max Day Demands (1,250 gpd/ESFR)
536	294,800 gpd	670,000 gpd	1,065	589,750 gpd	1,331,250 gpd

Sutter Creek, Amador City, Drytown Water Demands

Amador Water Agency System demands, meter readings and service area characteristics were reviewed for this PER. According to current Water Agency records there are currently 1,695 equivalent single family water services within Sutter Creek currently served by three gravity pipelines (two, 12 inch diameter and one 6 inch diameter) which discharge from the Tanner Water Treatment Plant. One of the 12 inch diameter gravity mains proceeds north to the Central Sutter Creek area. The second 12 inch diameter gravity main and the 6 inch diameter gravity main proceed west along Ridge Road and Old Ridge Road. These mains reconnect to the first 12 inch main along Church Street, south of the Sutter Creek waterway. As further described in Section V of this report the Amador Water Agency has constructed a 16 inch diameter main which crosses under the Sutter Creek waterway as well as two, 6 inch diameter,

mains placed on the Highway 49 bridge at Sutter Creek. From the "high pressure" feed available from Tanner Reservoir there are numerous pressure reducing valves (PRV) and lower pressure lines which distribute water to Sutter Creek services. While the existing and projected demands of these services are important to the design of the Plymouth Pipeline Project the reduced pressure distribution mains which branch from the Amador Water Agency main are not considered in the design of the proposed facilities. Based on Agency standards the average day demand of existing Sutter Creek services is approximately 848 gpm. Maximum day demands, based on Amador Water Agency records and AWA standards are estimated at 1,695 gpm (1.0 gpm service). As further discussed in Section V this demand is distributed from the Amador Water Agency main at branch connections and at PRV's.

There are approximately 171 equivalent single family demands within Amador City which are served from the Amador Water Agency main. The Amador City demands are metered. The maximum day meter reading for Amador City is approximately 145 gpm or close to the Amador Water Agency Standard of 1 gpm/ESFR.

There are approximately 57 Drytown ESFR's served by the Amador Water Agency pipeline. The maximum day demand at the Drytown meter is approximately 48.5 gpm. This maximum day demand is again close to the Agency's Standard of 1 gpm/ESFR.

Sutter Creek, Amador City, Drytown Growth Projections

Population estimates for Sutter Creek, Amador City, Plymouth and for all Amador County available from the State of California Department of Finance, are presented in **Table 3-2.**

TABLE 3-2

AMADOR CITY / AMADOR COUNTY
POPULATION ESTIMATES

City/County	Year 2000 Population	Year 2005 Population	% Growth Per Year
Amador City	196	216	1.2%
Plymouth	980	1,070	1.7%
Sutter Creek	2,303	2,725	3.3%
Amador County	35,110	37,574	1.4%

The State Department of Finance 20 year population projection (DOF Report 03 P-1) for Amador County is 42,757 equivalent to a 1.5% per year increase over the next 20 years.

The Amador County Housing Element, adopted by the Amador County Board of Supervisors in May 2005, includes 20 year growth projections ranging from 1.7% to 2.9% per year.

For the purpose of this PER, population growth along the existing Amador Water Agency pipeline which now serves Sutter Creek, Amador City and Drytown is conservatively estimated at 4% per year over the 20 year project planning period. Using this assumption the projected 20 year water demands for Sutter Creek, Amador City and Drytown are presented in **Table 3-3.**

TABLE 3-3

EXISTING AND PROJECTED SERVICE AREA AND WATER DEMAND CHARACTERISTICS SUTTER CREEK, AMADOR CITY, DRYTOWN

Community	Existing Service Area Demands			20 year Projected Service Area Demands		
	ESFR	Avg.Day Demands 720 gpd/ESFR	Max.Day Demands 1440 gpd/ESFR	ESFR	Avg.Day Demands 720 gpd/ESFR	Max. Day Demands 1440 gpd/ESFR
Sutter Creek	1,695	1,220,400 gpd (848 gpm)	2,440,800 gpd (1,695 gpm)	3,714	2,674,080 gpd (1,857 gpm)	5,348,160 gpd (3,714 gpm)
Amador City	171	123,120 gpd (86 gpm)	246,240 gpd (171 gpm)	375	270,000 gpd (188 gpm)	540,000 gpd (375 gpm)
Drytown	57	41,040 gpd (29 gpm)	82,080 gpd (57 gpm)	125	90,000 gpd (63 gpm)	180,000 gpd (125 gpm)

Fire flow demands are assumed to be 750 gpm/hydrant consistent with current Amador Water Agency Standards.

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EXISTING FACILITIES

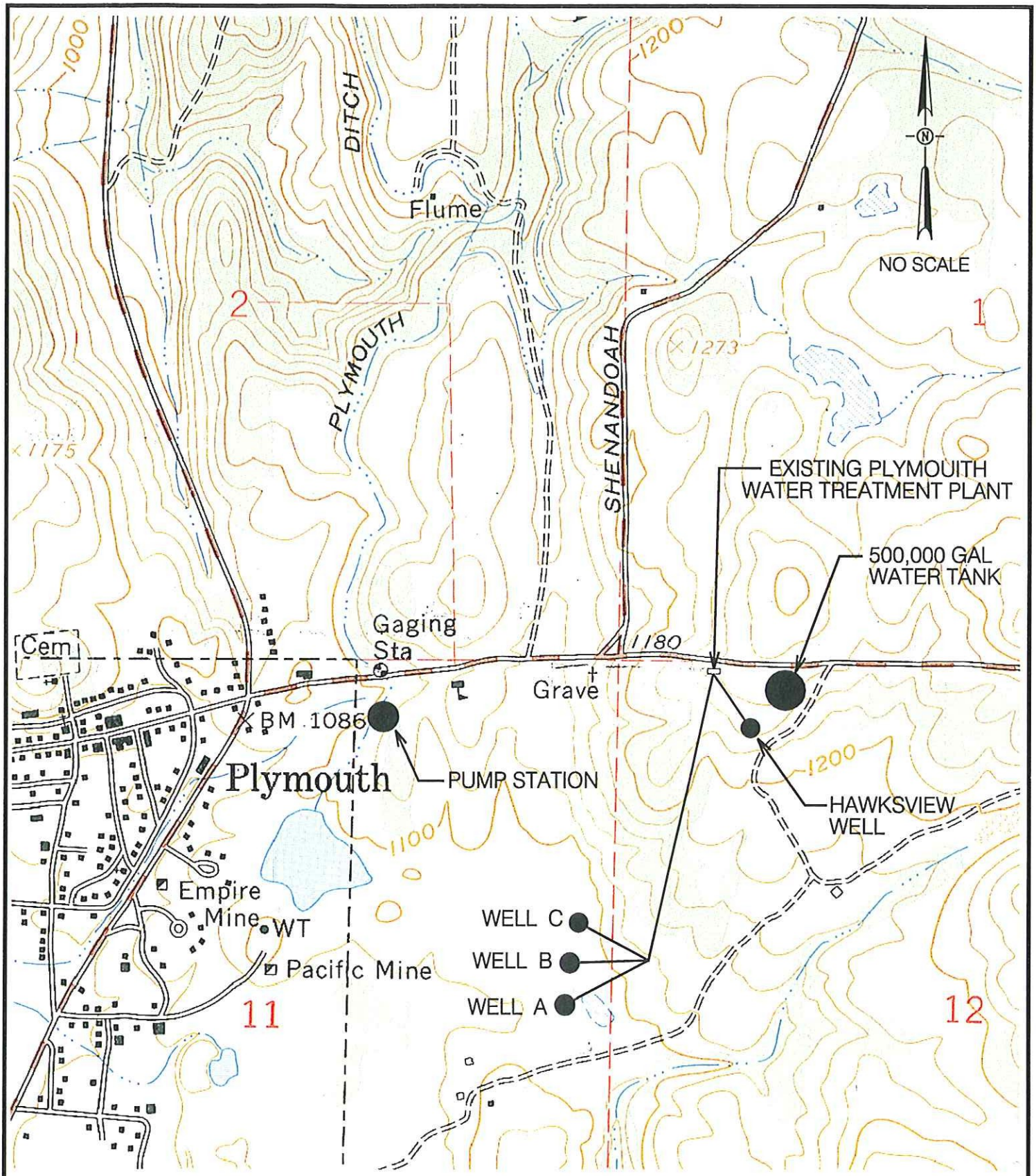
City of Plymouth

Water Supply

Water is supplied to the City of Plymouth by municipal wells and by the Arroyo Ditch. As shown on **Exhibit 3-6,** the city wells are located approximately 0.3 miles south of the existing water treatment plant. Well "A" is a 500 to 600 foot deep well. It has been pump tested at 400 gallons per minute. Based on State Department of Health Services criteria for foothill area groundwater resosurces this well is assigned a firm yield of 100 gpm. In close proximity to Well A are Municipal Wells "B" and "C". These wells serve as backup for Well A. With their close proximity to Well A, pumping from either Well B or Well C affects the production of Well A. Well B and Well C have a combined firm yield of 15 gpm.

The Hawksview Well is the city's newest. This well is reported to have a firm yield of 60 gpm (German Engineering, 1996 Water Supply Report). The total firm yield from Well A, Well B and Well C and the Hawksview Well is 175 gpm. As discussed earlier in this section of this PER, the existing average day demands for the City of Plymouth (536 ESFR at 550 gpd/ESFR) are estimated at 205 gpm. The maximum day demands, based on daily treatment plant filtration records are over 450 gpm. The firm yield from the existing municipal well meet, or nearly meet, existing average day water demands but are significantly less than existing maximum day water demands.

The Arroyo Ditch, originally constructed between 1850 and 1855, conveys water approximately 17 miles from the Middle Fork of the Cosumnes River to the City of Plymouth diversion point and pump station located approximately ½ mile west of the Plymouth Water Treatment Plant. According to previous water supply studies 10 to 34 cubic feet per second (cfs) have historically been diverted into the Arroyo Ditch from the Cosumnes River. In addition, the Arroyo Ditch crosses and intercepts numerous side streams including Spanish Creek, Pigeon Creek, Blood Gulch and Big Indian Creek and collects runoff from these tributaries. Due to the excessive length of the ditch and the lack of maintenance and repair, Arroyo Ditch water is lost through leaks, holes, percolation, evaporation and transpiration. Under best supply conditions the maximum rate that Arroyo Ditch water has been delivered to the City of Plymouth is 1 to 2 cfs. This flow is equivalent to 450 to 900 gpm. Peak ditch flows typically occur during winter and spring months. During summer and fall months there is normally no water available to the City from the Arroyo Ditch. Maximum water demand conditions occur during summer months. The State Department of Health Services has determined that, under present conditions, no firm yield can be assigned to the Arroyo Ditch. Estimated costs and measures to improve the reliability of the Arroyo Ditch are discussed in Section V of this PER.



PLYMOUTH PIPELINE PROJECT

EXISTING PLYMOUTH FACILITIES MAP

EXHIBIT 3-6

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Water Storage

Treated water storage is provided by a 500,000 gallon capacity welded steel tank. The water storage tank is located at the Plymouth Water Treatment Plant. The tank was constructed in 1972 with a base elevation of approximately 1,258 and a 36 foot side wall (shell) height. At its present height and normal water surface elevation adequate water pressure can be provided, by gravity, from the water storage tank to existing Plymouth water services.

The tank was initially constructed with a single (common) inlet/outlet pipe. This configuration did not permit adequate circulation. Recently, the City of Plymouth revised the inlet/outlet pipe configuration at the tank. Treated water now enters near the top of the tank and is delivered to services from an outlet near the bottom of the tank. The revised configuration improves circulation and improves chlorine contact time and disinfection. The tank should be inspected and recoated, as necessary. Additional inlet piping is recommended with multiple baffled inlet points and a baffled tank outlet. The inlet and outlet piping should be installed with above ground flexible connections to allow for seismic loadings.

Water storage tanks should provide for fire storage, peaking storage and emergency storage. The fire storage reservation should be no less than the product of the minimum design fire flow and design fire duration. The design fire flow, per City of Plymouth Standards, is 1,500 gpm. The minimum design fire duration should be two (2) hours. The minimum fire storage reservation provided at the City of Plymouth Water Storage tank, therefore, should be: 1,500 gpm x 2 hrs x 60 minute/hour = 180,000 gallons.

Water storage tanks should provide not less than twenty (20) percent of the total maximum day flow. Currently the maximum day demand is approximately 670,000 gallons per day. Twenty percent of the daily total = 134,000 gallons.

Water storage tanks should provide emergency storage capacity in excess of fire storage and system peaking requirements. Unless power outages which affect plant operation last more than 4 hours emergency storage equivalent to a four hour demand under maximum day conditions is normally recommended. Using these criteria, the Plymouth Water Storage Tank should provide not less than 112,000 gallons of emergency storage. The total storage requirements for the Plymouth Water Storage Tank under existing conditions are therefore:

Fire Supply =	180,000 gallons
Peaking Storage =	134,000 gallons
Emergency Storage =	112,000 gallons
	426,000 gallons

The existing 500,000 gallon capacity water storage tank meets these existing requirements. With the completion of the Plymouth Pipeline Project and the lifting of the Plymouth Building Restrictions the adequacy of the existing water storage tank under future maximum day demands should be evaluated. As further described in this PER, the Amador Water Agency uses more stringent criteria in designing water storage tanks. AWA Standards includes a 2 hour fire storage reserve, a peaking storage component of one third maximum day demands and a reserve component of 24 hours of average day demand. Based on these criteria, total existing water storage requirements for the City of Plymouth are:

Fire Supply =	180,000 gallons
Peaking Storage =	223,300 gallons
Emergency Storage =	294,800 gallons
	698,100 gallons

Amador Water Agency

Water Supply and Treatment Facilities

The Amador Water Agency currently supplies raw water to the Tanner Water Treatment Plant from the 23.5 mile long Amador Canal. According to the terms of a 1985 agreement with Pacific Gas and Electric, the Amador Water Agency is entitled to divert up to 15,000 acre feet (AF) per year of Mokelumne River Water stored in Lake Tabaud and may convey this annual entitlement at a rate up to 30 cfs.

The Amador Water Agency has designed, and is prepared to construct, the 8.5 mile long, 30 inch diameter, Amador Transmission Main which will replace the Amador Canal and which will permit the Agency to deliver its full entitlement of water from Lake Tabaud to the Tanner Water Treatment Plant. With the completion of the Amador Transmission Main the Agency would have adequate supply and raw water conveyance facilities to meet the demands of the Plymouth Pipeline Project.

The Tanner Water Treatment Plant includes multiple upflow flocculation/contact clarification and downflow multimedia filtration units. Both chemical preoxidation and post filtration disinfection are provided. The most recent plant expansion was completed in 1999. Current water treatment plant capacity is 5.2 million gallons per day (MGD). Current maximum day demands are approximately 4.6 MGD. As previously determined in this PER, the existing maximum day demand for the City of Plymouth is approximately 670,000 gallons. The projected, 20 year, maximum demand for the City of Plymouth is estimated at 1.3 MGD. Additional plant expansion at Tanner Reservoir will be needed to meet the projected demands from the City of Plymouth as well as from projected increased demands from Sutter Creek, Amador City and Drytown. As previously summarized in **Table 3-3**, the maximum day demand from these communities is estimated to increase from approximately 2.8 MGD to approximately 6.1 MGD. To

serve both the City of Plymouth and increased maximum demands from Sutter Creek, Amador City and Drytown at the end of the 20 year Project planning period will require as much as 4.6 MGD of additional treated water delivered form the Tanner Water Treatment Plant.

Transmission Mains

The Amador Water Agency Transmission mains constructed from Tanner Reservoir are typically high pressure ductile iron and asbestos cement pipes. Pressure is provided by the water surface elevation at Tanner Reservoir (Elevation 1710). With this elevation pressures in the discussed water mains constructed between Tanner and the Amador City Pressure Regulating Station are typically in excess of 150 psi. At the Sutter Creek waterway crossing water main pressures exceed 250 psi. As shown in **Exhibit 3-7**, there are numerous branch connections from the high pressure mains which are constructed with pressure reducing valves. These pressure reducing valves reduce high pressures to pressures which are suitable (typically 40 to 100 psi) for residential services. Most of the Amador Water Transmission improvements constructed between Tanner and Amador City have been in service at least 20 years. The adequacy of these facilities to serve the Plymouth Pipeline Project is discussed in Section V of this report.

FINANCIAL STATUS OF EXISTING FACILITIES

City of Plymouth

In 2003 the City of Plymouth authorized a water rate study. The purpose of this study was to support a rate increase so that annual water system revenues matched annual water system expenses. Based on that study (Bartle Wells Associates, 2003) a basic service rate of $3.10 per 100 cubic feet (cf) was set for the 2003/2004 fiscal year. Since that time the City has approved rate increases in both 2004/2005 and 2005/2006. The current 2005/2006, rate is $3.43/100cf plus a $1.00 per month meter change. An average monthly water service bill based on an average daily demand of 550 gpd/ESFR is $77.71 per month. Using the City's design average rate of 0.60 ac-ft/year, the average monthly water bill for a single family residence is estimated at $75.71. If it is assumed that 30% of the treated water produced by the Plymouth Water Treatment is "lost" or otherwise not metered, the average current monthly water bill for a Plymouth ESFR can be estimated at $60.00

In **Table 3-4** is presented annual revenues and expenses for the City of Plymouth water system for fiscal year 2004/05 (actual costs and revenues) and 2005/06 (Budget).

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TABLE 3-4

CITY OF PLYMOUTH WATER SYSTEM ACTUAL AND BUDGETED REVENUES AND EXPENSES

REVENUE	F.Y 2004/05 (Actual)	F.Y 2005/06 (Budget Request)
Water Service Charges [1]	$ 265,361	$ 265,760
Penalties	3,177	3,000
Connection Fees	2,163	1,000
Interest Earnings	7,598	8,000
Well Permit	200	0
Transfer (Fund 361)	21,715	0
Total Revenue	$ 300,213	$ 277,760
OPERATING EXPENSES		
Personnel [2]	$ 51, 664	$ 16, 476
Operating Expenses [2]	$243,990	$263,019
Total Expenses	$ 295,654	$ 279,494
Fund Balance	$ 4,559	$ 2,825

(1) $3.29 /100 cf, 2005/05; $3.43/100 cf, 2005/06
(2) City Personnel costs reduced in 2005/06, however operating costs reflect a $90,000 contract to AWA for system operations

As noted in Table 3-4 operating expenses in fiscal year 2005/06 include a significant reduction in City personnel costs. These are replaced, however, with a $90,000 operating contract with the Amador Water Agency. Annual operating expenses also include a $10,000 budget for maintenance of Arroyo Ditch. Operating Expenses include $1,050 for debt service principal and interest payments. Approximately $34,000 is budgeted for water treatment plant maintenance, repairs, chemicals and testing.

Amador Water Agency

The Amador Water Agency has developed monthly service rate specific to each of its service areas. These rates have been developed from an accounting of systems operation costs attributable to each service area. Implementation of the Plymouth Pipeline Project will include a Memorandum of Understanding (MOU) between the City of Plymouth and the Water Agency. This Memorandum will detail how water service is to be provided to the City of Plymouth and how City of Plymouth service costs and charges are to be determined.

The Plymouth Pipeline is to be designed and constructed in accordance with Amador Water Agency Standards. At the completion of the Project the Amador Water Agency may retain ownership of the pipeline and then charge the City of Plymouth a fee for the water which is delivered through the pipeline to the Plymouth Water Storage Tank. The basis for this fee could be a "master meter" placed upstream of the discharge of water from the new pipeline to the existing storage tank. If the MOU is approved on this basis the monthly service charges to the City of Plymouth could be determined using methods similar to the way monthly service charges are now assessed by the Water Agency to the Drytown County Water District.

The Amador Water Agency delivers water to Drytown through a 2 inch "Master Meter." Currently the service charges to Drytown are $327.67 per month plus $0.88 per 100 cf. There is an equivalent of approximately 57 ESFR in Drytown. As previously summarized in Table 3-3 the average daily flow through the Drytown meter is estimated at 41,000 gallons. Average monthly service charges are estimated at $1796, or approximately $31.51 per ESFR per month. Drytown residents also pay a monthly service charge to the Drytown CSD for operation and maintenance of the Drytown CSD distribution mains and water services.

If water is not delivered to the City of Plymouth through a master meter the Water Agency would establish a monthly service rate for the Plymouth Service area. These monthly charges would be determined in a manner comparable to those determined for individual services in Sutter Creek and in Amador City. Currently a single family residential service in Sutter Creek and in Amador City installed with a 5/8" meter is charged $18.09 per month plus $1.35 per 100 cf. Based on these rates the average ESFR water service charges are estimated at $39.74 per month. This monthly rate is approximately two thirds the monthly service charge estimated for Plymouth residents.

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IV. PROJECT NEED

HEALTH, SANITATION AND RELIABILITY

The City of Plymouth's existing well water supply system has a firm yield that meets, or nearly meets, existing average day demands but does not meet existing summer time demands or maximum day demands. The Arroyo Ditch supply system is unreliable and does not supply the City with water during critical summer months. Extensive repairs and/or modifications are required to adequately improve the reliability of the ditch supply system. The Plymouth Pipeline Project would significantly improve the reliability of the City's water supply.

To meet existing summer time water demands the City's wells are pumped at rates in excess of firm yields. When this occurs groundwater levels drop and the quality of the raw water decreases. Iron, manganese and turbidity levels increase. This condition results in additional treatment plant loadings, operation costs, chemical costs, and more frequent backwash cycles and can adversely affect the quality of the treated water. The Plymouth Pipeline Project would remove the Plymouth Water Treatment Plant from service or place the existing Plymouth Water Treatment Plant in "standby" status. Treatment would be provided at the Amador Water Agency's Tanner Water Treatment Plant. This treatment facility provides multibarrier water treatment and treatment process redundancy. The Tanner Water Treatment Plant has recently been expanded and is in full compliance with State Department of Health Services requirements for Surface Water Treatment.

To meet existing summer time demands, water intended for peaking storage, reserve storage and fire supply storage is used. The City has reported that during summer months, and especially during the Amador County Fair, (typically late July), little or no storage is available in the 500,000 gallon water storage tank. Without reserve storage there exists a threat to resident's health and safety should a fire or a power outage occur. The Plymouth Pipeline Project includes a new 1.5 MG water storage tank. This tank would help provide "backup" fire storage for the existing 0.5 MG Plymouth water storage tank. The Plymouth Pipeline Project shall be designed to deliver maximum day demands, projected for the year 2025, to the Plymouth Water Storage Tank. With this capacity water would be available in the Plymouth Water Storage Tank for peaking demands, emergency reserve and fire flows even during the hottest summer periods.

To meet existing summer time water demands the City of Plymouth has, on occasion, imposed water rationing. The Plymouth Pipeline Project would be supplied by the Water Agency's entitlement to 15,000 acre feet (AF) per year of Mokelumne River water stored in Lake Tabeaud. Barring a statewide drought condition it is unlikely that water rationing would occur at Plymouth with completion of the Plymouth Pipeline Project.

When summer overdraft of the City's wells occurs ground water levels in nearby private wells also drop. During summer months the City frequently receives complaints from Burke Ranch and from Sutter Home Winery regarding poor operating conditions in their wells. These private well owners claim that overpumping of City wells results in reduced flow and poor water quality. The Plymouth Water Project would remove, or significantly reduce demands on, the Plymouth municipal wells and respond to complaints from private well owners.

As an alternative to the Plymouth Pipeline Project the Arroyo Ditch could be improved. The estimated costs to replace the 17 mile ditch system with a closed conduit are presented in Section V. The estimated costs of the Arroyo Ditch improvements are significantly greater than the estimated costs of the Plymouth Pipeline Project.

As an alternative to the Plymouth Pipeline Project additional wells could be developed. In the Plymouth Project Planning area, there does not exist a firm, or reliable, groundwater table. The success and performance of hard rock wells varies from property to property. Area property owners report that they have successfully drilled wells which produce hundreds of gallons per minute. Others report drilling wells hundreds of feet deep which produce less than 5 gpm. Even the most "reliable" wells drilled in the Project planning area have known to go dry because they are not fed by a firm water bearing strata. The Department of Health Services limits firm yield to 25% of pump test results. To meet current maximum day demands of approximately 465 gpm would require an additional 290 gpm of firm yield. Three additional wells with capacity and yield similar to existing Well "A", or, 5 additional wells of capacity and yield similar to the Hawksview Well would be required. The City's experience with their existing municipal wells together with the performance of other nearby private wells suggests that the successful drilling and development of 3 to 5 wells with 60 to 100 gpm firm yield each, is unlikely. The Plymouth Pipeline Project would not rely on groundwater wells as the source of supply.

As an alternative to the Plymouth Pipeline Project the City has previously evaluated the construction of a 1,500 acre-foot reservoir which would capture flow from Big Indian Creek and Blood Gulch. In 1996, the cost of this project was estimated at $ 3.5 million. By 2004 land acquisition costs and environmental costs had increased the project costs to $10 million. In addition, the City has not been able to secure the USACOE 404 Permit for this project. The estimated cost of the Plymouth Pipeline Project is less than the costs estimated for the Reservoir Project. The Plymouth Pipeline Project will require a Nationwide 404 Permit for proposed utility crossings. Permit approval is expected to be significantly less complex than the Individual 404 Permit required for the Reservoir Project.

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System Operation and Maintenance

The Plymouth Pipeline Project would allow the existing Plymouth Water treatment Plant to be removed from service, or, placed in a "standby" mode of operation. Treated water would be delivered to the Plymouth Water Storage Tank from the Tanner Water Treatment Plant. The Plymouth Pipeline Project would, therefore, reduce the City's plant operating and maintenance expenses. In accordance with State Department of Health Services Standards, testing of chlorine residual would still be required and it is possible that some reduction in chlorine residual could occur over the eleven miles of pipeline between Tanner and Plymouth. Existing disinfection facilities at the Plymouth Water Treatment Plant would, therefore, remain in service. Operation and maintenance of chlorination facilities and the water storage tank would require significantly less time, materials, chemicals and energy than continued daily operation of the existing Plymouth Water Treatment Plant.

Placing the Plymouth Water Treatment Plant in standby or removing it from service would significantly reduce the scope of the Amador Water Agency's treatment plant operations agreement with the City of Plymouth. The Plymouth Pipeline Project would also remove from service, or significantly reduce demands on, the existing Plymouth municipal wells and the Arroyo Ditch Pump Station. The cost to operate and maintain these facilities would also be significantly reduced. Based on the City's 2005/2006 Budget for water operations, the Plymouth Pipeline should reduce the City's water system operating cost by approximately $150,000 per year. In exchange, the City would purchase treated water from the Amador Water Agency. The cost to purchase water from the Amador Water Agency , participation fees, meter fees and the method that these costs are determined and adjusted would be part of the Memorandum of Understanding between the Water Agency and the City.

With the Plymouth Pipeline Project water treatment plant operations would be consolidated at Tanner. The Tanner Treatment Plant has multiple treatment plant "trains" which provide redundancy and reliability. Amador Water Agency has adequate, trained, water treatment operations staff to provide continuous on-site or on-call services. Agency operations staff are on-call, 24 hours a day, 7 days a week, to respond to treatment plant alarms and emergency conditions. Treatment plant operations and maintenance will be more efficient, more reliable and more consistent with the Plymouth Pipeline Project.

Growth

In 1987 the State Department of Health Services issued Compliance Order 01-017 to the City of Plymouth citing violations of the California Health and Safety Code for failing to provide adequate potable water supplies. The City was directed to cease and desist from adding any new service connections to the City's potable water distribution system until adequate water supply facilities, approved by the Department of Health Services, were implemented. While this connection ban was modified in 1990 after well

water supply improvements were installed, there remains a strict limitation on the number of building permits which may be issued within the City.

The building moratorium and building permit limitation has effectively controlled growth within the City's service area. The well water supply facilities which were improved and developed by the City have been assigned a firm yield of 175 gpm. This firm yield is adequate to meet, or nearly meet, existing average day demands but does not meet existing summer time or maximum day demands. The limited firm yield approved for the existing wells also does not permit growth within the City's Sphere of Influence. Additional wells could be developed, however, as previously discussed in this PER, wells drilled in consolidated formations can experience drastic decreases in production capacity due to the compression of rock fractures or the mining of water from these fractures by other wells.

The Plymouth Pipeline Project is needed to meet existing summer time and maximum day demands, to provide for the health and safety of its existing residents and to allow for reasonable growth within the City's Sphere of Influence. Hookup fees and connection charges issued for new permits will provide needed revenue to support the City's public works. The City has been unable to maintain and repair facilities, in part, because the increasing costs of operation and maintenance have been borne by a constant base of rate payers. The Plymouth Pipeline Project will allow for a limited rate of growth and help revitalize the City's economy.

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V. PROJECT ALTERNATIVES

In this section of the PER is presented Plymouth Pipeline alternatives considered in the determination of the preferred project alignment and the preferred pipeline design. As discussed herein preliminary alignment alternatives were reviewed in the field. Alternative alignments were evaluated with respect to potential environmental affects, acquisitions, construction costs, and long term operation and maintenance costs. The preferred pipeline alignment was then re-evaluated in the field. The proposed pipeline design was also evaluated using the Haested WaterCad Network Model to determine pipeline size, capacity and pressure under existing and projected maximum day demands and under existing and projected fire flow conditions.

The City of Plymouth has previously evaluated improvements to the Arroyo Ditch and has evaluated the construction of a raw water reservoir as alternative, long term water supply solutions. The estimated cost to construct a reliable water supply system based on ditch supply or on reservoir supply shall be compared to the estimated cost of the Plymouth Pipeline Project.

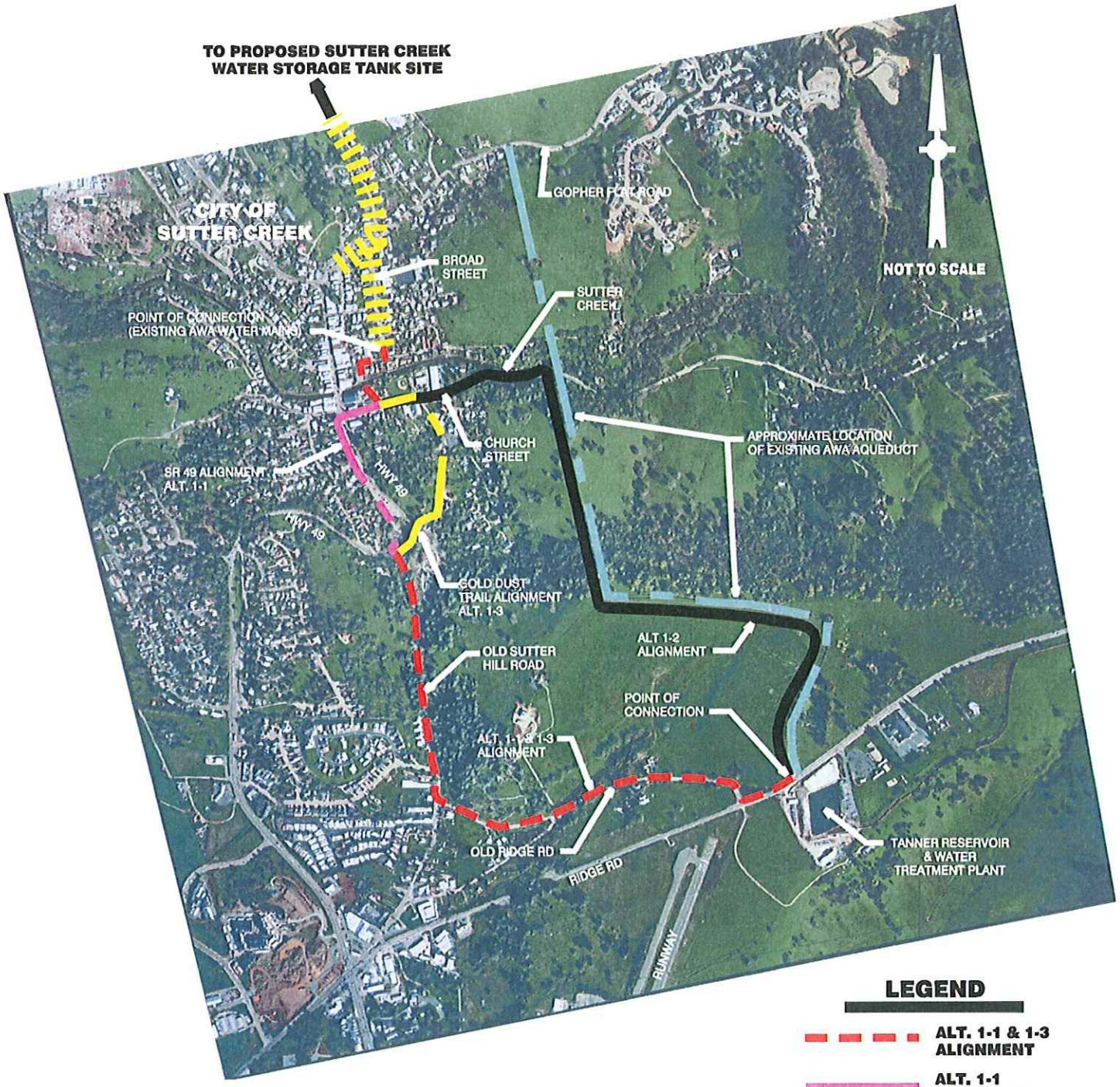
In conformance with USDA Rural Utilities Service guidelines and to present the pipeline alternatives in as clear and comprehensive format as possible, Pipeline Project alternatives are discussed and evaluated by Pipeline Project segments. The best apparent pipeline project solution is the summation of the best alternative selected for each Project segment. The preferred Pipeline Project is then compared, in Section VI of this PER, to Arroyo Ditch and raw water reservoir supply alternatives.

PLYMOUTH PIPELINE ALIGNMENT ALTERNATIVES

Segment 1: New Water Transmission Main, Tanner Water Treatment Plant to Existing Amador Water Agency Main, Eureka Street at Broad Street, City of Sutter Creek

Alignment Alternative 1-1

Three alternative pipeline routes between the Tanner Water Treatment Plant and the existing water mains at Broad Street and Eureka Street were evaluated. The first alignment follows Ridge Road, west to Old Ridge Road, westerly along Eureka Road to Old Sutter Hill Road, north along the Old Sutter Hill Road to existing Highway 49. After crossing State Highway 49, this alternative alignment parallels the west side of the State Highway in an area now used as a municipal parking lot. Continuing north, the pipeline would cross Highway 49 at Church Street and continue approximately 300 feet east to a City parking area. The pipeline would then turn north across the City of Sutter Creek parking lot and across the Sutter Creek Waterway. The pipeline would then cross another City parking lot located on the north side of Sutter Creek. The pipeline would continue north to Eureka Road and then east on Eureka Road to the point of connection with the existing AWA mains located near Broad Street and Eureka Road. The total length of this segment is approximately 8,050 feet. This Segment 1 alternative alignment is presented in **Exhibit 5-1**.



PLYMOUTH PIPELINE PROJECT

ALTERNATIVE ALIGNMENTS
SEGMENTS 1 & 2: TANNER WATER TREATMENT PLANT TO PROPOSED SUTTER CREEK WATER STORAGE TANK

EXHIBIT 5-1

If constructed along this alignment the Plymouth Pipeline would be placed within existing paved roadways or parking areas. The alignment would parallel existing AWA water mains located in Ridge Road, Old Ridge Road, Church Street, and Eureka Street and portions of Old Sutter Hill Road, and Highway 49. There are existing sewer lines in portions of Old Sutter Hill Road, Highway 49, Church Street and Eureka Street. There are underground storm drainage utilities in Highway 49, Church Street and Eureka Street. There are numerous underground power and utility lines in the vicinity of Church Street and Highway 49. In reviewing this alternative with the City of Sutter Creek, it was determined that minor roadways such as Old Ridge Road, Eureka Road and Old Sutter Hill Road could be temporarily closed (except to residents and emergency vehicles) during construction. At least one lane of traffic and traffic control would be required for pipeline construction on Church Street and Eureka Street.

Since this alternative alignment is located within existing paved roads and parking areas impacts to biological resources are minimized. The pipeline route would avoid potential historic resources in the vicinity of the Central Eureka Mine and the Old Eureka Mine. During construction historical consultants may be present to ensure that pipeline improvements do not impact historic structures along Church Street and Eureka Street. Having historical consultants "monitor" construction during pipeline trenching operation may be a mitigation measure included in the Project Environmental Document.

Construction of the Plymouth Pipeline along this alternative alignment would require encroachment permits from the City of Sutter Creek, Amador County, and from the California Department of Transportation. To construct the pipeline within the paved roads of the City or County a trench approximately 4-1/2 to 5 feet deep and approximately 3 to 4 feet wide would be required. Since adequate unpaved shoulder area is not available along these narrow City and County roads, an alignment within the existing paved section is assumed. As part of encroachment permits obtained from the City and from the County pavement replacement between the road centerline and edge of shoulder, in addition to reconstruction of the paved section at the pipeline trench, is assumed.

While State Highway 49 through Sutter Creek will be abandoned to the City with completion of the Highway 49 Bypass it is assumed, based on the proposed schedule of the pipeline and the anticipated completion of the Highway 49 Bypass, that an encroachment permit to place the pipeline within or across the Highway 49 right of way would be required from CalTrans. Normally bored utility crossings of State Highways are required. Since Highway 49 is soon to be abandoned to the City, it is assumed that an open trench crossing would be permitted for this project.

Alignment Alternative 1-2

As an alternative to the roadway alignment described above an alignment which would parallel the Amador Water Agency's existing (raw water) aqueduct was considered. The raw water aqueduct is an extension of the Amador Canal and begins at

the Tanner Raw Water Reservoir. This raw water pipeline is constructed across the Sutter Creek Waterway, serves Knights Foundry, and then continues north to Amador City. The Amador Water Agency has a prescriptive easement over this existing pipeline which does not include additional easement width parallel to the existing facility. The property owner who owns the land adjacent to the AWA Aqueduct did not grant permission to review this alignment in the field. Based on aerial photography and topographic mapping this alignment would cross heavily wooded areas between Sutter Ridge and Church Street and would also cross wooded areas near Church Street and the Sutter Creek Waterway. Between the Sutter Ridge and Church Street this alignment is very steep. Assuming that a pipeline constructed along this alignment would cross the Sutter Creek Waterway at the same location as described in Alternative Alignment 1-1, the total length of pipe placed along this alternative route is estimated at 7,850 lineal feet. Alignment Alternative 1-2 is also shown in Exhibit 5-1.

A pipeline placed along Alternative Alignment 1-2 would not be aligned within existing paved or unpaved roadways and underground utilities. To provide for operation and maintenance a 20 foot wide easement with a 12 foot wide all weather (aggregate base) access road would be constructed over and parallel to this pipeline route. Access roadway and pipeline construction would be difficult along the steep section of this alignment.

While Alignment Alternative 1-2 is slightly shorter than Alternative 1-1, the cost to acquire (or abandon) the pipeline and access easement (from an uncooperative landowner) together with the potential biological, cultural and historical resource impacts and the difficulties associated with long-term operation and maintenance eliminated Pipeline Alternative 1-2 from further consideration.

Alignment Alternative 1-3

Alignment Alternative 1-3 follows Alternative 1-1 from Tanner Reservoir until it reaches State Highway 49. At this location a pipeline placed along Alternative 1-3 would proceed along the southerly and easterly limits of State Highway 49 until it intercepts Gold Dust Trail, a prescriptive roadway within the City of Sutter Creek. Pipeline Alternative 1-3 would follow Gold Dust Trail east and south until it intercepts Church Street. At Church Street the alignment would proceed west approximately 400 feet to the City of Sutter Creek municipal parking lot which was previously described under Alternative 1-1. The pipeline could proceed across the parking lot and across the Sutter Creek Waterway to Eureka Street and then turn east to the point of connection with the Amador Water main at Eureka Street and Broad Street. Pipeline Alignment Alternative 1-3 is also shown in Exhibit 5-1.

The total length of Alignment 1-3 is approximately 8,300 feet; approximately 250 feet longer than Alternative 1-1. While slightly longer this alignment avoids crossing State Highway 49, would avoid, for the most part, conflicts with underground utilities within Highway 49 and on Church Street between Highway 49 and the Sutter Creek municipal parking log. This alternative also has the potential for mitigating impacts to historical resources as it would avoid historic structures located near Church Street and

State Highway 49. Gold Dust Trail is, in part, an unpaved prescriptive roadway. For a previous Amador Water Agency pipeline project a legal opinion was prepared for the Agency which found that the Amador Water Agency has authority to construct pipelines under or across any Amador County public roads. This authority includes roadways which exist through implied dedication. Since Alternative 1-3 represents a viable pipeline route and has been aligned in consideration of environmental, construction and pipeline operation and maintenance constraints, it shall be evaluated further in this PER.

Sutter Creek Waterway Crossing Alternatives

The crossing of the Sutter Creek Waterway is one of the most significant features of Project Segment 1.

Several alternatives for the Sutter Creek Waterway crossing were evaluated. These included:

- Crossing on the existing Highway 49 Bridge
- Crossing on an existing pedestrian bridge, east of the City of Sutter Creek Little League Baseball Field
- Crossing on an existing, abandoned, spillway structure
- A bored crossing
- Crossing on a new pedestrian bridge

While CalTrans intends to abandon the existing Highway 49 right of way through the City of Sutter Creek once the Highway 49 Bypass is constructed, permission to use the existing Highway 49 Bridge at Sutter Creek would require CalTrans approval until abandonment (to the City of Sutter Creek) is recorded. CalTrans will not permit the proposed Plymouth water main to be suspended from, or attached to, exposed portions of the bridge. The pipeline must be placed within a utility chase under the bridge. The underside of the existing bridge was inspected. There is not enough depth to place a new water main within the existing utility chase. Several smaller water mains (say three to five, 8-inch diameter mains) could be placed as an "equivalent" to a larger main. These could then be "manifolded" to a larger water main on either side of the bridge. There are, however, numerous existing utility conduits which have already been placed under the bridge making placement of addition 8-inch water mains impractical. Placement of additional pipelines on the underside of the Highway 49 Bridge at Sutter Creek was also evaluated with the City. Once CalTrans abandons the existing Highway 49 right of way to the City of Sutter Creek, the City intends to modify this existing structure. The City is, therefore, not supportive of placing addition utilities on the existing bridge which would then need to be relocated or modified with proposed bridge modifications.

There is an existing steel framed, light duty, pedestrian bridge which has been placed across Sutter Creek east of the existing Little League ballpark. This pedestrian bridge is ± 4-foot wide. There are sewer mains at each end of the bridge. This bridge was constructed to provide pedestrian access to the Little League Field and could also be used to support a sewer force main. There is not enough clearance to place both a water main and a sewer main on this bridge. The City of Sutter Creek does not support modification to the existing pedestrian bridge to also allow placement of a new water main.

There is an existing structure, being the remnant of an abandoned spillway, constructed across Sutter Creek approximately ½ mile upstream the State Highway 49 crossing. This structure is privately owned. Permission was not obtained form the owner of this structure to investigate the structural integrity or the feasibility of placing a water main across the top, or, attached to the downstream side of this structure.

A bored crossing of the Sutter Creek Waterway using horizontal directional drilling is possible though geotechnical investigations would be required to verify the feasibility of this crossing plan. The best apparent location for this bored crossing would be the City of Sutter Creek parking lots. A bored crossing would require a bore pit on one side of the creek and a receiving pit on the other. Typically these construction pits would need to be excavated at least as deep as the proposed crossing. The crossing should be placed with a minimum of 3 feet of cover below the creek invert. The creek invert is approximately 10 to 12 feet below the level of the adjacent parking lots. The bore pit and the receiving pit excavated to implement this crossing would therefore need to be approximately 14 to 16 feet deep.

Placement of the Plymouth Pipeline on a new pedestrian bridge constructed over the Sutter Creek Waterway with a span of approximately 100 feet is a viable crossing alternative. Placed between the municipal parking lots the pedestrian bride would provide a benefit to the City of Sutter Creek. A prefabricated clear span bridge of steel construction, 8 feet of width is suggested for this alternative. Typically, prefabricated bridges of this type are constructed with decking, safety rails and toe plates and are suitable for light vehicle traffic (golf carts, light duty trucks) as well as pedestrians and bicycles. Pedestrian bridges of this type are usually placed for elevated walkways, bikeways and on golf courses and can be designed to carry pipeline loads in addition to pedestrian and light duty vehicle loads. A pipeline crossing attached to a new pedestrian bridge was favorably received by the City of Sutter Creek. An aerial crossing of Sutter Creek would not require a Corps 404 Permit but would require a Section 1600 Fish and Game permit.

Construction Cost Estimates

Construction cost estimates prepared for Alignment Alternative 1-1 with either a bored crossing or an aerial crossing of Sutter Creek are presented in **Table 5-1**. Cost estimates prepared for Alternative Alignment 1-3 with either a bored or aerial crossing of Sutter Creek are presented in **Table 5-2.** The costs presented in Table 5-1 and 5-2 assume that an 18 inch main is required for Segment 1. This pipe design is based on a

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PLYMOUTH PIPELINE PROJECT
TABLE 5-1
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 1, PIPELINE SEGMENT 1
(ALT 1-1)

					ENRCCI-7480 August 2005
ITEM NO.	**DESCRIPTION**	**QUANTITY**	**UNIT**	**ESTIMATED UNIT COST**	**ESTIMATED TOTAL COST**
1	Point of Connection	1	LS	$20,000.00	$20,000.00
	Tanner Reservoir				
2	18" Water Main	5,150	LF	$110.00	$566,500.00
	Minor Utility Conflicts				
3	18" Water Main	2,000	LF	$125.00	$250,000.00
	Moderate Utility Conflicts				
4	18" Water Main	800	LF	$150.00	$120,000.00
	Major Utility Conflicts				
5	18" Butterfly Valves	6	EA	$4,500.00	$27,000.00
6	Fire Hydrants, 6" Hydrant	6	EA	$3,000.00	$18,000.00
	lead, 6" Valves				
7	Miscellaneous Fittings	20	EA	$1,500.00	$30,000.00
8	Air Relief Valves	2	EA	$3,500.00	$7,000.00
9	AC Replacement [1]	7,950	LF	$12.50	$99,375.00
10	AC Pavement [2]	79,500	SF	$1.25	$99,375.00
11	Point of Connection	1	LS	$10,000.00	$10,000.00
	Eureka and Broad Street				
12	Highway 49 Crossings	2	EA	$40,000.00	$80,000.00
13	Traffic Control [3]	16	DAY	$1,500.00	$24,000.00
				Subtotal	**$1,351,250.00**
14	Pedestrian Bridge	1	LS	$175,000.00	$175,000.00
	at Sutter Creek			**Subtotal**	**$1,526,250.00**
				Alt 1-1 with	
				Ped. Bridge	
				at Sutter Creek	
15	Bore Pit	1	LS	$50,000.00	$50,000.00
16	Receiving Pit	1	LS	$50,000.00	$50,000.00
17	Bored Crossing at Sutter Creek	140	LF	$800.00	$112,000.00
				Subtotal	**$1,563,250.00**
				Alt 1-1 with	
				Bored Crossing	
				Sutter Creek	

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PLYMOUTH PIPELINE PROJECT
TABLE 5-1 (cont.)
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 1, PIPELINE SEGMENT 1
(ALT 1-1)

	Subtotal			Alt 1-1 w/Ped Bridge at Sutter Creek 1,526,250	Alt 1-1 w/Bored Crossing at Sutter Creek $1,563,250.00
	Construction Contingencies	15%		$228,950.00	$234,500.00
	Admin, Engineering, & Permits	15%		$228,950.00	$234,500.00
	Inflation for 2006 Construction	2.5%		$38,150.00	$39,100.00
	Total Estimated Construction Costs			**$2,022,300.00**	**$2,071,350.00**

Notes:

(1) Assumes a 7" thick full depth pavement replacement over a 3' wide pipe trench and AC @ $100/ton

(2) Assumes a 2" thick AC overlay for an average width of 10 feet per foot of pipe trench and AC @ $100/ton

(3) Assumes no traffic control required on Old Ridge Road, Eureka Road, Old Sutter Hill Road

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PLYMOUTH PIPELINE PROJECT
TABLE 5-2
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 3, PIPELINE SEGMENT 1
(ALT 1-3)

					ENRCCI-7480 August 2005
ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	Point of Connection	1	LS	$20,000.00	$20,000.00
	Tanner Reservoir				
2	18" Water Main	6,500	LF	$110.00	$715,000.00
	Minor Utility Conflicts				
3	18" Water Main	1,200	LF	$125.00	$150,000.00
	Moderate Utility Conflicts				
4	18" Water Main	500	LF	$150.00	$75,000.00
	Major Utility Conflicts				
5	18" Butterfly Valves	6	EA	$4,500.00	$27,000.00
6	Fire Hydrants, 6" Hydrant	8	EA	$3,000.00	$24,000.00
	lead, 6" Valve				
7	Miscellaneous Fittings	24	EA	$1,500.00	$36,000.00
8	Air Relief Valves	3	EA	$3,500.00	$10,500.00
9	AC Replacement [1]	7,400	LF	$12.50	$92,500.00
10	AC Pavement [1]	74,000	SF	$1.25	$92,500.00
11	Point of Connection	1	LS	$10,000.00	$10,000.00
	Eureka and Broad Street				
12	Grading and Surfacing [2]	800	LF	$30.00	$24,000.00
	Gold Dust Trail				
13	Traffic Control [3]	12	DAY	$1,500.00	$18,000.00
				Subtotal	**$1,294,500.00**
14	Pedestrian Bridge	1	LS	$175,000.00	$175,000.00
	at Sutter Creek			**Subtotal**	**$1,469,500.00**
				Alt 1-3 with	
				Ped. Bridge	
				at Sutter Creek	
15	Bore Pit	1	LS	$50,000.00	$50,000.00
16	Receiving Pit	1	LS	$50,000.00	$50,000.00
17	Bored Crossing at Sutter Creek	140	LF	$800.00	$112,000.00
				Subtotal	**$1,506,500.00**
				Alt 1-3 with	
				Bored Crossing	
				Sutter Creek	

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PLYMOUTH PIPELINE PROJECT
TABLE 5-2 (cont.)
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 3, PIPELINE SEGMENT 1
(ALT 1-3)

	Subtotal			**Alt 1-3 w/Ped Bridge at Sutter Creek** 1,469,500	**Alt 1-3 w/Bored Crossing at Sutter Creek** $1,506,500.00
	Construction Contingencies	15%		$220,425.00	$225,975.00
	Admin, Engineering, & Permits	15%		$220,425.00	$225,975.00
	Inflation for 2006 Construction	2.5%		$36,750.00	$37,700.00
	Total Estimated Construction Costs			**$1,947,100.00**	**$1,996,150.00**

Notes:
(1) See Table 5-1 for Trench Pavement and AC Replacement Assumptions.

(2) Assumes Grading on 20 foot roadway and surfacing with 6" thick AB at $50/ton.

(3) Assumes no traffic control required on Old Ridge Road, Eureka Road, Old Sutter Hill Road or Gold Dust Trail.

preliminary determination conducted by the Amador Water Agency. This preliminary design is evaluated for the selected pipeline alignment later in this section of the PER.

Segment 2: Existing Amador Water Agency Mains, Broad Street and Eureka Street to Sutter Creek – Amador City Road

No improvements are proposed within Project Segment 2. The existing 10-inch main in Broad Street which continues north along Mill Street and then within an existing easement to Sutter Creek-Amador Creek Road together with parallel water mains in State Highway 49 (Main Street) and Spanish Street have adequate pressure and capacity to meet the year 2025 maximum day flows of the proposed project. Current pressures in the high pressure lines constructed through Sutter Creek are, typically, 150 to 200 psi. These findings will be reviewed in more detail later in this PER. The high pressure lines which are constructed through the central part of Sutter Creek feed Sutter Creek residential and commercial services through pressure reducing valves (PRV). As long as pressure losses caused by increased project demands do not cause the "out" pressures at the PRV's to drop below existing and projected "in" pressures, existing Sutter Creek services downstream of the PRV's will not notice reduced pressures or flows with the addition of Plymouth demands. In Table 5-3 is presented a summary of the PRV pressures and pressure settings on the existing high pressure main constructed through Sutter Creek to Amador City.

TABLE 5-3
AMADOR WATER AGENCY WATER MAIN PRESSURES AND PRV SETTINGS

PRV	("in" Pressures (psi)				("out") PRV Setting
	2005 Avg Day	2005 Max Day	2025 Avg Day	2025 Max Day	
1 (Amador City Pressure Reg. Sta.)	217	207	205	167	18
2	157	149	146	111	90
3	231	219	215	137	122
4	222	214	212	179	120

The total length of existing Segment 2 beginning at Eureka Street and ending at Sutter Creek-Amador Road is approximately 3,500 LF.

Segment 3: New Transmission Main and Water Storage Tank Constructed at Elevation 1640, North of Sutter Creek

The Amador Water Agency has previously determined that a water storage tank constructed with a base elevation of approximately 1,640 and located between Tanner Reservoir (elevation 1710) and the City of Plymouth Tank (elevation 1280) could be served by gravity and would benefit existing services within Sutter Creek, Amador City and Drytown as well as future demands in Plymouth. As further discussed in this PER there is adequate pressure from Tanner, both now and under projected maximum day conditions, to fill a storage tank with base elevation of 1640 and located north of Sutter Creek. Existing elevations north of Sutter Creek are shown on **Exhibit 5-2.** Alternative sites exist in the general area with elevations of 1640 or higher.

The Agency has previously discussed placement of the water storage tank on property owned by Edward Swift and located north of Gopher Flat Road and south east of Sutter Creek-Amador Road. Permission to access and evaluate the tank site was obtained from Mr. Swift. The tank site was screened for apparent cultural and biological resources by the Project team. Access to the tank site and the alignment of a pipeline to connect the tank existing water mains located in Gopher Flat Road, Mill Street and Sutter Creek-Amador Road were evaluated. From Sutter Creek-Amador Road there is an existing ranch road which passes immediately south of the "Swift" Tank site. A pipeline placed along this alignment would connect directly to the Agency's high pressure main located in Sutter Creek-Amador Road. There are no creek crossings along this alignment. Construction of the pipeline along and within the existing ranch road would minimize impacts to existing biological resources. There are no historic buildings along the alignment. Biological resources between the existing water main in Sutter Creek-Amador Road and the Tank site typically consist of annual grasslands with areas of oak savannah. A pipeline constructed along this alignment would not cause the removal of any oak trees. The pipeline would cross the existing Amador Raw Water Aqueduct. The final pipeline design would ensure that adequate vertical clearance is provided to not damage the aqueduct.

In **Exhibit 5-3** is presented a conceptual water storage tank layout and elevation at the "Swift" Tank site. A 1.5 million gallon (MG) welded steel water storage tank with dimensions of approximately 100 feet (diameter) by 28 feet (shell height) are proposed. A "knuckle roof" welded steel water tank constructed on a concrete ring foundation, at grade, is proposed. The tank would be coated per AWA's requirements (typically "sand" color). Existing Sutter Creek residences are, in general, not visible from the proposed tank site. A few existing residents in the Crestview Heights area across Highway 49 could see the tank if constructed, at grade, at the proposed tank site. Minor visual impacts of the tank could be mitigated by appropriate grading and landscape screening. As an alternative, the 1.5 MG water storage tank could be constructed below grade. Construction costs for a reinforced concrete tank constructed below grade would be significantly greater than for the proposed welded steel tank constructed at grade.

The estimated construction costs for construction of the 1.5 MG water storage welded steel tank on the Ed Swift site are presented in **Table 5-4**. Approximately 3,000

SEGMENT 3
TANK & PIPELINE PLANNING AREA
NORTH SUTTER CREEK

EXHIBIT 5-2

CONSULTING KASL ENGINEERS

PLYMOUTH PIPELINE PROJECT
TABLE 5-4
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION OF PIPELINE SEGMENT 3

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	Point of Connection	1	LS	$10,000.00	$10,000.00
	Sutter Creek-Amador Road				
2	18" Water Main	3,000	LF	$100.00	$300,000.00
	No Utility Conflicts				
3	18" Butterfly Valves	3	EA	$4,500.00	$13,500.00
4	Fire Hydrants, 6" Hydrant	2	EA	$3,000.00	$6,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	6	EA	$1,500.00	$9,000.00
6	1.5 MG Water Storage Tank	1,500,000	GAL	$0.60	$900,000.00
7	Tank Site Preparation	1	LS	$75,000.00	$75,000.00
	and Foundation				
8	Tank Site Electrical and SCADA	1	LS	$50,000.00	$50,000.00
9	Tank Inlet/Outlet Valving	1	LS	$50,000.00	$50,000.00
10	Tank Site Fencing	800	LF	$25.00	$20,000.00
11	Tank Site Gate	1	LS	$1,500.00	$1,500.00
12	Grading and Surfacing Access Road	3,300	LF	$30.00	$99,000.00
13	Retaining Wall	400	LF	$200.00	$80,000.00
14	Site Landscape and Screening	4,000	SF	$3.00	$12,000.00
15	Site Driveway and Surfacing	8,000	SF	$1.50	$12,000.00
16	Tank Site Fee Title	1	AL	$50,000.00	$50,000.00
17	Access Road Easement	3,000	LF	$12.00	$36,000.00
18	Solenoid Valve and Check Valve	1	LS	$90,000.00	$90,000.00
	Assembly at POC				
				Subtotal	**$1,814,000.00**
				Segment 3	
				Costs	
	Construction Contingencies	15%			$272,100.00
	Admin, Engineering, & Permits	13%			$235,820.00
	Inflation for 2006 Construction	2.5%			$45,380.00
	Total Estimated Segment 3 Construction Costs				**$2,367,270.00**

feet of 18 inch diameter tank draw/tank fill main is included in these costs. This design is reviewed later in this section of the PER. A ± 12 foot wide aggregate surfaced access road, place within a 20 foot wide easement, would be constructed from Sutter Creek-Amador Road to the proposed tank site. Currently the proposed access road and pipeline alignment follows the existing ranch road. Stored water levels within the proposed tank would "float" with system demands. Ideally, the tank would be designed and constructed to fill during low demand periods and draw during high demand periods. Water storage tank site improvements would include inlet and outlet valves, tank foundation, tank inlet, outlet and overflow piping, fencing, landscape screening, site surfacing and a level transmitter to transmit water level information to AWA's offices.

Segment 4: Existing Water Transmission Main; Sutter Creek – Amador Road to Amador City Pressure Regulating Station; Pressure Regulating Station to Amador Creek Road

Project Segment 4 begins at Sutter Creek – Amador Road at the point of connection with the new Segment 3 Water Transmission Main and the connection with the existing Segment 2 Water Transmission Main. This segment includes the existing 10 inch main constructed within Sutter Creek – Amador Road and within existing Amador Water Agency easements to the Amador City Pressure Regulating Station. The length of this portion of the Segment 4 pipeline is approximately 6800 feet. This main has been in operation for at least 25 years. According to the Amador Water Agency it is in good condition and requires little maintenance. Downstream of the Amador City Pressure Regulating Station is constructed an 8 inch water main. This water main is within an Amador Water Agency easement, crosses below Amador Creek and terminates in Amador Creek Road ("Water" Street) approximately 750 feet east of East School Street. This main is approximately 1800 feet long and has been in operation for more than 25 years. According to the Water Agency the 8 inch main requires periodic maintenance and repairs. Before the Amador Pressure Regulating Station was constructed there was a water storage reservoir at this location. The 8 inch main, still in operation, probably was constructed to deliver water from the now abandoned water storage reservoir to Amador City. The alignment and location of Project Segment 4 is shown on **Exhibit 5-4**.

As further discussed in this PER the velocities and head losses through the 10 inch and the 8 inch portions of the Project Segment 4 pipeline were evaluated under maximum day and fire flow conditions. While velocities and head losses in the 10 inch main are high the allowable head loss through this section of pipeline is also high. The Amador City Pressure Regulating Station is located at approximately elevation 1210; approximately 200 feet lower than the point of connection with Project Segments 2 and 3 and more than 400 feet below the water storage tank proposed in Segment 3. Under Year 2005 and Year 2025 average day and maximum day demand conditions the pressures in the 10 inch portion of the Segment 4 Project pipeline increase from the point of connection with the Segment 3 pipeline to the Amador City Pressure Regulating Station. Under these demand conditions the static head gained by elevation is greater

than the velocity head losses. Under Year 2025 maximum day plus fire flow conditions the static pressure gains are equalized by the velocity head losses. Under most demand conditions the incoming pressures at the Amador City Pressure Regulating Station range from 150 to 200 psi. At the Amador City Pressure Regulating Station pressures are reduced to 18 psi to avoid over-pressurizing the Amador City Service Area. Since the existing 10 inch main constructed between the Segment 2 / Segment 3 point of connection is in good condition and head losses through this pipeline, even under projected maximum day and fire flow demands do not adversely affect the pressures delivered to Amador City and Drytown services located downstream of the Amador City Pressure Regulating Station it is concluded that the existing 10 inch portion of the Segment 4 Project is adequate to meet the projected Year 2025 City of Plymouth water demands.

Alternatives for the 8 Inch Portion of Project Segment 4

Alternatives considered for the Segment 4 pipeline between the Amador City Pressure Regulating Station and the connection to the Project Segment 5 at Amador Creek Road included:

- Use of the existing 8 inch main and the existing Amador City Pressure Regulating Station with connection to the new main (begin Project Segment 5) at Amador Creek Road

- Use of the existing 8 inch main with relocation of the existing Amador City Pressure Regulating Station to Amador Creek Road with continuation of Project Segment 5 along Amador Creek Road.

- Connection of a new main at the existing 10 inch line ahead of the Pressure Regulating Station and then construction of this new water main parallel to the existing 8 inch main across Amador Creek to Amador Creek Road. The new pipeline would continue to the City of Plymouth from Amador Creek Road (begin Project Segment 5).

With the Amador City Pressure Regulating Station "out" pressure set at 18 psi there is inadequate static head to deliver water to the Plymouth water storage tank from the existing 8 inch main beginning downstream of the PER. As further discussed herein the Amador City Pressure Regulating Station "out" pressure will need to be set at 90 psi or higher to adequately overcome head losses under Year 2025 maximum day plus fire flow conditions and the water level in the Plymouth tank. Adjusting the "out" pressure in the Amador City Pressure Regulating Station to 90 psi would over-pressurize services in Amador City. Amador City water pressures are now typically 60 to 70 psi. Increasing the pressure setting at the Amador City Pressure Regulating Station to 90 psi would increase existing Amador City service pressures to over 130 psi.

If the existing Pressure Regulating Station were relocated to Amador Creek Road the existing 8 inch main would be subject to pressures well in excess of 300 psi. The existing ± 150 psi rated, 8-inch main would not be able to sustain these high pressures.

A new water main connected to the existing 10 inch main upstream of the existing Amador City Pressure Regulating Station and constructed some 1800 feet parallel to the exiting 8 inch water main across and below the Amador Creek channel to Amador Creek Road is proposed as the best alternative for Project Segment 4. Alternative pipeline sizes are evaluated in this PER. A "Plymouth" Pressure Regulating Station is proposed to avoid excessive downstream pressures along the Plymouth Pipeline route. The new Plymouth Pressure Regulating Station is proposed adjacent to the Amador City Pressure Regulating Station since the Water Agency has access and easements at this location. Construction of the new parallel pipeline will require vegetation clearing and the removal of oak trees and riparian habitat in the vicinity of the Amador Creek crossing. Additional field investigations will be conducted prior to final pipeline design and construction to select an alignment which mitigates the removal of trees and habitat. A Fish and Game Section 1600 Permit and a Corps of Engineers 404 Permit will be required. The crossing will be designed and constructed in accordance with the conditions of the Fish and Game and Corps Permits. Amador Creek "goes dry" during most summer months. Construction of the Amador Creek crossing during dry creek periods will mitigate project impacts. A creek crossing with ductile iron pipe backfilled with "lean" (2-sack) concrete mix and grouted cobble and a minimum cover of 3 feet is proposed.

There are no known historical or archaeological sites along the proposed Segment 4 alignment. Project historical and cultural resources consultants will review the final pipeline alignment between the Amador City Pressure Regulating Station and Amador Creek Road. Acquisition of an additional 20 foot easement parallel to the existing pipeline and encompassing the new parallel pipeline serving Plymouth is proposed.

Cost estimates for the Segment 4 portion of the Plymouth Pipeline Project are presented in **Table 5-5.**

Segment 5: New Water Transmission Main, Amador Creek Road to New Chicago Road

Two alternative alignments were evaluated for Project Segment 5. This segment is located between Amador Creek Road, beginning at the point of connection with Project Segment 4, and New Chicago Road, ending at the point of connection with Project Segment 6. Both alternatives are shown in Exhibit 5-4 and are described in the following.

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PLYMOUTH PIPELINE PROJECT
TABLE 5-5
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION OF PIPELINE SEGMENT 4

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	Point of Connection - Existing 10"	1	LS	$10,000.00	$10,000.00
	Water Main Upstream of Amador				
	City PRV Station				
2	Plymouth Pressure Reducing	1	LS	$70,000.00	$70,000.00
	Valve Station				
3	Clearing Along Pipeline Alignment	0.8	AC	$10,000.00	$8,000.00
4	Grading and Surfacing Along	1,800	LF	$30.00	$54,000.00
	Pipeline Easement				
5	12" Water Main;	1,700	LF	$55.00	$93,500.00
	No Utility Conflicts				
6	12" Butterfly Valves	2	EA	$2,500.00	$5,000.00
7	Fire Hydrants, 6" Hydrant	1	EA	$3,000.00	$3,000.00
	leads and 6" Valves				
8	Miscellaneous Fittings	4	EA	$1,000.00	$4,000.00
9	Amador Creek Crossing	100	LF	$200.00	$20,000.00
10	Pipeline Easement Acquisition	1,800	LF	$12.00	$21,600.00
				Subtotal	**$289,100.00**
				Segment 4	
				Costs	
	Construction Contingencies	15%			$43,400.00
	Admin, Engineering, & Permits	15%			$43,400.00
	Inflation for 2006 Construction	2.5%			$7,280.00
	Total Estimated Segment 4 Construction Costs				**$383,180.00**

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Alternative Alignment 5-1

From the point of connection in Amador Creek Road located approximately 750 feet east of East School Street a pipeline constructed along this alignment would proceed west to East School Street and then north along East School Street to Bunker Hill Road and then continue north along Bunker Hill Road to New Chicago Road. Amador Creek Road and East School Street are located within the City of Amador City. Bunker Hill Road is an Amador County Road. Construction of a pipeline along this alignment would require encroachment permits from both Amador City and Amador County. Amador Creek Road, East School Street and Bunker Hill Road are narrow paved roadways. The new water transmission main would be placed within the paved section since there is inadequate unpaved shoulder width to construct a new pipeline without damaging the existing pavement. Cost estimates prepared for this segment assume reconstruction of the road section along the pipe trench and re-pavement between centerline and edge of pavement, one side. There are existing underground water and sewer facilities within Amador Creek Road and East School Street. The cost estimates prepared for pipelines constructed along these roadways reflect minor utility conflicts. A new pipeline constructed along Alternative Alignment 5-1 would parallel the existing 8 inch water main in Amador Creek Road and the existing 6 inch water main in East School Street and Bunker Hill Road. The Bunker Hill Road water main serves Drytown. Consideration was given to replacing these existing 8 inch and 6 inch water mains with the Segment 5 water main, however, these existing water mains are in good condition and replacement would also require reconnection of existing water services at additional cost. The existing Amador City and Drytown water mains are served by the Amador City Pressure Regulating Station. The new Segment 5 water main would operate at higher pressures. A connection to the existing Amador City and Drytown mains could be made through a Pressure Reducing Valve. This would benefit the Amador City and Drytown services by providing an alternative source of supply should the 8 inch main, which now serves Amador City and Drytown from the Amador City Pressure Regulating Station, be repaired or replaced.

Construction of the Segment 5 pipeline improvements along and within paved roadways minimizes the impact of the project on natural resources. Along Alternative Pipeline Alignment 5-1 there is located the Little Amador Mine, Bunker Hill Mine, Treasure Mine and Fremont Mine. The limits of these old mines are well defined and it is unlikely that a pipeline constructed within the existing paved roadways would adversely impact these historical features. There are historic buildings located along East School Street and Bunker Hill Road. Construction of the pipeline within existing paved roadways will minimize impacts to these features. Alternative Alignment 5-1 includes crossing of Rancheria Creek. Rancheria Creek at Bunker Hill Road has been channeled to a relatively narrow width. An aerial crossing approximately 25 feet in length located on the downstream side of the existing Bunker Hill Road bridge is proposed. A Section 1600 Fish and Game Permit will be required for this crossing.

Construction of the pipeline within existing paved roadways would facilitate systems operation and maintenance. No easement acquisitions would be required for construction of the Segment 5 pipeline along this alternative alignment. The total pipeline length measured for this alternative is approximately 10,800 feet.

Alternative Alignment 5-2

Beginning at the Amador Creek Road point of connection, construction of the Segment 5 pipeline along Alternative Alignment 5-2 would proceed east to Turner Road and then north along Turner Road to New Chicago Road. Similar to Bunker Hill Road, Turner Road is a narrow paved County Road. Encroachment permits from both Amador City and Amador County would be required to place the pipeline along this alignment. Similar to construction along Alignment Alternative 5-1 there is inadequate unpaved shoulder width to allow placement of the pipeline outside of the paved roadway. Road reconstruction along the proposed pipeline and pavement replacement for a half roadway section (approximately 10 feet wide) is assumed. Placement of the pipeline within existing paved roadways would facilitate system operation and maintenance and would limit impacts on existing natural resources.

There are underground water and sewer improvements along portions of Amador Creek Road and there are underground telephone cables placed along Turner Road. Cost estimates prepared for this alternative alignment assume minor utility conflicts.

Turner Road crosses Rancheria Creek with a low water, at grade, crossing. An aerial crossing of Rancheria Creek on the downstream side of Turner Road is proposed. A Section 1600 Fish and Game Permit would be required for this crossing.

Along Turner Road there are two historic sites that have been recorded. These are the Rancheria Massacre Site (P-03-000197/000886) and a prehistoric milling feature (P-03-000888). Because of these known sites there is a potential for encountering human remains in these areas. Documentation of these resources and the mitigation of cultural resource impacts could require sub-surface investigations. These investigations would add to project costs and could cause project delays. Placement of the Segment 5 pipeline along this alignment would not parallel existing Amador City or Drytown water mains and would therefore not provide the same benefit to these existing communities as a pipeline placed along Alignment Alternative 5-1. The total pipeline distance measured along Pipeline Alignment 5-2 is approximately 10,500 feet or approximately 300 feet less than Alternative 5-1.

Cost estimates prepared for the Segment 5 pipeline constructed along Alternative Alignment 5-1 and 5-2 are presented in Tables **5-6 and 5-7.** The cost estimates presented in these tables assume a 12 inch diameter water main. Confirmation of the pipeline diameter and capacity is discussed later in this section of this PER.

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PLYMOUTH PIPELINE PROJECT
TABLE 5-6
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 1, PIPELINE SEGMENT 5
(ALT 5-1)

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	12" Water Main;	10,800	LF	$60.00	$648,000.00
	Minor Utility Conflicts				
2	Gate Valves	8	EA	$2,500.00	$20,000.00
3	Fire Hydrants, 6" Hydrant	7	EA	$3,000.00	$21,000.00
	leads and 6" Valves				
4	Miscellaneous Fittings	12	EA	$1,000.00	$12,000.00
5	Air Relief Valves	4	EA	$3,500.00	$14,000.00
6	AC Replacement (1)	10,800	LF	$9.00	$97,200.00
7	AC Pavement (2)	108,000	SF	$0.95	$102,600.00
8	Ranchera Creek Crossing	1	LS	$20,000.00	$20,000.00
9	Traffic Control (3)	36	DAY	$1,500.00	$54,000.00
				Subtotal	**$988,800.00**
	Construction Contingencies	15%			$148,325.00
	Admin, Engineering, & Permits	13%			$128,550.00
	Inflation for 2006 Construction	2.5%			$24,725.00
	Total Estimated Construction Costs ALT 5-1				**$1,290,400.00**

Notes:

(1) Assumes a 5" thick fill depth pavement section over a 3 foot wide trench and AC @ $100/ton.

(2) Assumes a 1-1/2" thick AC overlay for an average width of 10 feet per foot of pipe trench and AC @ $100/ton.

(3) Assumes traffic control on Amador Creek Road, East School Street and Bunker Hill Road.

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PLYMOUTH PIPELINE PROJECT
TABLE 5-7
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 2, PIPELINE SEGMENT 5
(ALT 5-2)

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	12" Water Main;	10,500	LF	$60.00	$630,000.00
	Minor Utility Conflicts				
2	Gate Valves	8	EA	$2,500.00	$20,000.00
3	Fire Hydrants, 6" Hydrant	7	EA	$3,000.00	$21,000.00
	leads and 6" Valves				
4	Miscellaneous Fittings	12	EA	$1,000.00	$12,000.00
5	Air Relief Valves	4	EA	$3,500.00	$14,000.00
6	AC Replacement [1]	10,500	LF	$9.00	$94,500.00
7	AC Pavement [1]	105,000	SF	$0.95	$99,750.00
8	Ranchera Creek Crossing	1	LS	$30,000.00	$30,000.00
9	Traffic Control [2]	36	DAY	$1,500.00	$54,000.00
10	Cultural Resource Impact	1	LS	$250,000.00	$250,000.00
	Mitigation Costs [3]				
				Subtotal	**$1,225,250.00**
	Construction Contingencies	15%			$183,800.00
	Admin, Engineering, & Permits	15%			$183,800.00
	Inflation for 2006 Construction	2.5%			$30,650.00
	Total Estimated Construction Costs ALT 5-2				**$1,623,500.00**

Notes:
(1) See Table 5-6.

(2) See Table 5-6.

(3) Costs estimated at 20 to 30 days of delay and $10,000 per day.

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Segment 6: New Water Transmission, New Chicago Road to City of Plymouth Water Treatment Plant

Three pipeline alignment alternatives were considered for Segment 6. These alternatives are also shown in Exhibit 5-4. All three alignments involve "cross county" routes and require acquisition of easements from private property owners. Property value appraisals have not been conducted for this PER. All three of the Segment 6 alignment alternatives have been reviewed in the field with the permission of property owners. Alternative alignments have been identified with the principal property owners involved and have been designated here and on the PER exhibits as the "Matulich" Alternative (Alternative Alignment 6-1), the "Evitt" Alternative (Alternative Alignment 6-2) and the "Gansberg" Alternative (Alternative Alignment 6-3).

All three alternatives were reviewed in the field by project biologists, cultural resource specialist, historical consultants, project planners, engineers and administrators. Results of these field surveys are described herein.

Alignment Alternative 6-1 "Matulich" Alternative

Beginning at New Chicago Road this alternative alignment would follow an existing ±20 to 25 foot wide graded roadway constructed to provide access to the existing Matulich mining operations. This roadway is gated with gates normally open during mining operation hours. On average, 1 to 2 haul trucks were observed traveling on this private roadway, per hour. There are storage ponds, drainage courses, oak woodlands and oak savannah habitat located along both sides of the mining haul road. To minimize impacts to biological resources Alternative Alignment 6-1 would remain within the limits of the existing graded roadway for some 9600 feet between New Chicago Road and Dry Creek. North of the mining office and the active mining operations, this alignment follows a 10 to 12 foot wide dirt roadway across Dry Creek. An open cut of Dry Creek and placement of the pipeline below the creek invert is proposed. Normally this could be done during summer months when there is little or no creek flow. Construction within the jurisdictional limits of Dry Creek would require a 404 Permit from the Army Corps of Engineers. A Section 1600 Fish and Game Permit will also be required. The Dry Creek crossing is the lowest (elevation) point along the Plymouth Pipeline Project. Extra strength pipeline (±350 psi rated) would be required. High strength ductile iron pipe backfilled with lean concrete mix and grouted cobble and placed with 3 feet of cover below the Dry Creek invert is proposed. Pipeline design details and construction safeguards would be subject to conditions of approval from both the Corps of Engineers and the Department of Fish and Game.

After crossing Dry Creek this alternative alignment would follow and old graded road cut to the northeast until it crosses into the Allison Parcel (APN 008-110-023). Within the Allison parcel the pipeline alignment would follow the abandoned County Road 81 and then turn east and north and follow existing ranch roads past the Allison residence. North of the existing residence the alignment would continue north along the Allison's graded access road. The final alignment, as approved by the Allisons, may

place the pipeline adjacent to the existing access road rather than within it. North of the Allison's property the pipeline alignment follows farm roads and vineyard access roads graded within parcels owned by the Sutter Home Winery (APNs 008-070-039, 008-070-040 and 008-070-036) to Shenandoah Valley Road near the intersection with Fiddletown Road. Burke Ranch owns a right-of-way over a portion of the pipeline alignment across Sutter Home Winery Parcel 008-070-036. Alternative Alignment 6-1 then proceeds east along the south side of Fiddletown Road parallel to the raw water pipeline constructed from the Arroyo Ditch pump station to the Plymouth Water Treatment Plant. The pipeline would terminate at the Plymouth Water Storage Tank. The Plymouth Water Storage Tank is constructed with a 36 foot shell height and a base elevation of 1,258.

The total length of the Matulich Alternative is approximately 22,565 lineal feet. Nearly all of this alignment would require easement acquisitions. Property owners include:

• Moore	APN 008-380-007
• Matulich	APN 008-140-014
• Emma Rose Mining Companies	APN 008-140-016
• Matulich	APN 008-140-017
• Matulich, Fontenrose, Carey	APN 008-140-295
• Matulich	APN 008-140-023
• Levaggi, Strohm, Matulich	APN 008-140-025
• Allison	APN 008-110-023
• Allison	APN 008-070-033
• Sutter Home Winery	APN 008-070-039
• Sutter Home Winery	APN 008-070-040
• Sutter Home Winery	APN 008-070-036
• Sutter Home Winery	APN 008-070-037

As noted earlier, Burke Ranch also owns a right-of-way over a portion of the APN 008-070-036 selected for the pipeline alignment.

With placement of the pipeline along existing mining roads, graded roads, access roads and vineyard roads, impacts to natural resources would be minimized. Impacts to riparian habitat at the Dry Creek crossing would be addressed as part of the Environmental Documents prepared for this project and in the conditions of approval issued as part of the Fish and Game and Corps of Engineers permits.

Near the Matulich alignment several historical cultural sites have been recorded. These include the Asorga Homestead (P-03-000468), the Italian-Seaton Mine (P-03-000722 / 000725 / 000787), the Pioneer Mining District (P-03-00804), Pioneer Mine (P-03-000805) and Pioneer Ditch (P-03-000964). Historically there was extensive mining activity along Dry Creek and several abandoned diggings were identified along the Matulich Pipeline Alignment.

Cost estimates for all three Segment 6 pipeline alternatives are presented following the description of the alignments.

Alignment Alternative 6-2, "Evitt" Alternative

This alternative alignment begins on New Chicago Road approximately half way between Bunker Hill Road and Turner Road. The alignment follows an existing ranch road graded along the ridge which crosses the Evitt Parcel (APN 008-140-030) and then continues along this ranch road across the Matulich Parcel (APN 008-140-005). Leaving the ranch road this alignment continues to the northeast down a moderate slope to the Gansberg Parcel (APN 008-140-004). After crossing an ephemeral creek, the proposed alignment would follow, or parallel, the abandoned County Road 81 alignment until it crosses Dry Creek. As with the Matulich Alternative previously described an open cut of Dry Creek is proposed. This crossing would normally be completed during summer months. As described with the Matulich Alternative, a Nationwide 404 Permit and a Section 1600 Fish and Game Permit would be required for this crossing. At this location the crossing of Dry Creek is relatively flat and wide and follows the Old County roadway. While design and construction details would be subject to conditions of the Fish and Game and Corps Permits, a high strength ductile iron pipe backfilled with lean mix concrete and grouted cobble and placed with not less than 3 feet of cover below the creek invert is proposed. After crossing Dry Creek the Evitt Alternative would cross onto the Allison Parcel (APN 008-110-023). The alignment would follow abandoned County Road 81 until it joins the alternative alignment previously described for the Matulich Alignment north through the Allison and Sutter Home Winery parcels to Shenandoah Valley Road, Fiddletown Road and the Plymouth Water Treatment Plant. The total length of this alternative alignment is approximately 20,375 lineal feet.

With the exception of approximately 1000 feet all of the Evitt Alternative alignment would be placed within existing farm roads, graded roads, access roads and vineyard roads. All or nearly all of this alignment would require the acquisitions of easements. Property owners with land along this alignment include:

- Pemberton APN 008-220-041
- Evitt APN 008-140-030
- Matulich APN 008-140-005
- Gansberg APN 008-110-019
- Gansberg APN 008-140-004

as well as the Allison and Sutter Home Winery Parcels identified for the Matulich Alternative.

Construction along existing ranch roads, graded roads, access roads and vineyard roads would minimize impacts to biological and natural resources. Where the Evitt Alignment leaves existing roadways biological habitat is characterized as annual grassland, pasture land, oak savanna and oak woodlands. Impacts to these resources

and the impacts of crossing Dry Creek will be addressed in the Environmental Documents prepared for the Plymouth Pipeline Project.

Cultural and historical resources along the Evitt Alignment include the rock walls and foundations of the old Centennial Mine located south of Dry Creek and Centennial Mine structures located north of Dry Creek. The Evitt Alignment follows some 3000 feet of abandoned Road 81. There are historic mine tailings located along this roadway. To reduce potential impacts to historic resources, historical consultant monitors may be required during trenching operation. This mitigation measure will be discussed in the Environmental Documents prepared for this project.

The estimated cost of the Segment 6 pipeline constructed along the Evitt, Alternative 6-2 alignment, is presented following the description of the pipeline alternatives.

Alignment Alternative 6-3 "Gansberg" Alternative

As shown in Exhibit 5-4, the Gansberg Alternative begins on New Chicago Road west of Turner Road. A pipeline constructed along this alignment would proceed east on New Chicago Road past the intersection of Turner Road some 2500 feet. Leaving New Chicago Road this alternative alignment would follow an existing graded access road, northwest, approximately 1500 lineal feet. Leaving this graded road at the Preuss Parcel (APN 015-100-002) the alignment would cross the Gansberg Parcel (APN 008-110-006) to the northwest and then cross to another Gansberg parcel (APN 008-110-019), following the southerly limit of this parcel, west, down to the abandoned County Road 81 roadway. From this point the Gansberg Alignment is common with the Evitt Alignment previously described. As described for the Evitt Alternative the Gansberg alignment would follow abandoned County Road 81 with an open cut of Dry Creek across to the Allison Parcel and then continue north through the Allison and Sutter Home Winery Parcels following existing ranch roads and vineyard roads to Shenandoah Valley Road, Fiddletown Road and the Plymouth Water Treatment Plant. The total length of this alignment from the end of Segment 5 to the Plymouth Water Storage Tank is approximately 24,875 feet.

The Gansberg Alternative includes approximately 7,900 lineal feet not aligned within existing paved roads, graded roads, access roads, farm roads or vineyard roads. Where this pipeline leaves existing roadways, natural resources can be described as pasture land, oak savanna, annual grassland, oak woodland and riparian habitat. Potential impacts to biological resources and at the Dry Creek crossing would be described in the Environmental Documents prepared for this project. As described for the Matulich and Evitt Alternatives, impacts associated with the Dry Creek crossing would be mitigated by Conditions of Approval issued with the Corps of Engineers and Department of Fish and Game Permits.

Historical features along the Gansberg Alignment include the rock walls, foundations and remnant structures of the Centennial Mine and the historic mine tailings and abandoned mines located along Old County Road 81. As previously discussed for

the Evitt Alignment, historic consultants may be required to monitor trenching near the Centennial Mine. This requirement will be further discussed in the Project Environmental Documents.

The estimated costs for the construction of the Segment 6 pipeline along the Matulich Alignment are presented in **Table 5-8**. The estimated costs for the Segment 6 pipeline constructed along the Evitt Alignment are presented in **Table 5-9.** The estimated costs for the Segment 6 pipeline constructed along the Gansberg Alignment are presented in **Table 5-10.**

Preferred Pipeline Alignment

Segment 1

The preferred pipeline alignment for Segment 1 is the Gold Dust Trail Alignment, Alternative 1-3. This alignment is estimated to be less costly than Alternative 1-1, would avoid crossing Highway 49, and avoid major utility conflicts near Church Street and Highway 49 and have less impact on Sutter Creek area historic buildings.

Crossing of the Sutter Creek waterway with a new pedestrian bridge is preferred. This alternative is most feasible and estimated to be less costly than drilling under and across the waterway. A pipeline crossing on a new pedestrian bridge was favorably received by the City of Sutter Creek.

The preferred pipeline alignment for Segment 1 is shown on **Exhibit 5-5.**

Segment 2

Continued use of the high pressure water mains on Broad Street, Main Street and Spanish Street is preferred for Pipeline Segment 2. Adequate pressure and capacity is available with these existing AWA mains to meet the 2025 maximum day and the 2025 maximum day plus fire flow demands of this project without the need for additional high pressure mains through Sutter Creek. The preferred (existing) alignment of Segment 2 is also shown on Exhibit 5-5.

Segment 3

A new water main and a new 1.5 MG, above ground, welded steel water storage tank constructed on the Ed Swift Property with a base elevation of 1640 is preferred. The pipeline should be aligned along the ranch road which exists between Sutter Creek-Amador Road and the Tank site. The new Segment 3 water main would connect to the existing 10 inch diameter high pressure water main constructed in Sutter Creek-Amador Road and would be designed to deliver water to the new water storage tank during low system demand periods and deliver water from the new water storage tank during high system demand periods. The location and alignment of the preferred Segment 3 components are shown in **Exhibit 5-6.**

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PLYMOUTH PIPELINE PROJECT
TABLE 5-8
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 1, PIPELINE SEGMENT 6
(MATULICH ALTERNATIVE)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST (ENRCCI-7480 August 2005)	ESTIMATED TOTAL COST
1	12" Water Main;	16,665	LF	$55.00	$916,575.00
	No Utility Conflicts				
2	12" Water Main;	6,000.0	LF	$60.00	$360,000.00
	Minor Utility Conflicts				
3	Gate Valves	12	EA	$2,500.00	$30,000.00
4	Fire Hydrants, 6" Hydrant	14	EA	$3,000.00	$42,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	28	EA	$1,000.00	$28,000.00
6	Air Relief Valves	6	EA	$3,500.00	$21,000.00
7	Grading Along Pipeline Easement	5,140	LF	$11.25	$57,825.00
8	Surface Along Pipeline Easement [1]	22,565	LF	$18.75	$423,100.00
9	Clearing Along Pipeline Easement	2.4	AC	$5,000.00	$12,000.00
10	Dry Creek Crossing	1	LS	$40,000.00	$40,000.00
11	Pipeline Easement Acquisition	22,565	LF	$12.00	$270,800.00
12	Point of Delivery, Plymouth	1	LS	$10,000.00	$10,000.00
	Water Storage Tank				
				Subtotal	**$2,211,300.00**
	Construction Contingencies	15%			$331,700.00
	Admin, Engineering, & Permits	15%			$331,700.00
	Inflation for 2006 Construction	2.5%			$55,300.00
	Total Estimated Construction Costs ALT 6-1				**$2,930,000.00**

Notes:
(1) Assumes a 12 foot wide surfaced access road with 6" thick AB @ $50/ton.

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PLYMOUTH PIPELINE PROJECT
TABLE 5-9
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 2, PIPELINE SEGMENT 6
(EVITT ALTERNATIVE)

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	12" Water Main;	14,375	LF	$55.00	$790,625.00
	No Utility Conflicts				
2	12" Water Main;	6,000	LF	$60.00	$360,000.00
	Minor Utility Conflicts				
3	Gate Valves	12	EA	$2,500.00	$30,000.00
4	Fire Hydrants, 6" Hydrant	14	EA	$3,000.00	$42,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	28	EA	$1,000.00	$28,000.00
6	Air Relief Valves	4	EA	$3,500.00	$14,000.00
7	Grading Along Pipeline Easement	4,400	LF	$11.25	$49,500.00
8	Surfacing Along Pipeline Easement	20,375	LF	$18.75	$382,050.00
9	Clearing Along Pipeline Easement	2	AC	$5,000.00	$10,000.00
10	Dry Creek Tributary Crossing	1	LS	$10,000.00	$10,000.00
11	Dry Creek Crossing	1	LS	$40,000.00	$40,000.00
12	Pipeline Easement Acquisition	20,375	LF	$12.00	$244,500.00
13	Point of Delivery, Plymouth	1	LS	$10,000.00	$10,000.00
	Water Storage Tank				
				Subtotal	**$2,010,675.00**
	Construction Contingencies	15%			$301,600.00
	Admin, Engineering, & Permits	15%			$301,600.00
	Inflation for 2006 Construction	2.5%			$50,300.00
					$2,664,175.00

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PLYMOUTH PIPELINE PROJECT
TABLE 5-10
PRELIMINARY COST ESTIMATE FOR CONSTRUCTION ALONG ALIGNMENT
ALTERNATIVE 3, PIPELINE SEGMENT 6
(GANSBERG ALTERNATIVE)

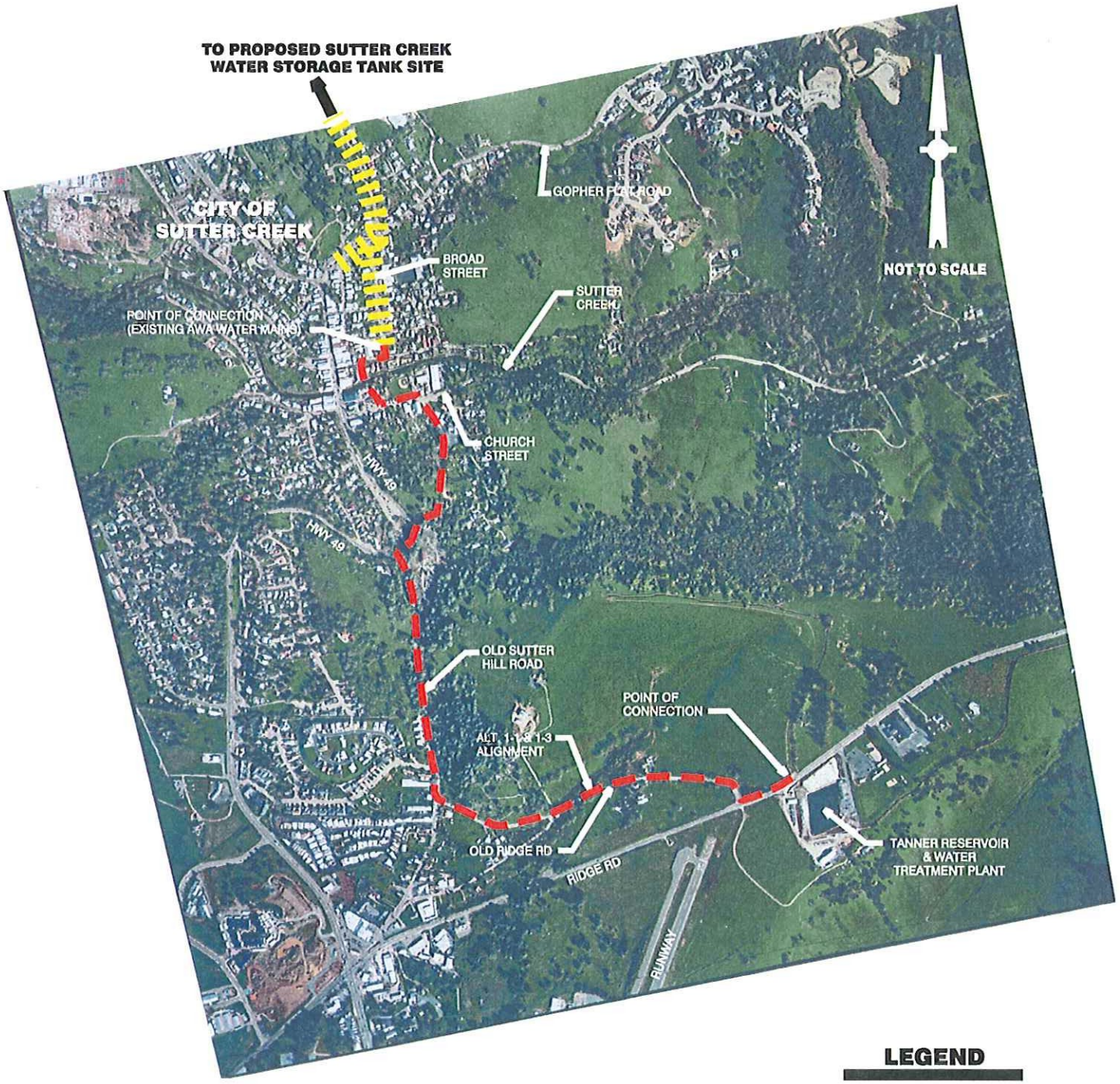
ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
1	12" Water Main;	18,875	LF	$55.00	$1,038,125.00
	No Utility Conflicts				
2	12" Water Main;	6,000	LF	$60.00	$360,000.00
	Minor Utility Conflicts				
3	Gate Valves	14	EA	$2,500.00	$35,000.00
4	Fire Hydrants, 6" Hydrant	16	EA	$3,000.00	$48,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	32	EA	$1,000.00	$32,000.00
6	Air Relief Valves	5	EA	$3,500.00	$17,500.00
7	Grading Along Pipeline Easement	7,900	LF	$11.25	$88,875.00
8	Surfacing Along Pipeline Easement	21,125	LF	$18.75	$396,100.00
9	Clearing Along Pipeline Easement	3.6	AC	$5,000.00	$18,000.00
10	AC Replacement (1)	3,750	LF	$9.00	$33,750.00
11	AC Pavement (1)	37,500	SF	$0.95	$35,625.00
12	Dry Creek Crossing	1	LS	$40,000.00	$40,000.00
13	Pipeline Easement Acquisition (2)	21,125	LF	$12.00	$253,500.00
14	Point of Delivery Plymouth	1	LS	$10,000.00	$10,000.00
	Water Storage Tank				
				Subtotal	**$2,406,475.00**
	Construction Contingencies	15%			$361,000.00
	Admin, Engineering, & Permits	15%			$361,000.00
	Inflation for 2006 Construction	2.5%			$60,175.00
	Total Estimated Cost Alternative 6-3				**$3,188,650.00**

Notes

(1) AC Replacement and AC Pavement required along the New Chicago Road Portion of alignment.

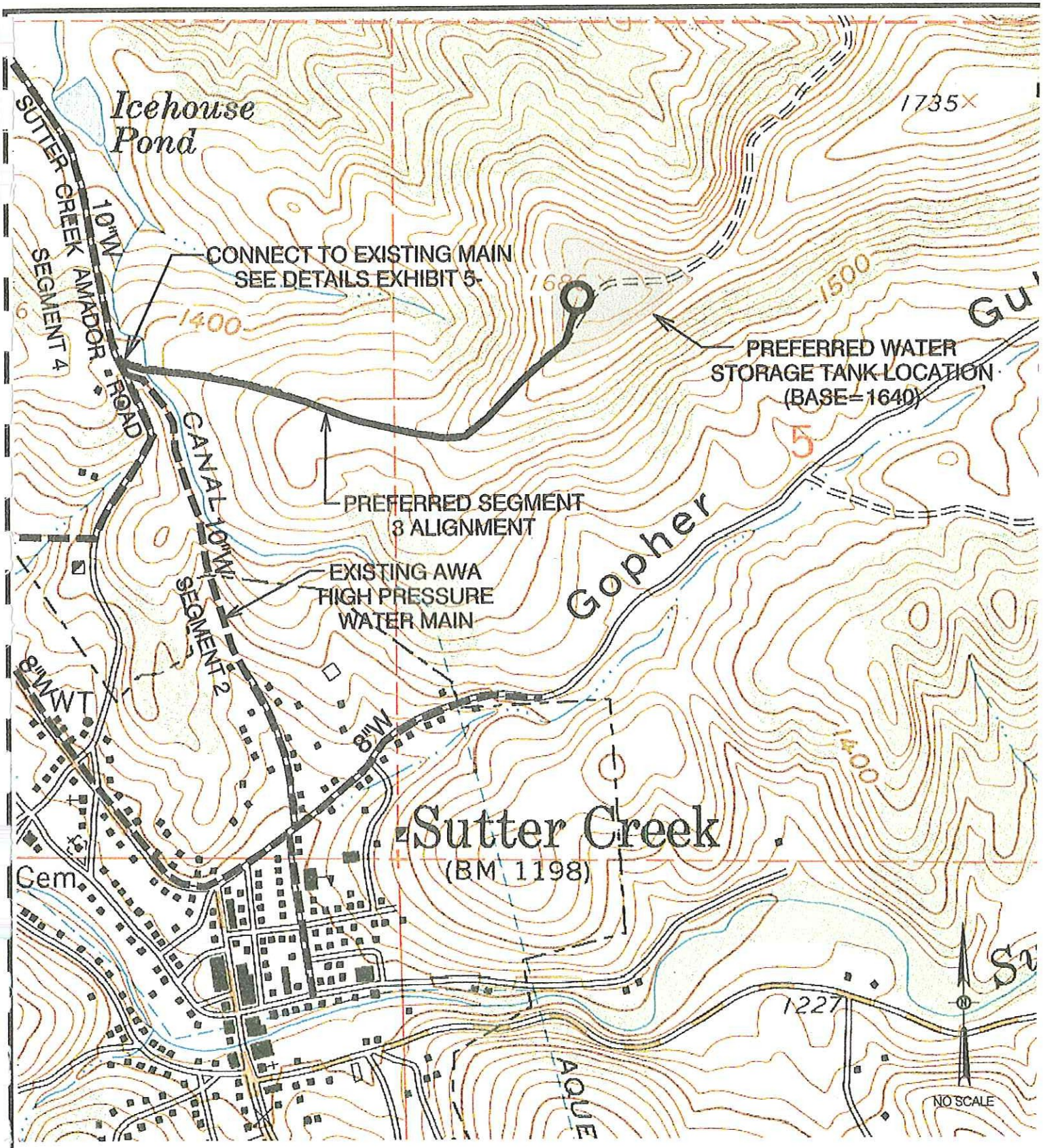
(2) Pipeline Easement acquisiton not required along New Chicago Road.



PLYMOUTH PIPELINE PROJECT

PREFERRED ALIGNMENT
SEGMENTS 1 & 2: TANNER WATER TREATMENT PLANT TO PROPOSED SUTTER CREEK WATER STORAGE TANK

EXHIBIT 5-5



PLYMOUTH PIPELINE PROJECT
PREFERRED ALIGNMENT SEGMENT 3

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Segment 4

The existing 10 inch water main constructed between Sutter Creek-Amador Road and the Amador City Pressure Regulating Station is adequate to serve the estimated 2025 maximum day and the 2025 maximum day plus fire flow demands of the Plymouth Pipeline Project. This main will experience high velocities and high head losses during peak demand periods, however, there is adequate head gained from the elevation difference between the beginning of Segment 4 and the Amador City Pressure Regulating Station to overcome these high head losses.

A new water main is recommended for construction from a point of connection ahead of the Amador City Pressure Regulating Station to Amador Creek Road. This new main would parallel the existing 8-inch diameter Amador City Supply main. The new main would operate at higher pressures than the 8 inch Amador City Main and would be regulated by a new Pressure Reducing Station. A new crossing of Amador Creek will be required. The location and alignment of the new Segment 4 pipeline is shown in **Exhibit 5-7.**

Segment 5

The preferred pipeline alignment for Segment 5 is Alternative 5-1. This alignment follows Amador Creek Road, East School Street and Bunker Hill Road. The alternative is estimated to be less costly than Alternate 5-2 and have less impact to cultural resources than Alternative 5-2. A pipeline placed along Alignment 5-1 could also be used to parallel and "back feed" Amador City and Drytown services with connection to the existing parallel water mains with a pressure reducing station. The preferred pipeline alignment for Segment 5 is also shown in Exhibit 5-7.

Segment 6

The preferred pipeline alignment for Segment 6 is Alternative 6-2, the Evitt Alignment. This alignment is approximately 10% (± 2,000 feet) shorter than the Matulich Alternative. It is estimated that alignment 6-2 is less costly than either alternative 6-1 or 6-3. The preferred pipeline alignment for Segment 6 is also shown in Exhibit 5-7.

Plymouth Pipeline Designs

With the preferred pipeline alignment selected proposed Plymouth Pipeline Project improvements were evaluated by conducting network modeling of the existing Amador Water Agency improvements and the existing Amador Water Agency improvements with the addition of the proposed Plymouth Pipeline improvements. The existing plus proposed pipeline improvements were then tested for capacities and pressures under average day, maximum day and maximum day plus fire flow demands assuming both current (year 2005) and projected (year 2025) service conditions.

Existing AWA System

The principal pipelines, reservoirs and PRV's of the existing AWA system are included in the Amador Water Agency Network Model. Pipeline sizes, material, connections and PRV settings were obtained from AWA engineering and operations personnel. In **Exhibit 5-8** existing pressures at selected nodes and PRV's are shown under average daily demand conditions. These have been reviewed with AWA staff. Results are summarized in **Table 5-11** (Existing Network, average day demands). In **Exhibit 5-9** existing pressures at selected nodes and PRV's are presented under existing maximum day demands. A 1.0 gpm per service demand, per AWA Standards, was used to approximate maximum day demand conditions. These results are also presented in Table 5-11.

In Exhibit 5-10 projected system pressures are presented under average day 2025 demands. This scenario assumes that the Plymouth Pipeline Project is not constructed. **Exhibit 5-11** includes system pressures under maximum day 2025 demands. This scenario also assumes no system improvements and no service to Plymouth. Results are summarized in Table 5-11. Year 2025 demands were estimated assuming a 4% per year growth rate for the existing Sutter Creek – Amador City – Drytown Service area.

Plymouth Pipeline Alternatives - Segment I

With baseline AWA system conditions established by the existing maximum day and 2025 maximum day results pipeline alternatives for each pipeline segment were evaluated using the network model. In each case construction of new pipelines along the preferred pipeline route was assumed. New PVC or HDPE pipe, with a Hazen Williams C=140, is assumed. In Segment 1, Tanner Reservoir to Eureka/Broad Street, alternative pipelines with 12", 14", 16" and 18" diameters were tested. Resultant pressures are presented in Table 5-11. Node pressures do not significantly improve with the increase in the Segment 1 Pipe diameter from 12" to 18". With a 12 inch diameter segment pipe, and 2025 maximum day demands, system pressures are not significantly lower than existing maximum day demand condition and are better than, or equal to, 2025 maximum day pressures determined for the existing system without improvements. A 4% per year increase in Sutter Creek, Amador City, Drytown and Plymouth demands is assumed in the determination of the 2025 demand conditions.

Recommendation: A 12 inch diameter water main is adequate for the Segment 1 Plymouth Pipeline project under 2025 maximum day demands. 2025 maximum day conditions with a 12 inch diameter pipeline constructed in Segment 1 are presented in **Exhibit 5-12.** A 12 inch diameter main constructed in Segment 3 and a 12 inch diameter main constructed in Segment 5 and Segment 6 are assumed in this analysis.

TABLE 5-11: SUMMARY OF AMADOR WATER AGENCY SYSTEM
COMPARISON OF PRESSURES WITH VARIOUS PLYMOUTH PIPELINE SCENARIOS

PRESSURES IN PSI

RANDOM SAMPLE OF NODES

NODE:	J-100	J-102	J-12	J-58	J-59	J-6	J-61	J-62	J-64	J-72	J-FHD1
EXISTING NETWORK (NO IMPROVEMENTS)											
AVERAGE DAY DEMANDS	59	65	156	118	220	87	161	133	58	99	143
MAXIMUM DAY DEMANDS	59	65	150	117	212	84	153	124	57	97	143
2025 AVERAGE DAY	59	65	148	117	210	84	151	122	57	97	143
2025 MAXIMUM DAY	59	62	119	114	177	73	116	86	54	91	140
EXISTING NETWORK PLUS SEGMENTS 1 AND 3 (NO CONNECTION TO PLYMOUTH)											
2025 MAXIMUM DAY	59	62	145	114	207	81	147	119	54	95	140
2025 MAXIMUM DAY DEMANDS WITH PIPELINE SEGMENT 1 ALTERNATIVES *											
SEGMENT 1: NO PIPE	59	64	134	114	197	77	136	110	57	93	142
SEGMENT 1: 6"	59	64	136	114	199	78	138	112	57	93	142
SEGMENT 1: 8"	59	64	139	114	200	79	140	113	57	94	142
SEGMENT 1: 10"	59	64	141	114	203	79	142	114	57	94	142
SEGMENT 1: 12"	59	64	144	114	205	80	144	115	57	95	142
SEGMENT 1: 14"	59	64	147	114	207	81	147	116	57	95	142
SEGMENT 1: 16"	59	64	149	114	209	82	149	117	57	96	142
SEGMENT 1: 18"	59	64	150	114	211	82	150	117	57	96	142
2025 MAXIMUM DAY DEMANDS WITH PIPELINE SEGMENT 3 ALTERNATIVES **											
SEGMENT 3: 6"	59	64	140	114	194	79	133	95	57	94	142
SEGMENT 3: 8"	59	64	142	114	199	80	139	105	57	94	142
SEGMENT 3: 10"	59	64	143	114	203	80	142	112	57	95	142
SEGMENT 3: 12"	59	64	144	114	205	80	144	115	57	95	142
SEGMENT 3: 14"	59	64	145	114	206	80	146	117	57	95	142
SEGMENT 3: 16"	59	64	145	114	207	81	146	118	57	95	142
SEGMENT 3: 18"	59	64	145	114	207	81	146	118	57	95	142

*** SEGMENT 1 ALTERNATIVES ASSUME:**
SEGMENT 3: 12" PIPE INSTALLED
SEGMENT 4: CONNECTION UPSTREAM OF AMADOR PRV WITH 12" PIPE
SEGMENT 5 & 6: 12" PIPE INSTALLED

**** SEGMENT 3 ALTERNATIVES ASSUME:**
SEGMENT 1: 12" PIPE INSTALLED
SEGMENT 4: CONNECTION UPSTREAM OF AMADOR PRV WITH 12" PIPE
SEGMENT 5 & 6: 12" PIPE INSTALLED

Plymouth Pipeline Alternatives – Segment 3

Segment 3 includes a new water main constructed form the existing Amador Water Agency main in Sutter Creek-Amador Road to/from the 1.5 MG water storage tank proposed on the Ed Swift Property at elevation 1640. As summarized in Table 5-11, increasing the diameter of this main from 12" to 18" does not significantly change pressures throughout the existing Sutter Creek-Amador City System. The 2025 maximum day conditions with a 12 inch main installed in Segment 3 results in system pressures which are not significantly lower than existing 2005 maximum day demand conditions and system pressures are equal to or better than 2025 maximum day conditions without the proposed Plymouth Pipeline Improvements.

Recommendation: A 12 inch diameter pipeline constructed in Segment 3 of the Plymouth Pipeline Project adequately meets 2025 maximum day demands. The Segment 3 finding assumes that a 12 inch main is constructed in Segment 1 and a 12 inch main is constructed in Segment 5 and 6.

Plymouth Pipeline Alternatives – Segment 4

Segment 4 includes the existing Amador Water Agency Pipeline constructed between Sutter Creek – Amador Road and a point of connection on Amador Creek Road downstream of the Amador City Pressure Regulating Station. Currently a 10 inch main is constructed upstream of the Amador Pressure Regulating Station and an 8 inch main is constructed downstream of the Amador Pressure Regulating Station. The elevation of the Amador City Pressure Regulating Station is approximately 1210. The downstream pressure is set at 18 psi to avoid overpressurizing Amador City. The mid-level Plymouth Tank elevation is approximately 1270. It is not possible to deliver water to the Plymouth Tank with a downstream head at the Pressure Regulating Station of 1210 ft. + 18 psi (2.31) = 1251 ft.

Recommendation: To avoid overpressurizing existing AWA services in Amador City and to provide adequate delivery pressures to the City of Plymouth Water Storage Tank, a new parallel pipeline must be constructed from the high pressure side of the Amador Pressure Regulating Station across Amador Creek to Amador Creek Road. A subsurface crossing of Amador Creek is proposed. The creek crossing would be included in the 404 Permit obtained for this project. A 12 inch main is proposed for Segment 4. A new (Plymouth) Pressure Regulating Station with a discharge pressure set at 90 psi is proposed. With a 12 inch main constructed for the parallel main in Segment 4 together with the proposed Segment 5 and Segment 6 mains, positive pressures would be maintained throughout the Plymouth Pipeline under 2005 and 2025 demand conditions. The maximum pipeline pressure (at the Dry Creek crossing) is less than 300 psi with this design.

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Plymouth Pipeline Alternatives – Segments 5 & 6

Ten inch diameter and twelve inch diameter pipeline alternatives were evaluated for Plymouth Pipeline Segments 5 and 6. While the 10 inch diameter pipeline alternative would be adequate for average and maximum day conditions in 2005, negative pressure at the Plymouth Tank delivery point occur when 2025 maximum day conditions are assumed. Maximum day plus fire flow conditions also result in negative pressures at the Plymouth Tank. Head loss and pressure conditions with a 10 inch diameter pipe constructed in Segment 5 and Segment 6 are summarized in **Table 5-12.**

With a 12 inch main constructed in Segments 5 and 6 adequate pressure is available to meet the 2005 and 2025 average day, maximum day and maximum day plus flow demand scenarios. These results are summarized in **Table 5-13.**

Recommendation: A 12 inch diameter main constructed in Segment 5 and Segment 6 of the Plymouth Pipeline Project is adequate to meet the 2025 demand conditions projected for the City of Plymouth

Evaluation of The Existing Amador Water Agency System and Plymouth Pipeline Project Alternatives under Fire Flow Conditions

The adequacy of existing Amador Water Agency improvements and the adequacy of proposed Plymouth Pipeline improvements to meet fire flow demands were tested as part of this analysis. In Exhibit 5-13 is presented a summary of conditions in the existing Sutter Creek to Amador City Service area with fire flows added to 2005 maximum day demands. Using the network model a fire flow of 750 gpm was applied, sequentially, to each of 97 existing service nodes. With each fire flow demand the entire system was then checked for pressures to remain in excess of 20 psi. If a node can deliver fire flows at 750 gpm and pressures throughout the system are maintained at 20 psi under maximum day demands the node "passes" the fire flow test. If under these maximum day plus fire flow conditions system pressures, anywhere in the system, drop below 20 psi, the node "fails" the fire flow test. As shown in **Exhibit 5-13**, and as summarized in Table 5-14, five nodes in the existing network, when tested under these maximum day plus fire flow conditions, resulted in pressures less than 20 psi at some location within the network.

In **Exhibit 5-14** is presented year 2025 maximum day demand conditions plus fire flows. As shown in this exhibit, and as summarized in **Table 5-14,** 17 of the 97 nodes within the existing Sutter Creek-Amador City service area failed the fire flow test criteria. In addition, pipeline segments along Spanish Road and Patricia Lane carried flows in excess of 7 feet per second under fire flow plus 2025 maximum day demands.

TABLE 5-14: SUMMARY OF AMADOR WATER AGENCY SYSTEM COMPARISON OF RESIDUAL PRESSURES RESULTING FROM FIRE FLOWS WITH VARIOUS PLYMOUTH PIPELINE SCENARIOS

	NO. NODES TESTED	NO. NODES FAILED	NO. NODES FAILED
EXISTING NETWORK			
AVERAGE DAY DEMANDS	97	5	5%
MAXIMUM DAY DEMANDS	97	5	5%
2025 AVERAGE DAY	97	5	5%
2025 MAXIMUM DAY	97	17	18%
2025 MAXIMUM DAY DEMANDS WITH PIPELINE SEGMENT 1 ALTERNATIVES *			
SEGMENT 1: 12"	107	14	13%
SEGMENT 1: 14"	107	14	13%
SEGMENT 1: 16"	107	14	13%
SEGMENT 1: 18"	107	14	13%
2025 MAXIMUM DAY DEMANDS WITH PIPELINE SEGMENT 3 ALTERNATIVES **			
SEGMENT 3: 12"	107	14	13%
SEGMENT 3: 14"	107	14	13%
SEGMENT 3: 16"	107	14	13%
SEGMENT 3: 18"	107	14	13%

TEST PROCESS:

DEMANDS AT EACH NODE ARE INCREASED STARTING FROM 0GPM TO 750GPM. THE ENTIRE SYSTEM IS CHECKED FOR MINIMUM RESIDUAL PRESSURE EQUAL TO 20PSI. IF A NODE IS ABLE TO FLOW 750GPM AND THE MINIMUM SYSTEM PRESSURE IS ABOVE 20PSI, THEN THE NODE PASSES THE FIRE FLOW TEST. IF NOT, THE NODE HAS FAILED.

*** SEGMENT 1 ALTERNATIVES ASSUME:**

SEGMENT 3: 12" PIPE INSTALLED
SEGMENT 4: CONNECTION UPSTREAM OF AMADOR PRV WITH 12" PIPE
SEGMENT 5 & 6: 12" PIPE INSTALLED

**** SEGMENT 3 ALTERNATIVES ASSUME:**

SEGMENT 1: 12" PIPE INSTALLED
SEGMENT 4: CONNECTION UPSTREAM OF AMADOR PRV WITH 12" PIPE
SEGMENT 5 & 6: 12" PIPE INSTALLED

Fire flow test results for the Plymouth Pipeline Segment 1 alternatives and 2025 maximum day demands are summarized in Table 5-14 and presented in **Exhibit 5-15**. With the Segment 1 pipeline modeled as a 12", 14", 16" and18" diameter pipe, a total of

14 of 107 nodes tested failed to meet the fire flow test criteria. As summarized in Table 5-14, no fewer failed fire flow test results occurred when the Segment 1 pipeline was increased in diameter from 12" to 18".

Recommendation: A 12 inch diameter pipeline constructed in Segment 1 did not result in any more failed fire test nodes than a 14, 16, or 18 inch diameter pipe evaluated for this segment.

Fire flow test results for Plymouth Pipeline Segment 3 alternatives and 2025 maximum day demands are summarized in Table 5-14 and are also shown in Exhibit 5-15. With the Segment 3 pipeline modeled as 12", 14", 16" or 18" pipe there were no changes in the number of nodes that failed the fire flow test criteria.

Recommendation: A 12 inch diameter pipeline constructed in Segment 3 does not result in any more failed fire test nodes than a 14, 16, or 18 inch diameter pipe evaluated for this segment.

In **Exhibit 5-16** is presented Plymouth Pipeline Project results with 2025 maximum day demands plus a fire flow added to the most remote location along Segment 5. With a 750 gpm fire flow assumed at the intersection of New Chicago Road and Bunker Hill, positive pressure is still available at the Plymouth Storage Tank delivery point. This finding assumes that Plymouth Pipeline Segments 5 and 6 are improved with 12 inch diameter mains. As previously presented in Table 5-13, positive pressures cannot be maintained under maximum day plus fire flow demands with a 10" diameter pipe installed in Segment 5 and 6.

Recommendation: A 12 inch diameter pipeline constructed in Segment 5 and Segment 6 will adequately convey 2025 maximum day plus fire flow demands to the end of Segment 5. Segment 6 crosses undeveloped pasture land and vineyards. If development should occur along Segment 6 an additional storage tank placed along this segment would be required to meet 2025 maximum demand plus fire flows in this segment. As previously discussed in this PER, the city should evaluate the adequacy of the 500,000 gallon Plymouth Water Storage when growth, and additional maximum day demands, occur.

Summary of Plymouth Pipeline Design Recommendations

- A 12 inch diameter pipeline is recommended for Pipeline Segment 1
- A 12 inch diameter pipeline is recommended for Pipeline Segment 3
- In Segment 4 a new 12 inch diameter water main is recommended to parallel the existing 8-inch Amador City Main from the Amador City Regulating Station to Amador Creek Road

- A 12 inch diameter pipeline is recommended for Pipeline Segment 5
- A 12 inch diameter pipeline is recommended for Pipeline Segment 6
- Additional demands in the Plymouth Service area beyond those projected for the 2025 maximum day conditions will require a new (parallel on replacement) water main in Segment 4 between Sutter Creek Amador Road and the Amador City Pressure Regulating Station
- If new development occurs along Pipeline Segment 6 an additional water storage tank constructed along this segment may be required.

SUMMARY – PLYMOUTH PIPELINE PROJECT RECOMMENDATIONS AND ESTIMATED COSTS

In **Table 5-15** is presented a summary of the Plymouth Pipeline components and costs. A new 12-inch water main constructed along Pipeline Segment 1-3 (Gold Dust Trail) is recommended. Continued use of existing Pipeline Segment 2 facilities is recommended with no modifications or costs proposed as part of the Plymouth Pipeline Project. A new 12-inch water main constructed between the existing 10-inch main in Sutter Creek-Amador Road and a 1.5 MG water storage tank constructed on the Ed Swift Property at (base) elevation 1,640 is recommended. Continued use of the existing 10-inch water main in Segment 4 upstream of the Amador City Pressure Regulating Station is recommended. A new 12-inch water man constructed parallel to the 8-inch Amador City main between the Amador City Pressure Regulating Station and Amador Creek Road is recommended. Pressures in this new main should be regulated with a new (Plymouth) Pressure Regulating Station.

For Pipeline Segment 5 a new 12-inch main constructed along Alternative Alignment 5-1 (Amador Creek Road – East School Street – Bunker Hill Road) is recommended. Connection should be provided, through a Pressure Regulating Station, to back feed the parallel Amador City and Drytown water mains. For Pipeline Segment 6 a new 12-inch water main constructed along Alternative Alignment 6-2 (Evitt Alternative) is recommended.

CONSULTING KASL ENGINEERS

PLYMOUTH PIPELINE PROJECT
TABLE 5-15
SUMMARY OF COST ESTIMATES AND
PIPELINE SEGMENT RECOMMENDATIONS

ENRCCI-7480
August 2005

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
	SEGMENT 1 - 12" MAIN, ALT. ALIGNMENT 1-3				
1	Point of Connection	1	LS	$20,000.00	$20,000.00
	Tanner Reservoir				
2	12" Water Main	6,500	LF	$60.00	$390,000.00
	Minor Utility Conflicts				
3	12" Water Main	1,200	LF	$80.00	$96,000.00
	Moderate Utility Conflicts				
4	12" Water Main	500	LF	$100.00	$50,000.00
	Major Utility Conflicts				
5	12" Butterfly Valves	6	EA	$2,500.00	$15,000.00
6	Fire Hydrants, 6" Hydrant	8	EA	$3,000.00	$24,000.00
	lead, 6" Valve				
7	Miscellaneous Fittings	24	EA	$1,000.00	$24,000.00
8	Air Relief Valves	3	EA	$3,500.00	$10,500.00
9	AC Replacement	7,400	LF	$12.50	$92,500.00
10	AC Pavement	74,000	SF	$1.25	$92,500.00
11	Point of Connection	1	LS	$10,000.00	$10,000.00
	Eureka and Broad Street				
12	Grading and Surfacing	800	LF	$30.00	$24,000.00
	Gold Dust Trail				
13	Traffic Control	12	DAY	$1,500.00	$18,000.00
14	Pedestrian Bridge	1	LS	$175,000.00	$175,000.00
	at Sutter Creek				
				Subtotal	**$1,041,500.00**
				Estimated	
				Segment 1	
				Costs	

TABLE 5-15 (cont.)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
	SEGMENT 3 - 12" MAIN AND 1.5 MG WATER STORAGE TANK				
1	Point of Connection	1	LS	$10,000.00	$10,000.00
	Sutter Creek-Amador Road				
2	12" Water Main	3,000	LF	$55.00	$165,000.00
	No Utility Conflicts				
3	12" Gate Valves	3	EA	$2,500.00	$7,500.00
4	Fire Hydrants, 6" Hydrant	2	EA	$3,000.00	$6,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	6	EA	$1,000.00	$6,000.00
6	1.5 MG Water Storage Tank	1,500,000	GAL	$0.60	$900,000.00
7	Tank Site Preparation	1	LS	$75,000.00	$75,000.00
	and Foundation				
8	Tank Site Electrical and SCADA	1	LS	$50,000.00	$50,000.00
9	Tank Inlet/Outlet Valving	1	LS	$50,000.00	$50,000.00
10	Tank Site Fencing	800	LF	$25.00	$20,000.00
11	Tank Site Gate	1	LS	$1,500.00	$1,500.00
12	Grading and Surfacing Access Road	3,300	LF	$30.00	$99,000.00
13	Retaining Wall	400	LF	$200.00	$80,000.00
14	Site Landscape and Screening	4,000	SF	$3.00	$12,000.00
15	Site Driveway and Surfacing	8,000	SF	$1.50	$12,000.00
16	Tank Site Fee Title	1	AL	$50,000.00	$50,000.00
17	Access Road Easement	3,000	LF	$12.00	$36,000.00
18	Solenoid Valve and Check Valve	1	LS	$90,000.00	$90,000.00
	Assembly at POC				
				Subtotal	**$1,670,000.00**
				Estimated	
				Segment 3	
				Costs	

TABLE 5-15 (cont.)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
	SEGMENT 4 - 12" MAIN				
1	Point of Connection - Existing 10" Water Main Upstream of Amador City PRV Station	1	LS	$10,000.00	$10,000.00
2	Plymouth Pressure Reducing Valve Station	1	LS	$70,000.00	$70,000.00
3	Clearing Along Pipeline Alignment	0.8	AC	$10,000.00	$8,000.00
4	Grading and Surfacing Along Pipeline Easement	1,800	LF	$30.00	$54,000.00
5	12" Water Main; No Utility Conflicts	1,700	LF	$55.00	$93,500.00
6	12" Butterfly Valves	2	EA	$2,500.00	$5,000.00
7	Fire Hydrants, 6" Hydrant leads and 6" Valves	1	EA	$3,000.00	$3,000.00
8	Miscellaneous Fittings	4	EA	$1,000.00	$4,000.00
9	Amador Creek Crossing	100	LF	$200.00	$20,000.00
10	Pipeline Easement Acquisition	1,800	LF	$12.00	$21,600.00
				Subtotal	**$289,100.00**
				Estimated	
				Segment 4	
				Costs	

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
	SEGMENT 5 - 12" MAIN, ALT. ALIGNMENT 5-1				
1	12" Water Main; Minor Utility Conflicts	10,800	LF	$60.00	$648,000.00
2	Gate Valves	8	EA	$2,500.00	$20,000.00
3	Fire Hydrants, 6" Hydrant leads and 6" Valves	7	EA	$3,000.00	$21,000.00
4	Miscellaneous Fittings	12	EA	$1,000.00	$12,000.00
5	Air Relief Valves	4	EA	$3,500.00	$14,000.00
6	AC Replacement	10,800	LF	$9.00	$97,200.00
7	AC Pavement	108,000	SF	$0.95	$102,600.00
8	Rancheria Creek Crossing	1	LS	$20,000.00	$20,000.00
9	Traffic Control	36	DAY	$1,500.00	$54,000.00
				Subtotal	**$988,800.00**
				Estimated	
				Segment 5	
				Costs	

TABLE 5-15 (cont.)

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	ESTIMATED UNIT COST	ESTIMATED TOTAL COST
	SEGMENT 6 - 12" MAIN, ALT. ALIGNMENT 6-2 AND 1.5 MG WATER STORAGE TANK				
1	12" Water Main;	14,375	LF	$55.00	$790,625.00
	No Utility Conflicts				
2	12" Water Main;	6,000	LF	$60.00	$360,000.00
	Minor Utility Conflicts				
3	Gate Valves	12	EA	$2,500.00	$30,000.00
4	Fire Hydrants, 6" Hydrant	14	EA	$3,000.00	$42,000.00
	leads and 6" Valves				
5	Miscellaneous Fittings	28	EA	$1,000.00	$28,000.00
6	Air Relief Valves	4	EA	$3,500.00	$14,000.00
7	Grading Along Pipeline Easement	4,400	LF	$11.25	$49,500.00
8	Surfacing Along Pipeline Easement	20,375	LF	$18.75	$382,050.00
9	Clearing Along Pipeline Easement	2	AC	$5,000.00	$10,000.00
10	Dry Creek Tributary Crossing	1	LS	$10,000.00	$10,000.00
11	Dry Creek Crossing	1	LS	$40,000.00	$40,000.00
12	Pipeline Easement Acquisition	20,375	LF	$12.00	$244,500.00
13	Point of Delivery, Plymouth	1	LS	$10,000.00	$10,000.00
	Water Storage Tank				
				Subtotal	**$2,010,675.00**
				Estimated	
				Segment 6	
				Costs	

SUBTOTAL, ESTIMATED SEGMENT COSTS		**$6,000,075.00**
Construction Contingencies	15%	$900,000.00
Engineering, Const. Admin., Env. Processing	13%	$780,000.00
Inflation for 2006 Construction	2.5%	$150,000.00
TOTAL ESTIMATED PLYMOUTH PIPELINE PROJECT COSTS		**$7,830,075.00**

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PLYMOUTH RESERVOIR ALTERNATIVE

The Plymouth Reservoir Alternative was first evaluated in a 1990 report "A Study of Water Supply for the City of Plymouth" (David Willer). An 860 acre-foot capacity reservoir on Big Indian Creek was recommended as the most financially feasible alternative. This reservoir project was identified as "a first phase" in the implementation of an overall water plan for the Plymouth area.

In 1996 the Big Indian Creek Reservoir alternative was modified. A 1500 acre-foot (ac-ft) capacity was proposed. Cultural resources found in the area of the originally proposed reservoir site forced relocation of the reservoir to an off-stream location near the previously proposed Big Indian Creek site. The location proposed for this 1500 ac-ft capacity reservoir site is shown in **Exhibit 5-17**. The reservoir site is located between Big Indian Creek, Blood Gulch and the Arroyo Ditch.

The Plymouth Reservoir alternative includes an earth fill dam with maximum crest height of 60 feet. A crest elevation of 1154 and a crest length of 1125 are recommended. The reservoir would have a capacity of 1500 ac-ft at a design water surface elevation of 1150. The reservoir would inundate 80 acres. Based on the "Plymouth Reservoir Hydrology Report" prepared in March 1994 (Jon Coburn, John German) the reservoir was determined to have a firm yield of approximately 400 ac-ft. The Plymouth Reservoir would intercept water from Big Indian Creek and Blood Gulch and transport the water stored to the existing City of Plymouth Pump Station via a 12-inch diameter pipeline. Raw water would then be lifted from the existing pump station to the Plymouth Water Treatment Plant. The Plymouth Reservoir Dam, two smaller berm dams, dam spillway, diversion on Big Indian Creek and the 12-inch diameter pipe from the Plymouth Pipeline to the existing pump station are the main components of the Plymouth Reservoir Project.

Detailed cost estimates for the Plymouth Reservoir Project are included in the 1996 Water Supply Study (German Engineering). A summary of this cost estimate is as follows:

Planning / Administration / Legal / Design	$277,300
Construction	$1,402,483
Agency Fees	$34,350
Land Acquisitions Costs	$383,000
(1996) Estimated Project Costs	$2,097,133

In October 2002, Plymouth Reservoir costs were updated as part of the Reservoir permit application process. A summary of the October 2002 cost estimate is as follows:

• Planning (includes Environmental Documents)	$438,721
• Assessment District Formation	$133,761
• Design	$305,266
• Construction Administration, Testing	$281,778
• Legal and Grant Administration	$1,247,356
• Construction Costs	$4,650,738
• Agency Fees	$66,399
• Land Acquisition	$2,766,980
(2002) Estimated Project Costs	$8,731,473

Between 1996 and 2002 the Plymouth Reservoir Project experienced significant increases in the construction costs, legal and administrative costs and land acquisition costs.

The 2002 cost estimate was based on an Engineering News Record Construction Cost (ENRCC) Index of 6396. To provide a reasonable comparison between the most recent cost estimates prepared for the Plymouth Reservoir and the cost estimates presented in this PER for the Plymouth Pipeline Alternatives the October 2002 costs should be inflated to reflect mid 2006 construction cost conditions. An ENRCC Index of 7355 is used in this PER for mid 2006 conditions. Applying a ratio of 7355 / 6396 or 15% to the October 2002 costs results in the following updated estimates:

• Planning	$504,502
• Assessment District Formation	$153,817
• Design	$351,037
• Construction Administration, Testing	$324,027
• Legal and Grant Administration	$1,434,381

- Construction Costs $5,348,058
- Agency Fees $76,355
- Land Acquisition $3,181,854

(2006) Estimated Project Costs $10,040,648

As summarized above, the Plymouth Reservoir Project is projected to be more costly than the Plymouth Pipeline Alternative. In addition, the City has not been able to obtain the necessary Corps of Engineers Individual 404 Permit to allow construction of this facility. Finally, the proposed reservoir project was designed to meet existing maximum day demands but did not provide any additional capacity for growth. According to the 1996 Water Supply Study, "The Plymouth Reservoir is not expected to sustain these (General Plan) populations and land use growth projections. The proposed reservoir is intended to more safely and adequately sustain the City's present population plus approximately 12% growth". At the time the 1996 report was prepared the City of Plymouth included a service population of approximately 950 persons. With allowance for the 12% growth estimated in the 1996 Study the Plymouth Reservoir would serve an estimated population of approximately 1065 persons. This is approximately the population which is now present in the City's service area.

The Plymouth Pipeline Project has been designed to serve a 4% per year growth rate over a 20 year period. The Pipeline Project has been designed to serve a projected 2025 population of approximately 2130 persons.

ARROYO DITCH ALTERNATIVE

The Arroyo Ditch, originally constructed in the 1860's is a 17 mile, open, unlined canal that conveys water from the Consumnes River to the City of Plymouth. The ditch was purchased from Amador County in the late 1980's. Since that time the City has been responsible for operation and maintenance of the ditch. Over the past 140 + years 10 to 34 cfs has been diverted into the Arroyo Ditch from the Consumnes River. Under present conditions only 1 to 2 cfs is actually delivered to the City of Plymouth. A location map for the Arroyo Ditch is resented in **Exhibit 5-18**.

In 2003, ECO:LOGIC, under contract to the City of Plymouth, conducted a "first order" engineering study to estimate the major capital improvements and costs associated with improving the reliability of the ditch system as a firm supply of water. Estimates were made based on rehabilitation of large sections of ditch. Rehabilitation assumed that the ditch would be encased in 30-inch corrugated metal pipe. It should be noted that previous engineering studies suggested replacing the ditch with 24-inch diameter high density polyethylene (HDP) pipe. The carrying capacity of a 24" diameter smooth wall HDPE pipe is comparable to a 30" CMP. In 2003 the estimated cost to pipe the ditch with a 30" CMP was $10.40 / inch-diameter-foot. This cost estimate included

pipe installation, engineering, administration and inspection and also attempted to account for surveying, design, inspection and work to establish access to the ditch . The unit costs estimated by ECO:LOGIC in 2003 are comparable to cost estimates prepared by Amador Water Agency for replacement of the Amador Canal with the 30-inch diameter Amador Pipeline Project.

A range of costs were developed in the 2003 study based on rehabilitating 25% to 100% of the entire ditch length. These estimates are summarized as follows:

Percentage of Ditch Encased in Pipeline	Linear Footage	Estimated Cost
25%	22,500	$7,020,000
50%	45,000	$14,040,000
100%	90,000	$28,080,000

Based on review of existing ditch conditions, known water losses and identified problem areas it is reasonable to assume that encasing only 25% of the ditch will not be adequate to establish the ditch as a firm system of supply. ECO:LOGIC assumed encasing 50 to 100 percent of the ditch to develop a range of costs.

The Consumnes River cannot provide sufficient water year round and historically wells have been used by the City to meet supply demands during summer – fall periods. As part of the Arroyo Ditch Alternative, a raw water storage reservoir must be developed to maintain delivery of water to the Plymouth Water Treatment Plant during seasonal interruptions in supply. In this 2003 study ECO:LOGIC used storage reservoirs with a capacity of 600 ac-feet and 1500 ac-feet to estimate the range of storage reservoir capacities and costs that would be needed to supplement the Arroyo Ditch Project. The estimated range of these reservoir costs is as follows:

Reservoir Capacity	Estimated Cost
600 ac-feet	$6,000,000
1,500 ac-feet	$10,000,000

The $10,000,000 estimate for the 1500 ac-ft capacity reservoir is consistent with the projected 2006 costs previously presented for the 1500 ac-ft capacity Plymouth Reservoir Project.

The existing capacity of the Plymouth Water Treatment Plant is 450 gpm. This capacity meets, or nearly meets, the existing maximum day demand of 670,000 gallons per day. To compare the Arroyo Ditch Alternative with the Plymouth Pipeline Project, costs should also be included to expand the plant from 450 gpm to at least 900 gpm.

The cost to expand the existing water treatment plant to provide not less than 900 gpm (1.3 MGD) capacity is estimated at $1.5 to $2.0 million. A summary of costs estimated for the Arroyo Ditch Alternative is as follows:

	Low Range	High Range
Ditch Rehabilitation	$14,040,000	$28,080,000
Storage Reservoir	$6,000,000	$10,000,000
Treatment Plant Expansion	$1,500,000	$2,000,000
Estimated Total Costs	$21,540,000	$40,080,000

Even if the low range of costs is assumed, the Arroyo Ditch Alternative is not cost effective when compared to the Plymouth Pipeline Alternative.

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VI. EVALUATION OF PROJECT ALTERNATIVES

In Section V of this PER, Plymouth Pipeline Project Alternatives were presented along with the Plymouth Reservoir and the Arroyo Ditch Alternatives. In this section of this report these alternative water supply systems are evaluated with respect to initial costs, annual operation and maintenance costs, reliability, constructability, capacity, ease of expansion, public health, safety and security.

INITIAL PROJECT COSTS

Initial project costs include planning, design, environmental processing, permits, land acquisition costs, construction costs, administrative and legal costs. The initial costs estimated for the Plymouth Pipeline Project were previously presented in Table 5-15.

The estimated initial costs for the Plymouth Reservoir and for the Arroyo Ditch Alternative were also presented in Section V. A summary of initial costs estimated for each alternative are presented in **Table 6-1.**

TABLE 6-1
SUMMARY COMPARISON OF INITIAL COSTS –
PLYMOUTH PROJECT ALTERNATIVES

Project Alternative	Estimated Initial Costs*
Plymouth Pipeline	$7,830,075
Plymouth Reservoir	$10,040,648
Arroyo Ditch	$21,540,000 (low range) to $40,080,000 (high range)

* Initial costs estimated for project construction in 2006 and includes planning, design, environmental processing, permits, land acquisition costs, construction costs, legal and administrative costs.

As summarized in Table 6-1, initial costs estimated for the Plymouth Pipeline alternative are lower than initial costs estimated for either the Plymouth Reservoir or the Arroyo Ditch Alternative.

ANNUAL COSTS

Plymouth Pipeline Alternative

Annual project costs estimated for the Plymouth Pipeline Project would include Plymouth's share of operating and maintaining a water main constructed from the Tanner Water Treatment Plant, Plymouth's share of operating and maintaining the Tanner Water Treatment Plant and Plymouth's share of operating and maintaining the raw water transmission system from Lake Tabeaud to the Tanner Water Treatment Plant. Plymouth would pay their share of these costs through commodity charges and master meter charges assessed by Amador Water Agency. Based on current commodity charges assessed by the Water Agency to Drytown and a current average daily water demand of 300,000 gallons per day, the initial annual commodity costs to Plymouth are estimated at:

$$\frac{\frac{\$0.88}{100\ ft^3} \times 300{,}000\ \frac{gal}{day} \times \frac{365\ day}{year}}{7.48\ gal / ft^3} = \$128{,}825 / year,\ estimated\ initial\ annual\ commodity\ charge$$

It is assumed that a master meter will be installed at a point of connection between the new Plymouth Pipeline and the existing Plymouth Water Storage Tank. This point of connection will be finalized as part of the MOU executed between the City and the Agency. Based on a maximum rate of flow projected through the Plymouth meter of:

$$\frac{1{,}250\ \frac{gpd}{ESFR} \times 1{,}065\ ESFR}{1{,}440\ min / day} = 925\ gpm$$

or the rate that the 500,000 gallon Plymouth Tank would refill (in 8 hours) after a fire or peak day demand:

$$\frac{500{,}000\ gallons}{8\ hrs \times 60\ min/hr} = 1{,}042\ gpm$$

a 6-inch master meter would be adequate to serve the City of Plymouth.

Monthly meter charges applicable to a 6" City of Plymouth meter can be estimated from the current charges that the Agency assesses Drytown (2" meter), the City of Jackson (8" meter) and Mule Creek State Prison (8" or 10" meter). Based on these charges, a monthly meter charge between $1,500 and $2,000 is appropriate. For the purpose of this estimate a $1,750 per month meter charge is assumed for a total annual meter charge of:

$21,000 / year, estimated annual meter charge

Debt service will be a significant component of annual costs. To determine these costs the following assumptions were made:

- USDA Rural Utilities Services loans can be obtained for a 40 year period and a 4.5% interest rate. The annual Capital Recovery Rate (debt service) for a 40 year loan at 4.5% = 0.0543 of the loan amount.

- Plymouth would pay the Amador Water Agency an initial participation fee of $2,500 per ESFR. For the existing 536 ESFR's in Plymouth, the total participation fees are estimated at $1,340,000.

- The City and the Water Agency have calculated Plymouth's share of the Plymouth Pipeline Project at $4,654,595 or approximately 59.5% of the total estimated project cost of $7,830,075. The final share determination will be included in the MOU executed between the City and the Water Agency.

- The City will obtain a $3,000,000 USDA RUS Grant and a $500,000 CDBG Grant to help reduce their share of the Plymouth Pipeline cost. The City's net project costs to be financed are therefore estimated at:

  $4,654,595 - $3,500,000 = $1,154,595.

- To stabilize funds for the first 3 years of the project, the City would "hold back" $200,000 of the Grant Funds

- The principal to be financed with the USDA loan is therefore:

$1,154,595 (Plymouth's Local Share Less Grant Funding)	+ $200,000 (Rate Stabilization Fund)	+ $1,340,000 (Initial Participation Fees to Agency)	P = $2,694,595
Annual Debt Service	= (P) (CRF)	= ($2,694,595) (.0543)	= $146,315 / year Estimated annual debt service

With completion of the Plymouth Pipeline Project, annual operating expenses for the Plymouth Treatment Plant, municipal wells and Arroyo Ditch pump would be significantly reduced. Current (2005 / 2006) operating expenses, as summarized in **Table 3-4,** are approximately $263,019. Approximately $200,000 of this total would be affected by placing the Plymouth Water Treatment Plant, wells and Arroyo Ditch Pump Station on "standby". It is conservatively estimated that with the Plymouth Pipeline Project, the current water system operating expenses would be reduced by $150,000, annually, to $113,019. It is assumed that $10,000 per year would be retained for Arroyo Ditch maintenance. It is assumed that $25,000 per year would be retained in the

operating budget for plant "standby" operating funds. Annual operating expenses are therefore estimated at:

$263,019 (2006-2005) Budget	- $150,000 (Reduction for Significantly Reduced Op.)	+ $10,000 (Arroyo Ditch Maintenance Fund)	+$25,000 (WTP Reserve) Fund)	= $148,020 / year (first year) operating expenses

When a 5% inflation factor is applied to approximate 2006 – 2007 budget conditions an estimated first year annual operating cost of $155,424 / year is obtained.

Currently water system personnel costs are $16,476 per year. Adjusting these current annual costs for a 2006 – 2007 budget results in a $17,300, first year, personnel cost estimate.

The estimated, first year cost for the Plymouth Pipeline Alternative is summarized as follows:

• $128,825	Commodity charge
• $ 21,000	Meter charge
• $146,315	Debt service
• $155,425	First year operating cost
• $ 17,300	First year personnel cost
$468,865	Estimated (first year) annual operating and maintenance cost

Plymouth Reservoir Alternative

The estimated initial cost of the Plymouth Reservoir Alternative is $10,040,648. Unlike the Plymouth Pipeline Project, the Amador Water Agency would not participate in the cost of this project. The City obtained $1,000,000 in grant funds for the Reservoir Project. It is assumed that the City could obtain additional grant funding for this project similar to the grant funding projected for the Plymouth Pipeline Alternative. The project cost to be funded through loans is therefore estimated at:

$10,040,648 - $4,500,00 USDA and CDBG Grants = $5,540,648 to be financed through USDA loans.

The annual debt service for this loan amount, assuming a 40 year loan at 4.5%, would be:

$5,540,648 x 0.0543 = $300,855 / year estimated annual debt service.

In the 1996 Plymouth Water Supply Study (German Engineering) annual operations and maintenance costs for the Plymouth Reservoir were estimated at

$15,000 per year. Adjusting this August 1996 estimate to 2006 conditions would result in a first year annual reservoir maintenance cost of:

$24,420 / year estimated reservoir O & M costs.

With the Plymouth Reservoir, the Plymouth Water Treatment Plant would continue to operate. The 2005 / 2006 operating expenses of $263,019 would be reduced by approximately 10% to account for reduced well operation but increased for additional Arroyo Ditch pump operation. Adjusting this 2005 / 2006 total for 2006 / 2007 conditions results in an annual treatment plant operating cost of:

$248,555, first year, estimated operating costs.

Personnel costs are estimated at:

$17,300, first year, estimated personnel costs.

same as the Plymouth Pipeline Alternative.

A summary of the first year costs estimated for the Plymouth Reservoir Alternative are as follows:

• $300,855	Debt service
• $ 24,420	Reservoir maintenance costs
• $248,555	First year operating costs
• $ 17,300	First year personnel costs
$591,130	Estimated first year annual costs

Arroyo Ditch Alternative

The estimated (low range) initial cost of the Arroyo Ditch Alternative is $21,540,000. Assuming that the City is successful in obtaining a USDA Grant and CDBG Grant similar to the Plymouth Pipeline Project, the local share to be financed is estimated at $18,040,000. Assuming that a USDA loan could be obtained for a 40 year period and an interest rate of 4.5%, the annual debt service would be:

($18,040,000) (0.0543) = $979,570 annual debt service.

Annual ditch maintenance costs were estimated in the 1993 ECO:LOGIC study at $222,000. This estimate assumed 1.5 full time ditch tenders for inspection, routine maintenance and operation plus 2.5 additional laborers for seasonal (3 week) ditch maintenance work.

$222,000 = Estimated annual ditch maintenance cost.

As previously discussed, implementation of the Arroyo Ditch Alternative requires that a raw water reservoir be constructed to provide storage during seasonal fluctuations in the raw water supply. An annual reservoir maintenance cost of:

$24,420 = Annual reservoir maintenance costs

is estimated based on the previous Plymouth Reservoir estimate.

With the ditch alternative, operation of the Plymouth Water Treatment Plant would still be required. Annual Treatment plant operating and personnel costs consistent with the previous Plymouth Reservoir Alternative are as follows:

- $248,555 first year operating costs
- $ 17,300 first year personnel costs

A summary of the annual Arroyo Ditch Alternative costs are as follows:

- $979,570 Debt service
- $222,000 Ditch maintenance costs
- $ 24,420 Reservoir maintenance costs
- $248,555 First year operating costs
- $ 17,300 First year personnel costs
- $1,491,855 Estimated first year annual costs

A summary of estimated, first year, costs for each alternative is presented in **Table 6-2.**

TABLE 6-2
SUMMARY COMPARISON OF
ANNUAL COSTS – PLYMOUTH PROJECT ALTERNATIVES

Project Alternative	Estimated First Year Annual Costs
Plymouth Pipeline	$ 468,865
Plymouth Reservoir	$ 591,130
Arroyo Ditch	$1,491,855

As summarized above, the annual costs estimated for the Plymouth Pipeline Project are lower than the annual costs estimated for either the Plymouth Reservoir or the Arroyo Ditch Alternative.

RELIABILITY

Plymouth Pipeline Alternative

The Amador Water Agency is entitled to divert up to 15,000 acre feet annually from the Mokelumne River stored in Lake Taubeaud and may convey this annual entitlement to the Tanner Water Treatment Facility at a rate up to 30 cfs. Water directed from the Mokelumne River and treated at the Tanner Water Treatment Plant would be conveyed to the City of Plymouth via the Plymouth Pipeline Improvements. Multiple and redundant treatment plant "trains" are provided at the Tanner Water Treatment Plant to deliver treated water to the City of Plymouth. The 1.5 MG water storage tank proposed as part of Segment 3 of the Plymouth Pipeline Project would further enhance system reliability. The Plymouth Pipeline Project can reliably serve the existing City of Plymouth demands plus a 20 year, 4% per year, growth rate.

Plymouth Reservoir Project

The Plymouth Reservoir Project would rely on winter and spring runoff from the Big Indian Creek and Blood Gulch to supplement raw water flows from the Arroyo Ditch. During drought year conditions, a firm yield of 400 ac–ft was projected in the 1996 Water Supply Study for the 1,500 acre-ft capacity reservoir. In the 1996 study it was estimated that this firm yield would serve existing City of Plymouth demands with no capacity to service additional, future demands.

Arroyo Ditch Alternative

The Arroyo Ditch relies on the transport of water available from the Cosumnes River to the City of Plymouth. In **Table 6-3** is presented a summary of average monthly and annual stream flows measured in the Cosumnes River near the Arroyo Ditch diversion and in the Mokelumne River near the diversion to Lake Tabeaud. As shown, during critical summer time periods, flows available in the Mokelumne River are approximately 10 to 30 times greater than the flows available in the Cosumnes River. The Mokelumne River is a more reliable source of water to serve the City of Plymouth than the Cosumnes River.

CONSTRUCTABILITY

Plymouth Pipeline Alternative

Most of the Plymouth Pipeline Project is proposed within existing paved roadways, unpaved roadways, ranch roads and vineyard roads. Access is available to construct all of the pipeline of the Plymouth Pipeline Project. Acquisition of pipeline easements is required for approximately 57% of the total pipeline proposed.

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TABLE 6-3
MONTHLY AND ANNUAL STREAM FLOW STATISTICS

	Cosumnes River [1] (cfs)	Mokelumne River[2] (cfs)
January	775	922
February	840	1,044
March	988	1,172
April	1,151	1,356
May	838	1,870
June	317	1,786
July	80.5	738
August	27.7	555
September	17.5	527
October	30.4	513
November	62.2	581
December	471	762
Annual	**5,598 cfs**	**11,826 cfs**

[1] USGS Sta 11333334500 Upstream of Plymouth; Avg Data for period 1951-1960.
[2] USGS Sta 11219500 Upstream of Mokelumne Hill; Avg Data for period 1927-2004.

No unique construction features are required to complete the pipeline construction. Permits will be required for creek crossings at Sutter Creek, Amador Creek, Rancheria Creek and Dry Creek. A Nationwide Corps of Engineer 404 Permit will be required for the creek crossings proposed at Dry Creek and Amador Creek. California Department of Fish and Game and State Water Resource Water Quality Control Board permits will be required to construct all of the creek crossings.

Plymouth Reservoir Project

A Corps of Engineering Individual 404 Permit is required for the Reservoir Project. Between 2000 and 2004 the City submitted applications and environmental documentation to obtain this permit. To date, the Plymouth Reservoir Corps of Engineers 404 Permit has not been obtained.

The proposed reservoir site is not owned by the City of Plymouth. Attempts to acquire the site at a reasonable cost have not been successful.

Arroyo Ditch Alternative

Construction access to the Arroyo Ditch is virtually unavailable for most of the ditch length. The cost to obtain construction access and the cost to secure permanent easements and temporary construction easements along the ditch are two of the most significant factors associated with the relatively high costs of the Arroyo Ditch Alternative. Once constructed, ongoing operation and maintenance access would need to be secured.

The feasibility of obtaining permits to construct Arroyo Ditch improvements including Corps of Engineers, Fish and Game and Water Quality approvals have not been evaluated in detail.

CAPACITY

The Plymouth Pipeline Project has the capacity to serve existing City of Plymouth maximum day demands plus 4% growth over a 20 year period. The capacity of the Plymouth Pipeline Project, as proposed, is at least twice the existing maximum day demands.

The Plymouth Reservoir Project has a firm yield to serve the existing maximum day demands. No additional capacity is provided by the firm yield projected with this project.

The capacity of the Arroyo Ditch Alternative is dependent on the amount of raw water available in the Cosumnes River and the efficiency of the ditch system to convey

this water to the City. Currently the Arroyo Ditch System is unable to reliably deliver to the City 10% of the water diverted from the Cosumnes River.

EASE OF EXPANSION

Plymouth Pipeline Alternative

The Plymouth Pipeline Project has been designed to serve existing Plymouth maximum day demands plus a 4% growth rate over a 20 year period. The 2025 service population for Plymouth is projected at 1,065 ESFR. Without additional improvements the Plymouth Pipeline Project, as presently proposed, could meet the projected maximum day demands of approximately 1,265 Plymouth ESFR or approximately 729 more equivalent single family households than the existing 536 ESFR total.

With the addition of a second 1.5 MG water storage tank at an appropriate elevation along Pipe Segment 6, approximately 1,000 additional ESFR could be served by the Pipeline Project. With replacement of the 10-inch diameter pipe in Project Segment 4, the Plymouth Pipeline Project, with the second 1.5 MG Tank could serve approximately 1,650 additional ESFR in Plymouth. Additional treatment plant capacity is needed at the Tanner Water Treatment Plant to serve Plymouth demands and other future demands in the Amador Water Agency service area.

Plymouth Reservoir Alternative

The capacity of the Plymouth Reservoir Project is limited by the capacity of the proposed reservoir under drought conditions and the capacity of the existing Plymouth Water Treatment Plant and Arroyo Ditch Pump Station. Additional reservoir capacity, additional water treatment plant capacity and additional raw water pumping capacity would be needed to expand the Plymouth Reservoir capacity to meet future water demands within the City of Plymouth.

Arroyo Ditch Alternative

Similar to the Plymouth Reservoir Alternative, the capacity of the Arroyo Ditch Alternative is limited by the existing Plymouth Water Treatment Plant, the existing Arroyo Ditch raw water pump station and Arroyo Ditch reservoir improvements. Additional raw water storage, additional water treatment plant capacity and additional raw water pumping capacity would be needed to expand the Arroyo Ditch system capacity to meet future demands within the City of Plymouth.

PUBLIC HEALTH, SAFETY AND SECURITY

The Plymouth Pipeline Alternative, the Plymouth Reservoir Alternative and the Arroyo Ditch Alternative all would rely on surface water supply sources. All surface

water treatment plants must comply with Environmental Protection Agency and Department of Health Service Surface Water Treatment Rules. These Surface Water Treatment Rules include treatment and disinfection standards designed to protect the public against adverse health effects of exposure to giardia lamblia, viruses, legionella as well as many other waterborne pathogenic organisms. It can be assumed that for any of the Plymouth Project Alternatives, treatment facilities, either present or proposed, would be designed to provide:

1. maintenance of an adequate disinfectant residual in the distribution system

2. removal or inactivation of a minimum of 3-log (99.9%) of giardia and

3. removal or inactivation of a minimum of 4-log (99.99%) of viruses.

Public Health project safety and security are, however, a function of how waste treatment works are operated, maintained and protected, and how activities that could be harmful to water quality are controlled. Water systems that include miles of unfenced and largely uncontrolled open ditch conveyance systems are difficult to control. Even with daily "ditch patrols" it is impossible to keep livestock and wildlife from entering unfenced and unsecured ditch systems.

Replacement of the Amador Canal with the Amador Pipeline will improve the reliability, quality and security of the Amador Water Agency's raw water conveyance system. The Amador Pipeline will deliver raw water to the Tanner Water Treatment Plant. Treated water would then be conveyed to the City of Plymouth via the Plymouth Pipeline Improvements. With replacement of the Amador Canal, the Plymouth Pipeline Alternative becomes a safer and more secure water system than either the Plymouth Reservoir or the Arroyo Ditch Alternatives.

SUMMARY

In summary:

1. The initial costs estimated for the Plymouth Pipeline Alternative are lower than the initial costs estimated for the other project alternatives considered.

2. The annual costs estimated for the Plymouth Pipeline Alternative are lower than the annual costs estimated for the other project alternatives considered.

3. The Plymouth Pipeline Alternative can more reliably meet current and projected maximum day demands than the other project alternatives considered.

4. The constructability of the Plymouth Pipeline Alternative is superior to the other project alternatives considered.

5. The capacity of the Plymouth Pipeline Alternative is greater than the other project alternatives considered.

6. The Plymouth Pipeline Alternative includes features that will allow expansion and additional capacity.

7. With replacement of the Amador Canal with the Amador Pipeline, the Plymouth Pipeline alternative would not rely on open ditches for raw water conveyance. This improvement would result in a safer and more secure water system than the other project alternatives considered.

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VII. PROJECT RECOMMENDATIONS

In this section of the PER, project recommendations are presented. These recommendations are based on the considerations and alternatives presented in Section V and the analysis of alternatives presented in Section VI. The Plymouth Pipeline Project, as previously described in Section V is recommended. A summary of the proposed design recommendations is as follows:

- A new 12-inch diameter pipeline is recommended for Pipeline Segment 1. Pipeline Alignment Alternative 1-3 (Gold Dust Trail) is preferred.

- No new pipelines are proposed for Pipeline Segment 2.

- A new 12-inch diameter pipeline is recommended for Pipeline Segment 3.

- A new 1.5 MG capacity, above ground, steel, storage reservoir with base elevation of approximately 1640 is proposed for Pipeline Segment 3.

- In Pipeline Segment 4, a new 12-inch diameter pipeline is recommended to parallel the existing 8-inch Amador City Main from the Amador City Regulating Station to Amador Creek Road.

- A new 12-inch diameter pipeline is recommended for Pipeline Segment 5. Pipeline Alignment Alternative 5-1 Amador Creek Road, (East School Street, Bunker Hill Road, New Chicago Road) is preferred.

- A new 12-inch diameter pipeline is recommended for Pipeline Segment 6. Pipeline Alignment Alternative 6-2 (Evitt Alternative) is preferred.

- The Plymouth Pipeline Project, as presently designed, will meet the maximum day demands of the City of Plymouth projected over 20 years with a 4% growth rate. The 2025 Plymouth demand conditions are estimated at 1065 ESFR with future maximum day demands estimated at 1,331,250 gpd.

- The Plymouth Pipeline Project could meet the maximum day demands of approximately 200 Plymouth ESFR in addition to the 2025 Plymouth ESFR demand projections. Maximum day demands within the City of Plymouth beyond this total could be met by a second, 1.5 MG capacity water storage tank to connect to Pipeline Segment 6 (tank base elevation approximately 1350) and / or a new (parallel or replacement) water main in Segment 4 between Sutter Creek – Amador Road and the Amador City Pressure Regulating Station.

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PROJECT DESIGN

Water Supply

Mokelumne River water stored in Lake Tabeaud is to be conveyed to the Tanner Water Treatment Plant via the 8.5 mile long, 30-inch diameter Amador Transmission Main. The Amador Water Agency is entitled to divert up to 15,000 AF annually of Mokelumne River water. With the high losses in the Amador Canal, the Water Agency can not divert all of the flow that it is entitled and can not convey adequate additional raw water to serve the City of Plymouth. Without the reliability and superior conveyance capacity provided by the Amador Transmission Main, service to the City of Plymouth is not possible. The Plymouth Pipeline Project can only move forward with approval and construction of the Amador Transmission Main.

Treatment

The Tanner Water Treatment Plant includes multiple upflow flocculation / contact clarification and downflow multimedia filtration units. Both chemical preoxidation and post filtration disinfection are provided. The most recent plant expansion was completed in 1999. Current water treatment capacity is 5.2 MGD. Current maximum day demands are approximately 4.6 MGD. As previously determined in this PER, the existing maximum day demand for the City of Plymouth is approximately 670,000 gallons. The projected, 20 year, maximum demand for the City of Plymouth is estimated at 1.3 million gallons per day. Additional plant expansion at Tanner Reservoir will be needed to meet the projected demands for the City of Plymouth as well as from projected increased demands from Sutter Creek, Amador City and Drytown. As previously summarized in **Table 3-3**, the maximum day demand from these communities is estimated to increase from approximately 2.8 MGD to approximately 6.1 MGD. To serve both the City of Plymouth and increased maximum demands from Sutter Creek, Amador City and Drytown at the end of the 20 year Project planning period will require as much as 4.6 MGD of additional treated water delivered from the Tanner Water Treatment Plant.

The City of Plymouth would pay initial participation fees of approximately $1,340,000 to "buy" plant capacity and to help pay their share of treatment plant expansion. Hook up fees for new services within the City of Plymouth will also include payment for treatment plant capacity.

Storage

The 1.5 MG capacity water storage tank proposed as part of the Plymouth Pipeline Project in Segment 3 has been designed, per Water Agency Standards to provide:

- 2 hours, minimum, fire flow
- 8 hours, maximum day demand
- 24 hours, emergency reserve, average day demand

The existing 500,000 gallon capacity Plymouth Water Storage Tank meets the City's current fire flow, maximum day and emergency storage requirements in accordance with the City's criteria. Additional water storage capacity will be needed in Plymouth to meet future Plymouth service demands.

Pumping Stations

Treated water stored at Tanner Reservoir will be conveyed by gravity to the Plymouth Water Storage Tank. The Plymouth Water Storage Tank now serves the City of Plymouth without pumping.

Water Transmission Mains

The Plymouth Pipeline Project has been designed to convey a maximum day demand, in Plymouth, of 1250 gpd per ESFR. Maximum day demands within the Sutter Creek, Amador City and Drytown areas are estimated at 1 gpm per ESFR in accordance with Amador Water Agency Standards. These maximum day demands, plus fire flows, have been evaluated for the existing Amador Water Agency Main and the proposed Plymouth Pipeline improvements using the WaterCad Computer Simulation Program developed by Haestad Methods. Proposed transmission mains would comply with Amador Water Agency Standards.

PROJECT COSTS

Initial project costs including planning, design, environmental processing, permits, land acquisition, easements, construction contract administration costs, are estimated at $7,830,075.

The first year operation and maintenance costs including commodity charges, (master) meter charges, debt service, operation and personnel are estimated at $468,865.

ANNUAL OPERATING BUDGET

Annual Costs

As previously described in Section VI, the first year annual costs estimated for the Plymouth Pipeline Project are itemized as follows:

- $128,825 Commodity Charge
- $21,000 Meter Charge
- $146,315 Debt Service
- $155,425 Operating Cost

• $ 17,300	Personnel Costs
$468,865	Estimated First Year Annual Operating and Maintenance Cost

The RUS recommends that in addition to operation and maintenance costs and debt repayments, a debt service reserve not less than 1/10 of the annual debt repayment should be included in this Annual Operating Budget. Additional reserve amounts for short-lived assets such as paint, small equipment, chemical pumps, may be added. With the addition of debt repayment reserves the recommended first year operating budget for the Plymouth Project is:

$468,865	O & M Costs
$ 20,000	Debt Service and Short-Lived Asset Reserves
$488,865	First Year Operating Budget

Rate Schedule

The Reed Group has been retained by the City of Plymouth to conduct a comprehensive Rate Study for the Plymouth Pipeline Project. For the purpose of this PER, monthly service costs per ESFR can be estimated from the Annual Operating Budget, itemized above.

It is estimated that during the first 3 years of the project, no new hook ups would occur within the City. To help offset no hook up fee revenues, application of rate stabilization funds are proposed.

As previously discussed in Section VI it is proposed that $200,000 in grant funds be held back to help stabilize initial operating costs. Assuming that these rate stabilization funds are applied evenly over the first three years, the net annual expenses would be:

	$488,865	First Year, Operating Budget
Less	[-$66,670]	Stabilization Fund
Net First YearAnnual Cost	$422,195	

The average monthly service cost in Year 1 for 536 ESFR (no new hook ups) would be: $65.64 / ESFR / month.

In the fourth year of operation, it is assumed that 25 new hook ups would occur. Projected hook up fees are presented in **Table 7-1**. In year 4, there would be no rate stabilization funds available, however, the City of Plymouth's portion of the projected hook up fees would be: (25 hook ups) ($3377 / hook up) = $84,425. It is estimated that annual commodity charges, meter charges, operating costs and personnel costs would increase by 5% per year. Debt service and reserve fund costs would remain constant.

With these assumptions, the estimated fourth year operating expenses area as follows:

$156,284	Commodity Charge
$24,300	Meter Charge
$146,315	Debt Service
$179,620	Operating Costs
$20,025	Personnel Costs
$20,000	Reserve Fund
$564,544	Est. Operating Costs, Year 4
Less [-$84,425]	Hook up Fees
Net $462,119	Est. Net Costs, Year 4

Average monthly service costs in Year 4 with 536 + 25 = 561 ESFR would be:

$68.65 / ESFR / month.

With continued hook up at an average of 25 to 30 per year, the estimated budget and monthly service costs in Year 10 with a 5% increase per year in commodity charges, meter charges, operating costs and personnel costs would be:

$278,079	Commodity Charge
$34,205	Meter Charge
$146,315	Debt Service
$253,165	Operating Costs
$28,180	Personnel Costs
$20,000	Reserve Fund
$759,944	Est. Operating Costs, Year 10
Less (25) ($5189)	Hook Up Fees
$630,219	Est. Net Costs, Year 10

Average Monthly Service Costs in Year 10: $73.87 / ESFR / month.

The estimated monthly service costs projected for Year 1, Year 4 and Year 10 of the Project are comparable to the average monthly costs of $60.00 per month now paid by Plymouth households for water service.

Annual costs, revenues and monthly service costs are estimates prepared for this PER. Project cost sharing, commodity charges, meter charges and participation fees will be formalized with the MOU executed between the City of Plymouth and the Amador Water Agency. With these factors determined, the Reed Group will initiate a more formal rate study and hook up fee schedule. Public workshops and public meetings will be held to discuss findings and recommendations of this rate study.

CONSULTING KASL ENGINEERS

TABLE 7-1

PRELIMINARY HOOK UP FEE SCHEDULE [1]

Year	Estimated [2] Hookup Fees	Amador Water Agency Share	City of Plymouth Share
1	$5000 + 69	$2500	$2569
2	$5250 + 207	$2625	$2832
3	$5513 + 345	$2756	$3102
4	$5789 + 483	$2895	$3377
5	$6078 + 624	$3039	$3660
6	$6382 + 759	$3191	$3950
7	$6701 + 897	$3350	$4248
8	$7036 + 1035	$3518	$4553
9	$7388 + 1173	$3694	$4867
10	$7757 + 1311	$3879	$5189
15	$9900 + 2001	$4950	$6951
20	$12,635 + 2691	$6317	$9009

(1) This Schedule is prepared to satisfy the conditions of the PER. A water service rate and hook up fee schedule will be developed by the Reed Group under contract to the City of Plymouth.

(2) It is assumed that City of Plymouth hookup fees for equivalent SFR would initially be $\pm$ $5000 (comparable to Reed Group recommendations to Amador Water Agency for equivalent SFR Participation Fee). Assume that this total is split 50 / 50 with Amador Water Agency. Assume that hookup fees increase by 5% per year. Hookup fees should also increase for payment of "fair share" of Plymouth Pipeline cost debt service. If debt service to repay USDA = (1,135,595) (0.543) = $\frac{\$73,555}{\text{year}}$

Debt service per equivalent service per month = $\frac{\$73,555}{536 \times 12}$ = $11.44 per SVC per mo., say $11.50 / mo.

Estimated City of Plymouth hookup fees per year (assume service connect at mid year; 6 months of debt service = $69.00 / year)