FINAL REPORT

Phase 2 Project Definition Scoping Study Report

October 2012

CDM Smith

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Abbreviations

AF	acre-foot
AFY	acre-feet per year
BARWRP	Bay Area Regional Water Recycling Program
BHP	brake horsepower
Board	Board of Directors
CCI	Construction Cost Index
CEQA	California Environmental Quality Act
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENR	Engineering News Record
HP	horsepower
LCWD	Los Carneros Water District
LF	linear foot
LGVSD	Las Gallinas Valley Sanitary District
MG	million gallon
mgd	million gallons per day
MMWD	Marin Municipal Water District
MOU	Memorandum of Understanding
MST	Milliken-Sarco-Tulocay
Napa SD	Napa Sanitation District

NBWRA	North Bay Water Reuse Authority
NBWRP	North Bay Water Reuse Program
NEPA	National Environmental Policy Act
NOI	Notice of Intent
NOP	Notice of Preparation
Novato SD	Novato Sanitary District
Reclamation	U.S. Bureau of Reclamation
RWTP	Recycled Water Treatment Plant
SCWA	Sonoma County Water Agency
SHPO	State Historical Preservation Officer
SVCSD	Sonoma Valley County Sanitation District
TAC	Technical Advisory Committee
USFWS	United States Fish and Wildlife Service
WWTF	wastewater treatment facility
WWTP	wastewater treatment plant

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Executive Summary

The Phase 2 Project Definition Scoping Study was conducted to assist the North Bay Water Reuse Authority's (NBWRA's) existing and potential new members in determining whether to proceed to the next steps in the scoping studies, feasibility-level engineering analysis, environmental documentation, and financial analysis for Phase 2 of the North Bay Water Reuse Program (NBWRP). The purpose of the Phase 2 studies is to explore options for recycled water use and, as feasible, to develop a program expanding recycled water use within the North San Pablo Bay region beyond the projects currently being constructed as Phase 1 of the NBWRP.

ES.1 Scoping Study Process

The Project Definition Scoping Study is the second step in a proposed series of scoping studies under Phase 2 of the NBWRP. The Phase 2 scoping study process is shown in Figure ES-1.

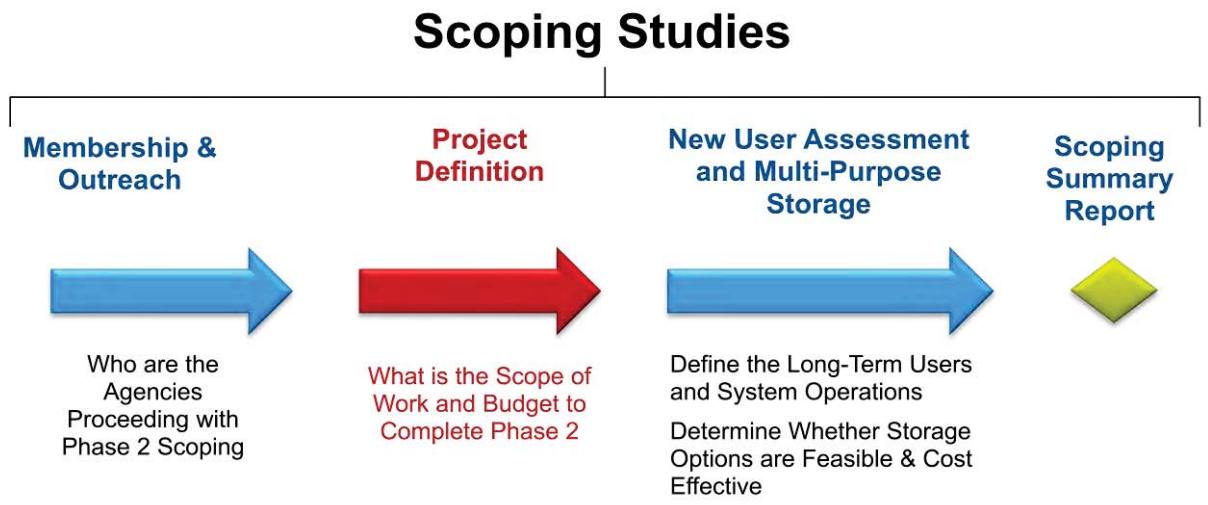

Figure ES-1
NBWRP Phase 2 Scoping Study Process

The first scoping study, Membership and Outreach, identified the potential partners for studies to expand the NBWRP beyond Phase 1. The Membership and Outreach process and subsequent conversations with interested agencies resulted in several new agencies partnering with the NBWRA in the Project Definition Scoping Study: Marin County; Marin Municipal Water District (MMWD); City of Petaluma; and the City of American Canyon. The City of Sonoma contributed directly to Sonoma Valley County Sanitation District's (SVCSD's) participation in this study.

The Project Definition Scoping Study consisted of the tasks detailed below: two engineering planning tasks; two financial related topics; discussion of benefits; and the scope of work to complete a feasibility study based on the preliminary list of engaged agencies. This Project Definition Scoping Study Report is intended to provide preliminary information on the potential size and costs of Phase 2 project construction and the potential costs to complete feasibility studies and environmental analysis.

- **Conceptual Level Operational Analysis** – determine seasonal storage needs, potential integration with Phase 1 facilities, and general points of delivery.
- **Preliminary Identification of Program and Costs for Design and Construction** – develop an order of magnitude-level estimate of cost based on conceptual level layouts of storage, conveyance, and distribution facilities.
- **Initiation Fee for New Participants** - define a range of financial options under which a new agency may become a fully vested participating member.
- **Conceptual Level Project Benefits –** identify the programmatic benefits of potential Phase 2 projects to justify local and federal expenditures.
- **Scope of Work for Full Phase 2 Feasibility, Economic, and Environmental Studies** – prepare scope of work for future studies.

A second financial task, Review of Members' Ability to Meet Non-Federal Cost Share, was to prepare a preliminary assessment of the capacity of participating and new agencies to take on construction projects following Phase 1 commitments. However, as the NBWRA moved through the Project Definition Scoping Study process, this task was postponed because the detail regarding which projects and agencies are to be included in future Phase 2 studies and the potential costs per agency are still too preliminary at this point. This analysis will be revisited during the potential feasibility study phase, when projects and partners are more clearly defined.

Following the Project Definition Scoping Study, the New User Assessment and Multi-Purpose Storage Scoping Study would focus on the specific users, opportunities for partnerships between agencies for reuse projects, and an expanded list of potential demands beyond the preliminary list provided by the agencies in this study, as well as address the specific aspects of developing new seasonal storage in concert with creating habitat enhancements.

ES.2 Findings

The findings of the Project Definition Scoping Study include a summary of identified potential Phase 2 projects, preliminary analysis of operations, preliminary construction costs for the Phase 2 projects, and the scope of work to complete scoping studies and feasibility studies to allow for Phase 2 program implementation. Costs for these future studies are not included in this report as the level of effort, and therefore costs, cannot be determined until the included agencies and projects are more clearly defined. The potential "initiation costs" for new agencies to join the NBWRA and the approach to maximize the NBWRA's programmatic benefits are also summarized below. Lastly, future activities have been identified which are required should the NBWRA choose to continue through the Phase 2 scoping study process and into the feasibility study phase.

ES.2.1 Potential Projects

Six existing NBWRA member agencies participated in the Project Definition Scoping Study: Las Gallinas Valley Sanitary District (LGVSD); Novato Sanitary District (Novato SD); Sonoma County Water Agency; SVCSD; Napa County; and Napa Sanitation District (Napa SD). Five additional agencies participated in the Phase 2 study: Marin County; MMWD; City of Petaluma; City of Sonoma (directly with SVCSD); and the City of American Canyon. Collectively, these agencies are referred to in this report as "participating agencies."

Seven agencies have initially identified 20 potential Phase 2 projects through the Project Definition Scoping Study. Figure ES-2 presents the locations of the Phase 2 projects, shown in yellow. For reference, each agency's existing recycled water projects are shown in blue and NBWRP Phase 1 projects are shown in red. The potential Phase 2 projects are listed in Table ES-1 and described in more detail in Section 3.1.

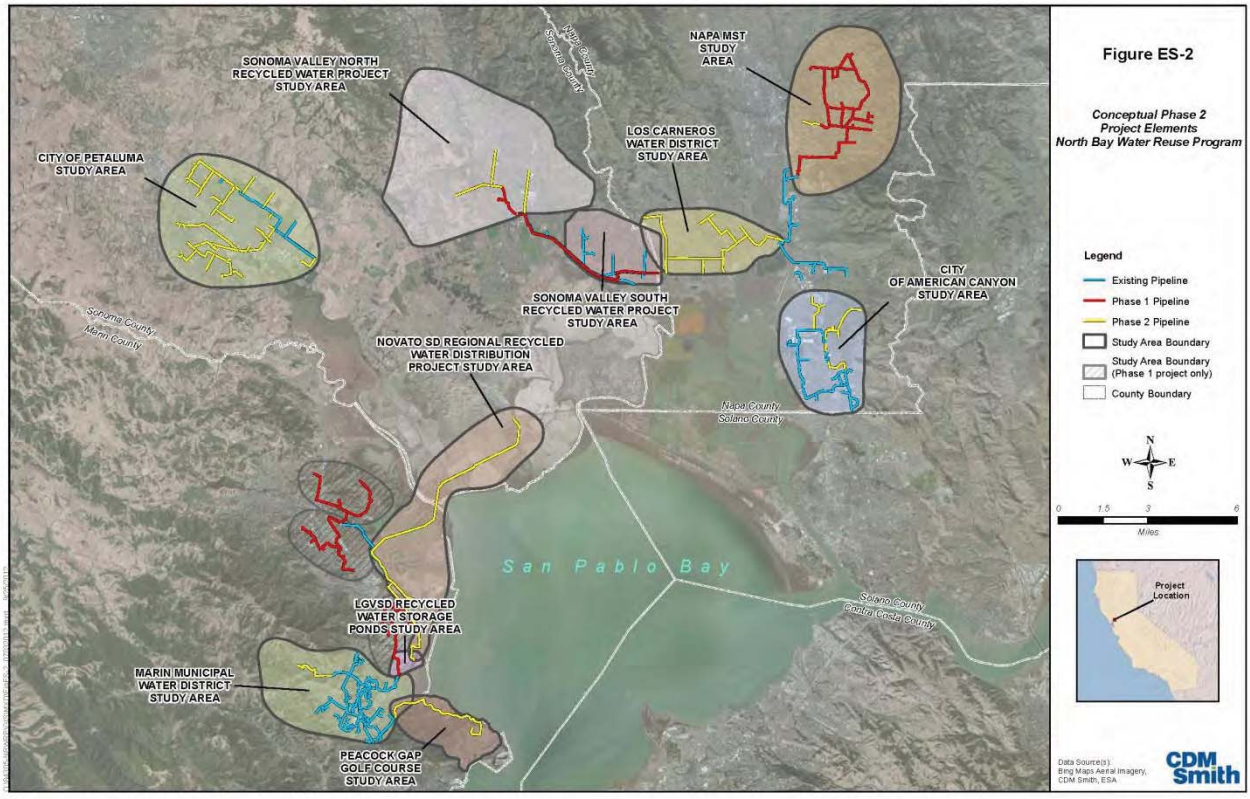

Figure ES-2
Conceptual Phase 2 Project Elements

Table ES-1. Potential NBWRP Phase 2 Projects

Agency	Potential Projects
MMWD	• Peacock Gap Extension • Peacock Gap Area • Lucas Valley Extension • Recycled Water Treatment Plant (RWTP) Expansion
LGVSD	• Additional Storage Ponds • Recycled Water Facility Expansion
Novato SD	• Regional Recycled Water Distribution Project • Transmission Pipeline to LGVSD • Replace Existing Outfall Pipe with Recycled Water Wetland
City of Petaluma	• Local Recycled Water Distribution
SVCSD	• Sonoma Valley North Recycled Water Project • Sonoma Valley South Recycled Water Project
Napa SD	• Los Carneros Water District (LCWD) Project • Milliken-Sarco-Tulocay (MST) Tulocay Pipeline • Increase Filter Capacity • Additional Storage • Increase Pump Station Capacity
City of American Canyon	• Green Island Road Project • Tower Road Project • Private Vineyard Project

ES.2.2 Supply, Demand, and Conceptual Operation

The Project Definition Scoping Study determined the available recycled water supply from each participating wastewater agency and tabulated the water demands for Phase 1 and Phase 2 projects on an annual and monthly basis. The net flow, after completion of Phase 1 projects, available to meet potential Phase 2 demands was calculated and is summarized in Table ES-2. Section 3.2 provides more detail for each participating agency.

Table ES-2. Summary of Recycled Water Supplies and Demand in the NBWRP Study Area

Total estimated 2010 effluent flow by all agencies	16,162 acre-feet per year (AFY)
Phase 1 annual demands based on Phase 1 Feasibility Study	7,826 AFY
Net effluent flow available for Phase 2 projects	8,237 AFY
Phase 2 total demands for all potential projects	5,726 AFY

As shown in Table ES-2, significant recycled water supply is available on an annual basis to meet the currently identified potential Phase 2 water demands. However, Phase 1 projects minimized the use of seasonal storage to meet the peak irrigation needs in the summer and early autumn. Consequently, a significant amount of the summer season[1] recycled water flows are used by the Phase 1 projects and are not available for Phase 2 projects. Most of the net flow is available during the winter when demands are low to non-existent.

An operations review of the available supplies versus projected demands demonstrated the need for seasonal storage to meet the potential future Phase 2 demands. Based on monthly average water demand, up to 5,364 acre-feet of seasonal storage could be needed to effectively use existing supplies (after Phase 1 project needs) to meet Phase 2 demands. This storage could be developed by changing the function of existing regulating ponds at water reclamation plants, creating new seasonal storage sites similar to what exists at SVCSD facilities, revised use of existing farm ponds, or potentially through groundwater recharge.

This stage in the analysis only addresses the individual recycled water suppliers and projects. As discussed in Section ES.1, future scoping studies will look at regional opportunities and synergies between agencies and geographies to meet the potential Phase 2 demands.

ES.2.3 Phase 2 Project Costs

A reconnaissance-level construction cost estimate was prepared, in accordance with the Bureau of Reclamation's (Reclamation's) Title XVI guidelines, for the potential Phase 2 projects identified by the agencies. The cost estimating approach was the same as used for the Phase 1 Feasibility Study. Although feasibility-level costs estimating approaches were applied, the level of detail for the project layouts and descriptions were available at a reconnaissance-level of detail; therefore, the estimates of costs can only be considered reconnaissance-level in this report.

The unit costs used to develop the Phase 1 cost estimates were updated to reflect a February 2012 Engineering News Record's Construction Cost Index and were reviewed by the agencies participating in the Project Definition Scoping Study. A few of the unit costs are based on an evaluation of recent construction cost experience by each of the agencies. Only the major components were incorporated in the cost estimates, including distribution pipelines, treatment plant improvements, system storage

[1] The "summer" season, when effluent discharged is not permitted, may vary between the participating wastewater agencies.

components, and distribution pump stations. The estimates also include allowance, contingency, and non-contract costs such as engineering, legal and license fees, and engineering construction services.

Table ES-3 summarizes the opinion of probable total project capital costs for each of the potential Phase 2 projects identified in Table ES-1. Section 4.2 presents more detail on the cost estimates for each project, approach and methodology, and assumptions. These preliminary cost estimates include the following elements:

- Construction costs for distribution pipelines, pump stations, storage, and wastewater treatment plant upgrades prepared using the unit cost factors;
- Reclamation's prescribed allowance for additional work that may be identified during additional design phases and for overruns on quantities, changed site conditions, change orders, etc.; and
- Reclamation's prescribed estimate for non-contract costs for the services provided by consultants/contractors in support of the project.

Table ES-3. Summary of Phase 2 Conceptual Projects Preliminary Cost Estimates

Agency	Projects	Opinion of Probable Total Project Capital Costs	Summary by Agency
MMWD	Peacock Gap Extension	$8,100,000	$20,470,000
	Peacock Gap Area	$4,730,000	
	Lucas Valley Extension	$1,730,000	
	Recycled Water Treatment Plant Expansion	$5,910,000	
LGVSD	Additional Storage Ponds	$17,490,000	$22,550,000
	Recycled Water Facility Expansion	$5,060,000	
Novato SD	Regional Recycled Water Distribution Project	$35,290,000	$57,620,000
	Transmission Pipeline to LGVSD	$9,640,000	
	Replace Existing Outfall Pipe with Recycled Water Wetland	$12,690,000	
City of Petaluma	Local Recycled Water Distribution	$24,150,000	$24,150,000
SVCSD	Sonoma Valley North Recycled Water Project	$4,440,000	$9,650,000
	Sonoma Valley South Recycled Water Project	$5,210,000	
Napa SD	LCWD Project	$22,080,000	$37,320,000
	MST Tulocay Pipeline	$880,000	
	Increase Filter Capacity	$8,440,000	
	Additional Storage	$3,380,000	
	Increase Pump Station Capacity	$2,540,000	
City of American Canyon	Distribution Pipelines	$7,460,000	$12,570,000
	Storage Pond and Pumps	$4,910,000	
	Storage Reservoir (steel)	$200,000	
Total		$184,330,000	

Note: Section 4.2 presents more detail on the cost estimates for each project, approach and methodology, and assumptions.

ES.2.4 Phase 2 Feasibility Study Scope of Work

The future scope of work to complete the next scoping study, the scoping study report, and the feasibility studies are discussed in Section 4.1 and presented in detail in Appendix A. The major task headings and their purpose are summarized in Table ES-4.

Table ES-4. Summary of Phase 2 Study Scopes of Work

Category	Major Task	Purpose
Scoping Studies	New User Assessment and Multi-Purpose Storage Scoping Study	Define the long-term users, system operations, inter-regional partnership opportunities, and storage requirements. Determine whether seasonal storage options are feasible and cost effective.
	Scoping Study Report	Summarize the three Phase 2 scoping studies.
Feasibility Studies	Alternatives Development	Develop and rank alternatives for the Phase 2 program.
	Engineering Study	Define the selected alternative at feasibility-level design layouts and costs.
	Financial Evaluation	Evaluate how the participating agencies will meet the financial demands of Phase 2.
	Environmental Evaluation	Analyze the potential effects of the Phase 2 alternatives on the local and regional environment.

ES.2.5 Initiation Fee

The initiation fee analysis defined a range of financial options under which a new agency may become a fully vested, participating member of the NBWRA. The ultimate decision on the NBWRA initiation fee for new agencies, if any, is at the discretion of the current NBWRA members and is subject to revision. The decision may take into account not only the findings of this analysis but also political and institutional considerations. The purpose of the initiation fee is to provide parity for the ratepayers who invested in Phase 1, with a goal to not exceed the amount existing members paid for developing the NBWRP. Section 5 and Appendix B present more details of the initiation fee study.

ES.2.6 Future Benefits

A broader definition and quantification of program benefits would provide the NBWRA with broader public and institutional support and greater potential for accumulating funding support from multiple sources to help defray agency and ratepayer costs for project implementation.

The NBWRA members and the region could derive significant additional benefits from modest, but fundamental, changes in the approach to Phase 2. As described in Section 6, this entails a broadening of scope that transitions the NBWRP from individual recycled water projects towards a regional-scale reuse program. This direction accomplishes the objectives of both local member agencies and Reclamation, the program's Federal funding partner, by demonstrating how recycled water, developed and managed as supply, can benefit all needs and users in the North Bay. More information on these potential benefits and the future studies needed to quantify them is available in Appendix C.

ES.2.7 Recommended Future Activities

The Phase 2 Project Definition Scoping Study illustrates the potential volumes of recycled water supply and the initial list of projects that could be implemented to meet regional water needs, reduce discharges, and enhance the environment. The purpose of the report was to share the potential projects

being considered by the agencies, identify the potential total costs of such an expanded program, and to develop the path forward.

However, this reconnaissance-level analysis only provides preliminary insight into the issues and challenges towards implementing expanded reuse beyond Phase 1. Questions remain regarding technical issues with the potential projects and institutional issues for the NBWRA as it considers moving forward with the subsequent Phase 2 scoping study and report.

The following sections present these remaining issues. The scope of work items summarized in Table ES-4 have been developed to address the technical issues in a logical step-wise approach that meets the Reclamation criteria and supports the decision-making process of the NBWRA on proceeding with, and Reclamation in potentially funding, a Phase 2 program.

NBWRA Organization Issues

In order to proceed with Phase 2 scoping and feasibility studies, significant organizational, financial, and institutional questions, such as the following, must be addressed:

- Which agencies will engage in further studies to complete analysis of a Phase 2 NBWRP?
- Are the reconnaissance-level costs for Phase 2 projects greater than potential funding given that total Phase 1 construction costs were limited to $100 million in the federal authorization?
- How will the NBWRA organize to conduct both Phase 1 and Phase 2 projects that have different agencies engaged?
- What NBWRA organizational activities are needed for Phase 2 studies versus Phase 1 implementation activities?

Technical Issues

Technical questions remaining to be addressed are summarized below. The recommended Phase 2 Scoping Study and Feasibility Studies tasks shown in Table ES-4 are designed to address these questions.

- Determine whether the initial list of Phase 2 projects provided by the agencies in this report is complete. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Identify subregional partnership opportunities that may provide efficiencies and cost savings. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Identify a broad range of potential additional projects that could expand the opportunities and benefits of a Phase 2 program. ***[New User Assessment and Multi-Purpose Storage Scoping Study]*** Potential new uses for water reuse in the region could include:
  - Agricultural;
  - Urban irrigation – parks greenbelts, industrial complexes;
  - Other environmental restoration;
  - Recreation;

  - Groundwater recharge;
  - In-lieu stream flow;
  - Indirect potable reuse; and
  - Direct potable reuse.

- Identify the role of reuse in mitigating groundwater overdraft or salinity intrusion. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Quantify the role and volume of storage to implement greater reuse in the NBWRP. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Determine the locations, layouts, costs, and implementation constraints for new seasonal storage required to meet Phase 2 demands. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Define the regional alternatives and screen them to determine the most cost effective and implementable program to take to feasibility-level engineering. ***[Alternatives Development of Feasibility Study]***
- Estimate the total value of NBWRP activities to the region. Assess how the role recycled water plays in supporting the many and diverse uses of water in the region can be quantified and how the true value of recycled water and what it does for the North Bay can be understood. ***[Alternatives Development of Feasibility Study]***
- Define benefits accrued to the environment when existing users of stream diversions or groundwater pumping are switched to reuse. ***[Alternatives Development of Feasibility Study]***
- Determine the feasibility-level engineering analysis and cost estimates to select the final alternative. ***[Engineering Study of the Feasibility Study]***
- Assess whether the local agencies have the funds to complete the required studies. ***[Financial Evaluation of Feasibility Study]***
- Identify the potential impacts of and, if needed, mitigation required to implement the selected alternative. ***[Environmental Evaluation of the Feasibility Study]***

Additional Study Topics

Several additional study topics were identified through the review and comment process for the Draft Project Definition Study Report. These topics will be addressed in the New User Assessment and Multi-Purpose Storage Scoping Study in the tasks associated with exploring subregional partnerships and identifying any additional demand types and users.

- Collaborate with Marin County watershed programs for Novato Creek and Miller Creek.
- Evaluate LGVSD participation in MMWD's Peacock Gap Extension project to allow for conveyance of treated wastewater to a potential new deep water discharge outfall in San Pablo Bay.
- Assess most feasible and cost effective facility for expanded capacity to serve MMWD.

- Evaluate optimization of existing LGVSD storage ponds for use as a habitat resource and for adapting to climate change effects.
- Evaluate options for storage in upper Lucas Valley.

In summary, the Phase 2 scoping studies and feasibility study have been designed to address the key issues and questions and lead the potential Phase 2 projects to funding, design, and implementation. The scoping study process has built-in stop/go decision points to allow the NBWRA agencies to incrementally, and at relatively low cost, determine if a complete feasibility study process should be initiated. The proposed next scoping study (New User Assessment and Multi-Purpose Storage Scoping Study) will provide the NBWRA with critical information and insights. Given the multi-agency cost sharing and potential for a cost share with Federal funding, this study is a cost-effective approach for an individual agency to address these key questions and issues regarding expanded reuse in the North Bay.

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Section 1
Introduction

The Phase 2 Project Definition Scoping Study was conducted to assist the North Bay Water Reuse Authority's (NBWRA's) existing and potential new members in determining whether to proceed to the next steps in the scoping studies, feasibility-level engineering analysis, environmental documentation, and financial analysis for Phase 2 of the North Bay Water Reuse Program (NBWRP). The purpose of the Phase 2 studies is to explore options for recycled water use and, as feasible, to develop a program expanding recycled water use within the North San Pablo Bay region beyond the projects currently being constructed as Phase 1 of the NBWRP.

1.1 Background

NBWRP Phase 2 studies have been initiated to provide a seamless transition to design and construction of Phase 2 when the NBWRP Phase 1 construction projects are substantially completed in 2016 or shortly after. Phase 1 of the NBWRP was initiated in 2003, was federally authorized in 2009, and the Record of Decision was completed in 2011.

The timing of Phase 2 studies can be critical to continued success of the NBWRA project funding and implementation. The NBWRA has developed a strong reputation with the U.S. Bureau of Reclamation (Reclamation) as a regional reuse program that can effectively leverage federal funds to provide critical water supplies and support the regional economy with construction. The timeline to complete Phase 2 studies in coordination with completing Phase 1 construction is critical to maintaining Reclamation's attention and potential support for this regional program.

Figure 1-1 illustrates the conceptual timeline to pursue a continued stream of funding to implement the region's projects to meet long-term water needs and maintain the economic strength of the region. Readiness to proceed is a key aspect of obtaining funding as federal agencies' success can depend on how effectively they administer the funds budgeted by the Administration and Congress. The sequence of NBWRP Phase 1 activities below highlights the time required to go from early studies to initiation of funding and design of projects.

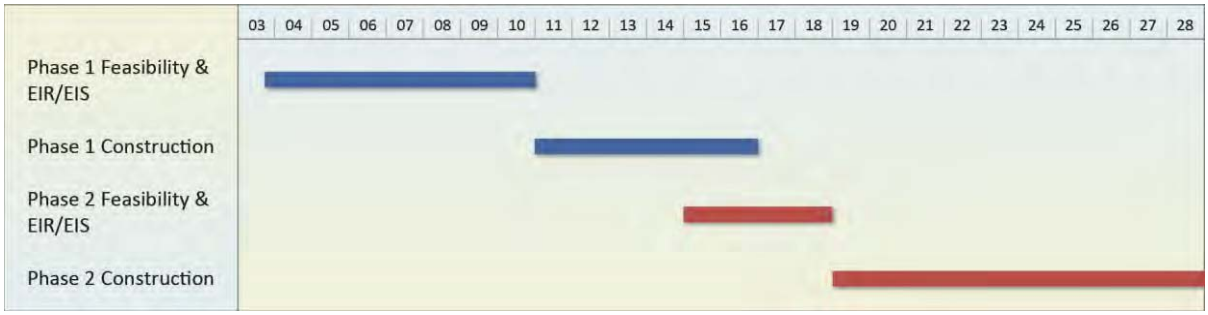

Figure 1-1
NBWRP Phase 1 and Phase 2 Conceptual Schedules

Given the NBWRA's understanding and knowledge of the process, it is expected that the Phase 2 program timeline could be significantly shorter. The key step of going from feasibility study to federal authorization is not required specifically for Phase 2 as the existing federal authorization already covers a second phase of the NBWRP; however, the Phase 1 activities and dates below, going from project initiation to first construction funding, illustrate the need to initiate and maintain Phase 2 activities to be ready for design and construction as early as 2016.

- 2003-2008: The first NBWRA members organized and agreed to investigate the potential for a regional program. They worked with federal representatives to secure 50 percent matching grants for the Phase 1 Feasibility Study in partnership with Reclamation. The Program planning, engineering, environmental, and economic studies were completed in 2008 with a combined federal and local cost of $3 million.
- 2005-2009: The NBWRA members continued to work with their federal Representatives to secure the NBWRP construction authorization. Under the Omnibus Public Land Management Act of 2009, the NBWRP was authorized for construction in two phases. The first phase has a project cost ceiling of a $100 million, with a $25 million, or 25 percent, federal cost share.
- 2008-2011: The federal and state environmental documents and permits were prepared and were completed in 2011.
- 2009-2011: Preliminary investigations were conducted of the potential to expand the use of recycled water by adding a storage element to the NBWRP.
- 2010: The NBWRA received its first construction funding, a $7.3-million American Recovery and Reinvestment Act grant, for projects studied and authorized under Phase 1.

1.2 Scoping Study Process

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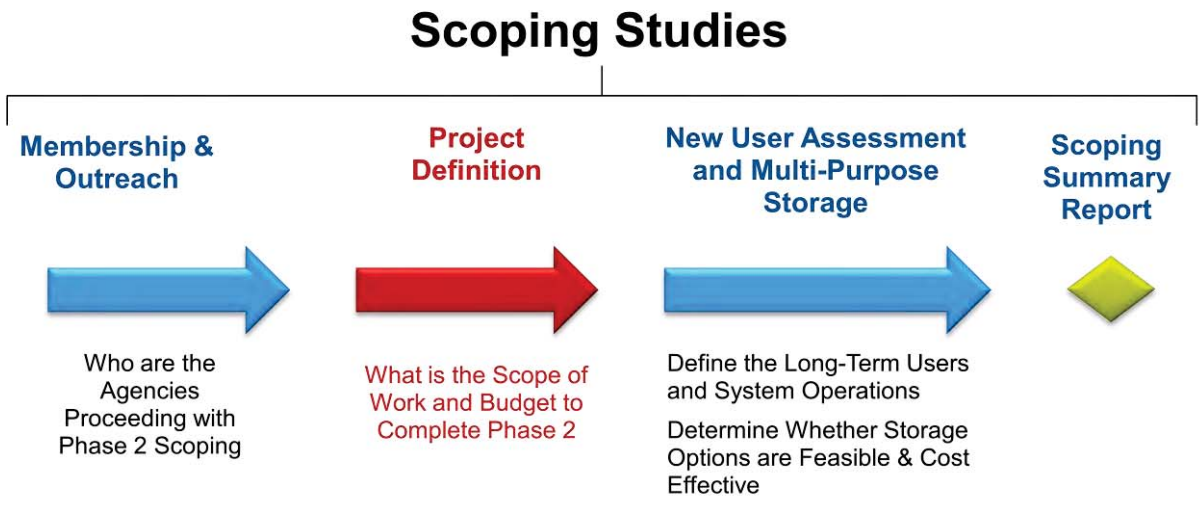

Figure 1-2
NBWRP Phase 2 Scoping Study Process

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Following the Project Definition Scoping Study, the New User Assessment and Multi-Purpose Storage Scoping Study would focus on the specific users, opportunities for partnerships between agencies for reuse projects, and an expanded list of potential demands beyond the preliminary list provided by the agencies in this study, as well as address the specific engineering and cost aspects of developing new seasonal storage in concert with creating habitat enhancements.

1.3 Project Definition Scoping Study Tasks

The Project Definition Scoping Study consisted of the tasks detailed below: two engineering planning tasks; two financial related topics; discussion of benefits; and the scope of work to complete a feasibility study based on the preliminary list of engaged agencies. This Project Definition Scoping Study Report is intended to provide preliminary information on the potential size and costs of Phase 2 project construction and the scope of work to complete scoping studies, feasibility studies, and environmental analysis.

- **Conceptual Level Operational Analysis** – determine seasonal storage needs, potential integration with Phase 1 facilities, and general points of delivery.
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A second financial task, Review of Members' Ability to Meet Non-Federal Cost Share, was to prepare a preliminary assessment of the capacity of participating and new agencies to take on construction projects following Phase 1 commitments. However, as the NBWRA moved through the Project Definition Scoping Study process, this task was postponed because the detail regarding which projects and agencies are to be included in future Phase 2 studies and the potential costs per agency are still too preliminary at this point. This analysis will be revisited during the potential feasibility study phase, when projects and partners are more clearly defined.

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Section 2
Participants

The efforts of the Membership and Outreach Scoping Study identified the agencies potentially interested in participating in the rest of NBWRA Phase 2 scoping studies. The existing NBWRA member agencies and the new agencies who agreed to contribute as partners in the Project Definition Study are discussed below. Figure 2-1 presents the location of these agencies in relation to the Phase 1 and Phase 2 study area boundaries.

Figure 2-1
Agencies Participating in the Project Definition Study

2.1 Existing NBWRA Members

The six existing NBWRA member agencies who participated in the Project Definition are listed below in Table 2-1, along with their Phase 1 projects for reference. North Marin Water District declined to take part in this study.

Table 2-1. Existing NBWRA Member Agencies Participating in the Project Definition Study

Agency	Phase 1 Projects
Las Gallinas Valley Sanitary District (LGVSD)	Novato North
Novato Sanitary District (Novato SD)	Novato South Novato Central
Sonoma County Water Agency	No project – fiscal agent for NBWRA
Sonoma Valley County Sanitation District	Sonoma Valley Recycled Water Project Napa-Sonoma Salt Marsh
Napa County	Napa State Hospital Recycled Water Pipeline Milliken-Sarco-Tulocay (MST) Recycled Water Pipeline
Napa Sanitation District (Napa SD)	

2.2 New Agencies

The Membership and Outreach Scoping Study resulted in several new agencies partnering with the NBWRA for this study: Marin County; City of Petaluma; City of Sonoma (directly with SVCSD); and the City of American Canyon. Since the completion of the Membership and Outreach Scoping Study, MMWD decided to join the Phase 2 Project Definition Study. These agencies are briefly described below.

2.2.1 Marin County

Marin County covers the study area from San Rafael at the southern end of the Phase 2 study area north through Novato. While not sponsoring a specific project in Phase 2 of the NBWRP, Marin County has two watershed restoration, recreation, and flood control projects that could interface with potential Phase 2 projects, the Novato Flood Protection and Watershed Program and the Miller Creek Flood Protection and Watershed Program. Marin County would benefit through partnering with NBWRA members in two ways: jointly planning to integrate desired goals and accomplish mutually beneficial project outcomes; and leveraging financial contributions for project infrastructure construction. The Marin County Flood Control and Water Conservation District has been the primary contact with the NBWRA consultant staff.

2.2.2 Marin Municipal Water District

MMWD has been providing recycled water to its customers in northern San Rafael since the early 1980s. (MMWD 2012) MMWD receives secondary treated wastewater from LGVSD and treats it to tertiary standards at their own recycled water facility, serving up to two million gallons per day (mgd) to over 350 customers.

2.2.3 City of Petaluma

Petaluma's Ellis Creek Water Recycling Facility treats 5 mgd of wastewater and produces about 2,150 acre-feet per year (AFY) of secondary and tertiary treated recycled water for reuse at the plant and irrigation. (City of Petaluma 2012) Currently the plant serves two golf courses, a vineyard, and additional agricultural land. The City's 2004 Recycled Water Master Plan identified an additional 3,000 AFY of tertiary and secondary demand that could be served by the recycled water system. (City of Petaluma 2004)

2.2.4 City of Sonoma

The City of Sonoma receives water from the Sonoma County Water Agency and operates three groundwater wells. The expanded use of recycled water in the City of Sonoma could result in significant water supply and environmental benefits, including reduced diversions from creeks and streams and

reduced peak potable water demands on the City's distribution systems including Russian River and groundwater supplies.

2.2.5 City of American Canyon

American Canyon's wastewater treatment plant (WWTP) produces up to 1 mgd of tertiary treated wastewater. The city is currently completing the final segments of its recycled water transmission system, which will be able to supply about 1,000 AFY of recycled water at build out. As of 2010, the city delivered 73 AFY of recycled water to 13 users. By 2015, the city expects to have 45 customers connected, for a total recycled water delivery of 666 AFY. (City of American Canyon 2011)

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Section 3

Potential Phase 2 Projects for Investigation

Section 3 presents the potential NBWRP Phase 2 recycled water projects initially identified by each of the participating agencies for further investigation. The section discusses the general layout and provides a preliminary description of the physical components of each project. It also examines how the demands of the new Phase 2 projects could be met by the recycled water supplies that will be available after completion of the ongoing Phase 1 projects. Finally, the section identifies how future seasonal storage of recycled water may be needed to meet the new demands

3.1 Potential Phase 2 Projects

The addition of new projects under Phase 2 of the NBWRP could allow participating agencies to further expand the area for beneficial use of recycled water that was developed under Phase 1 of the Program. Figure 3-1 illustrates the areas of potential projects and pipelines that could be investigated under Phase 2, shown in yellow. For reference, each agency's existing recycled water projects are shown in blue and NBWRP Phase 1 projects are shown in red. The potential Phase 2 projects are listed in Table 3-1.

Table 3-1. Potential NBWRP Phase 2 Projects

Agency	Potential Projects
MMWD	• Peacock Gap Extension • Peacock Gap Area • Lucas Valley Extension • Recycled Water Treatment Plant (RWTP) Expansion
LGVSD	• Additional Storage Ponds • Recycled Water Facility Expansion
Novato SD	• Regional Recycled Water Distribution Project • Transmission Pipeline to LGVSD • Replace Existing Outfall Pipe with Recycled Water Wetland
City of Petaluma	• Local Recycled Water Distribution
SVCSD	• Sonoma Valley North Recycled Water Project • Sonoma Valley South Recycled Water Project
Napa SD	• Los Carneros Water District (LCWD) Project • Milliken-Sarco-Tulocay (MST) Tulocay Pipeline • Increase Filter Capacity • Additional Storage • Increase Pump Station Capacity
City of American Canyon	• Green Island Road Project • Tower Road Project • Private Vineyard Project

3.1.1 MMWD – Peacock Gap Study Area

As a part of Phase 2, MMWD would investigate extending its existing recycled water distribution system south and eastward to serve the Peacock Gap area in two projects. The information on potential projects in the Peacock Gap study area was compiled from the following sources:

Figure 3-1

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

SONOMA VALLEY NORTH RECYCLED WATER PROJECT STUDY AREA

NAPA MST STUDY AREA

LOS CARNEROS WATER DISTRICT STUDY AREA

CITY OF PETALUMA STUDY AREA

SONOMA VALLEY SOUTH RECYCLED WATER PROJECT STUDY AREA

CITY OF AMERICAN CANYON STUDY AREA

NOVATO SD REGIONAL RECYCLED WATER DISTRIBUTION PROJECT STUDY AREA

LGVSD RECYCLED WATER STORAGE PONDS STUDY AREA

MARIN MUNICIPAL WATER DISTRICT STUDY AREA

PEACOCK GAP GOLF COURSE STUDY AREA

Napa County
Sonoma County

Sonoma County
Marin County

Napa County
Solano County

Solano County
Contra Costa County

San Pablo Bay

Legend

- Existing Pipeline
- Phase 1 Pipeline
- Phase 2 Pipeline
- Study Area Boundary
- Study Area Boundary (Phase 1 project only)
- County Boundary

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Miles

Data Source(s):
Bing Maps Aerial Imagery, CDM Smith, ESA

CDM Smith

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- Email from Michael Ban of MMWD dated March 16, 2012, and an MMWD memorandum attached in that email titled, *Hydraulic Analysis of Recycled Water Expansion to the Peacock Gap Area*, dated April 19, 2007; and
- Phone conversation with Paul Sellier of MMWD on April 26, 2012.

The first project would convert irrigation of the Peacock Gap Golf Course from potable water to recycled water, and would consist of a 12" diameter pipeline totaling approximately 25,500 linear feet (LF). The pipeline would begin at the end of the existing recycled water distribution system on N. San Pedro Road, follow N. San Pedro road east towards Peacock Gap, and end at the existing Peacock Gap tank. The 0.5-million gallon (MG) Peacock Gap tank would be converted from potable water storage to recycled water storage. The location of these planned and existing project elements is shown in Figure 3-2. This first project is anticipated to allow approximately 193 AFY of recycled water to be used by the golf course.

The second project would connect several homeowner associations and residential neighborhoods in the Peacock Gap area to the new 12" pipeline so that recycled water would be used for irrigation in these neighborhoods. The MMWD memorandum estimates the project would supply water to a total of 10 acres of landscaping, equating to approximately 22 AFY, based on typical water use rates for landscape irrigation. The locations of these additional users are not shown on Figure 3-1, but are anticipated to be in the vicinity of the Peacock Gap Golf Course.

3.1.2 MMWD – Lucas Valley Study Area

MMWD would also investigate extending its existing recycled water distribution system westward to serve additional customers in the Lucas Valley area. Information on this potential pipeline extension in the Lucas Valley study area was provided by Michael Ban of MMWD in an email dated March 16, 2012.

The project would include construction of a 6" pipeline totaling approximately 10,600 LF. The pipeline would begin at the end of the existing distribution system on Lucas Valley Road and follow Lucas Valley Road for approximately 3,000 LF. It would then turn north and west again and run through a mostly residential neighborhood with several institutional and recreational facilities. This new pipeline would supply recycled water for irrigation at those facilities. The location of the proposed pipeline is shown in Figure 3-3. The estimated amount of recycled water supplied by this new pipeline is 21 AFY.

3.1.3 MMWD Recycled Water Treatment Plant Expansion

MMWD would investigate expanding its existing recycled water treatment plant by installing new filtration units. According to email communications from Michael Ban of MMWD dated March 16, 2012, and a phone conversation with Paul Sellier of MMWD on April 26, 2012, MMWD has been evaluating several filtration technologies for the plant expansion and is inclined towards selecting Zenon membranes. Construction costs associated with Zenon membranes were used in calculating the project construction costs presented in Section 4.

3.1.4 LGVSD Study Area

As a part of Phase 2, LGVSD would investigate a new 400-acre-foot (AF) multi-purpose recycled water storage pond near its WWTP. This pond will provide storage for secondary effluent that could be used

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

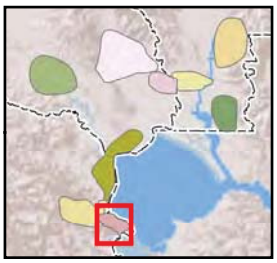

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Figure 3-2
MMWD Peacock Gap Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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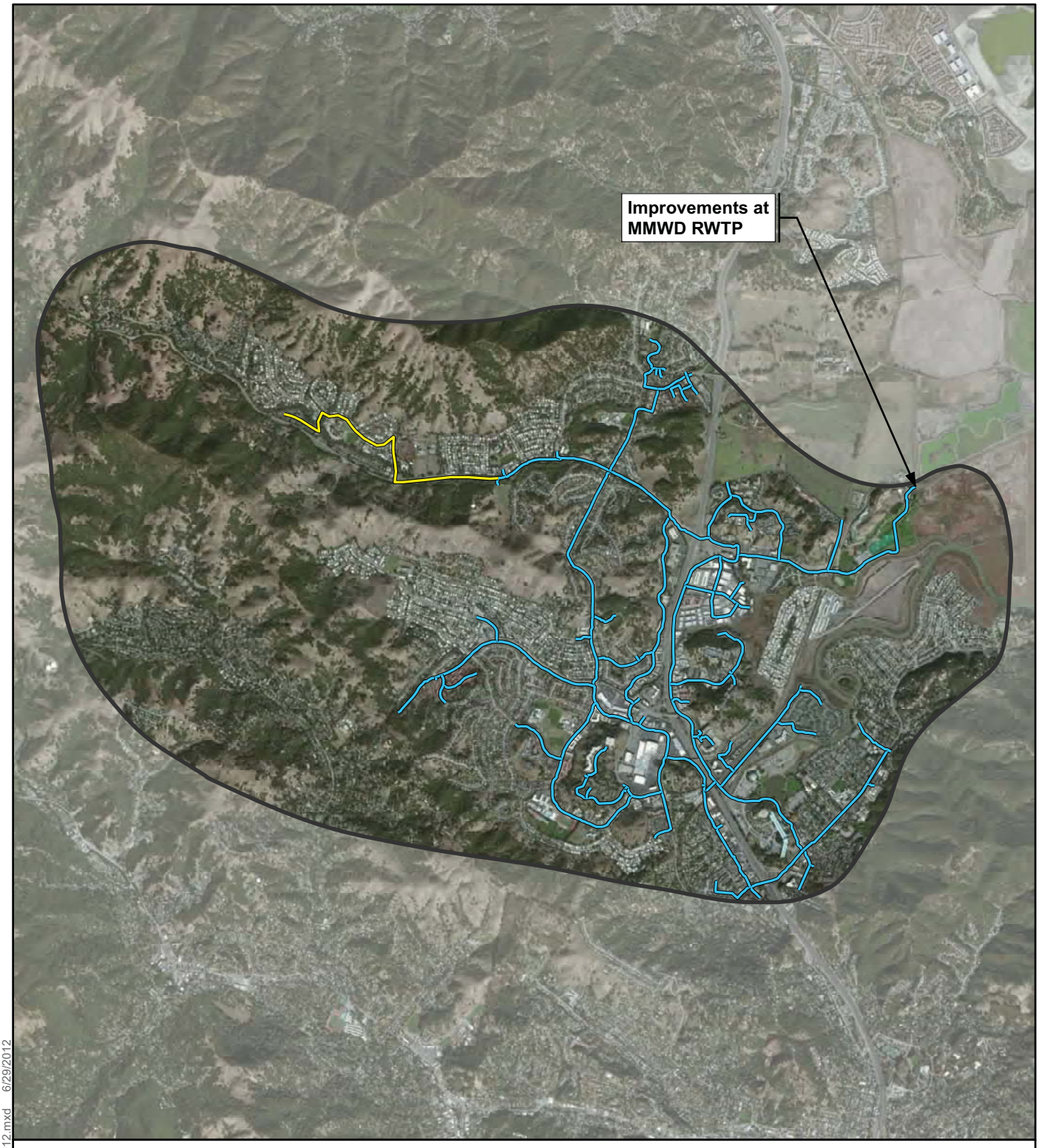

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

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0 0.4 0.8 1.6 Miles

Figure 3-3
MMWD Lucas Valley Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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as is or further treated to tertiary levels as needed to serve customers in the adjacent Novato South and MMWD service areas. The location of this proposed storage feature is shown in Figure 3-4.

Information on this potential storage pond was provided by Mark Williams during development of the *Preliminary Study of Multi-Purpose Reservoir Opportunities for the North Bay Water Reuse Program* (CDM Smith 2012).

As part of Phase 2, LGVSD would also investigate expanding its new Recycled Water Facility, increasing its capacity from 1.4 mgd to 5.4 mgd. Based on information provided by Mike Cortez of LGVSD in a phone conversation on August 14, 2012, the expansion would require the installation of two new membrane filtration units, two ultraviolet disinfection units, new 75-horsepower influent pumps, a new discharge pump, and associated piping, electrical, and SCADA control upgrades.

3.1.5 Novato SD Regional Recycled Water Distribution Project

Novato SD is considering several new recycled water storage and distribution facilities during Phase 2. The information on potential projects by Novato SD was provided in the documents *Bel Marin Keys Unit V Restoration Project – Evaluation of NSD Outfall Alternatives* (California State Coastal Conservancy 2012), and *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008). The locations of these facilities are shown in Figure 3-5.

Novato SD would investigate construction of a new 248-acre multi-purpose storage pond to temporarily store secondary effluent from Novato SD's WWTP before the water is pumped to off-site locations for use. Approximately 9,000 LF of earthen levee would be constructed to create the new storage pond. The earthen levee would be approximately 15 feet tall, and designed similar to other new and planned levees in the area. The pond would provide 2,700 AF of capacity, equivalent to 85 days of storage at the average wet weather flow of 10.3 mgd from the WWTP. This new storage pond would provide wet-weather storage for reuse during the summer months, reducing the amount of effluent discharged into San Pablo Bay.

The existing outfall pipeline discharging into San Pablo Bay would be truncated to discharge into the new storage pond/wetlands. The overflow from the storage pond/wetlands would flow directly into the adjacent new bay wetlands.

A new flow splitting structure and pump station would be constructed to pump the water stored in the pond to users. The pump station is assumed to include three 250-horsepower (HP) pumps (two duty, one standby). For agricultural reuse, the pump station would deliver the stored secondary effluent directly into the agricultural irrigation system. For tertiary reuse, the pump station would pump the stored effluent to a treatment facility for further treatment to Title 22 tertiary standards before the recycled water is supplied to users.

A potential new 18" pipeline could convey secondary effluent from the pond to agricultural and vineyard users in Sonoma County. The 43,800-LF pipeline would run northward from the pump station, and cross beneath the Petaluma River in order to reach agricultural users (primarily vineyard and pasture farms) in Sonoma County.

Another new 18" pipeline, approximately 20,700 LF in length, would run southward from the pump station and interconnect with LGVSD's recycled water system. This pipeline will allow the two systems to be able to share recycled water resources during peak usage periods in either area.

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

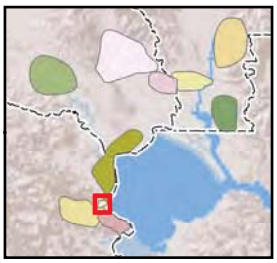

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Figure 3-4
LGVSD Recycled Water Storage Ponds Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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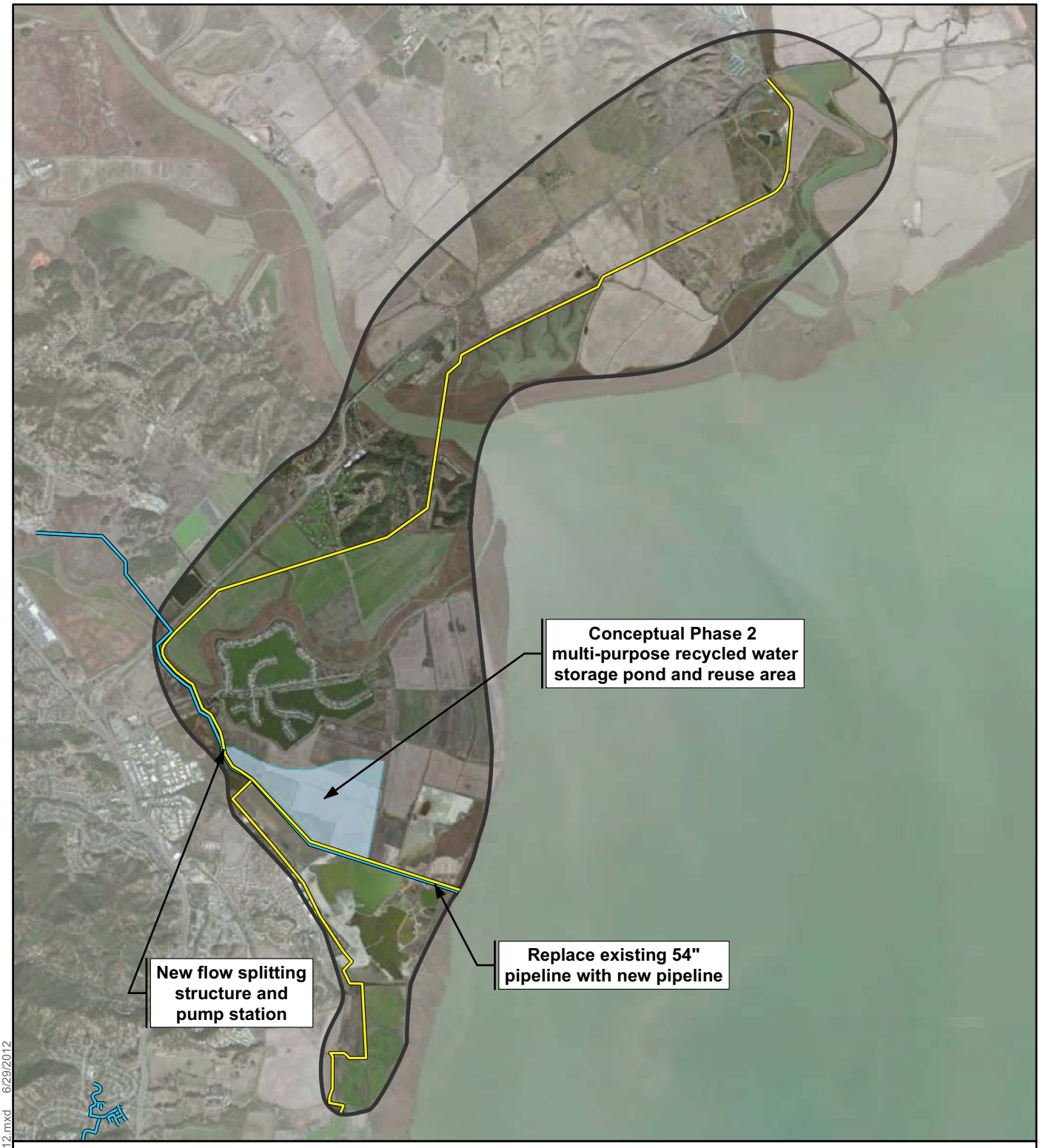

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

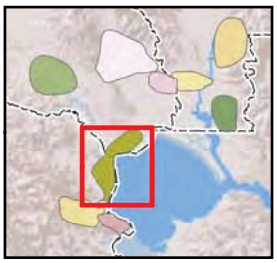

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Figure 3-5
Novato SD Regional Recycled Water Distribution Project

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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The Phase 2 infrastructure described above is expected to provide 535 AFY of recycled water to users.

3.1.6 City of Petaluma Study Area

As a part of Phase 2, the City of Petaluma would investigate a tertiary recycled water distribution system consisting of 113,000 LF of pipelines. Information on the City of Petaluma projects was compiled from the following sources:

- City of Petaluma *2010 Urban Water Management Plan*, Public Review Draft (City of Petaluma 2011); and
- City of Petaluma *Water Demand & Supply Analysis Report* (City of Petaluma 2006).

The pipelines would range in size from 6" to 20" in diameter. The distribution system would consist of two main branches: one branch would extend from the end of an existing (but not yet in use) 20" pipeline that originates from the Ellis Creek Water Recycling Facility and would run westward to serve customers; the second branch would connect to the existing 20" pipeline upstream of the first branch and extend in the southwest direction. The distribution system would serve mostly schools and parks, but the two biggest users would be golf courses.

The locations of the proposed pipelines are shown in Figure 3-6. This distribution system would provide 1,994 AFY of tertiary recycled water, of which 1,423 AFY would offset potable water demands and 571 AFY would offset non-potable water demands.

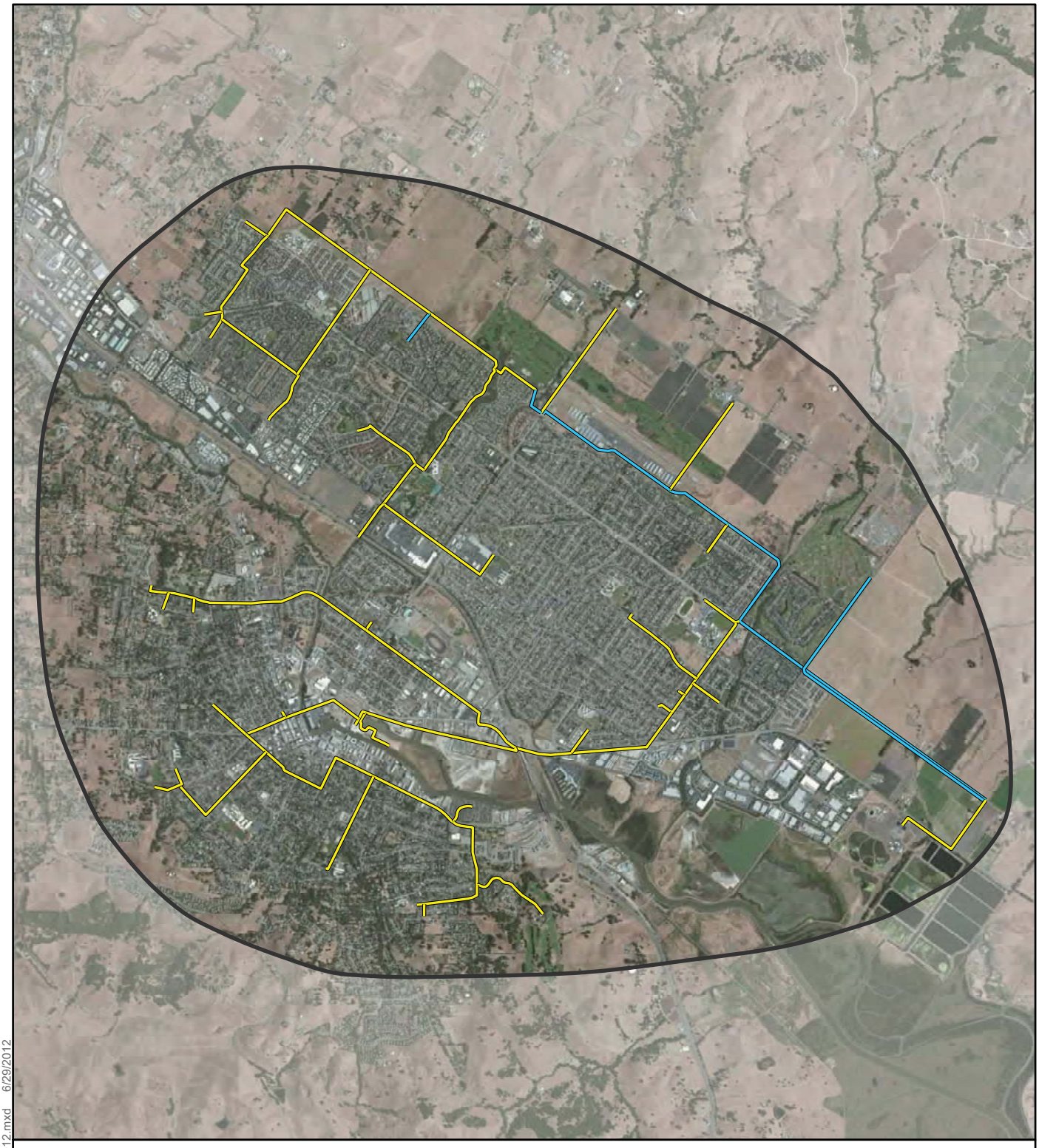
3.1.7 Sonoma Valley Recycled Water Project Study Area

For its Phase 2 project elements, SVCSD would investigate new recycled water pipelines to expand its recycled water service area north of the SVCSD wastewater treatment facility (WWTF). The locations of the proposed pipelines are shown in Figure 3-7. The new pipelines will range in size from 6" to 12" in diameter and will total 22,750 LF. One branch would begin at the WWTF and extend north for approximately three miles. Another branch would connect to the end of an existing Phase 1 pipeline and continue in the north and west directions. The new pipelines would deliver an estimated 354 AFY of recycled water to new customers.

SVCSD would also expand its existing recycled water network south and east of the WWTF to existing vineyards and local ponds in the area. The location of the targeted project area is shown in Figure 3-8. Exact locations for the pipelines have not been identified, but based on discussions with SVCSD staff, it is estimated that approximately 20,000 LF of 12" pipelines would be considered for construction. Through a review of the vineyard acreage within the targeted project area, it is estimated that this expansion could deliver an additional 314 AFY to new customers.

Information on these proposed pipeline expansion projects was compiled from the following sources:

- *SVCSD WWTF Recycled Water Effluent Pumping Station Design Report*, draft, dated July 5, 2011. (Sonoma Valley County Sanitation District 2011);
- Discussions with Kevin Booker in October 2011; and
- Email correspondence with Marc Bautista and Kevin Booker on March 12, 2012.



Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

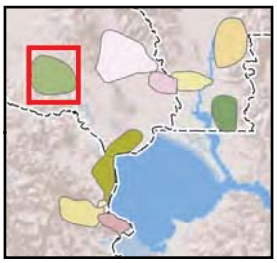


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Figure 3-6
City of Petaluma Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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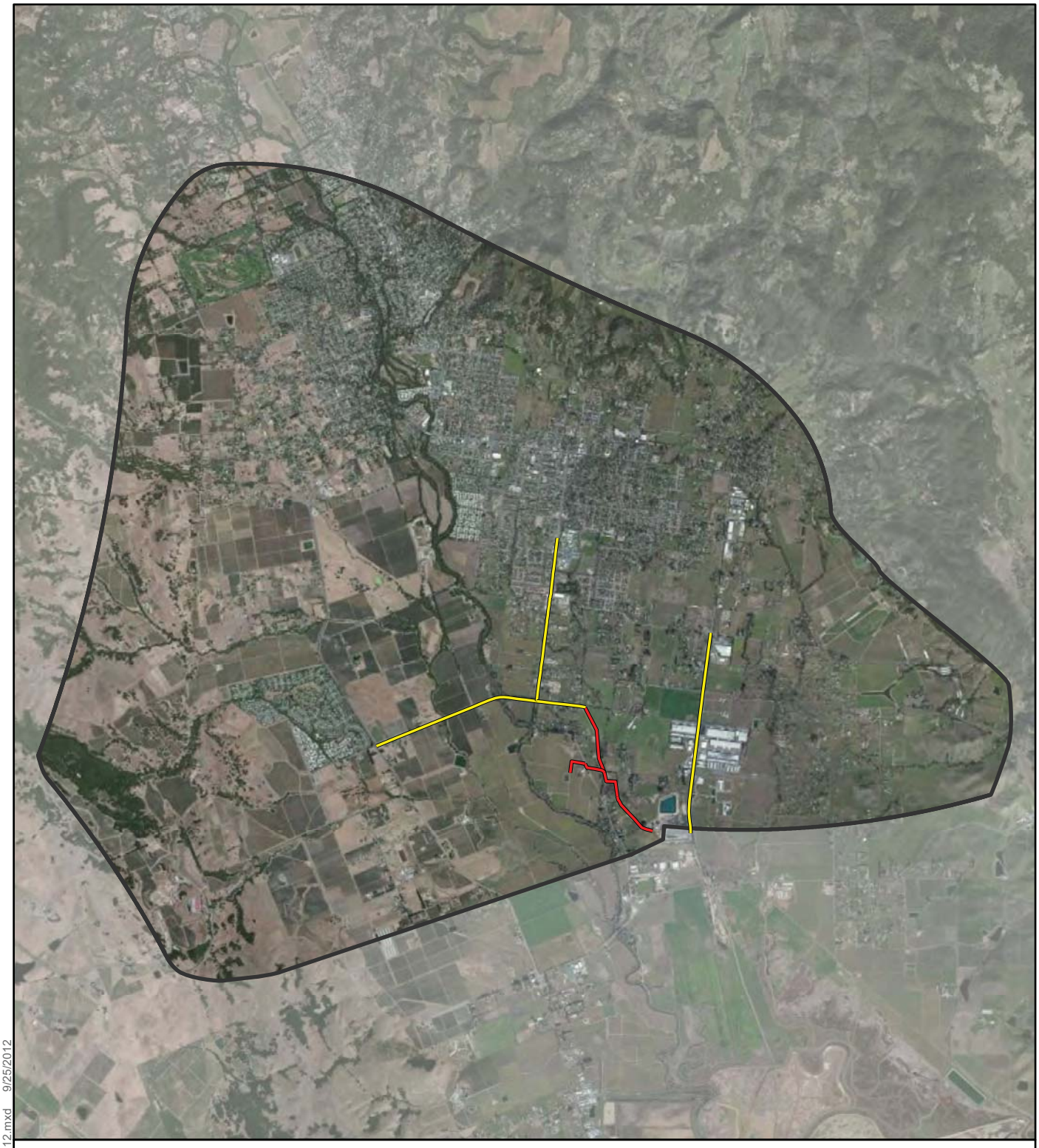

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

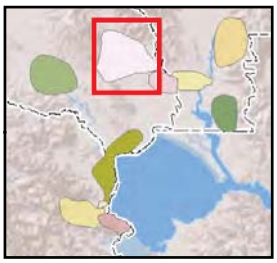

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Figure 3-7
Sonoma Valley North Recycled Water Project Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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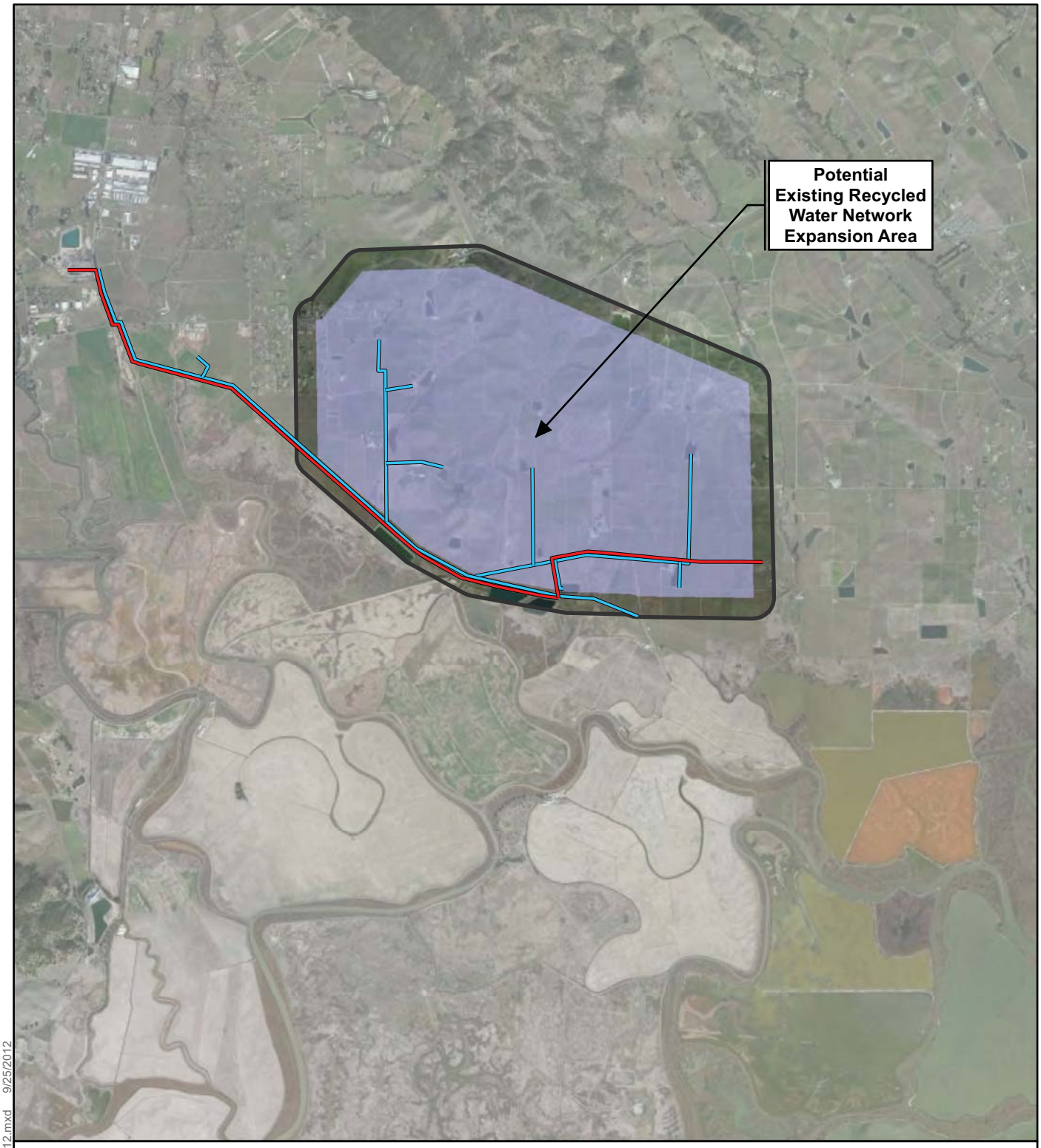

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

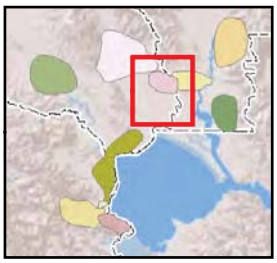

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Figure 3-8
Sonoma Valley South Recycled Water Project Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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3.1.8 Los Carneros Water District Study Area

As part of Phase 2, Napa SD and Los Carneros Water District (LCWD) would investigate a recycled water distribution system to provide tertiary recycled water to LCWD's existing members and two new users (Stanly Ranch and Haire property). The recycled water would be supplied by Napa SD and is therefore identified as a Napa SD project in this report. Information on the proposed LCWD recycled water system was obtained from the *Los Carneros Water District Recycled Water Feasibility Study* (Los Carneros Water District 2011).

The project would consist of approximately 55,400 LF of pipelines ranging in diameter from 6" to 24", with 1,000 LF of the 24" pipeline in a 42" casing at a Napa River crossing. The 24" pipeline would originate from Napa SD's Soscol Water Recycling Facility, cross the Napa River, continue through Stanly Ranch, and run along Stanly Cross Road. At the intersection with Cuttings Wharf Road, the 24" pipeline would branch into two smaller branches. One branch would continue in the northeast direction and end in Withers Road, serving the eastern portion of LCWD's service area. The second branch would extend west, continue in Las Amigas Road, and branch out further on Duhig Road, serving the southern and western portions of LCWD's area. The locations of the proposed pipelines are shown in Figure 3-9.

The projected demand in this distribution system would be 1,806 AFY. Over 65 percent of the projected use would be for vineyard irrigation, while the remaining demand would consist of primarily landscape irrigation.

3.1.9 Napa SD Study Area

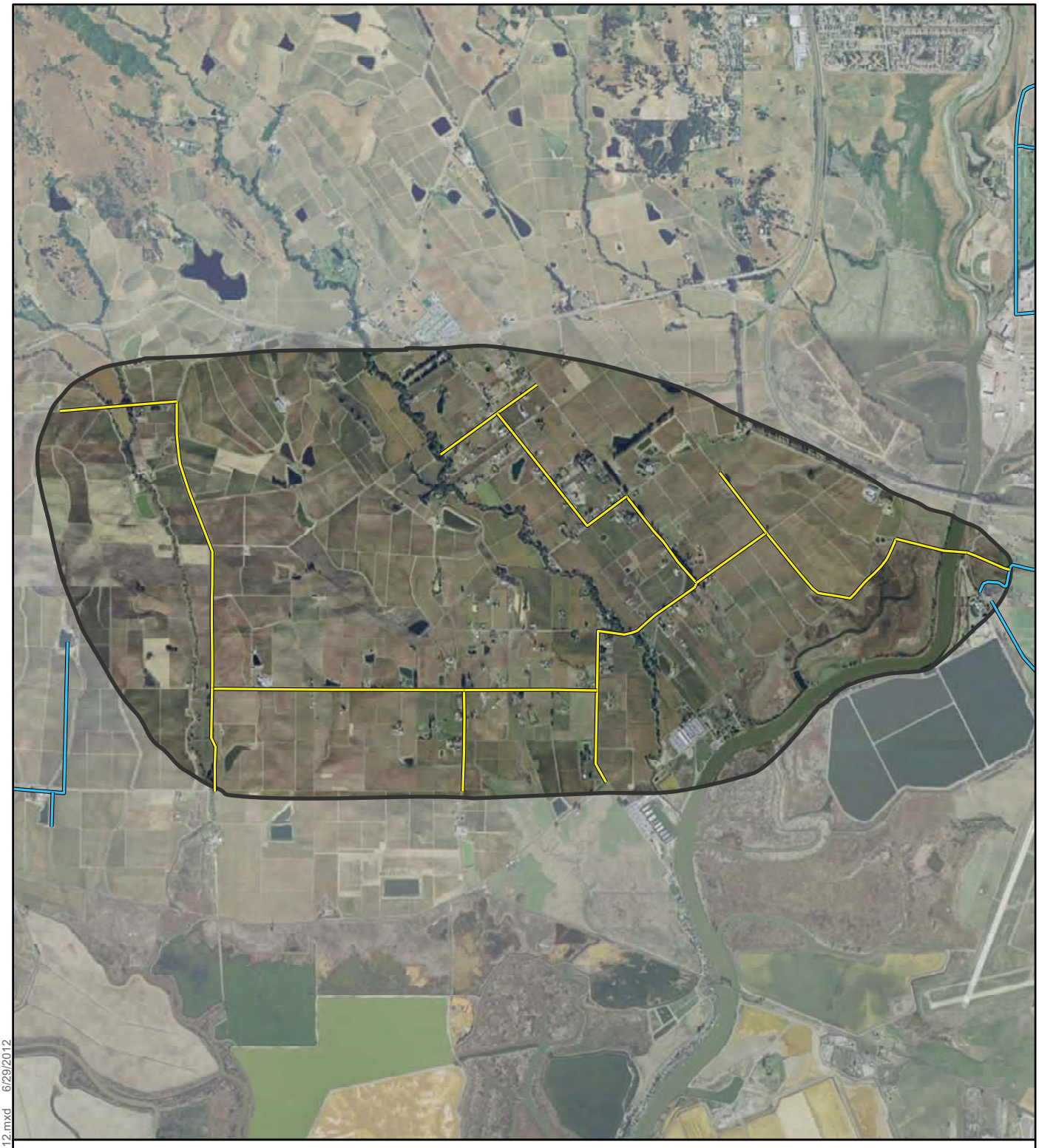
For its Phase 2 elements, Napa SD could investigate an extension to Phase 1 recycled water pipelines in the MST area identified in the Phase 1 Feasibility Study, as well as increase recycled water treatment, storage, and pumping capacities at its WWTP. The locations of these potential project elements are shown in Figure 3-10.

A 3,200-LF pipeline extension would expand the recycled water pipeline network in the MST area. The new 12" pipeline would supply an estimated 77 AFY of recycled water to an existing cemetery for landscape irrigation. This estimate was developed through an aerial review of the landscaped acreage at the cemetery.

Several improvements would be considered at the WWTP. An additional 600 square feet of filters would be built at the WWTP to increase the tertiary treatment capacity by 1.7 mgd. A 200-HP jockey pump would be added at the existing Soscol Pump Station, where tertiary effluent from the Soscol Water Recycling Facility is pumped into the recycled water distribution system. The new pump would be considerably smaller than the existing 600-HP pumps, and would improve reliability when recycled water demands are low. A 10-AF storage pond would also be constructed to store tertiary effluent that would be supplied to customers to meet daily peak demands. Similar to two existing 10-AF ponds, the new pond would have a clay bottom, concrete-lined side slopes, and a Hypalon cover.

Information on the proposed Napa SD projects was compiled from the following:

- Draft Technical Memorandum – *Napa Sanitation District MST Recycled Water Pipeline* (Napa Sanitation District 2011a);
- Napa Sanitation District *Wastewater Treatment Plant Master Plan* (Napa Sanitation District 2011b); and



Data Source(s):
ESRI World Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

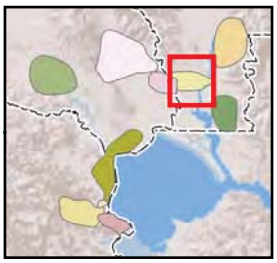


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Figure 3-9
LCWD Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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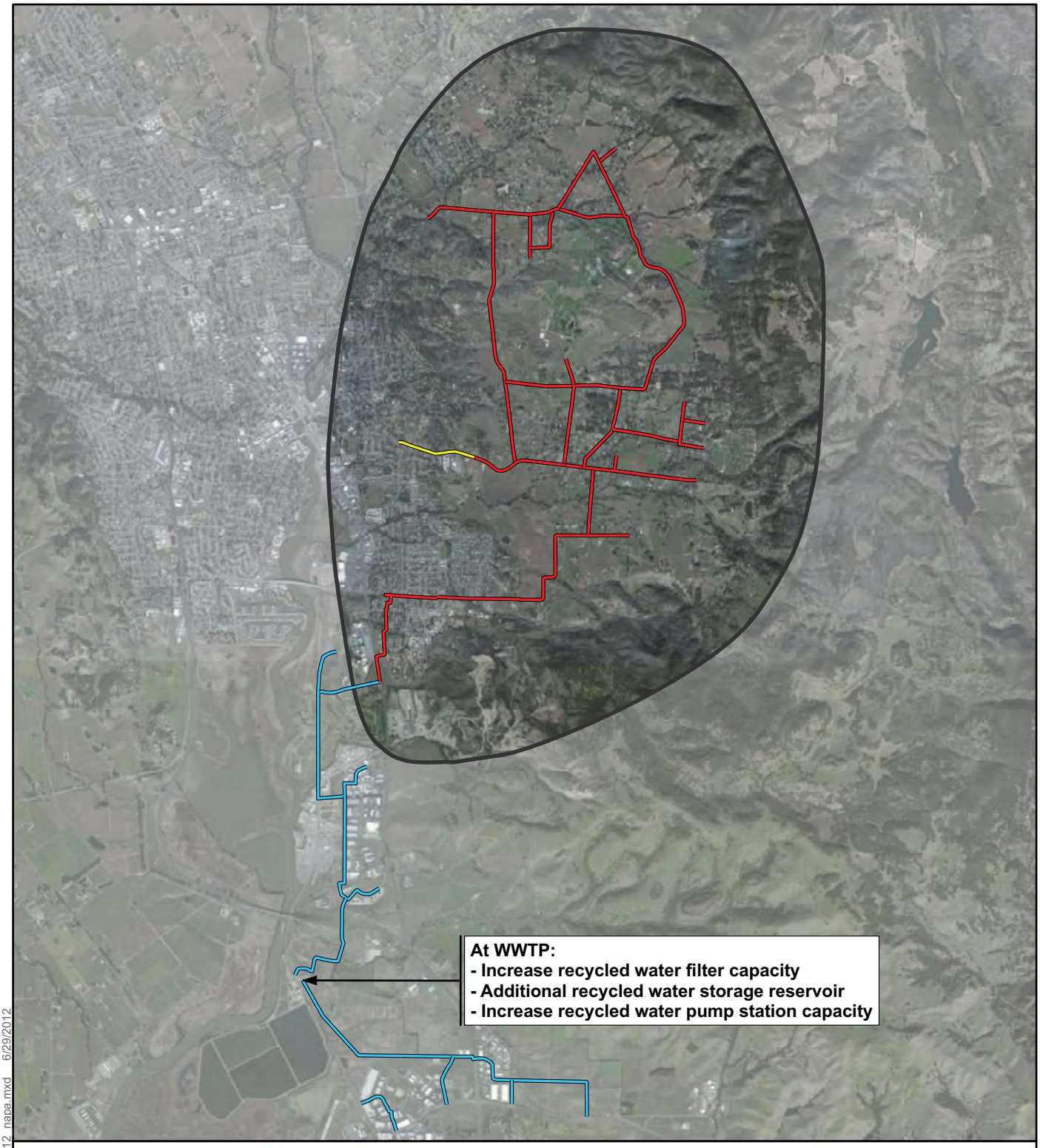

Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

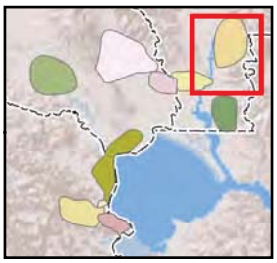

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Figure 3-10
Napa SD WWTP and MST Study Areas

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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- Discussion with Tim Healy of Napa SD on January 26 and April 6, 2012; and email from Jeff Tucker of Napa SD on April 5, 2012.

3.1.10 City of American Canyon Study Area

As part of Phase 2, the City of American Canyon would evaluate expanding its existing recycled water system by constructing new conveyance and storage facilities. New seasonal storage ponds would store excess recycled water during the winter months when irrigation demands would be low, and supplement the supply in summer when demands would be high. New pipelines would complete a looped system, allowing the storage provided by the seasonal ponds and an existing recycled water tank to be available to serve any user in the system. The locations of these proposed project elements are shown in Figure 3-11.

The information on proposed City of American Canyon Phase 2 projects, summarized in the paragraphs that follow, was compiled from the following sources:

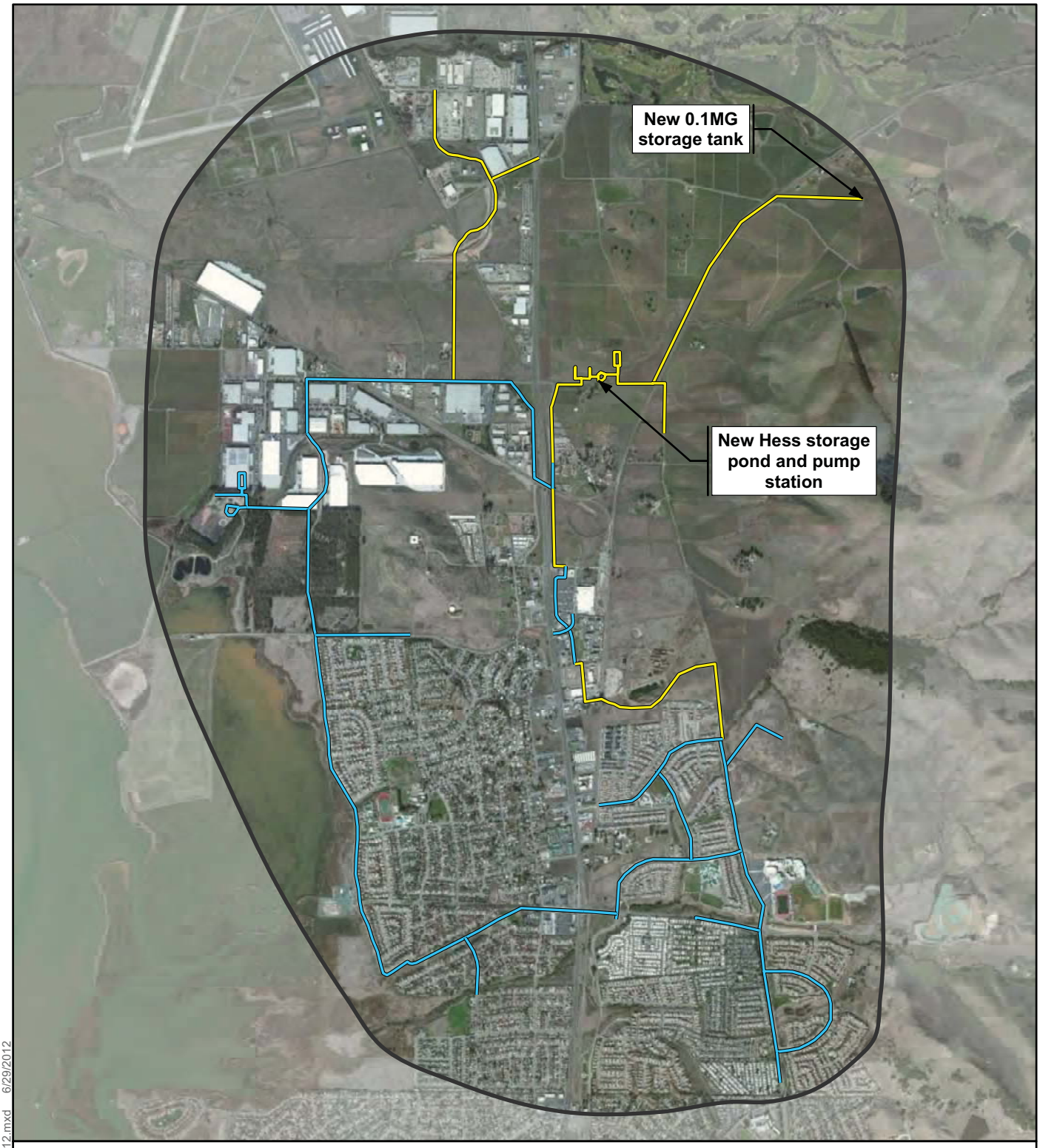
- American Canyon *Recycled Water Implementation Plan* (City of American Canyon 2005);
- City of American Canyon *Final 2010 Urban Water Management Plan* (City of American Canyon 2011); and
- City of American Canyon *Recycled Water Distribution Plan* (2010) provided by the City of American Canyon Public Works & Engineering (City of American Canyon 2010).

New pipelines to serve the New Vineyard portion of the American Canyon's Recycled Water Distribution Plan would extend from the end of the existing Green Island Road Pipeline, and would provide an estimated 356 AFY of recycled water primarily to vineyard users. American Canyon would partner with one of the users, Hess Collection Wineries, to construct seasonal storage ponds to store 98 AF of water to supplement supply during the summer when demand is at its highest. A high-zone pump station, assumed to include two 30-HP pumps, would be constructed near the Hess ponds because this portion of the system would be at higher elevations than the southern system. In addition, a 100,000-gallon steel storage reservoir would be constructed at the northeast end of the pipelines. The reservoir would help regulate service pressures in the high zone and could also serve as redundant storage for the low zone, if needed.

Pipelines serving the Town Center portion of the city would run parallel to and east of Highway 29, connecting existing pipelines in the north and south and completing a looped system. The pipeline would generally follow the alignment of Main Street, South Napa Junction, Town Center Drive, and Newell Drive through the proposed Town Center Project. It is anticipated that this pipeline would only add new customers requiring an additional 3 AFY, but the completion of a looped distribution system in this part of the city would be the greatest benefit of these pipelines.

The pipeline serving the Tower Road area would begin at Green Island Road and extend to the airport industrial area in the northern part of the City's service area. The pipeline would generally follow the Devlin Road alignment, and would provide approximately 51 AFY of recycled water to industrial users.

The sum of all of American Canyon's proposed Phase 2 projects would consist of approximately 2,500 LF of 6" pipes and 27,400 LF of 12" pipes, providing a total of 410 AFY of recycled water to new customers.



Data Source(s):
Bing Maps Aerial Imagery,
CDM Smith, ESA

Legend

- Existing Pipeline
- Phase 1
- Phase 2
- Study Area Boundary

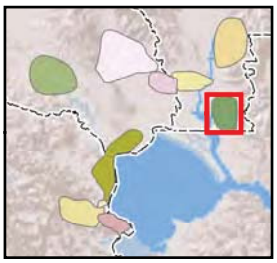


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Figure 3-11
City of American Canyon Study Area

Conceptual Phase 2 Project Elements
North Bay Water Reuse Program

CDM Smith

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3.2 Phase 2 Recycled Water Supply and Demand Details

A major constraint for developing NBWRA Phase 2 projects is the availability of tertiary recycled water after a portion of that supply is committed to Phase 1 projects. The Phase 1 program minimized the use of seasonal storage to meet the peak irrigation needs in the summer and early autumn. Consequently, a significant amount of the summer season[1] recycled water flows are projected to be used by the Phase 1 projects and are not available for Phase 2 projects. However, there is significant supply available on an annual basis, with most of the flow available during the winter when demands are low to non-existent.

The following sections define the available recycled water supplies by agency and tabulate the water demands on an annual and monthly basis based on information provided by the agencies and tools developed in Phase 1. The net available flow to meet Phase 2 potential demands after completion of Phase 1 is also presented. Finally, a monthly operations review of the available supplies versus potential Phase 2 projected demands demonstrates the need for seasonal storage to meet these demands. This stage in the analysis only addresses the individual recycled water suppliers and projects. Future studies will look at regional opportunities and synergies between agencies and geographies to meet the potential Phase 2 demands and need for seasonal storage.

3.2.1 Total Supply of Recycled Water

Monthly WWTP effluent flow data was obtained from the participating agencies or derived from other sources if not directly available from the agency. The year 2010 was identified as the most consistent basis of supply information for this report because monthly WWTP flow data for 2010 could either be directly obtained from some of the agencies or could be synthesized from older monthly data. Assuming implementation for Phase 2 could occur after 2016, future analysis should include updated forecast for future flows from the agencies on a consistent format.

Whenever possible, WWTP effluent flow data was used instead of influent flow data to better account for WWTP process losses. The 2010 estimated monthly flows, by participating WWTP, are summarized in Table 3-2.

[1] The "summer" season, when effluent discharged is not permitted, may vary between the participating wastewater agencies.

Table 3-2. Summary of Monthly WWTP Effluent Flows

Agency	Data Year	Monthly WWTP Effluent Flow MG (AF)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
LGVSD	2010	144	125	114	109	79	69	67	66	63	66	69	126
		(442)	(383)	(348)	(334)	(241)	(212)	(207)	(202)	(192)	(204)	(212)	(386)
Novato SD	2010	224	204	214	202	156	130	132	127	128	136	144	236
		(688)	(627)	(657)	(621)	(480)	(399)	(405)	(390)	(393)	(417)	(441)	(725)
City of Petaluma	2010	--	--	--	--	256	235	239	170	175	187	--	--
		--	--	--	--	(787)	(722)	(734)	(522)	(536)	(574)	--	--
SVCSD	2010	171	148	152	148	91	71	66	68	65	81	89	198
		(525)	(455)	(466)	(454)	(278)	(219)	(203)	(207)	(200)	(248)	(274)	(609)
Napa SD	2006-2008 avg	1,464	855	1,050	756	744	663	658	656	638	623	622	1,061
		(4,493)	(2,624)	(3,222)	(2,320)	(2,283)	(2,035)	(2,019)	(2,013)	(1,958)	(1,912)	(1,909)	(3,256)
City of American Canyon	2010	70	61	63	61	53	48	47	49	46	47	41	46
		(215)	(188)	(194)	(186)	(162)	(146)	(146)	(151)	(143)	(144)	(127)	(143)

A summary of the data sources, assumptions, and calculations for the monthly flows found in Table 3-2 is found below:

LGVSD: Mark Williams provided monthly WWTP effluent data for 2010 in an email dated August 23, 2011.

Novato SD: Beverly James provided monthly WWTP data for 2010 in an email dated October 21, 2011. The values in Table 3-2 reflect effluent data for January to May 2010, since the WWTP did not have influent monitoring until that point, and reflect influent data from June to December 2010, due to a transition to influent flow monitoring.

City of Petaluma: Jeanne Castro provided historical recycled water planning-related documents on October 6, 2011. The WWTP average dry weather flow data was obtained from Tables W-1 and W-3 of the City of Petaluma *Water Demand & Supply Analysis Report* (City of Petaluma 2006). The 2005 monthly WWTP flow data in Table W-3 was modified by adding an additional 1.18 mgd base load to each day to develop the projected 2010 average dry weather flow presented in Table W-1. The average dry weather flow was calculated by averaging the three consecutive summer months that reflected the lowest flows. A summary of this effort is presented below in Table 3-3.

Table 3-3. City of Petaluma WWTP Monthly Flow Synthesis Method Summary

Month	2005 Flows (mgd)	Assumed Additional Base Load (mgd)	Projected 2010 Flows (mgd)
May	7.09	1.18	8.27
Jun	6.66	1.18	7.84
Jul	6.54	1.18	7.72
Aug	4.31	1.18	5.49
Sep	4.64	1.18	5.82
Oct	4.85	1.18	6.03
Average Dry Weather Flow (Aug – Oct)	4.60		5.78

SVCSD: Kevin Booker provided monthly WWTP effluent data for 2010 in an email dated October 17, 2011.

Napa SD: Tim Healy provided historical WWTP seasonal flow summary information from 2002 to 2008 from the Napa SD *Wastewater Treatment Plant Master Plan* (Napa Sanitation District 2011b) in an email dated November 22, 2011. Monthly distribution of WWTP effluent flow was synthesized from 2002 monthly WWTP flow records obtained during preparation of the *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008). The 2002 monthly flow records were modified by including the additional potential winery waste flows to the WWTP (Table 2-9; Napa SD *Wastewater Treatment Plant Master Plan*; 2011), adding an additional 0.21 mgd base load to each day, and elevating the January average daily flow rate to 15.4 mgd. The resulting monthly flows closely match the average annual, average dry weather, average dry weather maximum month, and average wet weather maximum month flows from 2006-2008 per Table 2-8 of the Napa SD *Wastewater Treatment Plant Master Plan*. A comparison of this effort is presented below in Table 3-4.

Table 3-4. Napa SD WWTP Monthly Flow Synthesis Method Summary

Month	2002 Flows (mgd)	Contribution from Wineries (mgd)	Assumed Additional Base Load (mgd)	Assumed Additional Wet Weather Flows (mgd)	Total Flow Rate (mgd)
Jan	11.71	0.00	0.21	3.46	15.38
Feb	9.74	0.00	0.21	0.00	9.95
Mar	10.83	0.00	0.21	0.00	11.04
Apr	8.00	0.00	0.21	0.00	8.21
May	7.61	0.00	0.21	0.00	7.82
Jun	6.99	0.00	0.21	0.00	7.20
Jul	6.46	0.25	0.21	0.00	6.92
Aug	6.06	0.62	0.21	0.00	6.89
Sep	5.96	0.75	0.21	0.00	6.92
Oct	5.74	0.60	0.21	0.00	6.55
Nov	6.25	0.29	0.21	0.00	6.75
Dec	10.80	0.14	0.21	0.00	11.15

Napa SD WWTP Flow Condition	Reported 2006-2008 Average (mgd)	Calculated From Above Totals (mgd)
Average Annual Flow	8.72	8.73

Table 3-4. Napa SD WWTP Monthly Flow Synthesis Method Summary

Month	2002 Flows (mgd)	Contribution from Wineries (mgd)	Assumed Additional Base Load (mgd)	Assumed Additional Wet Weather Flows (mgd)	Total Flow Rate (mgd)
Average Dry Weather Flow			6.79		6.79
Average Dry Weather Maximum Month			7.81		7.82
Average Wet Weather Maximum Month			16.08		15.38

City of American Canyon: Steve Moore provided monthly WWTP effluent data for 2010 in an email dated September 21, 2011. Because flow data for November and December 2010 was not available at the time this file was received, the data in Table 3-A represents monthly flows from November 2009 through October 2010.

3.2.2 Available Recycled Water Supply After Phase 1 Implementation

The recycled water supply available for Phase 2 projects is a function of the total effluent supply shown in Section 3.2.1 less the water committed to meet Phase 1 projects identified in the Phase 1 Feasibility Study and the Environmental Impact Report (EIR)/Environmental Impact Statement (EIS). Additionally, potential new agency supplies were determined based on the information provided during project research. The available supply of recycled water for Phase 2 projects from each of the participating agencies reflects the following:

- For the existing NBWRA agencies, included in the *Final North San Pablo Bay Restoration and Reuse Project EIR/EIS*: The available supply of recycled water for Phase 2 projects reflects near-term full development of the Phase 1 recycled water projects as identified in the *Final North San Pablo Bay Restoration and Reuse Project EIR/EIS* (Bureau of Reclamation and North Bay Water Reuse Authority 2009); and
- For new agencies participating in Phase 2 studies: The available supply of recycled water for Phase 2 projects reflects the current availability of treated water for future recycled water projects as provided by the agencies.

3.2.2.1 Water Demands

A summary of the monthly recycled water demands anticipated from completion of the existing and Phase 1 near-term recycled water projects for each agency is presented below in Table 3-5. The recycled water demands were obtained from calculations used to develop the *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008), modified (as was necessary for SVCSD) by the *Final North San Pablo Bay Restoration and Reuse Project EIR/EIS* (Bureau of Reclamation and North Bay Water Reuse Authority 2009).

Table 3-5. Existing and Phase 1 Monthly Recycled Water Use by Agency (Acre Feet/Month)

Month	MMWD/LGVSD	Novato SD	Petaluma[1]	SVCSD	Napa SD	American Canyon	Total
January	1	1	0	1	0	0	3
February	1	1	0	0	0	0	2
March	8	7	0	3	0	0	17
April	71	57	0	21	305	36	489
May	88	71	0	224	500	58	941
June	169	137	0	329	938	116	1,690
July	197	160	0	324	981	121	1,783
August	203	164	0	214	803	98	1,482
September	139	112	0	70	533	64	918
October	109	88	0	20	223	26	466
November	13	11	0	1	0	0	25
December	5	4	0	0	0	0	10
Subtotal (AFY)	**1,004**	**812**	**0**	**1,207**	**4,283**	**519**	**7,826**

1: City of Petaluma's values reflect tertiary recycled water demands only.

3.2.2.2 Net Water Supply for Phase 2 Projects

The graphs that follow present the 2010 total supply data from each WWTP, compared to the available supply assuming current or near-term completion of each participant's existing reuse and Phase 1 recycled water projects. In some cases, the available water supply during peak demand months is negative, indicating that the agency has a mechanism for seasonally storing water during off peak months to serve peak demand months. The total amount of storage required to meet these demands is represented by the shaded areas in Figures 3-12 through 3-17 and summarized in Table 3-6.

LGVSD: LGVSD can meet its projected Phase 1 recycled water demands without storage and has capacity to serve some additional summer demands except in July and August.

Figure 3-12. LGVSD Total Recycled Water Supply and Supply After Phase 1

Novato SD: Novato SD can meet Phase 1 demands without storage and has capacity to serve additional summer demands.

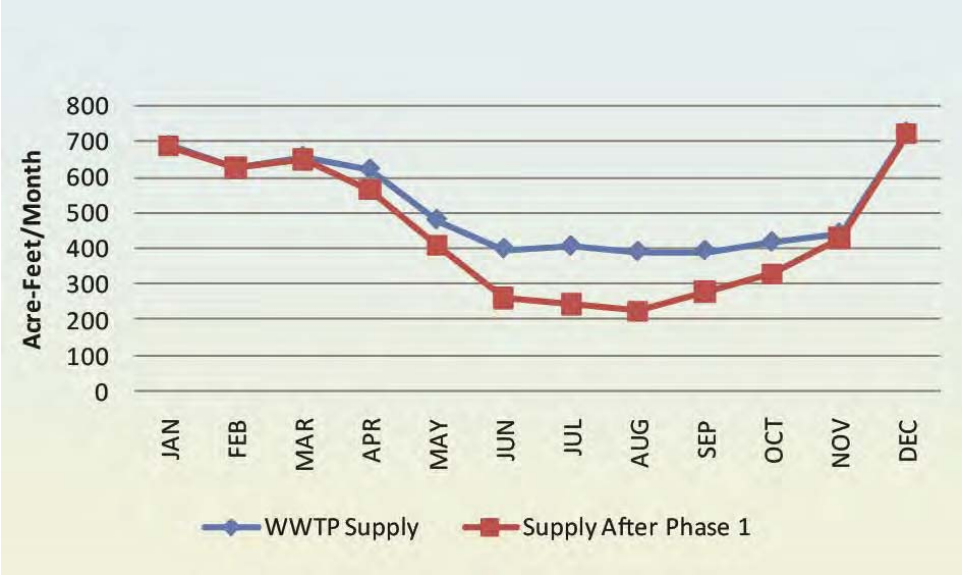

Figure 3-13. Novato SD Total Recycled Water Supply and Supply After Phase 1

City of Petaluma: The City of Petaluma is planning to scale back service from its existing secondary recycled water system in order to expand and meet the demands of its planned tertiary recycled water system. The City currently has no tertiary effluent users. As a result, the City could effectively use storage to maximize water supply service and minimize effluent discharges by continuing to serve existing customers that use secondary recycled water while expanding service to customers that could receive tertiary treated recycled water.

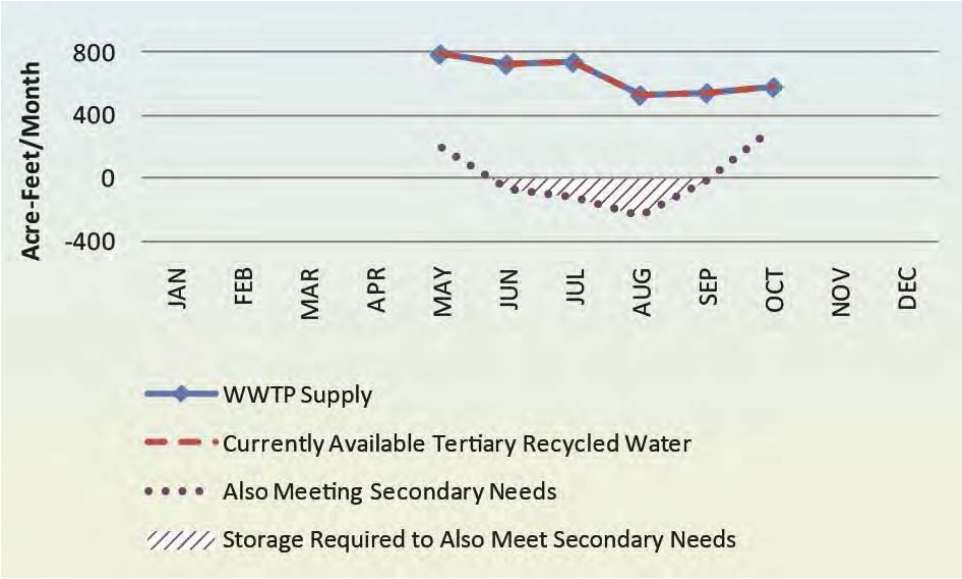

Figure 3-14. City of Petaluma Total Recycled Water Supply and Supply After Existing Reuse

SVCSD: Figure 3-15 illustrates that SVCSD requires the additional storage developed in Phase 1 to meet the commitments of Phase 1 demands[2]. The storage needed to meet SVCSD's Phase 1 demands is approximately 238 AF.

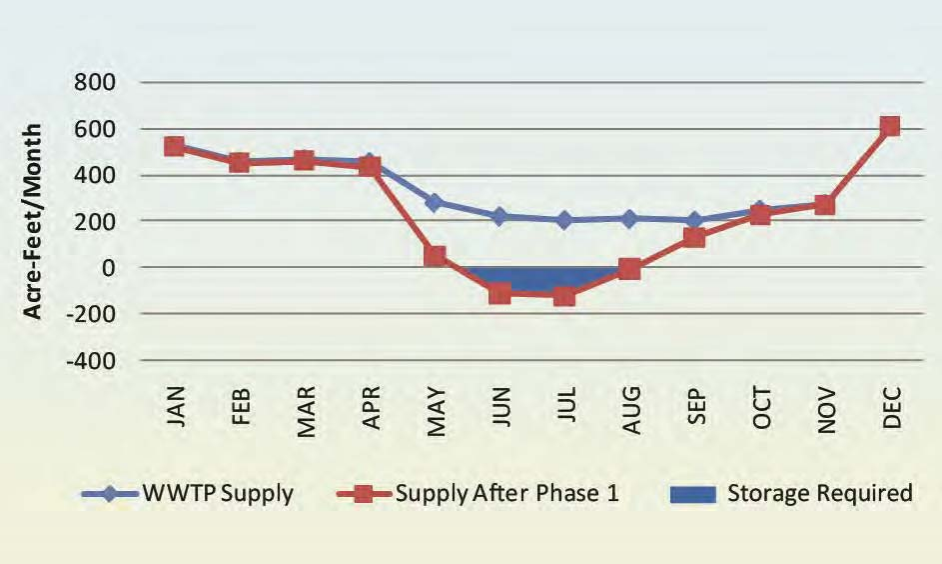

Figure 3-15. SVCSD Total Recycled Water Supply and Supply After Phase 1

Napa SD: Napa SD could rely on a number of storage options at its WWTP and on parcels associated with potential recycled water users to meet peak demands identified in the Phase 1 Feasibility Study and EIR/EIS. The storage needed to meet Napa SD's Phase 1 demands is approximately 745 AF.

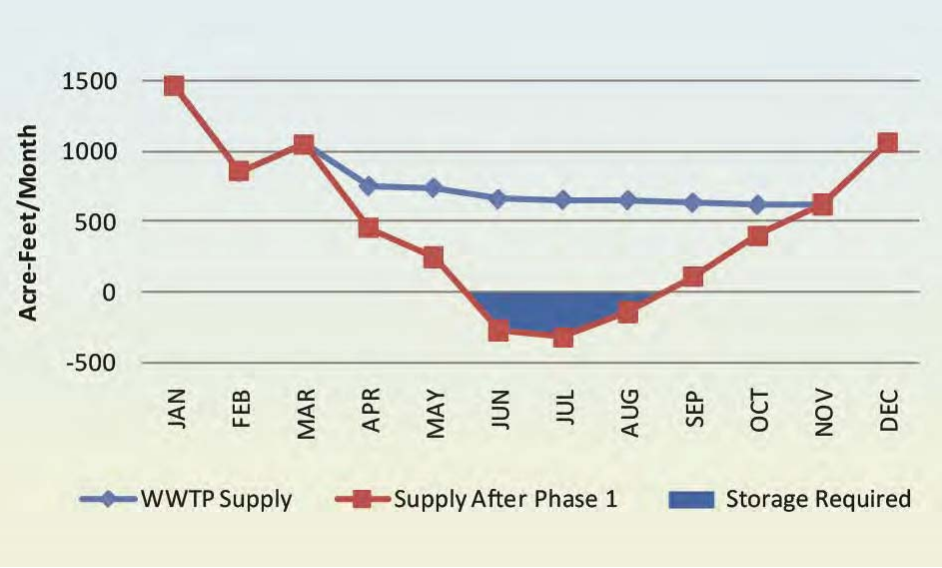

Figure 3-16. Napa SD Total Recycled Water Supply and Supply After Phase 1

[2] SVCSD's Phase 1 demand is based on data in the *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008), modified by the *Final North San Pablo Bay Restoration and Reuse Project EIR/EIS* (Bureau of Reclamation and North Bay Water Reuse Authority 2009). Any changes to the projected demand for the Napa-Sonoma Salt Marsh Project should be incorporated into future studies.

City of American Canyon: The City of American Canyon can meet its existing demands with no storage and has capacity to serve some additional summer demands.

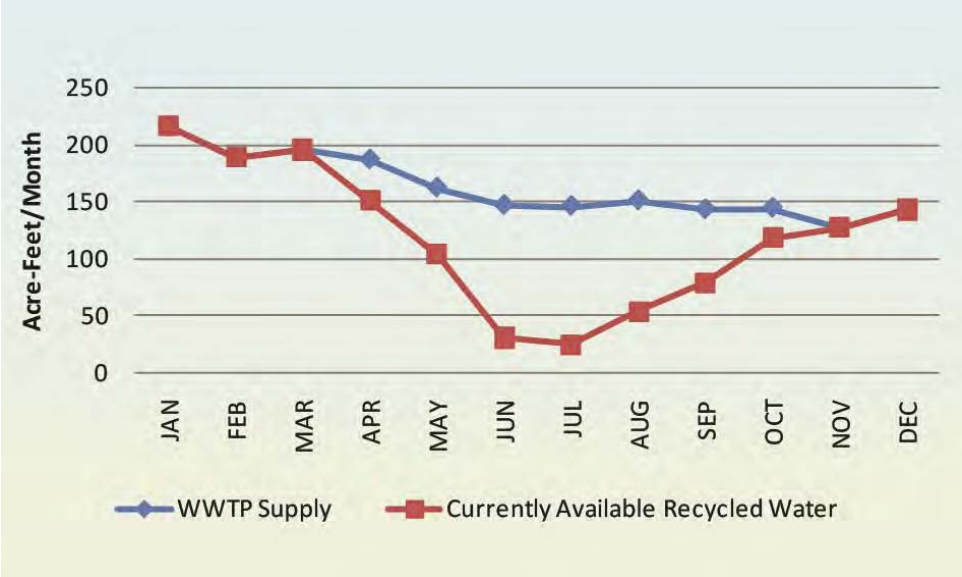

Figure 3-17. City of American Canyon Total Recycled Water Supply and Supply After Existing Reuse

3.2.2.3 Phase 1 Implementation Summary and Insights

Table 3-6 presents the amount of storage currently required by each participant to meet existing reuse and Phase 1 recycled water demands, per the shaded volumes shown in Figures 3-12 through 3-17. Depending on the nature of the recycled water distribution system and its users, the required storage may be generated through a combination of WWTP storage (e.g., wet wells and ponds), distribution system storage (e.g., holding ponds or elevated reservoirs), or user storage (e.g., agricultural ponds, golf course ponds). The required storage volumes are calculated on purely a recycled water supply-demand basis, and do not take into consideration other operational factors which typically increase the amount of storage desired.

Table 3-6. Storage Required for Existing Reuse and Phase 1 Tertiary Recycled Water Demands

LGVSD/MMWD	Novato SD	City of Petaluma[1]	SVCSD	Napa SD	City of American Canyon	Total
0 AF	0 AF	0 (456 AF)	238 AF	745 AF	0 AF	983 AF

[1] Value in parenthesis for City of Petaluma indicates the amount of storage required assuming continued delivery of secondary recycled water to existing customers while expanding delivery of tertiary treated recycled water.

3.2.3 Phase 2 Recycled Water Demands

Forecasting the monthly water demands for potential Phase 2 projects requires a multi-step approach, including:

- Identify the water demand unit rates by agency, by demand type, and by month;
- Identify the number of acres of demand by project, by agency, and by demand type;
- Calculate the monthly water demand by project using unit factors and demand type; and

- Summarize the monthly demand by water supply agency.

Whenever available, the recycled water demands and water use rates provided by the participating agencies for each proposed Phase 2 project were applied by this study. A summary of the water use rates used in the study is presented in Table 3-7. Of special note:

- Whenever specific water use rates were not identified for a proposed Phase 2 project, the study applied previously developed water use rates as presented in *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008);
- If only a total projected water use was identified for a proposed Phase 2 project, it was matched to the most likely water use rate to approximate the number of acres irrigated and monthly irrigation demand; and
- If no information was provided for a proposed Phase 2 project, the likely area and type(s) of users, as estimated through a review of aerial imagery, was calculated and matched to the most likely water use rate to approximate the number of acres irrigated and monthly irrigation demand.

Table 3-7. Water Use Rates by Demand Type (AF/acre/month)

	Land-scaping Pasture (Carneros)	Land-Scaping (Petaluma)	Land-scaping (Napa) & Agriculture (Petaluma)	Land-scaping (Sonoma)	Land-scaping (Marin)	Vineyard (Carneros)	Vineyard (Napa)	Vineyard (Sonoma)	Stanley Ranch	Irrigated Farm
January	0	0	0	0	0.002	0	0	0	0	0.008
February	0	0	0	0	0.002	0	0	0	0	0.001
March	0	0	0	0	0.018	0	0	0	0	0.021
April	0.217	0.263	0.243	0.281	0.157	0	0	0	0	0.063
May	0.355	0.431	0.398	0.461	0.195	0.048	0	0.104	0.029	0.135
June	0.476	0.578	0.533	0.618	0.376	0.107	0.088	0.153	0.064	0.222
July	0.511	0.621	0.573	0.664	0.439	0.103	0.086	0.145	0.062	0.281
August	0.455	0.552	0.509	0.591	0.452	0.061	0.053	0.084	0.037	0.305
September	0.330	0.401	0.369	0.428	0.309	0.016	0.023	0.014	0.010	0.208
October	0.158	0.193	0.178	0.206	0.242	0	0	0	0	0.086
November	0	0	0	0	0.030	0	0	0	0	0.009
December	0	0	0	0	0.012	0	0	0	0	0.001
TOTAL AF/acre/ year	**2.502**	**3.039**	**2.801**	**3.250**	**2.234**	**0.335**	**0.250**	**0.500**	**0.201**	**1.339**

Table 3-8 summarizes the irrigated acres, by demand type, associated with each of the proposed Phase 2 projects.

Table 3-8. Potential Phase 2 Project Irrigated Acres by Demand Type (Acres)

Agency	Proposed Phase 2 Project	Land-scaping & Pasture (Carneros)	Land-scaping (Petaluma)	Land-scaping (Napa) & Agriculture (Petaluma)	Land-scaping (Sonoma)	Land-scaping (Marin)	Vineyard (Carneros)	Vine-yard (Napa)	Vineyard (Sonoma)	Stanley Ranch	Irrigated Farm	TOTAL
MMWD/ LGVSD	Peacock Gap Extension	0	0	0	0	86	0	0	0	0	0	86
MMWD/ LGVSD	Peacock Gap Area	0	0	0	0	10	0	0	0	0	0	10
MMWD/ LGVSD	Lucas Valley Extension	0	0	0	0	9	0	0	0	0	0	9
Novato SD	Regional Recycled Water District	157	0	0	0	0	0	0	148	0	52	357
City of Petaluma	Local Recycled Water District	0	617	37	0	0	0	0	30	0	0	684
SVCSD	Sonoma Valley Pipelines	0	0	0	11	0	0	0	635	0	1.2	647.2
SVCSD	Expand SVCSD Ex Recycled Network	0	0	0	0	0	0	0	629	0	0	629
Napa SD	LCWD Project	208	0	0	0	0	3,623	0	0	356	0	4,187
Napa SD	MST Tulocay Pipeline	0	0	28	0	0	0	0	0	0	0	28
City of American Canyon	Phase 2 Projects	0	0	16	0	0	0	1,464	0	0	0	1,480
Total		365	617	81	11	105	3,623	1,434	1,442	356	53	8,087

Table 3-9 uses the irrigated acres (Table 3-8) and the water use rates for each demand type (Table 3-7) to develop the recycled water use demand, by demand type, associated with each of the proposed Phase 2 projects.

Table 3-9. Potential Phase 2 Project Recycled Water Use by Demand Type (AFY)

Agency	Proposed Phase 2 Project	Land-scaping & Pasture (Carneros)	Land-scaping (Petaluma)	Land-scaping (Napa) & Agriculture (Petaluma)	Land-scaping (Sonoma)	Land-scaping (Marin)	Vine-yard (Car-neros)	Vine-yard (Napa)	Vine-yard (Sonoma)	Stanley Ranch	Irriga-ted Farm	Total De-mand
MMWD/ LGVSD	Peacock Gap Extension	0	0	0	0	193	0	0	0	0	0	**193**
MMWD/ LGVSD	Peacock Gap Area	0	0	0	0	22	0	0	0	0	0	**22**
MMWD/ LGVSD	Lucas Valley Extension	0	0	0	0	21	0	0	0	0	0	**21**
Novato SD	Regional Recycled Water District	392	0	0	0	0	0	0	74	0	69	**535**
City of Petaluma	Local Recycled Water District	0	1,875	104	0	0	0	0	15	0	0	**1,994**
SVCSD	Sonoma Valley Pipelines	0	0	0	34	0	0	0	318	0	2	**354**
SVCSD	Expand SVCSD Ex Recycled Network	0	0	0	0	0	0	0	314	0	0	**314**
Napa SD	LCWD Project	520	0	0	0	0	1,214	0	0	72	0	**1,806**
Napa SD	MST Tulocay Pipeline	0	0	77	0	0	0	0	0	0	0	**77**
City of American Canyon	Phase 2 Projects	0	0	44	0	0	0	366	0	0	0	**410**
Total		912	1,875	225	34	236	1,214	366	721	72	71	**5,726**

Table 3-10 aggregates by agency the potential Phase 2 project level recycled water use for Phase 2 from Table 3-9.

Table 3-10. Potential Phase 2 Recycled Water Use by Agency and Demand Type (AFY)

	Land-scaping & Pasture (Carneros)	Land-scaping (Petaluma)	Land-scaping (Napa) & Agriculture (Petaluma)	Land-scaping (Sonoma)	Land-scaping (Marin)	Vineyard (Carneros)	Vine-yard (Napa)	Vineyard (Sonoma)	Stanley Ranch	Irrigated Farm	Total Demand
MMWD/ LGVSD	0	0	0	0	236	0	0	0	0	0	**236**
Novato SD	392	0	0	0	0	0	0	74	0	69	**535**
City of Petaluma	0	1,875	104	0	0	0	0	15	0	0	**1,994**
SVCSD	0	0	0	34	0	0	0	632	0	2	**668**
Napa SD	520	0	77	0	0	1,214	0	0	72	0	**1,883**
City of American Canyon	0	0	44	0	0	0	366	0	0	0	**410**
Total	912	1,875	225	34	236	1,214	366	721	72	71	**5,726**

Finally, Table 3-11 calculates the potential Phase 2 monthly recycled water use rate by wastewater generating agency utilizing the data found in Tables 3-6 through 3-9.

Table 3-11. Potential Phase 2 Monthly Recycled Water Use by Agency (AF/Month)

Month	MMWD/LGVSD	Novato SD	Petaluma	SVCSD	Napa SD	American Canyon	Total
January	0	0	0	0	0	0	0
February	0	0	0	0	0	0	0
March	2	1	0	0	0	0	3
April	17	37	171	3	52	4	284
May	21	78	284	137	269	6	795
June	40	109	381	201	524	138	1,393
July	46	116	409	191	517	135	1,414
August	48	99	362	112	343	86	1,050
September	33	64	261	22	140	39	559
October	26	29	125	2	38	3	223
November	3	0	0	0	0	0	3
December	1	0	0	0	0	0	1
Subtotal (AFY)	**236**	**535**	**1,994**	**668**	**1,883**	**410**	**5,726**

3.2.4 Phase 2 Operations Analysis

The total monthly recycled water demand generated by adding the proposed Phase 2 projects to the existing reuse and near-term Phase 1 recycled water projects of each agency is summarized in Table 3-12.

Table 3-12. Total Recycled Water Use Following Completion of Phase 1 & Phase 2 Projects (AF/Month)

Month	MMWD/LGVSD	Novato SD	Petaluma	SVCSD	Napa SD	American Canyon	Total
January	1	1	0	1	0	0	3
February	1	1	0	0	0	0	2
March	10	8	0	3	0	0	20
April	87	94	171	24	357	39	779
May	108	149	284	360	769	65	1,735
June	209	245	381	530	1,463	254	3,081
July	244	276	409	515	1,498	256	3,197
August	251	264	362	326	1,145	184	2,532
September	172	177	261	92	673	103	1,477
October	134	117	125	22	261	29	689
November	17	11	0	1	0	0	29
December	7	4	0	0	0	0	11
Subtotal (AFY)	**1,240**	**1,348**	**1,994**	**1,875**	**6,166**	**929**	**13,552**

3.2.4.1 Net Water Supply Following Implementation of Proposed Phase 2 Projects

The figures that follow demonstrate the impact of including the proposed Phase 2 projects' monthly demands to the 2010 total supply data from each WWTP as reduced by the demands of the existing reuse and completed Phase 1 projects, presented in Section 3.2.2.2. In some cases, the available water

supply during peak demand months is negative, indicating that the agency will need to provide a mechanism for seasonally storing water during off peak months to serve peak demand months. The total amount of storage required to meet these demands is represented by the shaded areas in Figures 3-18 through 3-23 and summarized in Table 3-13.

LGVSD: As a result of the proposed Phase 2 MMWD projects, LGVSD will potentially need to increase the amount of storage dedicated to serving Phase 1 and Phase 2 demands from approximately 0 AF to approximately 86 AF.

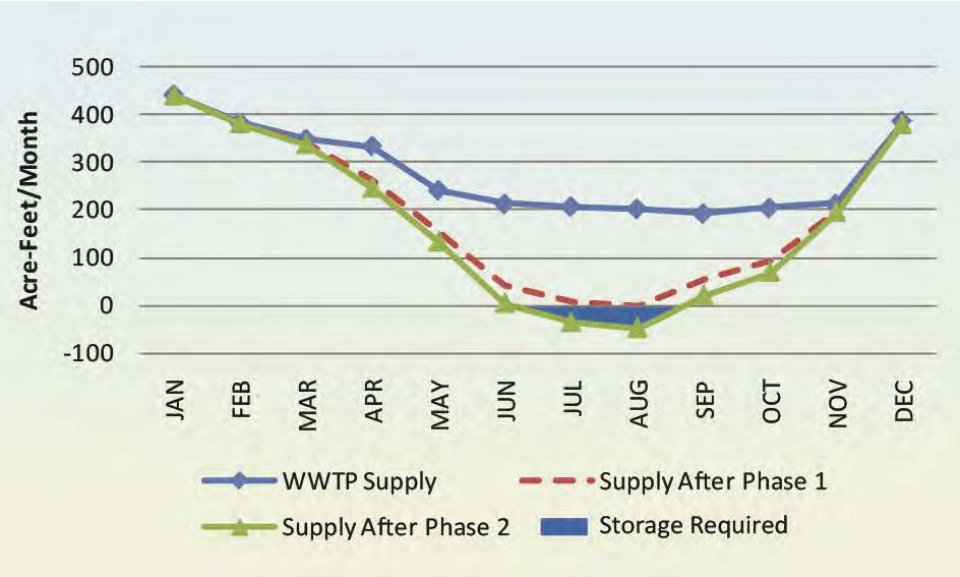

Figure 3-18. LGVSD Recycled Water Supply After Phase 1 and Phase 2

Novato SD: Novato SD will potentially be able to meet Phase 1 and Phase 2 demands without dedicated storage.

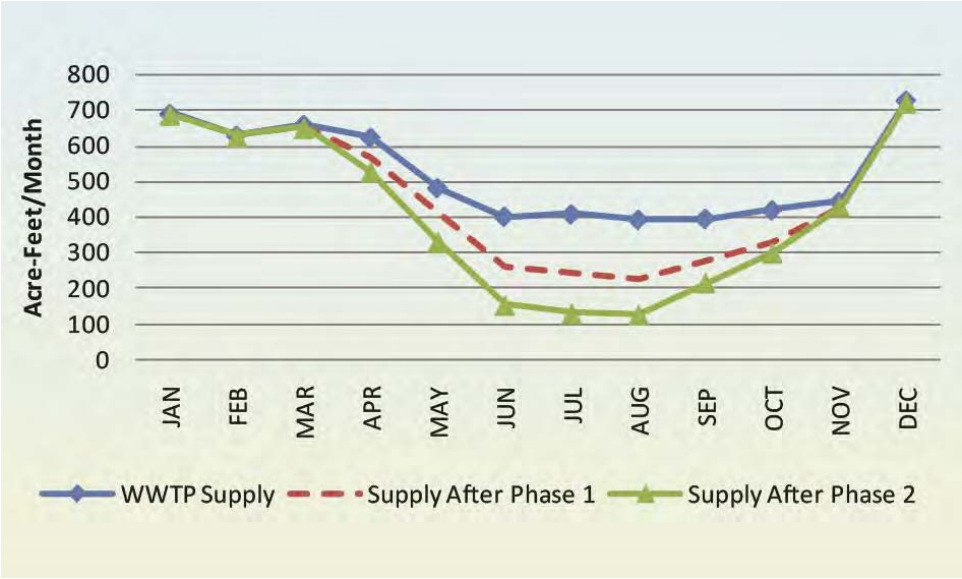

Figure 3-19. Novato SD Recycled Water Supply After Phase 1 and Phase 2

City of Petaluma: The City of Petaluma will potentially be able to meet Phase 2 tertiary demands without dedicated storage. However, should the City wish to maximize its service to existing customers that could use secondary recycled water in additional to tertiary water users, approximately 1,961 AF of storage will need to be developed.

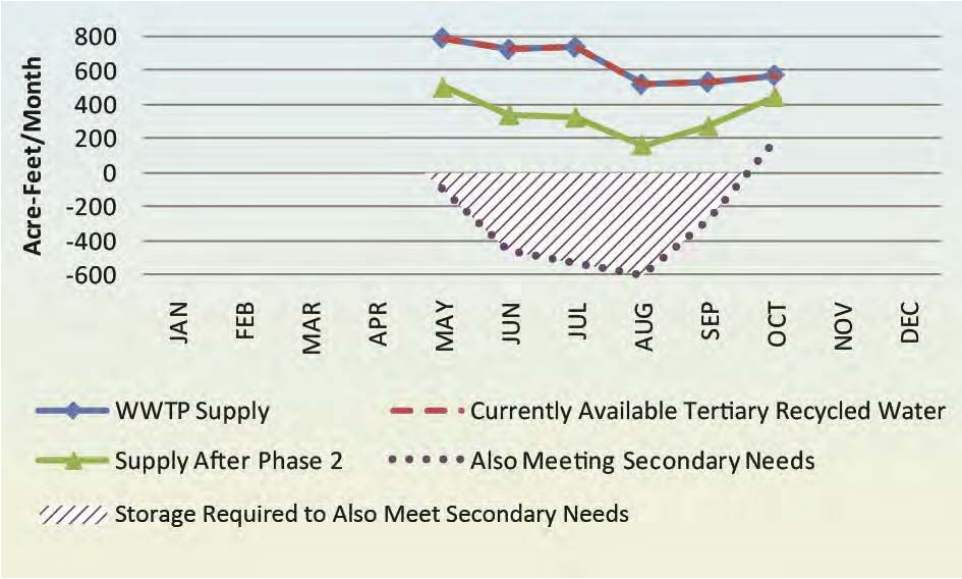

Figure 3-20. City of Petaluma Recycled Water Supply After Existing Reuse and Phase 2

SVCSD: As a result of the proposed Phase 2 SVCSD projects, SVCSD will potentially need to increase the amount of storage dedicated to serving Phase 1 and Phase 2 demands from approximately 238 AF to approximately 824 AF. This total storage requirement can be met by a combination of existing and new SVCSD facilities and private storage facilities owned by individual users.

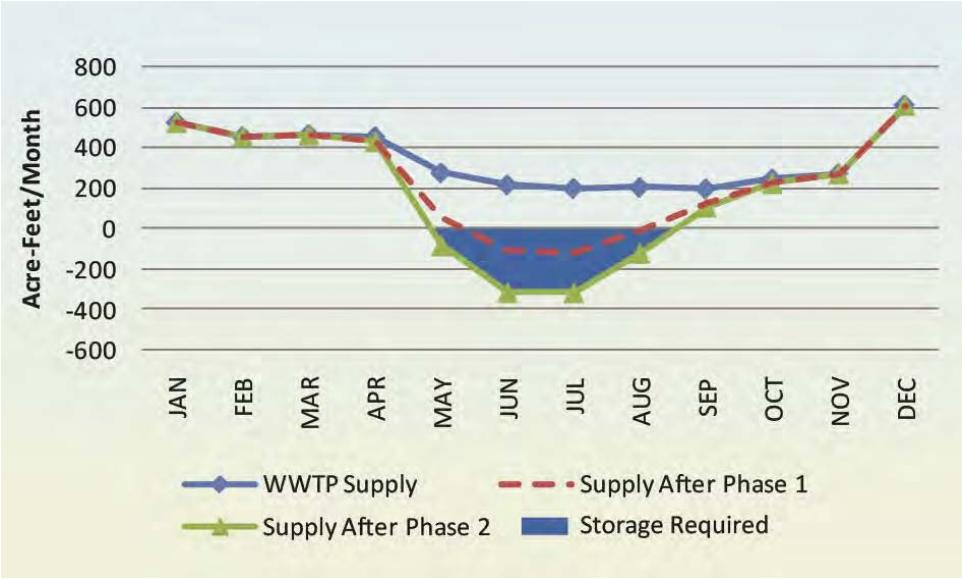

Figure 3-21. SVCSD Recycled Water Supply After Phase 1 and Phase 2

Napa SD: As a result of the proposed Phase 2 Napa SD projects, Napa SD will potentially need to increase the amount of storage dedicated to serving Phase 1 and Phase 2 demands from approximately 745 AF to approximately 2,190 AF.

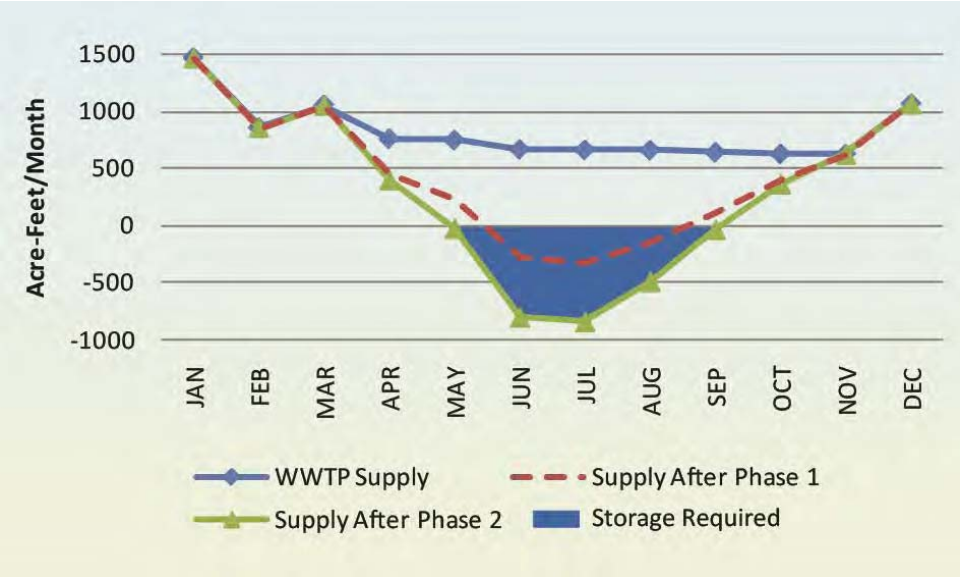

Figure 3-22. Napa SD Recycled Water Supply After Phase 1 and Phase 2

City of American Canyon: As a result of its proposed Phase 2 projects, the City of American Canyon will potentially need to increase the amount of storage dedicated to serving its existing reuse and new Phase 2 demands from approximately 0 AF to approximately 250 AF.

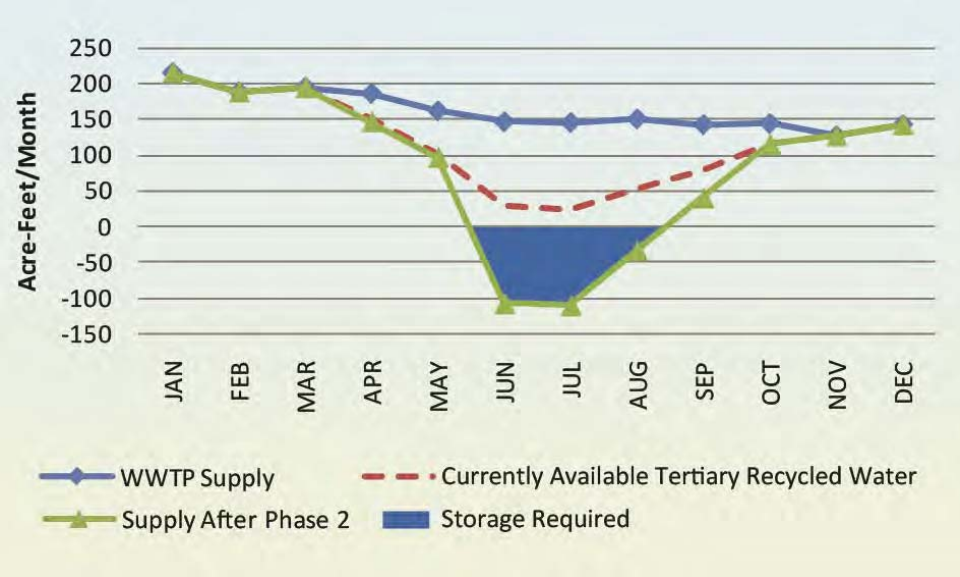

Figure 3-23. City of American Canyon Recycled Water Supply After Existing Reuse and Phase 2

3.2.4.2 Phase 2 Implementation Summary and Insights

Table 3-13 presents the amount of storage that would potentially be required by each participant to meet the sum of existing reuse demands, Phase 1 recycled water demands, and proposed Phase 2 projected demands, per the shaded volumes shown in Figures 3-18 through 3-23. Depending on the nature of the recycled water distribution system and its users, the required storage may be generated through a combination of WWTP storage (e.g., wet wells and ponds), distribution system storage (e.g., holding ponds or elevated reservoirs), or user storage (e.g., agricultural ponds, golf course ponds). The required storage volumes are calculated on purely a recycled water supply-demand basis, and do not take into consideration other operational factors which typically increase the amount of storage desired.

Table 3-13. Total Estimated Storage Required to Implement Existing Reuse, Phase 1, & Phase 2 Projects

LGVSD/MMWD	Novato SD	City of Petaluma[1]	SVCSD	Napa SD	City of American Canyon	Total
86 AF	0	0 (1,961 AF)	824 AF	2,190 AF	250 AF	3,350 AF

[1] Value in parenthesis for City of Petaluma indicates the amount of storage required assuming continued delivery of secondary recycled water to existing customers.

3.2.5 Summary of Storage Status by Agency

The storage volume required to support water reuse activities is related to the seasonal water use of potential customers as compared to the recycled water supplies available from contributing WWTPs. Generally, the supply available from a contributing WWTP is lower during the summer season and greater during the winter season. Conversely, the need for water in the project area is typically lowest in the winter season, and greatest in the summer season due to the high water requirements of landscaping and agriculture during the summer season.

The implementation of Phase 1 of the NBWRP, as defined in the 2008 feasibility study, is anticipated to further reduce the amount of summer season recycled water available to be supplied directly from the participating WWTPs. In Phase 1, little or no seasonal storage is provided; therefore, with Phase 1 implementation, a majority of the water previously available during the summer irrigation season will be committed to meet summer demands. The solution to this separation in periods of water abundance versus water use requires that water be seasonally stored when it is available, so that it may be used when it is needed.

Having developed the total estimated storage required to implement all currently proposed Phase 1 and Phase 2 projects in Section 3.2.4.2, it is useful to compare these volumes to both the storage currently owned and made available by each of the participating agencies for recycled water distribution, as well as the estimated volume of storage that could be utilized through the use of local user ponds. Table 3-14 compares the total estimated storage required to implement existing reuse, Phase 1 projects, and all currently proposed Phase 2 projects to the estimated storage volumes available.

Table 3-14. Summary of Agency Owned and Potential Usable Local Pond Volumes

Agency	Estimated Phases 1 & 2 Storage Needs (AF)	Agency Owned Storage for Recycled Water Distribution (Existing) (AF)	Potential Usable Local Storage Pond Volumes (AF)
LGVSD/MMWD[1]	86	400	Phase 1 • None currently used Phase 2 • Potential user storage possible in Peacock Gap area
Novato SD[2]	0	490	Phase 1 • None currently used Phase 2 • Potential volumes unknown
City of Petaluma[3]	0 (1,961)	0	Existing Reuse • Local storage volumes unknown Phase 2 • Potential local volumes unknown
SVCSD[4]	824	607	Phase 1 • Approximately 350-400 AF estimated in existing Carneros West distribution area. • Approximately 0-50 AF estimated in new Phase 1 area. Phase 2 • None currently used
Napa SD[5]	2,190	20 (Finished Water) 1,540 (Oxidation Ponds)	Phase 1 • Approximately 500 AF estimated in MST area Phase 2 • Approximately 1,000 AF estimated in LCWD area
City of American Canyon[6]	250	3.1 (=1 MG Reservoir)	Existing Reuse • None currently used Phase 2 • Approximately 98 AF estimated on Hess property (requires construction by City)

[1] Agency owned storage per *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008)

[2] Agency owned storage per *Preliminary Study of Multi-Purpose Reservoir Opportunities for the North Bay Water Reuse Program* (CDM Smith 2012)

[3] Value in parenthesis for City of Petaluma indicates the amount of storage required assuming continued delivery of secondary recycled water to existing customers.

[4] SVCSD available volume includes recently completed R5 reservoir, and accounts for water that must remain in R4 & R5 reservoirs to keep liner from floating. (Sonoma Valley County Sanitation District 2011)

[5] Potential usable Napa SD owned storage per Napa SD *Wastewater Treatment Plant Master Plan, Technical Memorandum #13* (Napa Sanitation District 2011b)

[6] American Canyon storage information per *Recycled Water Implementation Plan* (City of American Canyon 2005)

As shown in Table 3-14, many of the Phase 1 and Phase 2 projects are anticipated to include several local users that currently have their own agricultural or landscape water storage ponds. These local ponds allow their owner to have increased flexibility in the way that the water is used; in addition, the local ponds (for those owners interested in receiving recycled water) are valuable assets to a recycled water program because the period for seasonally filling a pond is typically flexible. This flexibility allows recycled water providers to distribute recycled water to pond-owning customers early in the year, and to focus distributing to on-demand customers during the peak summer months. However,

the location of the local storage, off-stream versus on-stream, may impact its use for storing recycled water. Future scoping studies will address the issue.

When evaluating the total storage needs for a WWTP, it is important to not only include the needs of the recycled water system, but to also consider other factors such as WWTP operations and maintenance, seasonality and variation of flow, the needs of engineered or natural habitats, and dry weather discharge limitations, all of which typically increase the amount of storage desired. In addition, because the total volume contributed by local ponds can be significant, maximizing their use can both: 1) lead to a considerable reduction in the amount of agency-owned, recycled water storage required; and 2) allow a participating agency to take a more aggressive stance towards regional use of recycled water. The sizing of storage features to account for these additional considerations should be performed on a case-by-case basis, and will be addressed in the next scoping study.

Section 4

Phase 2 Feasibility Study Scope of Work and Preliminary Estimate of Phase 2 Construction Costs

This section presents the approach and assumptions for the scope of work to prepare a Phase 2 Feasibility Study, and presents the preliminary estimate of costs for construction of the currently identified Phase 2 projects.

4.1 Feasibility Study

The costs for completing the next Scoping Study and conducting the Feasibility Study activities are highly dependent on the number of agencies involved and the footprint of the proposed projects relative to the Phase 1 boundaries of programmatic environmental documents. Appendix A provides a detailed scope of work in sufficient detail to estimate the level of effort and costs once the Phase 2 agencies are confirmed.

4.1.1 Approach

The scope of work to take Phase 2 through the final scoping study and completion of feasibility engineering, environmental, and financial analysis is based on Reclamation guidelines, NBWRA experience in the Phase 1 analysis, and the understanding of Reclamation processes and formats. Phase 1 feasibility studies generally went efficiently through the Reclamation review process. However, there are some "lessons learned" on some aspects, particularly in the final environmental analysis and completion in the Record of Decision, that have been applied to the scope of work for Phase 2.

4.1.2 Scope of Work Summary

The future scope of work to complete the last scoping study, the scoping study report, and the feasibility studies are presented detailed in Appendix A. The major task headings and their purpose or are summarized in Table 4-1.

Table 4-1. Summary of Phase 2 Study Scopes of Work

Category	Major Task	Purpose
Scoping Studies	New User Assessment and Multi-Purpose Storage Scoping Study	Define the long-term users, system operations, inter-regional partnership opportunities, and storage requirements. Determine whether seasonal storage options are feasible and cost effective.
	Scoping Study Report	Summarize the three Phase 2 scoping studies.
Feasibility Studies	Alternatives Development	Develop and rank alternatives for the Phase 2 program.
	Engineering Study	Define the selected alternative at feasibility-level design layouts and costs.
	Financial Evaluation	Evaluate how the participating agencies will meet the financial demands of Phase 2.
	Environmental Evaluation	Analyze the potential effects of the Phase 2 alternatives on the local and regional environment.

Table 4-2 summarizes the breakdown of tasks for the last scoping study and the Phase 2 feasibility study.

Table 4-2. Phase 2 Scoping Study and Feasibility Study Tasks and Activities

Category	Major Task	Subtask
Scoping Studies	New User Assessment and Multi-Purpose Storage Scoping Study	▪ Update future demands
		▪ Conceptual operations analysis
		▪ Screen initial storage sites
		▪ Identify & screen new storage sites
		▪ Preliminary layout and environmental enhancements
		▪ Reconnaissance level cost estimate
	Scoping Study Report	▪ Summary report of all scoping studies
	Workshops and Public Decision Processes	▪ Presentations and meeting summary
Feasibility Studies	Alternatives Development	▪ Evaluate existing and future conditions
		▪ Establish project criteria and considerations
		▪ Develop feasibility study alternatives
		▪ Estimate project costs
		▪ Perform fatal flaw analysis
		▪ Report
	Engineering Study	▪ Finalize project criteria and considerations
		▪ Perform alignment surveying and mapping
		▪ Perform geotechnical studies
		▪ Perform hydraulic studies
		▪ Finalize feasibility level alternatives
		▪ Detailed project costs and benefits
		▪ Analyze alternatives
		▪ Draft feasibility study report
		▪ Final feasibility Study report
	Financial Evaluation	▪ Economic analysis
		▪ Financial capability analysis
		▪ Project cost effectiveness
	Environmental Evaluation	▪ Environmental constraints analysis
		▪ Environmental compliance: – Notice of Intent and scoping – Administrative draft EIS/EIR – Public draft EIS/EIR – Final EIS/EIR – Certification materials and record of decision – Permitting and regulatory process
	Public Involvement Support to Environmental Evaluation	▪ Document public response
		▪ Develop materials to respond to concerns
	Workshops and Public Decision Processes for Feasibility and Environmental Evaluation	▪ Presentations and meeting summary

4.1.3 Feasibility Study Costs

As indicated above, the cost for completing these studies depends upon on the number of agencies involved and the geographic scope of the Phase 2 program versus Phase 1 for the environmental documentation. Costs for these future studies are not included in this Project Definition Report as the level of effort, and therefore costs, cannot be determined until the included agencies and projects are more clearly defined.

4.2 Construction Costs

A reconnaissance-level construction cost estimate is provided for the Phase 2 projects identified by the agencies. Cost estimating approach is the same as was used for the Phase 1 projects as documented in Appendix F of the *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008). Note that although feasibility-level costs estimating approaches were applied, the level of detail for the project layouts and descriptions must be considered as a reconnaissance-level of detail. Therefore, the estimates of costs can only be considered reconnaissance level in this report. The results of the estimating effort, performed in accordance with Title XVI guidelines, are presented below.

4.2.1 Approach

The Reclamation standards utilized for estimating the feasibility- level costs consist of the following:

- FAC TRMR-8 (Policy - Cost Estimating);
- FAC 09-01(Directives & Standards - Cost Estimating); and
- FAC TRMR-9 (Directives & Standards - Cost Estimating).

Only the major components were incorporated in the cost estimates, including: distribution pipelines, treatment plant improvements, system storage components, and distribution pump stations. The estimates also include allowance, contingency, and non-contract costs such as engineering, legal and license fees, and engineering construction services.

All present worth costs are based on cost indices that are measures of the average change in process over time. For this study, the Engineering News Record's (ENR) Construction Cost Index (CCI) for San Francisco is used. This index is widely used for studies and estimates of construction projects and is published quarterly in ENR. The Phase 1 cost estimates were based on an April 2008 CCI of 9155; the Phase 2 costs have been brought up to date by utilizing a February 2012 CCI of 10,208. A few of the costs are based on an evaluation of recent construction cost experience by each of the participating agencies.

4.2.2 Unit Cost Curves and Estimating Assumptions

Unit costs for each of the major construction components were initially provided and agreed upon by each of the member agencies during the Phase 1 technical workshop process. The unit costs utilized to develop the Phase 1 cost estimates have been updated to reflect a February 2012 ENR CCI of 10,208, and have been reviewed by the participating agencies through the Project Definition Scoping Study process. Table 4-3 provides a summary of the unit cost associated with the Phase 2 project components.

Table 4-3. Project Unit Construction Cost Comparison

Construction Item	Unit	Project Unit Construction Costs Used in 2008 Feasibility Study (ENR CCI (SF) = 9,155)		Project Unit Construction Costs for Preliminary Cost Estimate (updated to ENR CCI (SF) = 10,208)
		Unit Costs	Source	Unit Costs
Pipeline <12" (cut and cover)	inch-ft	$10.04	Napa SD[1]	$11.19
Pipeline 18" (cut and cover)	inch-ft	$11.45	Napa SD[1]	$12.77
Pipeline 24" (cut and cover)	inch-ft	$12.87	Napa SD[1]	$14.35
Pipeline 30" (cut and cover)	inch-ft	$14.40	Napa SD[1]	$16.06
Pipeline 36" (cut and cover)[2]	inch-ft	$15.93	Napa SD[1,2]	$17.76
Pipeline (microtunnel)	inch-ft	$135	Napa SD	$150.53
Storage (pond impoundment)	acre-ft	$23,230	SCWA	$25,900
Storage (reservoir)	MG	$1,085,000	Novato SD/LGVSD/ CDM Smith	$1,210,000
Treatment Upgrades	mgd	$2,500,000	Napa SD	$2,788,000
Pump Stations	HP	Formula[3]	SCWA	Formula[4]

Sources:
1. Napa SD *Strategic Plan for Recycled Water Use* (Napa Sanitation District 2005). Material and installation costs
2. Price for 36" and larger pipe extrapolated from smaller pipe diameters.
3. Formula: Construction Cost = $19,717 x BHP^(0.69). Updated to April 2008 ENR CCI = 9,155
4. Formula: Construction Cost = $21,985 x BHP^(0.69). Updated to February 2012 ENR CCI = 10,208

Treatment Costs: Due to the specific nature of the work and costs associated with any upgrades at a WWTP, actual cost estimates for each individual treatment upgrades project, where available, were used, instead of a unit cost. A unit cost was used for the Napa SD WWTP treatment upgrades, in the absence of a project-specific construction cost estimate.

Pipeline Costs: Pipeline costs are calculated by first determining a base cost for each pipe size for a base construction condition. For this study, construction through rural or barren land using conventional dry trenching techniques is used as the base condition. As discussed in Section 2 of the *North San Pablo Bay Restoration and Reuse Project, Draft Phase 3 Engineering and Economic/ Financial Analysis Report* (Sonoma County Water Agency and Bureau of Reclamation 2008), these base condition costs were increased to reflect potential geological and geotechnical constraints that may exist along each of the pipeline segments. Because a specific evaluation of the geotechnical conditions along each of the proposed Phase 2 project pipelines has not yet been performed, an engineering judgment of the conditions, based on work performed during Phase 1, was used to develop these estimates.

Costs for pipe sizes ranging from 4" to 54" in diameter were developed for use in this study, and are based on the unit costs used during Phase 1, updated to the ENR CCI of 10,208.

Pumping Costs: The estimated brake horsepower is used as the basis for developing pump station costs. Although the type of pump station can affect costs, this factor is not considered in the pump cost due to the uncertainties and variety of pump station operating requirements, and equipment preferences of each participating agency. As a result, the pump station costs developed using the formula below reflect what may be considered by some to be a basic pumping facility, with a minimal footprint and security fencing, but without any more substantial buildings to house equipment.

Land acquisition costs for pump stations are not included in the cost estimate. While some treatment plants may need to purchase additional land if expanded to distribute recycled water to users, others will not require any land acquisition. Booster pump stations, however, will likely require costs for land, as they would not be located at the treatment plant sites.

The referenced Bay Area Regional Water Recycling Program (BARWRP) study determined that the construction cost was found to be proportional to the peak brake horsepower (BHP) raised to the 0.69 power. The following equation calculates the construction cost of a pump station (updated to the ENR CCI of 10,208):

$$\text{Construction Cost} = \$21{,}985^{1} \times \text{BHP}^{(0.69)}$$

For multiple pumps constructed at a single station (e.g., at a WWTP), the BHP values of all pumps at the station were summed to develop the pump station cost.

Storage Costs: Unit costs for constructing earthen storage reservoirs are estimated at approximately $25,900 per AF of storage created, based on historic storage pond construction costs from SVCSD updated to the ENR CCI of 10,208.

4.2.3 Phase 2 Project Construction Costs

The estimated construction costs for the variety of potential Phase 2 projects and project elements are presented in Table 4-4.

Finally, the total estimated capital costs for the potential Phase 2 projects are presented in Table 4-5.

The Probable Total Project Capital Costs includes the following elements:

- **Subtotal Cost:** Calculated using the unit costs developed by the member agencies for the Project as discussed in Section 4.2.2. The unit costs assume a normal (average) construction environment, and do not include such activities as significant rock excavation or dewatering, unusual working hours, or exotic construction methods.
- **Allowance for Unlisted Items:** Per Reclamation Directives and Standards and Engineering Research Center guidelines, a markup of 15 percent of the total Subtotal Cost was added to account for additional work that may be identified during additional design phases of the Project.
- **Contingency:** Per Reclamation Directives and Standards, a markup of 20 percent of the total Subtotal Cost was added to pay contractors for overruns on quantities, changed site conditions, change orders, etc. Contingencies are considered as funds to be used after construction starts and not for design changes or changes in project planning.
- **Opinion of Probable Construction Costs:** This reflects an estimate of the capital costs of a feature or project from award to construction closeout. The Opinion of Probable Construction Costs equals the construction contract cost plus contingencies. Contingencies are intended to account for costs resulting from changes in design and/or differing site conditions encountered

[1] BARWRP Study, based on ENR CCI of 6700, used Construction Cost = $14,430 x BHP$^{(0.69)}$. BARWRP TM No. 2, 1999.

during construction. The Opinion of Probable Construction Cost is often called the Field Cost by Reclamation.

- **Non-Contract Cost:** This term refers to the costs of work or services provided by consultants/contractors in support of the project. This cost item reflects 25 percent of the Opinion of Probable Construction Costs to cover the following items:
  - Preliminary and final design engineering, preparation of construction plans and specifications (11%);
  - Construction services including construction management, construction inspection, engineering support during construction, construction surveying, start-up services, and as-built drawings (13%); and
  - Project administration, legal support (1%).
- **Opinion of Probable Total Project Capital Cost:** The sum of the total Opinion of Probable Construction Costs plus Non-Contract costs. The Opinion of Probable Total Project Capital Cost is often called the Construction Cost by Reclamation.

The Opinion of Probable Total Project Capital Costs for the currently proposed list of Phase 2 projects at this stage of analysis is $184,330,000.

Table 4-4. Proposed Phase 2 Projects Estimated Construction Contract Costs

MMWD	**Peacock Gap Main Pipeline**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	12	26,500	11.19	1.35	$4,804,231	Length from MMWD memo emailed by Michael Ban on March 16, 2012.
	Lucas Valley Pipeline Ext Elements	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	6	10,623	11.19	1.15	$820,275	Pipeline information included in email from Michael Ban on March 16, 2012.
		Volume (MG)		**Unit Price ($/MG)**		**Total**	**Comments**
	rehabilitate reservoir	0.5		$403,293		$201,647	Assumes rehabilitation of the reservoir is one-third the price of new construction.
	Peacock Gap Area Infill	**Volume (mgd)**		**Unit Price ($/mgd)**		**Total**	**Comments**
	Infill projects to homeowners' associations[2]					$2,800,000	Capital costs of $3.5M provided in email from Michael Ban on March 16, 2012, assumed to have 25% contingency.
	Tertiary Treatment Upgrades	**Volume (mgd)**		**Unit Price ($/mgd)**		**Total**	
	tertiaty treatment plant upgrades[2]	2.2				$3,500,000	Pre-contingency construction costs of $3.5M provided in email from Michael Ban on March 16, 2012.
LGVSD	**Additional Storage Ponds**	**Volume (AF)**		**Unit Price ($/AF)**		**Total**	**Comments**
	storage pond	400		$25,900		$10,360,000	
	Tertiary Treatment Upgrades	**Volume (mgd)**		**Unit Price ($/mgd)**		**Total**	
	tertiaty treatment plant upgrades[2]	4.0				$3,000,000	Estimated based on construction costs of LGVSD recently completed tertiaty membrane & UV packages and amount of work required to increase existing total tertiary capacity from 1.4 mgd to 5.4 mgd.
Novato SD	**Regional Recycled Water Dist Project**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	18	40,800	12.77	1.35	$12,662,834	Lengths measured from aerial mapping available from internet.
	pipelines	18	3,000	12.77	2.00	$1,379,394	Pipe length for assumed microtunnel crossing beneath the Petaluma River.
		Length (LF)		**Unit Price ($/LF)**			
	storage pond 15' levee	9,000		$500		$4,500,000	Levee section required to develop 2,700-AF storage pond.
		Lump Sum		**Unit Price ($/LF)**			
	pond diversion/inlet/outlet structures	1		$250,000		$250,000	Pricing from Moffatt & Nichol and RMC document, February 2012.
	pumping station	Formula = $21,985 x HP^0.69				$2,117,965	Assumes single pump station at pond w/ 3x250HP pumps (2 duty:1 standby)
	Transmission Pipeline to LGVSD	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	18	20,700	12.77	1.2	$5,710,690	Lengths measured from aerial mapping available from internet.
	Replace Existing Outfall Pipe	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	54	5,300	21.90	1.2	$7,519,666	54" HDPE pipeline in levee per Moffatt & Nichol and RMC document, February 2012.
City of Petaluma	**Local Recycled Water Distribution**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	6	50,860	11.19	1.15	$3,927,249	Lengths measured from aerial mapping available from internet.
	pipelines	8	18,350	11.19	1.15	$1,889,239	
	pipelines	10	15,430	11.19	1.15	$1,985,760	
	pipelines	12	14,710	11.19	1.15	$2,271,720	
	pipelines	20	13,900	13.26	1.15	$4,238,814	
SVCSD	**Sonoma Valley North Recycled Water Project**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	6	6,600	11.19	1.15	$509,631	Lengths measured from aerial mapping available from internet.
	pipelines	8	6,400	11.19	1.15	$658,917	
	pipelines	10	1,910	11.19	1.15	$245,807	
	pipelines	12	7,840	11.19	1.15	$1,210,760	
	Sonoma Valley South Recycled Water Project	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	12	20,000	11.19	1.15	$3,088,674	Lengths estimated per email correspondence with Kevin Booker and Mark Bautista on March 12, 2012.
Napa SD	**LCWD Project Pipelines**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	6	11,511	11.19	1.15	$888,843	Lengths from Los Carneros Water District *Recycled Water Feasibility Study* (Los Carneros Water District 2011)
	pipelines	8	11,833	11.19	1.15	$1,218,276	
	pipelines	10	7,157	11.19	1.15	$921,068	
	pipelines	12	7,637	11.19	1.15	$1,179,410	
	pipelines	14	6,534	11.68	1.15	$1,228,433	
	pipelines	16	3,440	12.29	1.15	$777,630	
	pipelines	18	4,497	12.77	1.15	$1,188,934	
	pipelines	24	10,387	14.35	1.15	$4,114,873	
	pipelines	42	1,000	18.61	2.00	$1,563,313	
	MST Tulocay Pipeline	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
	pipelines	12	3,220	11.19	1.20	$520,000	Length measured from end of Phase 1 MST project piping.
	Increase Recycled Water Filter Capacity	**Capacity (mgd)**		**Unit Price ($/mgd Increase)**		**Total**	**Comments**
	treatment[2]	1.7		$2,941,176		$5,000,000	Construction cost provided in email from Jeff Tucker on April 5, 2012.
	Additional WWTP Storage	**Volume (AF)**		**Unit Price ($/AF)**		**Total**	**Comments**
	storage pond[2]	10		$200,000		$2,000,000	Construction cost provided in email from Jeff Tucker on April 5, 2012.
	Increase Pump Station Capacity					**Total**	**Comments**
	pumping[2]					$1,500,000	Construction cost provided in email from Jeff Tucker on April 5, 2012.
City of American Canyon	**Distribution Pipelines**	**Diam (in)**	**Length (ft)**	**$/in-ft**	**Constructability[1]**	**Total**	**Comments**
		6	2,540	11.19	1.15	$196,131	Lengths measured from aerial mapping available from internet.
		12	27,380	11.19	1.15	$4,228,395	Lengths measured from aerial mapping available from internet.
	Hess Storage Pond and Pumps	**Volume (AF)**		**Unit Price ($/AF)**		**Total**	**Comments**
	storage pond	98		$25,900		$2,538,200	
	pumping	Formula = $21,985 x HP^0.69				$370,724	Assumes single pump station at pond w/ 2x30HP pumps
	Storage Tank (steel)	**Volume (gal)**		**Unit Price ($/MG)**		**Total**	**Comments**
	storage reservoir	0.1		$1,210,000		$121,000	
					Total Construction Contract Costs	**$109,208,503**	

Notes:
1: Constructability reflects a potential cost increase due to site specific geotechnical or other currently unknown conditions that could affect construction.
2: Agency supplied pricing used in Phase 2 item estimate due to insufficient information available to use Phase 1 estimating method.

Table 4-5. Summary of Proposed Phase 2 Projects Total Estimated Capital Costs[1]

Agency	Projects	Distribution Pipelines	Pump Stations	Storage	WWTP Treatment Upgrades	Total Construction Contract Costs	USBR Allowance/ Contengencies (35%)[2]	Opinion of Probable Const Costs	USBR Non-Contract Costs (25%)[3]	Opinion of Probable Total Project Capital Costs	*Summary by Agency*
MMWD	Peacock Gap Extension	$ 4,804,231	$ -	$ -	$ -	$ 4,804,231	$ 1,680,000	**$ 6,480,000**	$ 1,620,000	**$ 8,100,000**	
	Peacock Gap Area	$ 2,800,000	$ -	$ -	$ -	$ 2,800,000	$ 980,000	**$ 3,780,000**	$ 950,000	**$ 4,730,000**	$ 20,470,000
	Lucas Valley Extension	$ 820,275	$ -	$ 201,647	$ -	$ 1,021,921	$ 360,000	**$ 1,380,000**	$ 350,000	**$ 1,730,000**	
	Tertiary Treatment Upgrades	$ -	$ -	$ -	$ 3,500,000	$ 3,500,000	$ 1,230,000	**$ 4,730,000**	$ 1,180,000	**$ 5,910,000**	
LGVSD	Additional Storage Ponds	$ -	$ -	$ 10,360,000	$ -	$ 10,360,000	$ 3,630,000	**$ 13,990,000**	$ 3,500,000	**$ 17,490,000**	$ 22,550,000
	Tertiary Treatment Upgrades	$ -	$ -		$ 3,000,000	$ 3,000,000	$ 1,050,000	**$ 4,050,000**	$ 1,010,000	**$ 5,060,000**	
Novato SD	Regional Recycled Water Dist	$ 14,042,228	$ 2,117,965	$ 4,750,000	$ -	$ 20,910,193	$ 7,320,000	**$ 28,230,000**	$ 7,060,000	**$ 35,290,000**	
	Transmission Pipeline to LGVSD	$ 5,710,690	$ -	$ -	$ -	$ 5,710,690	$ 2,000,000	**$ 7,710,000**	$ 1,930,000	**$ 9,640,000**	$ 57,620,000
	Replace Existing Outfall Pipe	$ 7,519,666	$ -	$ -	$ -	$ 7,519,666	$ 2,630,000	**$ 10,150,000**	$ 2,540,000	**$ 12,690,000**	
City of Petaluma	Local Recycled Water Dist	$ 14,312,782	$ -	$ -	$ -	$ 14,312,782	$ 5,010,000	**$ 19,320,000**	$ 4,830,000	**$ 24,150,000**	$ 24,150,000
SVCSD	Sonoma Valley North Recycled Water Proje	$ 2,625,116	$ -	$ -	$ -	$ 2,625,116	$ 920,000	**$ 3,550,000**	$ 890,000	**$ 4,440,000**	$ 9,650,000
	Sonoma Valley South Recycled Water Proje	$ 3,088,674	$ -	$ -	$ -	$ 3,088,674	$ 1,080,000	**$ 4,170,000**	$ 1,040,000	**$ 5,210,000**	
Napa SD	LCWD Project	$ 13,080,780	$ -	$ -	$ -	$ 13,080,780	$ 4,580,000	**$ 17,660,000**	$ 4,420,000	**$ 22,080,000**	
	MST Tulocay Pipeline	$ 520,000	$ -	$ -	$ -	$ 520,000	$ 180,000	**$ 700,000**	$ 180,000	**$ 880,000**	
	Increase Filter Capacity	$ -	$ -	$ -	$ 5,000,000	$ 5,000,000	$ 1,750,000	**$ 6,750,000**	$ 1,690,000	**$ 8,440,000**	$ 37,320,000
	Additional Storage	$ -	$ -	$ 2,000,000	$ -	$ 2,000,000	$ 700,000	**$ 2,700,000**	$ 680,000	**$ 3,380,000**	
	Increase Pump Station Capacity	$ -	$ 1,500,000	$ -	$ -	$ 1,500,000	$ 530,000	**$ 2,030,000**	$ 510,000	**$ 2,540,000**	
City of American Canyon	Distribution Pipelines	$ 4,424,526	$ -	$ -	$ -	$ 4,424,526	$ 1,550,000	**$ 5,970,000**	$ 1,490,000	**$ 7,460,000**	
	Storage Pond and Pumps	$ -	$ 2,538,200	$ 370,724	$ -	$ 2,908,924	$ 1,020,000	**$ 3,930,000**	$ 980,000	**$ 4,910,000**	$ 12,570,000
	Storage Reservoir (steel)	$ -	$ -	$ 121,000	$ -	$ 121,000	$ 40,000	**$ 160,000**	$ 40,000	**$ 200,000**	
Total		$ 73,748,967	$ 6,156,165	$ 17,803,371	$ 11,500,000	$ 109,208,503	$ 38,240,000	**$ 147,440,000**	$ 36,890,000	**$ 184,330,000**	

Notes:
1: Based on Phase 1 Costing Methods Updated to ENR CCI = 10,208 [February 2012]
2: USBR Allowance/Contingencies (35%) includes:
Allowance for Unlisted Items accounts for additional work that may be identified during additional design phases of the Project (15%),
Contingencies are considered as funds to be used after construction starts to pay contractors for overruns on quantities, changes site conditions, change orders, etc. (20%)
3: Non-Contract Cost (25%) includes:
Preliminary and final design engineering, preparation of construction plans and specifications (11%),
Construction services including construction management, construction inspection, engineering support during construction, construction surveying, start-up services, and as-built drawings (13%),
Project administration, legal support (1%)

Section 5
Initiation Fee Analysis

The initiation fee analysis defined a range of financial options under which a new agency may become a fully vested, participating member of the NBWRA. The ultimate decision on the NBWRA initiation fee for new agencies, if any, is at the discretion of the current NBWRA members and is subject to revision. That decision may take into account not only the findings of this analysis but also political and institutional considerations. The purpose of the initiation fee is to provide parity for the ratepayers who invested in Phase 1, with a goal to not exceed the amount existing members paid for developing the NBWRP. This section provides key facets of the initiation fee analysis. More detail is presented in Appendix B, Initiation Fee White Paper.

5.1 Background

Ratepayers located within the service areas of the seven existing NBWRA member agencies provided revenues to their agencies which were used to obtain a Federal authorization for funding from Reclamation to construct wastewater reclamation facilities for their benefit. However, if additional agencies join the NBWRA, the authorization extends to these other agencies where ratepayers did not contribute to the costs necessary to obtain the authorization. In order to assure ratepayers within the seven existing NBWRA agencies that their payments for wastewater services are not directly benefitting other ratepayers, a mechanism must be established that reimburses the existing agencies (and therefore, ratepayers) for a proportionate share of the costs expended to obtain the Federal authorization. The goal is to achieve parity among all NBWRA agencies and their ratepayers ultimately gaining benefit from the Federal authorization. If new partners are gaining the benefits of work done by (and money spent by) the early participants, they must share in the costs and reimburse the original agencies.

5.2 Definition of Benefit

In simple terms, a new agency perceives value in joining the NBWRA and pursuing Phase 2 funding because the NBWRP has an open Federal construction authorization. The authorization provides a mechanism to obtain Federal funding through various methods or grant opportunities. Although official "Federal earmarks" of the past are not anticipated at this time, there will be future Federal funding through such programs as Reclamation's WaterSMART grants.

Additional benefits are derived by the existence of the programmatic aspects of the Phase 1 EIR/EIS, which allows for "tiering off" an existing document for future studies, and by the public outreach that created and maintains support for the NBWRP. For the new agencies to assess the value of "initiation," they must view the initiation costs compared to costs to pursue other funding mechanisms.

5.3 Preliminary Definition of Initiation Fee

The basic assumption for estimating the value of Phase 1 to new agencies is that the Federal authorization is the primary benefit and, therefore, costs of obtaining that authorization should be shared. The preliminary valuation approach is to determine what costs the existing NBWRP agencies incurred since the August 2005 NBWRA Memorandum of Understanding (MOU) for acquiring the Federal authorization, but not count all technical studies, environmental analysis, public involvement,

program development, lobbying, and program management costs that might be counted towards specific projects. This analysis only includes consulting costs and does not attempt to address individual agency costs. The agencies may, in the future, attempt to quantify their specific Phase 1 expenditures and provide a suggested percentage value of those costs towards the authorization.

Table 5-1 presents the costs for each NBWRP consultant from the time of the 2005 MOU through June 2011, for a total of almost $4 million. An estimate was made of the portion of each of those fees that was related to developing the Phase 1 authorization, as opposed to work for NBWRA projects outside of Phase 1 (e.g., development and analysis of projects included in EIR/EIS Alternatives 1, 2, and 3 but not Phase 1). The costs attributable specifically to the Phase 1 authorization are over $2.6 million. Reclamation provided a Federal cost share for the engineering, environmental, and public involvement efforts. Table 5-1 also specifies the local share (i.e., NBWRP member agency portion of costs) for each of the consultant efforts, ranging from 50% to 100%. Based on these assumptions, the net attributable costs for development of the Phase 1 authorization, and the basis for the initiation fee, are just over $1.8 million. These costs only represent the consulting services to the NBWRA in Phase 1 and do not include any agency costs specific to technical analyses or costs to support lobbying efforts locally or in Washington D.C.

Table 5-1. NBWRP Phase 1 Authorization Costs

Activity	Total Phase 1 Costs Since 2005 MOU (through June 2011)	Percent Attributable for Phase 1 Initiation	Attributable Costs for Phase 1 Initiation	Local Share	Net Attributable Costs for Phase 1 Initiation
Program Development	$470,809	100%	$470,809	100%	$470,809
Federal Lobbyist	$387,851	100%	$387,851	100%	$387,851
Engineering	$977,700	70%	$688,300	50%	$344,150
Environmental	$1,390,285	50%	$695,143	50%	$347,571
Public Involvement	$362,107	75%	$271,580	50%	$135,790
Program Manager	$246,637	0%	$0	100%	$0
State Lobbyist	$126,065	100%	$126,065	100%	$126,065
Total	$3,961,454		$2,639,748		$1,812,236

To address the value of these costs, the costs were compared to the estimated Phase 1 construction cost of $104 million. The costs associated with authorization and programmatic environmental analyses are about $1,812,236, which equates to about 1.7% of the estimated Phase 1 total construction costs. One approach for an initiation fee would be to base the charge on 1.7% of the new agency's anticipated total construction costs. This percentage could be reconciled following the Phase 2 feasibility study, when Phase 2 costs are further defined. This basis of the initiation fee is subject to revision and at the discretion of the current members.

5.4 Allocation of Funds to Existing Agencies

The money potentially received from initiation fees will be distributed to the existing agencies based on the NBWRA's Second Amended MOU. MOU Exhibit B, Percentages for Ongoing NBWRA Costs, identifies the breakdown of ongoing costs for Phase 1 by NBWRA member agency, shown in Table 5-2. It is assumed that any money received through initiation fees would be distributed back to the existing NBWRA member agencies based on their percentage of ongoing Phase 1 costs as shown below.

Table 5-2. MOU Exhibit B, Percentages for Ongoing NBWRA Costs

Agency	Total of Percentages
Las Gallinas Valley Sanitary District	7.24%
Novato Sanitary District	8.61%
North Marin Water District	17.64%
Sonoma Valley County Sanitation District	27.47%
Sonoma County Water Agency	3.57%
Napa Sanitation District	31.89%
Napa County	3.57%
Total	100.00%

Source: North Bay Water Reuse Authority Second Amended Memorandum of Understanding

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Section 6

Conceptual Benefits

This section briefly provides a summary of expanded approaches to identify Phase 2's conceptual benefits. More detail is provided in Appendix C. A broader definition and quantification of program benefits would provide the NBWRA with broader public and institutional support and greater potential for accumulating funding support from multiple sources to help defray agency and ratepayer costs for project implementation.

The NBWRA members and the region could derive significant additional benefits from modest, but fundamental, changes in approach to Phase 2. This entails a broadening of scope that transitions the NBWRP from individual recycled water projects towards a regional-scale reuse program. This direction accomplishes the objectives of both local member agencies and Reclamation, the program's Federal funding partner, by demonstrating how recycled water, developed and managed as supply, can benefit all needs and users in the North Bay.

Examples of the multiple benefits or broader secondary uses include water supply planning from the watershed and sub-regional perspective, which encompasses planning for:

- Riparian, wetland, and other environmental benefits;
- Designing facilities for recycled water storage and habitat, but also, where appropriate, capturing and storing stormwater for additional supply to assist with groundwater recharge;
- Direct application of the resource and determining where in-lieu benefits can be realized;
- Traditional community landscape applications; and
- Year-round agricultural water needs.

Under Phase 2, the NBWRP not only could include members' traditional infrastructure projects but also could achieve a broader objective of including recycled water as part of the North Bay's water supply, with the goal being a high quality, regionally self-sufficient and reliable supply for urban, environmental, and agricultural uses. Fully describing and understanding these benefits and uses and how they relate to each other is what will transition Phase 1's efficient water reuse projects into Phase 2's contribution to regional water supply reliability.

Regional-scale water reuse planning can help address the many demands placed on an increasingly valuable resource. If Phase 2 alternatives include broader secondary uses, the options for financial assistance from Federal and State agencies also broaden. Potential partnering opportunities for projects with mutual goals include the following:

- **Bureau of Reclamation** – WaterSMART Title XVI Reclamation and Reuse Program grants and expanded WaterSMART grants for regional-focused projects;
- **U.S. Fish and Wildlife Service** – opportunities for funding habitat and wildlife restoration projects in the North Bay;

- **California's Bay-Delta Program** – water reuse programs in the region have received funds from the Bay-Delta program for projects that meet their goals;
- **U.S. Department of Agriculture** – projects that improve habitat and save water and power through improved management; NBWRA members could partner with local agricultural groups on projects that contribute toward NBWRP water use efficiency and habitat restoration goals;
- **U.S. Department of Energy** – funds alternative energy sources for treatment and transmission of recycled water by partnering with Reclamation and funds alternative energy projects with a water and power nexus; and
- **Many State agencies** – integrated planning approaches can be incorporated into NBWRP planning alternatives and provide an opportunity for positioning project implementation to attract grant funding of surface and groundwater supply, water conservation and quality, habitat and fisheries restoration, and alternative energy production.

Phase 1 included general discussion of how the regional, multi-benefit approach allowed local, State, and Federal goals to be accomplished. In Phase 2 of the NBWRP, this approach needs to be integrated into the study alternatives. In doing so, the NBWRA can demonstrate how new reuse projects can be designed to accomplish Federal, State, and local goals and, in the process, find new partners to assist with implementation costs.

To fully assess what recycled water could provide in Phase 2, additional economic study should be undertaken to understand the aggregate value of water in the region. This study process, Total Value Economics[1] (sometimes referred to as Whole System Economics), is being used for large watershed approaches around the world and would analyze all water uses in the North Bay. Total Value Economics quantifies the value of water in all its applications and how NBWRP projects support the regional economy and the overall sustainability of the region. This new perspective would provide additional information that is critical to understanding the full value of a given project or alternative – its infrastructure through end users, primary and secondary benefits, and the region as whole.

With the outcomes of this study added to the traditional infrastructure information developed under the Feasibility study process, the role recycled water plays in supporting the many and diverse uses of water in the region can be quantified and the true value of recycled water and what it does for the North Bay can be understood. The full benefits a given alternative provides to all recycled water users or beneficiaries can be measured against the investment, and decision makers can determine where maximum value can be realized for investing Federal and local financial resources.

[1] Total economic value is a concept in cost benefit analysis that refers to the value derived by people from a natural resource, a man-made heritage resource, or an infrastructure system, compared to not having it. It appears in environmental economics as an aggregation of the (main function based) values provided by a given ecosystem.

Section 7
Findings

The Phase 2 Project Definition Scoping Study illustrates the potential volumes of recycled water supply and the initial list of projects that could be implemented to meet regional water needs, reduce discharges, and enhance the environment. The purpose of the report was to share the potential projects being considered by the agencies, identify the potential total costs of such an expanded program, and to develop the path forward.

However, this reconnaissance-level analysis only provides preliminary insight into the issues and challenges towards implementing expanded reuse beyond Phase 1. Questions remain regarding technical issues with the potential projects, additional projects identified through member agency comments, and institutional issues for the NBWRA as it considers moving forward with the subsequent Phase 2 scoping studies.

The following presents these remaining issues. The scope of work items discussed in Section 4.1 and detailed in Appendix A have been developed to address the technical and project issues in a logical step-wise approach that meets the Reclamation criteria and supports the decision-making process of the NBWRA on proceeding with, and Reclamation in funding, a Phase 2 program.

7.1 NBWRA Organization Issues

In order to proceed with Phase 2 scoping and feasibility studies, significant organizational, financial, and institutional questions, such as the following, must be addressed:

- Which agencies will engage in further studies to complete analysis of a Phase 2 NBWRP?
- Are the reconnaissance-level costs for Phase 2 projects greater than potential funding given that total Phase 1 construction costs were limited to $100 million in the federal authorization?
- How will the NBWRA organize to conduct both Phase 1 and Phase 2 projects that have different agencies engaged?
- What NBWRA organizational activities are needed for Phase 2 studies versus Phase 1 implementation activities?

7.2 Technical Issues

Technical questions remaining to be addressed are summarized below. The recommended Phase 2 Scoping Study and Feasibility Studies tasks shown in Table ES-4 are designed to address these questions.

- Determine whether the initial list of Phase 2 projects provided by the agencies in this report is complete. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Identify subregional partnership opportunities that may provide efficiencies and cost savings. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***

- Identify a broad range of potential additional projects that could expand the opportunities and benefits of a Phase 2 program. ***[New User Assessment and Multi-Purpose Storage Scoping Study]*** Potential new uses for water reuse in the region could include:
  - Agricultural;
  - Urban irrigation – parks greenbelts, industrial complexes;
  - Other environmental restoration;
  - Recreation;
  - Groundwater recharge;
  - In-lieu stream flow;
  - Indirect potable reuse; and
  - Direct potable reuse.
- Identify the role of reuse in mitigating groundwater overdraft or salinity intrusion. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Quantify the role and volume of storage to implement greater reuse in the NBWRP. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Determine the locations, layouts, costs, and implementation constraints for new seasonal storage required to meet Phase 2 demands. ***[New User Assessment and Multi-Purpose Storage Scoping Study]***
- Define the regional alternatives and screen them to determine the most cost effective and implementable program to take to feasibility-level engineering. ***[Alternatives Development of Feasibility Study]***
- Estimate the total value of NBWRP activities to the region. Assess how the role recycled water plays in supporting the many and diverse uses of water in the region can be quantified and how the true value of recycled water and what it does for the North Bay can be understood. ***[Alternatives Development of Feasibility Study]***
- Define benefits accrued to the environment when existing users of stream diversions or groundwater pumping are switched to reuse. ***[Alternatives Development of Feasibility Study]***
- Determine the feasibility-level engineering analysis and cost estimates to select the final alternative. ***[Engineering Study of the Feasibility Study]***
- Assess whether the local agencies have the funds to complete the required studies. ***[Financial Evaluation of Feasibility Study]***
- Identify the potential impacts of and, if needed, mitigation required to implement the selected alternative. ***[Environmental Evaluation of the Feasibility Study]***

7.3 Additional Study Topics

Several additional study topics were identified through the review and comment process for the Draft Project Definition Study Report. These topics will be addressed in the New User Assessment and Multi-Purpose Storage Scoping Study in the tasks associated with exploring subregional partnerships and identifying any additional demand types and users.

- Collaborate with Marin County watershed programs for Novato Creek and Miller Creek.
- Evaluate LGVSD participation in MMWD's Peacock Gap Extension project to allow for conveyance of treated wastewater to a potential new deep water discharge outfall in San Pablo Bay.
- Assess most feasible and cost effective facility for expanded capacity to serve MMWD.
- Evaluate optimization of existing LGVSD storage ponds for use as a habitat resource and for adapting to climate change effects.
- Evaluate options for storage in upper Lucas Valley.

In summary, the next Phase 2 scoping study and feasibility study have been designed to address the key issues and questions and lead the potential Phase 2 projects to funding, design, and implementation. The scoping study process has built-in stop/go decision points to allow the NBWRA agencies to incrementally, and at relatively low cost, determine if a complete feasibility study process should be initiated. The proposed next scoping study (New User Assessment and Multi-Purpose Storage Scoping Study) will provide the NBWRA with critical information and insights. Given the multi-agency cost sharing and potential for a cost share with Federal funding, these studies are a cost-effective approach for an individual agency to address these key questions and issues regarding expanded reuse in the North Bay.

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Section 8
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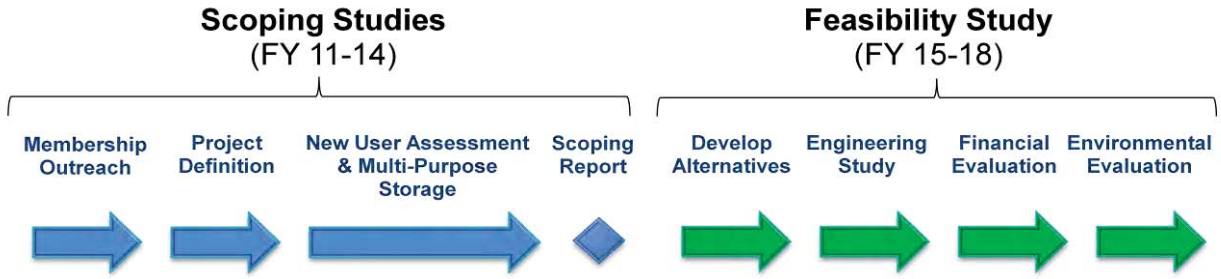
Appendix A

Scopes of Work for Phase 2 Scoping Studies and Feasibility Study

A.1 Overview

Appendix A addresses the cost to complete the last Phase 2 Scoping Study and conduct the feasibility level analysis under Title XVI criteria to access potential funding for the design and construction of the Phase 2 potential facilities. The first activities shown below highlight the Scoping Studies to support the NBWRA decision process regarding conducting full feasibility analysis. The Feasibility Study scope of work focuses on the tasks and costs to conduct the technical analysis required to complete the engineering planning, environmental evaluation, and financial evaluations. In addition to the activities shown in the figure below, the scope also includes the public involvement activities to specifically support the environmental evaluation. Not included below are the Agency Administration activities of Sonoma County Water Agency (SCWA) as the Fiscal Agent and the agency that holds the agreements with Reclamation.



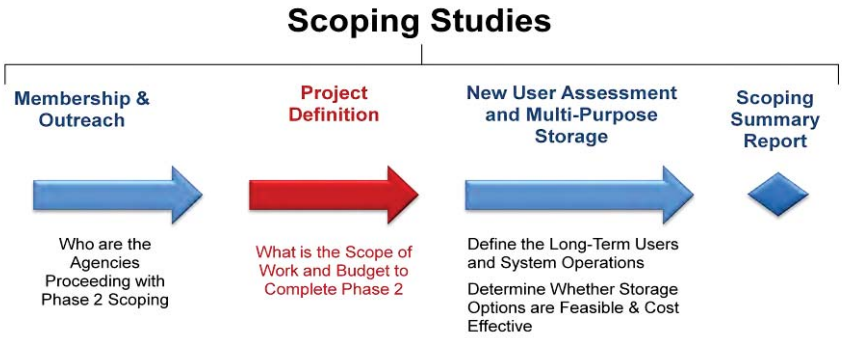
All activities in this appendix, plus the Fiscal Agent role, would be eligible to receive potentially available matching funds from Reclamation. These activities would be provided as an attachment to future agreements with Reclamation.

Note that other activities regarding NBWRA organizational administration, NBWRA general public involvement, Federal Program Development, and State Program Development are not included here as they are not considered eligible for matching funds.

A.2 Scoping Studies

The figure below illustrates the complete series of scoping studies proposed in Phase 2 of the NBWRP. The Scoping Studies are intended to provide preliminary information leading to a complete feasibility studies and environmental analysis. The Membership and Outreach Scoping Study identified the potential partners for studies to expand the NBWRP beyond Phase 1 and was completed in 2011. The current Project Definition Scoping Study provides preliminary information on the potential size and costs of a Phase 2 project construction and the scope of work to complete scoping and feasibility studies and environmental analysis.

The future New User Assessment and Multi-Purpose Storage Scoping Study will focus on the specific users and an expanded list of potential demands beyond the preliminary list provided by the agencies in this study, as well as provide insight into locations and the significant costs and issues potentially associated with storage. A brief summary report drawing from each of the three scoping studies will serve as the final NBWRA decision document and will provide information to Reclamation as to the funding needed to support NBWRA in a Phase 2 feasibility analysis. The activities shown in blue below are included in the scope of work that follows.



A.2.1 New Users Assessment

The purpose of this scoping task is to more accurately quantify additional recycled water demand not previously identified in local studies or in earlier NBWRP activities. A broader range of conceptual options and potential uses has been identified by NBWRA as a result of insights provided by the Project Definition Scoping Study. Therefore, additional analysis has been requested to determine the full range of projects and the commitment of potential new users prior to agencies committing resources and funds towards more detailed engineering and environmental screening of multi-purpose storage facilities. The updated demands and the available supply will be used in monthly operation studies to determine the amount and potential general locations for seasonal storage.

A.2.1.1 Update Potential Projects and Future Demands

The consultant team will collect information on potential projects and potential sites for recycled water use not in existing planned projects identified in the Project Definition Scoping Study. Concepts for the expanded program will be developed in conjunction with the agencies through in-person meetings. Discussions will be held with the agencies participating in the study to identify additional project concepts and potential customers that may be known to those agencies, and to explore inter-agency partnership opportunities that could increase system efficiencies and cost savings.

Potential new uses to be identified could include the following:

- Agricultural;
- Urban irrigation – parks greenbelts, industrial complexes;
- Environmental restoration;
- Recreation;
- Groundwater recharge;
- In-lieu stream flow;

- Indirect potable reuse; and
- Direct potable reuse.

The potential new recycled water uses will be assessed for their volume, proximity to available supply, and elevation differences between supplies and demands. Preliminary contact with potential large scale recycled water users (e.g., public parks) will be initiated through the participating agencies. Issues affecting implementation of the potential demand service will be identified and summarized. Concepts for integrated water supply and effluent management/discharge to meet environmental objectives will be identified. The process to be used to accomplish the tasks in the scope of work that follows includes:

- Meet with each participating agency:
  - Discuss new or not fully defined concepts (not included by agencies in the Project Definition Scoping Study).
  - Identify where and how much demand exists – specific users will be identified if possible.
  - Develop schematic model of the system with technical data for each source and demand area. The schematic will illustrate all the potential near-term and conceptual long-term options for reuse. Each agency (or agencies) will review and confirm the schematic before detailed information is developed.
  - Assume 7 meetings with individual agencies.
- Facilitate meeting of subregional agencies:
  - Identify linkage between concepts identified by individual agencies in meetings.
  - Link supply agencies (wastewater districts) to use agencies (water agencies, wastewater districts, counties, private industry, or environmental demands).
  - Expand schematic models & data to illustrate potential interagency opportunities.
  - Assume 2 meetings with regional groups of agencies.
- Evaluate the boundary conditions of each subregion to develop regional programmatic approaches and benefits:
  - Expand schematic models and data.
  - Identify transfers between subregions to address subregional deficit or excess supply.
  - Summarize supplies, demand, and potential transfers of water to meet regional water demands and habitat enhancement..

A.2.1.2 Updated Conceptual Operational Analyses

A Preliminary monthly operations analysis will be conducted for the identified regional projects to determine recycled water seasonal storage needs, potential integration with Phase 1 facilities, general points of delivery, and coordinated discharge of effluent. Monthly irrigation demand distribution patterns presented in the Phase 2 Project Definition Scoping Study will be applied unless specific information can be provided by the agency. A water balance illustrating the monthly demands and

monthly supply will be used to determine the available water and the need for storage or additional supply from others.

Monthly demand patterns of uses other than irrigation (e.g., habitat enhancement, stream restoration, groundwater recharge) will be estimated. The monthly demands will be used to prepare conceptual-level sizing of storage and other facilities. The analysis will address the conceptual conveyance concepts to deliver available water to demand locations. Options for seasonal storage in multi-purpose storage projects will be identified in terms of volume requirements to meet seasonal needs and locations to facilitate delivery.

A.2.2 Multi-Purpose Storage Analysis

Following completion of the New User Assessment Scoping Study, data regarding the required seasonal storage volumes and conceptual locations for storage will be available. This task will provide insight into the technical aspects of the storage sites and provide preliminary estimates of costs.

A.2.2.1 Screening of Initial Proposed Storage Sites

The "Preliminary Study of Multi-Purpose Reservoir Opportunities for the North Bay Water Reuse Program" identified preliminary multi-purpose storage sites for some of the existing agencies. The locations were generally defined based on the following issues:

- Where feasible, the construction of new storage by the customer near the point or area of use would be preferred (e.g., golf course pond storage or vineyard management pond storage);
- Where the construction of local storage ponds is not feasible or does not provide the desired storage volume or operational flexibility, storage ponds would be constructed by the member agency in the region; and
- When constructed by a member agency, new storage would most likely occur on existing agency-owned property before new property would be purchased for this sole use.

A screening process will be applied to review the previously identified sites to determine if the sites are appropriate for inclusion into a future Phase 2 Feasibility Study and environmental documentation. Specific issues to be addressed in the screening criteria include:

- Design Criteria
  - Conceptual pond layout
  - Combined use ponds
  - Segregated use ponds
  - LGVSD potential concept
- Operational Issues
  - Storage volumes
  - Operational volume changes
  - Water management

- Design Issues
  - Environmental design issues
  - Engineering design elements
- Site Constraint Issues
  - 100-year floodplain
  - Climate change and sea level rise potential
  - Impacts
  - Buffers
  - Public access
  - Depth to groundwater
  - Water quality
  - Wetlands delineations

A.2.2.2 Identification and Screening of Potential New Storage Sites

NBWRA's preliminary investigation of multi-purpose reservoir opportunities did not identify specific sites for the potential new NBWRA agencies. Following operational analyses to determine the location and volumes of new storage sites, a screening processes will be applied to determine if the sites are appropriate for inclusion into a future feasibility study and environmental documentation. Specific issues to be addressed include those identified in Section A.2.2.1.

A.2.2.3 Preliminary Layout, Identification of Utility Components, and Environmental Enhancements

For each storage location, site-specific conceptual operations studies will be conducted to address the needs of the individual agencies to incorporate the ponds into their existing operations and to meet the operational needs of an expanded system that relies on storage. Conceptual layout of water conveyance to and from the ponds and interfaces with treatment facilities will be required. Concepts for integrating habitat enhancement as an integrated system or as an independent adjacent system will be addressed for each site depending on the needs and objectives.

Preliminary pond layouts will be based on the available information on conditions, agency operational concepts, utility constraints, environmental enhancement needs, and required volumes. Layouts will be developed using available mapping from USGS and satellite imagery from Google Earth Pro and will be at reconnaissance level. The layouts will include conceptual pond configuration, piping systems, pumping facilities, and access.

A.2.2.4 Reconnaissance-Level Cost Estimates

The team will develop a reconnaissance level estimate of Project Capital Costs including construction costs, contingency, and implementation allowances, in accordance with Reclamation's Guidelines.

A.2.3 Scoping Studies Report

The Scoping Study Report will summarize the three completed scoping studies work and findings, and layout the steps for the feasibility study process. The draft report will be presented at the TAC and Board Meetings. The study report will be finalized after incorporating comments from the TAC and the Board.

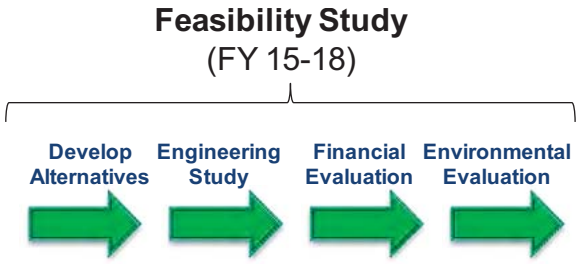
A.2.4 Workshops and Public Decision Processes

In coordination with the Program Development consultant, the team will plan, prepare materials for, and co-facilitate seven workshops to present findings and seek input from NBWRA stakeholders as the New User Assessment and Multi-Purpose Storage Scoping Study and Scoping Study Report are being produced.

A.3 Feasibility Study

The Feasibility Study is intended to produce a planning document that will identify the most feasible recycled water project alternatives in accordance with Reclamation's Title XVI Guidelines. The Phase 2 Feasibility Study will be comprised of engineering, financial, and environmental evaluations to investigate how recycled water can best be utilized and to provide municipal and agricultural water users with a reliable source of water and to realize environmental benefits to fish and wildlife from the restoration of wetland and marshland habitat.

Feasibility level engineering studies involve the tasks to further investigate and define the scope and goals of the proposed project beyond those generated during the Scoping Studies. It includes the necessary field studies, mapping, supply and demand forecasting, and more detailed development of alternatives to define the project and perform the environmental and financial review to meet Federal standards for feasibility.



A.3.1 Alternatives Development

A.3.1.1 Evaluate Existing and Future Regional Conditions

The purpose of this task will be to evaluate the existing physical, environmental, and socioeconomic conditions of the potentially expanded NBWRP Phase 2 service area to make it consistent with the analysis completed for the existing Phase 1 boundary. It is intended to identify the new regions that would be potentially affected by performing the project, and to discuss the potential future of the region without the project. Conditions to be evaluated will include the following:

- Agricultural and urban land use;
- Agricultural soil capabilities;
- Project physical constraints;

- Water resources (surface and groundwater quantity and quality);
- Impact on anticipated water resource developments (including reduction or elimination of new or expanded water supplies, reduction or elimination of existing water diversions or aquifer withdrawals, and reduction of existing Federal water supply demands);
- Urban, agricultural, and environmental water demands;
- Regional water rights;
- Recycled water effluent flows and quantities from each reclamation plant;
- Impacts to regional endangered species;
- Regulatory requirements and involvement;
- Impacts to regional cash crops;
- Impacts to all high and low volume regional water users; and
- Costs.

A.3.1.2 Establish Project Criteria and Considerations

This task will update the Phase 1 design assumptions and criteria important for investigation discussions and decision-making to incorporate new agencies and lessons learned during Phase 1 design and construction. Such criteria will include: overall pipeline function and the level of control allocated to each project sponsor; anticipated seasonal recycled water quantity and quality from each potential sponsor; public health and environmental quality issues associated with the use of recycled water; potential seasonal agricultural and urban demands; pipeline system physical and hydraulic design criteria; and long term operational and maintenance requirements.

A.3.1.3 Develop Feasibility Study Alternatives

Once the above tasks have been completed, the project team will develop alternatives for additional evaluation. Alternatives identified in New User Assessment Scoping Study and the Multi-Purpose Storage Scoping Study will be reviewed and final regional alternatives will be generated that meet the initial planning criteria and constraints, but may differ with regard to the following: pipeline alignments; recycled water supply and demand; project sponsors; project criteria; local irrigation system requirements; drainage impacts; and the effects of habitat restoration.

A.3.1.4 Estimate Project Costs

The purpose of this task will be to prepare a preliminary estimate of cost on each of up to three alternatives. At a minimum, the estimate will consider those costs associated with the design, construction, and annual operations and maintenance of the facilities.

A.3.1.5 Perform Fatal Flaw Analysis

The viability of the alternatives will be assessed based on a fatal flaw analysis that will be used to judge the practicality of proceeding with each alternative into feasibility-level study. At a minimum, the fatal flaw analysis will evaluate the following for each alternative:

- Environmental impacts and mitigations;

- Easement acquisition;
- Utility conflicts;
- Costs;
- Constructability and physical constraints;
- Compliance with environmental laws, regulations, and requirements;
- Consideration of operations and maintenance issues; and
- System hydraulics (including energy and storage requirements).

A.3.1.6 Alternatives Development Report

This task will generate a final report summarizing the results of those activities performed during the Alternatives Development activities. The report will discuss the viability of each of three alternatives and identify a recommended preliminary plan for moving the alternatives into development of a feasibility level study report.

A.3.2 Engineering Study

The purpose of the Phase 2 Feasibility Study engineering tasks will be to further investigate and define the proposed project and incorporate it into the format required for the feasibility study under Title XVI Guidelines.

A.3.2.1 Finalize Project Criteria and Considerations

This task will finalize those project assumptions and criteria important at a final feasibility level for discussions and decision-making. Such criteria will include: overall pipeline function and the level of control allocated to each project sponsor; recycled water supply contributed by each member; potential seasonal demands; pipeline system physical and hydraulic design criteria; and long-term operational and maintenance requirements.

A.3.2.2 Perform Alignment Surveying and Mapping

This task will generate figures and topographic maps suitable for the feasibility-level design and cost estimating activities. The figures and topographic maps will need to sufficiently cover the extent of each of the three alternatives.

A.3.2.3 Perform Geotechnical Studies

This task will include geotechnical studies and sampling in support of those engineering activities necessary for feasibility-level design and cost estimating. The geotechnical studies will need to sufficiently cover the extent of each of the alternatives, but at this stage would include only a minimal amount of intrusive work.

A.3.2.4 Perform Hydraulic Studies

This task will include hydraulic modeling, pipeline efficiency studies, and related engineering activities suitable for feasibility-level design and cost estimating. The engineering activities will need to sufficiently evaluate the detailed hydraulics of each of the three alternatives and include the effects of seasonal supply, demand, and available surface storage.

A.3.2.5 Finalize Feasibility-Level Alternatives

Once the above tasks have been completed, the three alternatives will be redefined and finalized by the project team to a feasibility-level for the additional review described below. The Engineering Feasibility Study Report will incorporate information and data from the Phase 1 Feasibility Study Report, the Phase 2 Scoping Studies, and the Alternatives Analysis Study, and will be in agreement with Reclamation's Title XVI Guidelines.

A.3.2.6 Detailed Project Costs and Benefits

This task will revise the cost estimates for each of the three finalized project alternatives. At a minimum, the analysis will consider the ultimate costs associated with the design, construction, and annual operations and maintenance of the pipeline. Similarly, the analysis will consider the ultimate benefits associated with avoided treatment costs, zero discharge goals, and revenue collected from the sale of recycled water.

A.3.2.7 Analyze Alternatives

Each of the three finalized alternatives will be analyzed, at a minimum, to review the results of any previous fatal flaw analyses and each alternative according to the following criteria:

- Environmental impacts and mitigations;
- Results of initial easement acquisitions and negotiations;
- Utility conflicts;
- Constructability and physical constraints; and
- Ultimate economic and environmental benefits and costs for each alternative.

A.3.2.8 Draft Engineering Feasibility Study Report

The Draft Engineering Feasibility Study Report will define the selected alternative and address key issues identified in Reclamation's WaterSMART Program:

- What is the amount of water expected to be made available by the project phase and the extent to which the project phase will reduce demands on existing facilities and otherwise reduce water diversions?
- Does the project provide water available to address a specific concern (e.g., water supply shortages due to climate variability, and/or heightened competition for limited water supplies)?
- To what extent is the water made available by this project phase more drought-resistant than alternative water supply options?
- How will the project improve surface, groundwater, or effluent discharge quality; restore or enhance habitat for non-listed species; or provide water or critical habitat for Federally-listed threatened or endangered species?
- Will the project incorporate renewable energy and/or addresses energy efficiency?
- What are the cost per acre-foot of water expected to be delivered upon completion of the project phase and other benefits of the project?

- Does the project help fulfill any of Reclamation's legal or contractual obligations such as providing water for Indian tribes, water right settlements, river restoration, minimum flows, legal court orders, or other obligations?
- Does the project serve a rural or economically-disadvantaged community?
- Does the project promote or apply a watershed perspective by implementing an integrated resources management approach, implementing a regional planning effort, or forming a collaborative partnership with other entities?

A.3.2.9 Finalize Engineering Feasibility Study Report

The Final Engineering Feasibility Study Report will utilize the results of the engineering, financial, and environmental analyses to identify those recycled water use alternatives which best achieve environmental benefits to fish and wildlife, from the restoration of wetland and marshland habitat, and provide municipal and agricultural water users with a reliable source of water. The feasibility study will provide a planning document that will identify the most feasible means of using recycled water for irrigation and habitat restoration in the northern San Pablo Bay region.

This task will generate a final report in agreement with Reclamation's Title XVI Guidelines. The report will summarize the results of those activities performed during both phases of the Feasibility Study including engineering, financial, and environmental analyses. The report will discuss each of the three alternatives, and identify the recommended alternative for final design.

A.3.3 Financial Evaluation for the Feasibility Study

A.3.3.1 Economic Analysis

The economic analysis will describe the existing economic conditions in the project area, including the current cost of water to agricultural users. It will also provide projections of future economic conditions, both with and without the proposed recycled water project, including the cost of developing future water supply. The economic benefit attributable to the project would be the difference between the cost of developing the proposed recycled water project and the cost of developing additional water supply, development of alternative disposal methods, and cost associated with habitat and endangered species protection. When evaluating the cost of developing new water supply, only alternatives that are likely, realistic, and viable from an engineering perspective will be considered. If a future water supply alternative has not been identified, the cost of the most recent addition to supply will be used.

A.3.3.2 Financial Capability Analysis

The purpose of the Financial Capability Determination is to develop a financial analysis approved by Reclamation to ensure nonfederal partners can provide their cost-sharing. Two analyses will be conducted to determine the financial capability to construct, operate and maintain the project. First, a survey of available federal, state, and local funding will determine if the substantial cost of construction can be partially offset with grants and/or low-interest loans. Second, an assessment will determine if sufficient revenue can be generated from the sale of recycled water to allow the repayment of any debt incurred for construction and pay for the ongoing operation and maintenance of the facilities. Together, these analyses will result in either a statement of financial capability or a statement that the project is not financially feasible, given present conditions.

A.3.3.3 Project Cost Effectiveness

An analysis of the cost-effectiveness of the proposed alternative will be conducted to determine if it provides the least cost method for achieving the project objectives. Cost effectiveness will be expressed as the cost per acre-foot of water produced or offset. The cost per acre-foot of the project will be calculated using the following formula: annualized life cycle cost of this project phase divided by average annual volume of water that will be made available upon completion of the project phase. The cost per acre-foot of the project will be compared to the cost per acre-foot of one alternative (i.e., non-recycled water option) that would satisfy the same demand as the proposed project phase. Any economic benefits of the project phase that are not captured by the cost per acre-foot analysis, or that are difficult to quantify will be described.

A.3.4 Environmental Evaluation for the Feasibility Study

Concurrent with the Phase 2 engineering feasibility evaluation, an environmental evaluation will be conducted to determine the potential environmental constraints and requirements associated with various project design alternatives identified in the engineering evaluation phase of the feasibility study. The environmental evaluation will outline both the environmental planning and review requirements under the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA), and the potential permitting requirements for the project. The purpose of the environmental evaluation is to identify any major environmental impacts associated with various project alternatives. The analysis will be used to both eliminate project alternatives that have major environmental issues, and select alternatives to move forward to the project environmental review phase of the project. The environmental evaluation will consist of an environmental constraints analysis, and all required permits and documents to comply with state and federal environmental requirements.

A.3.4.1 Environmental Constraints Analysis

The environmental constraints analysis will consist of a review of alternatives identified in the engineering evaluation phase of the feasibility study. The purpose of the environmental analysis is to both eliminate alternatives with major environmental issues and to help in the selection of alternatives that will be the focus of design and project environmental review.

Upon completion of background research and field visits, a summary of environmental constraints will provide an environmental analysis of engineering feasibility alternatives. The analysis will: 1) summarize the environmental work completed to date, including the results of background research and field visits; 2) include a section that identifies those alternatives with major environmental issues; and 3) recommend alternatives that should be carried over to design and project environmental review. The completed environmental constraints analysis will be included as an attachment to the feasibility study report.

A.3.4.2 Environmental Compliance

To satisfy federal and state environmental compliance, all necessary documentation will be prepared and completed in accordance with NEPA/CEQA. Information from the environmental constraints analysis will be used to determine the appropriate document to complete to satisfy NEPA/CEQA requirements. The proposed NEPA/CEQA document will comprise the environmental evaluation portion of the feasibility report. An environmental impact report/environmental impact statement (EIR/EIS) will be prepared if the proposed action is determined to cause significant environmental effects. Compliance with federal, state, and local permits and regulations will also be addressed during the NEPA/CEQA process. A public scoping process to determine the scope of issues to be addressed and to identify any additional significant issues will be conducted.

Due to the scope and complexity of the proposed project, it is anticipated that the project will require a project-level EIR/EIS consistent with Reclamation's NEPA requirements. The analysis will consider all applicable federal, state, and local environmental regulations, statutes, and other environmental requirements. Requirements may include but are not limited to:

- Federal:
  - NEPA;
  - National Historic Preservation Act;
  - Federal Endangered Species Act;
  - Fish and Wildlife Coordination Act; and
  - Clean Water Act.
- State:
  - CEQA;
  - State Office of Historic Preservation compliance;
  - California Endangered Species Act;
  - California Fish and Game Code;
  - Porter-Cologne Water Quality Control Act; and
  - Title 22 Division 4 of the California Code of Regulations pertaining to the use of recycled water.
- Local:
  - County and City General Plan Consistency;
  - County and City permitting; and
  - County and City Zoning Ordinances.

Major tasks for environmental compliance are identified below.

- Summary
- Introduction
- Project Descriptions
- Geology and Soils
- Surface Water Resources
- Groundwater Resources

- Water Quality
- Biological Resources
- Fisheries
- Cultural Resources
- Noise
- Air Quality
- Traffic
- Hazardous Materials
- Socioeconomics
- Environmental Justice
- Aesthetics
- Growth Inducement

A.3.4.2.1 Notice of Intent/Preparation and Scoping

The purpose of this task is to prepare and release a combined Notice of Intent (NOI) and Notice of Preparation (NOP) to describe the proposed project and request public comments concerning the proposed project. The NOI/NOP will be sent to regulatory agencies, landowners, and interested parties, and posted in the Federal Register. SCWA will hold a series of public scoping meeting based upon project geography to provide an opportunity for input into the scope of the environmental analysis and alternatives to be examined. Following completion of the public review process, the scoping report will summarize the comments received and identify key issue areas for analysis.

A.3.4.2.2 Administrative Draft EIR/EIS

The Administrative Draft EIR/EIS will describe the proposed project and alternatives and analyze the potential environmental impacts related to the proposed project and its alternatives. Significant environmental impacts would include direct or indirect, short and long-term, and cumulative and unavoidable impacts associated with the proposed project or project alternatives. Within the administrative draft EIR/EIS, mitigation measures to reduce or avoid potential environmental impacts will also be proposed. Two rounds of comment are anticipated prior to preparation of a Public Draft. The Administrative Draft EIR/EIS will include the following sections:

The Administrative Draft EIR/EIS will be circulated to Reclamation and NBWRA member agencies for review and comment. A Second Administrative Draft EIR/EIS will be prepared for review by Reclamation and NBWRA member agencies.

A.3.4.2.3 Public Draft EIR/EIS

Following review by Reclamation and NBWRA Member Agencies, a Public Draft EIR/EIS will be prepared for circulation. A Notice of Availability and Notice of Completion will be distributed to regulatory agencies, landowners, and interested parties. In coordination with Reclamation, the NOA will

be filed in the Federal Register, which will commence a 60-day review period. A series of public meetings will be held to receive public comments.

A.3.4.2.4 Final EIR/EIS

This task will include addressing all comments submitted, preparing responses to comments, and including any revisions to the draft EIR/EIS upon completion of the draft EIR/EIS review period, in accordance with NEPA/CEQA. The administrative draft Final EIR/EIS will be prepared and reviewed by Reclamation and NBWRA member agencies. After responding to one round of comments, the Second Administrative Draft EIR/EIS will be prepared for final review by Reclamation and NBWRA member agencies. After addressing remaining comments, the Final EIR/EIS will be circulated and filed Federal Register, in coordination with Reclamation.

A.3.4.2.5 Certification Materials and Record of Decision

Following circulation of the Final EIR/EIS, the draft Record of Decision will be prepared for Reclamation review and processing. This task will also include preparation of CEQA Certification Materials and filing of CEQA Notice of Determination for individual NBWRA member agencies.

A.3.4.2.6 Permitting and Regulatory Process

As necessary, SCWA will consult with applicable federal, state, and local agencies to obtain necessary permits and comply with all required federal, state, and local environmental regulations. This will include preparation of a draft and final Biological Assessment to support Reclamation's consultation with United States Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service under Section 7 of the Endangered Species Act. This task will also include preparation of a Cultural Resource Inventory Report, including establishment of the Area of Potential Effect for proposed facilities, to support Reclamation's consultation with the State Historical Preservation Officer (SHPO) under Section 106 of the National Historical Preservation Act. The Record of Decision will be updated for Reclamation processing as appropriate following completion of the consultation process with USFWS and SHPO.

A.3.6 Public Involvement Support to Environmental Evaluation

The NBWRA member agencies will work collaboratively with potential partners, public stakeholders, and agricultural interests to identify and respond to specific questions and concerns. The effort described here focuses specifically on support to the Phase 2 environmental documents activities.

Specific tasks associated with this approach may include:

- Update the list of the other NBWRA member agencies, potential partners, and other key stakeholders in the area beyond Phase 1 study area with which to meet and gather information regarding questions and concerns;
- Compile key concerns and develop informational materials and presentations that respond to these questions and concerns;
- Update the NBWRA webpage identifying Phase 2 activities and coordinating responses to questions submitted to the website; and
- Follow up by developing and distributing additional information (e.g., mailing or direct communication) to respond to stakeholder questions and concerns

This public involvement process includes public meetings that will be required by CEQA and NEPA to inform the public about project alternatives and environmental review activities, and to solicit public input on the project's environmental documentation process.

A.3.7 Workshops and Public Decision Processes for Feasibility Studies

The Program Development and other NBWRA consultants will plan, prepare materials for, and co-facilitate five workshops per year to present findings and seek input from NBWRA stakeholders as the Feasibility Study is being produced. The consultant team will provide and format technical information to support activities of the Program Development Consultant and the Public Involvement Consultant.

A.4 Scope of Work Agency Administration

SCWA is the administrative agency for the NBWRA and is the signatory to the cooperative agreement with Reclamation. As such, SCWA is responsible for the collection, assimilation, and reporting of the NBWRA activities for Phase 2. Activities associated with this role include the following:

- Funding agreements;
- Reporting;
- Invoicing;
- General grant/ project management; and
- Environmental coordination.

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Appendix B

Initiation Fee White Paper

B.1 Scope of Work

The now-completed Phase 1 Feasibility Study was supported at varying levels by seven current North Bay Water Reuse Authority (NBWRA) participating members. The intrinsic value of the Phase 1 Study includes: (1) analysis results; (2) participating member foundational relationships with the Bureau of Reclamation (Reclamation); and (3) the Federal authorization to NBWRA for new project funding. Up to four new local agencies have expressed a potential interest in becoming NBWRA participating members in the Phase 2 Feasibility Studies. The purpose of this evaluation is to define a range of financial options (initiation charges) under which a new agency may become a fully-vested participating member of NBWRA. The NBWRA Memorandum of Understanding (MOU) uses the term "initiation fee" to describe the charges for new members to join.

The initiation fee evaluation scope of work included: (1) an assessment of the equity of the NBWRA; (2) allocation of the equity among the existing members; and (3) the assessment methods of an initiation charge to new members. The ultimate decision on the NBWRA initiation charge to new agencies, if any, is at the discretion of the current NBWRA members. That decision should include not only the findings of this analysis but also political and institutional considerations.

B.2 Background

Ratepayers located within the service areas of the seven original agencies have provided revenues to their agencies which have been used to obtain a Federal authorization for funding from Reclamation to construct wastewater reclamation facilities to their benefit. However, the authorization extends to other agencies where ratepayers did not contribute to the costs necessary to gain that benefit. In order to assure ratepayers within the seven original NBWRA agencies that their payments for wastewater services are not directly benefitting ratepayers located within the boundaries of other agencies, a mechanism must be established that reimburses them for a proportionate share of the costs expended to obtain the Federal authorization. This concept is identical to the buy-in concept for calculating impact fees (connection fees, capacity charges, system development charges, etc.) universally used by municipal utilities throughout California to assure its existing customers that growth will pay for growth. The goal is to achieve parity among all NBWRA agencies and their ratepayers ultimately gaining benefit from the Federal authorization. If new partners are gaining the benefits of work done by (and money spent by) the early participants, they must share in the costs and reimburse the original agencies.

B.3 Definition of Benefit

B.3.1 Benefit to New Agencies

In simple terms, a new agency perceives value in joining NBWRA and pursuing Phase 2 funding because the North Bay Water Reuse Program (NBWRP) has an open Federal construction authorization. The authorization provides a mechanism to obtain Federal funding through various methods or grant opportunities. Although official "Federal earmarks" of the past are not anticipated at this time, there will be future Federal funding program such as Reclamation's WaterSMART program. Additional benefits are derived by the existence of the programmatic aspects of the Environmental Impact Report/

Environmental Impact Statement which allows for "tiering off" an existing document for future studies and by the public outreach that created and maintains support for the NBWRP. For the new agencies to assess the value of "initiation," they must view the initiation costs compared to costs to pursue other funding mechanisms.

In order to determine the value of the Phase 1 activities leading up to an authorized program to new partners in Phase 2, it is important to identify all the costs expended and determine those that are of specific benefit to a new member agency. Costs since the adoption of the MOU in 2005 have included a variety of services and consultants:

- Program Development
- Federal Lobbyist
- Planning/Engineering
- Environmental
- Public Involvement
- Program Manager
- State Lobbyist

All the costs for "Program Development" and "Federal Lobbyist" are directly related to acquisition of the authorization; however, not all other services costs can be considered to have contributed directly to obtaining of the Federal authorization. For example, significant time was expended in "Planning/Engineering" to address questions regarding the planning processes and rationale for pursuing a regional program and regarding the development of the organization. Key Planning/Engineering work was done to define the program and project to allow for the Program Development consultant and Federal Lobbyist to demonstrate project benefits for Reclamation, Congress, and the Office of Management and Budget to allow the Federal authorization to provide design and construction funding. Additionally, much of the engineering approach and tools developed in Phase 1 will be reusable and timesaving when applied to Phase 2.

The "Environmental" services had two components: the programmatic issues of the NBWRP and project specific aspects for the Phase 1 projects. Consequently, not all of the environmental analysis will be perceived as benefit to the new Phase 2 partners. Similarly, the "Public Involvement" services include some activities specific to Phase 1; however, the majority of public involvement activities to develop a broad base of support for the project will continue to support the efforts to obtain project funding in Phase 2.

The "State Lobbyist" efforts have gained project support from various state legislators and state agency staff and supported NBWRA efforts in tracking and positioning to capitalize on state funding opportunities.

B.3.2 Benefit to Existing Agencies

In addition to benefits to new agencies, the existing NBWRA agencies receive the benefit of new agencies joining the NBWRA. Anticipated benefits to the existing NBWRA agencies include additional recycled water to meet expanded needs, greater local funding capacity, and broader political support at the local,

regional, state, and federal levels. Additionally, the addition of new partners will allow general organizational overhead costs to be spread over a larger number of agencies.

B.4 Assumptions of Costs Incurred Attributable to the Federal Authorization

The basic initial assumption for estimating the value of Phase 1 to new agencies is that the Federal authorization is the primary benefit and therefore costs that should be shared. The preliminary valuation approach is to determine what costs the existing NBWRP agencies incurred since the August 2005 MOU toward acquiring the Federal authorization, but not count all technical studies, environmental analysis, public involvement, program development, lobbying, and project management costs that might be towards specific projects. This analysis only includes consulting costs and does not attempt to address individual agency costs. The agencies may in the future attempt to quantify their specific Phase 1 costs and provide a suggested percentage value of those costs towards the authorization

The contribution of each consultant towards the authorization is discussed below:

Program Development:

- Contributes 100% to authorization
- 0% of the total allocated costs are provided by Reclamation

Federal Lobbyist:

- Contributes 100% to authorization
- 0% of the total allocated costs are provided by Reclamation

Engineering:

- Assumptions:
  - Technical analyses related to development of the feasibility study required for authorization contribute 100% to authorization. This includes technical support to the environmental analysis through completion of the Record of Decision.
  - Activities associated with developing and providing program information to support the Program Development and Lobbyist activities contribute to the authorization. This includes developing and formatting project descriptions of key details for use in discussions at Reclamation and Congressional staff, and includes attendance at key meetings in Sacramento, Denver, and Washington D.C.
  - Program management and meeting documentation prior to NBWRA contracting for a program manager do not contribute to the authorization.
  - 50% of the total allocated costs for engineering and planning are provided by Reclamation.

CDM Smith Contracts for Engineering and Planning[1]	Total Costs	Allocation Percentage	Allocated Costs
Phase 2B Engineering Feasibility Study	$11,200	50%	$5,600
Phase 2C Engineering Feasibility Study	$389,700	50%	$194,850
Phase 3 Engineering Feasibility Study, Part 1	$95,000	100%	$95,000
Phase 3 Engineering Feasibility Study, Part 2	$239,900	100%	$239,900
Phase 3 Engineering Feasibility Study, Part 3	$110,000	100%	$110,000
Fiscal Year 2009-2010 Services	$39,900	50%	$19,950
Fiscal Year 2010-2011 Services	$92,000	25%	$23,000
Total	**$977,700**	**70%**	**$688,300**

[1] See Attachment A for tasks by contract

Environmental:

- Includes the general background and specific regional analysis and descriptions that can extend beyond the Phase 1 boundary.
- Does not include efforts regarding specific project level analysis costs.
- Does not include the permitting activity costs for specific projects.
- 50% of costs allocated to Authorization.
- 50% of the total allocated costs for environmental are provided by Reclamation.

Public Involvement:

- Public involvement contributed to tours to advance Congressional and state/federal agency support, website that was accessed by Congressional staff, public documents, and supporting discussions with local stakeholders.
- These efforts supported the ability to successfully obtain program authorization.
- 75% of costs allocated to Authorization.

Program Manager:

- All Program Manager costs are associated with the business aspects of the NBWRA.
- 0% of costs allocated to Authorization.

State Lobbyist:

- Provided access to and support by State legislators and their staff to support the Federal authorization
- Initiated and supported state legislators and staff tours to gain support for funding.
- Supported NBWRA efforts to track and to be successful in gaining state funding via the Integrated Regional Water Management Plan process.

- 0% of the total allocated costs are provided by Reclamation.

B.5 Preliminary Definition and Allocation of Costs

Based on the above assumptions, the following table illustrates the costs allocated to supporting acquisition of an authorization.

Activity	Total Phase 1 Costs Since 2005 MOU (through June 2011)	Percent Attributable for Phase 1 Initiation	Attributable Costs for Phase 1 Initiation	Local Share	Net Attributable Costs for Phase 1 Initiation
Program Development	$470,809	100%	$470,809	100%	$470,809
Federal Lobbyist	$387,851	100%	$387,851	100%	$387,851
Engineering	$977,700	70%	$688,300	50%	$344,150
Environmental	$1,390,285	50%	$695,143	50%	$347,571
Public Involvement	$362,107	75%	$271,580	50%	$135,790
Program Manager	$246,637	0%	$0	100%	$0
State Lobbyist	$126,065	100%	$126,065	100%	$126,065
Total	$3,961,454		$2,639,748		$1,812,236

To address the value of these costs, the costs were compared to the estimated Phase 1 construction cost of $104 million. The preliminary estimate of attributable costs toward the Federal authorization represented by project value is summarized below.

Cost Summary	Total Phase 1 Since 2005 MOU (Though June 2011)	Percent of Estimated Construction Costs ($104M)
Total Phase 1 Costs Since 2005 MOU	$3,961,454	3.8%
Attributable Costs for Phase 1 Initiation	$2,639,748	2.5%
Net Attributable Costs for Phase 1 Initiation	$1,812,236	1.7%

As suggested in the above tables, the costs associated with authorization and programmatic environmental analyses are about $1,812,236, which equates to about 1.7% of the estimated Phase 1 total construction costs of about $104 million.

One approach for an initiation fee would be to base the charge on 1.7% of the new agency's anticipated total construction costs. This percentage could be reconciled following the Phase 2 feasibility study where the costs are further defined.

These costs only represent the consulting services to the NBWRA in Phase 1 and do not include any agency costs specific to technical analyses or costs to support lobbying efforts locally or in Washington, D.C.

B.6 Sensitivity Analysis

Due to the somewhat subjective nature of estimating the contribution towards Federal authorization by each activity, it is important to investigate the sensitivity to varying percentages. In the summary below, Valuation #2 is the preliminary value estimated above. Two other estimates are provided to "bracket" the preliminary estimate.

	Initiation Fee as Percent of Estimated Construction Costs	Fee per $1M in Construction Costs
Valuation #1	1.5%	$14,600
Valuation #2	1.7%	$17,400
Valuation #3	2.3%	$23,500

Activity	Percent Attributable for Phase 1 Initiation Fee		
	Valuation #1	Valuation #2	Valuation #3
Program Development	100%	100%	100%
Federal Lobbyist	100%	100%	100%
Engineering	50%	70%	100%
Environmental	25%	50%	100%
Public Involvement	50%	75%	100%
Program Manager	0%	0%	0%
State Lobbyist	75%	100%	100%

Note: Shaded cells identify differences between Valuations #1, #2, and #3.

B.7 Allocation of Funds to Existing Agencies

The money potentially received from initiation fees will be distributed to the existing agencies based on the NBWRA Second Amended MOU. Exhibit B, Percentages for Ongoing NBWRA Costs, identifies the costs by agencies for Phase 1. It is assumed here that any money received would be distributed back to the agencies based on their percentage of Phase 1 costs as shown below.

Agency	Total of Percentages
Las Gallinas Valley Sanitary District	7.24%
Novato Sanitary District	8.61%
North Marin Water District	17.64%
Sonoma Valley County Sanitation District	27.47%
Sonoma County Water Agency	3.57%
Napa Sanitation District	31.89
Napa County	3.57%
Total	100.00%

Source: North Bay Water Reuse Authority Second Amended Memorandum of Understanding

Attachment A
CDM Smith NBWRP Phase 1 Planning & Engineering Contracts Since the 2005 MOU

Year	Details	Contract and Tasks
2004	**Tasks 16-17**	**North San Pablo Restoration and Reuse Project**
		Project Coordination and Review
		Appraisal Investigation Engineering - Phase 2B
		Technical Workshops
		Regional Supply and Demand
		Alignment Surveying and Mapping
		Hydraulic Studies
		Quarterly Status Reports
2005-2006	**Phase 2C Engineering Feasibility Study**	**North San Pablo Restoration and Reuse Project**
	Tasks 18-19	Project Coordination and Review
		Appraisal Investigation Engineering - Phase 2C
		Technical Workshops
		Project Criteria and Considerations
		Regional Supply and Demand
		Existing and Future Regional Conditions
		Alignment Surveying and Mapping
		Geotechnical Studies
		Hydraulic Studies
		Finalize Phase 2 Report
		Quarterly Status Reports
2007	**Phase 3 Engineering Feasibility Study, Part 1**	**North San Pablo Restoration and Reuse Project**
	Task 20	Project Management
		Hydraulic Studies
		CEQA/NEPA Project Support
		Update Final Draft Phase 2 Engineering Feasibility Study Report
		Public Outreach Support
2008-2009	**Phase 3 Engineering Feasibility Study, Part 2**	**North San Pablo Restoration and Reuse Project**
	Task 21	Engineering Support of Project Partners
		Engineering Input to CEQA/NEPA Project Activities
		Engineering Input to Public Outreach Activities
		Update Hydraulic Studies
		Perform Cost Effectiveness, Economic, and Financial Capability Analyses for the Feasibility Study
		Develop Final Project Feasibility Study Report
2009	**Phase 3 Engineering Feasibility Study, Part 3**	**North San Pablo Restoration and Reuse Project**
	Task 22	Engineering Support of Project Partners
		Engineering Input to CEQA/NEPA Project Activities
		Engineering Input to Public Outreach Activities
		Update Hydraulic Studies
		Update Draft Phase 3 Engineering and Economic/Financial Analysis Report

Attachment A
CDM Smith NBWRP Phase 1 Planning & Engineering Contracts Since the 2005 MOU

Year	Details	Contract and Tasks
2010	**Fiscal Year 2009-2010 Services**	**North San Pablo Restoration and Reuse Project**
		Engineering Support of Project Partners
		Engineering Input to CEQA/NEPA Project Activities
		Engineering Input to Public Outreach Activities
2010-2011	**Fiscal Year 2010-2011 Services**	**Fiscal Year 2010-2011 Services**
		Program Support and Coordination
		Federal Appropriations Support
		State Appropriations Support
		Manage Federal Appropriations Reporting
2011-2012	**Fiscal Year 2011-2012 Services**	**Fiscal Year 2011-2012 Services**
		Program Support and Coordination
		Federal and State Appropriations/Grant Support
		Federal Appropriations Reporting

BRYANT & ASSOCIATES
Strategies & Solutions for Water Resources

Appendix C

Project Definition Scoping Study
Phase 2 Conceptual Benefits

Prepared for the North Bay Water Reuse Program
by Ginger Bryant, Bryant & Associates

June 2012

Phase 2 - Conceptual Benefits

Introduction

The need for this definition of potential Program benefits emerged over the course of several conversations with both locally elected and Administration officials that support the North Bay Water Reuse Program (NBWRP/Program) and its goals. Its primary purpose is to identify the diverse secondary uses, or multiple benefits, that have emerged as the regional-scale approach to water reuse in the North Bay has developed. This discussion describes the broadest role recycled water plays in regional-scale resource management and briefly catalogs these diverse uses, often unseen in traditional engineering studies but fundamental to maintaining quality of life in the North Bay.

These multiple benefits are what can expand the Program beyond a collective of agencies that have successfully planned to upgrade their own agency's facilities into a group that works collectively to provide recycled water that extends the reach of benefits across the North Bay region. Potential new funding options are also brought into consideration as they can assist in implementing projects with multiple benefits. But all of this is not without challenges; so also discussed here are the institutional impediments associated with implementing a Program of this scale.

Finally, these multiple benefits or uses all need detailed analysis in Phase 2 Feasibility, Economic, Financial and Environmental Studies. The results of these studies will provide local, State and Federal decision makers a comprehensive understanding of the broader role recycled water plays in the region and the financial commitments associated with various alternatives developed under Phase 2 studies.

Changes in Approach

The NBWRA members and the region could derive significant additional benefits from modest, but fundamental, changes in approach to Phase 2. This entails a broadening of scope that transitions the Program in part from individual recycled water projects toward regional-scale reuse. This direction accomplishes the objectives of both local member agencies and our Federal partner, the US Bureau of Reclamation (Reclamation), by demonstrating how recycled water, developed and managed as supply, can benefit all needs and users in the North Bay.

Under Phase 2, the Program not only could include members' traditional infrastructure projects but also could achieve a broader objective of including recycled water as part of the North Bay region's water supply, with the goal being a high quality, regionally self-sufficient and reliable supply for urban, environmental and agricultural uses.

Examples of the multiple-benefits or broader secondary uses include water supply planning from the watershed and sub-regional perspective, which encompasses planning for:

- Riparian, wetland, and other environmental benefits;
- Designing facilities for recycled water storage and habitat, but also, where appropriate, capturing and storing storm water for additional supply to assist with groundwater recharge;
- Direct application of the resource and determining where in-lieu benefits can be realized;
- Traditional community landscape applications; and,
- Year-round agricultural water needs.

Fully describing and understanding these benefits and uses and how they relate to each other is what will transition Phase 1's efficient water recycling projects into Phase 2's contribution to regional water supply reliability.

Partnering Helps Meet Federal and State Agency Mandates

Throughout the west, Federal and State water resource managers are seeking ways to meet competing and complex demands on the resource to meet regulatory, economic, and environmental uses. Increasingly, the only new supply available is recycled water and, even then, demands on this resource far exceed what can be met by a single-facility or small-scale water recycling project.

This is where regional-scale water reuse planning can help address the many demands placed on an increasingly valuable resource. With forethought and planning, decisions are not made at the expense of other goals; instead, alternatives are developed where multiple resource and agency goals can be accomplished within the same project – within financial and supply constraints – providing more value for the same amount of water.

Federal and State Agencies Are also Potential Project Funding Partners

If Phase 2 alternatives include broader secondary uses, the options for financial assistance from Federal and State agencies also broadens. The following provides a few examples of potential partnering opportunities to be found when projects with mutual goals are implemented.

As part of its mission, the Department of Interior is responsible for managing natural resources and energy supplies in the western 17 states. Residing within the Department of Interior is the Bureau of Reclamation. As we know, Reclamation, through its Title XVI Reclamation and Reuse Program, is the primary Federal funding partner for the NBWRP.

However, Reclamation is a sister Bureau to another Department of Interior agency in the Program area - the US Fish and Wildlife Service. This agency manages the San Pablo Bay National Wildlife Refuge and associated Conservation Partnerships: the Migratory Bird Program, Coastal Restoration Program and Habitat Joint Ventures, all of which provide opportunities for funding habitat and wildlife restoration projects in the North Bay.

California's Bay-Delta Program is another place where Reclamation plays a leading role. Although the NBWRP is not formally a part of this effort, water quality and restoration projects do contribute to the health of the Bay and, in turn, the goals of this greater program. Other water reuse programs in the region have received funds from the Bay-Delta program and if any new Program alternatives can help meet the Bay-Delta Program goals we may qualify for funding from this program.

Reclamation also collaborates with the US Department of Agriculture to fund projects that improve habitat and save water and power through improved management, thus resulting in habitat and fisheries recovery while providing an efficient, reliable water and power supply for agricultural irrigation. Programs such as these provide grants and NBWRA members could partner with local agricultural groups on projects that contribute toward Program water use efficiency and habitat restoration goals.

Many of the NBWRP agencies have included solar energy in the operation of their treatment plants. This presents another option to fund alternative energy sources for treatment and transmission of recycled water by partnering with Reclamation and the US Department of Energy on their grant programs that support alternative energy projects with a water and power nexus.

There are also many State agency goals that can be integrated into Program planning alternatives and provide an opportunity for positioning project implementation to attract grant funding. These are found in the areas of surface and groundwater supply, water conservation and quality, habitat and fisheries restoration and alternative energy production.

In Phase 1, there was general discussion about how the regional, multi-benefit approach allowed local, State and Federal goals to be accomplished. In the next phase of the Program, this approach needs to be integrated into the study alternatives. In doing so, we can then demonstrate how new reuse projects can be designed to accomplish Federal, State and local goals and, in the process, find new partners to assist with implementation costs.

Optimizing Regional Benefits Brings Institutional Challenges

Phase 1 of the NBWRP provided the structure necessary for members to plan and construct $50 million dollars in public works projects in the last three years. When completed, the Program will have played a leading role in the development of over $100M in recycled water infrastructure for the region. This is a significant achievement and not to be dismissed. However, as members consider Phase 2, they must look at their participation under changed circumstances and many fundamental questions need to be given careful consideration.

The regional-scale approach has allowed agencies to pay reasonable costs for planning studies and Program Development that would be financially out of reach without the collaboration of other partners. It allows many projects to be included into the larger Program that, when implemented over time, increases both Program yield and community benefits while maximizing the value of the local and Federal dollar invested.

As we approach Phase 2, this premise still applies for new members, but existing members have invested significant financial resources to build infrastructure. The question of how much existing members can afford to pay for additional planning and subsequent projects looms large.

Compounding this situation is the reality that local agency planning dollars are a luxury. If the NBWRP is to continue to provide value to its members, we must use the same approach we are applying to managing the resource, i.e., how do we provide multiple benefits and maximize value to the members, their ratepayers and the County members that support the Program?

Water and Sanitation Districts could justify participating in Phase 1 as the projects directly benefited their rate payers. However, in considering Phase 2 regional benefits, those lines are not so clearly drawn. Can members jointly plan for long-term water supply reliability and all that it brings to the region, or will the institutional obstacles prove too much?

The decisions coming before the Technical Advisory Committee and Board of Directors are pivotal and won't likely be fully understood or measured until Feasibility and other studies are completed. How and whether to proceed with Phase 2 needs to be carefully weighed against the cost of lost opportunity.

All public utilities are giving careful consideration as to how they conduct business and can they provide more or just maintain services without dramatically increased revenues. Infrastructure investments and how water and power are provided to future generations require new alliances and we must give serious thought to what the utility business looks like In the future.

The decision to proceed with Phase 2 from a single project perspective will be much easier. But determining who pays for the regional Program benefits and how they pay may be the harder task. Members must consider both their single reuse projects as well as that project's potential contribution to regional water supply.

Valuing Recycled Water as Water Supply – Total Value Economics

In Phase 1, projects were compiled and analyzed in aggregate under Reclamation's Feasibility study process that included engineering, financial, environmental and cultural resource assessments.

To fully assess what recycled water could provide in Phase 2, additional economic study should be undertaken to understand the aggregate value of water in the region. This study process, Total Value Economics* also sometimes referred to as Whole System Economics, is being used for large watershed approaches around the world and would analyze all water uses in the North Bay, individually, in aggregate, and in support of each alternative developed for Phase 2 projects.

***Total economic value** (**TEV**) is a concept in cost benefit analysis that refers to the value derived by people from a natural resource, a man-made heritage resource or an infrastructure system, compared to not having it. It appears in environmental economics as an aggregation of the (main function based) values provided by a given ecosystem.*

We are familiar with traditional economic analysis of the value of agriculture – its jobs, tourism and contribution to local economy – and the value of wetlands, in particular, what they mean to the region in carbon sequestration, protection from sea level rise, habitat value, recreation and ecotourism. It is useful information but does not provide the full value from a water resource perspective.

Total Value Economics provides decision makers with critical perspective as it quantifies the value of water in all its applications and how NBWRP projects support the regional economy and the overall sustainability of the region. This new perspective provides additional information that is critical to understanding the full value of a given project or alternative – its infrastructure through end users, primary and secondary benefits and the region as whole.

With the outcomes of this study added to the traditional infrastructure information developed under the Feasibility study process, the role recycled water plays in supporting the many and diverse uses of water in the region can be quantified and the true value of recycled water and what is does for the North Bay understood.

The full benefits a given alternative provides to all recycled water users or beneficiaries can be measured against the investment and decision makers can determine where maximum value can be realized for investing Federal and local financial resources.

Summary

As stated in the Introduction, the purpose of this section is to provide an overview of the coming challenges and benefits for consideration in the next Phase. The discussion provides a brief assessment in adaptive management: how we plan for quality of life through infrastructure, partner with others to realize mutual goals, function as an organization and understand the value of significant financial investment.

As has been stated many times, this Program is a model for how a region can plan for self-sufficiency with recycled water. The realization of this model will be determined in Phase 2 as we study and understand how local, State and Federal agencies all contribute toward the level of Program implementation that is affordable and yields the greatest benefits to all participants and end users in the region.


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