
Final Workplan
Lake Tahoe Wastewater Infrastructure Partnership
Capital Improvement and Replacement Program



**US Army Corps
of Engineers** ®
Sacramento District

December 15, 2005

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Appendix A - Workplan Schedule and Milestones

Acronyms and Abbreviations

CCTV	Closed Circuit Television
CEQA	California Environmental Quality Act
CMOM	Capacity Assurance, Management, Operations, and Maintenance
Corps	U.S. Army Corps of Engineers
CRP	Capital Replacement Program
DCSID	Douglas County Sewer Improvement District, No. 1
EIP	Environmental Improvement Program
EPA	Environmental Protection Agency
GID	General Improvement District
GIS	Geographic Information System
HDR	HDR Engineering, Inc.
IVGID	Incline Village General Improvement District
Lahontan	Lahontan Regional Water Quality Control Board
LTWIP	Lake Tahoe Wastewater Infrastructure Partnership
Kingsbury GID	Kingsbury General Improvement District
NPDES	National Pollutant Discharge Elimination System
NTPUD	North Lake Tahoe Public Utility District
O&M	Operation & Maintenance
Round Hill GID	Round Hill General Improvement District
SSMP	Sanitary Sewer Management Plan
SSO	Sanitary Sewer Overflow
STPUD	South Lake Tahoe Public Utility District
TCPUD	Tahoe City Public Utility District
TRPA	Tahoe Regional Planning Agency

Final Workplan

Lake Tahoe Wastewater Infrastructure Partnership Capital Improvement and Replacement Program

1.0 Introduction: The U.S. Army Corps of Engineers (Corps), Tahoe Regional Planning Agency (TRPA), the eight local Tahoe Basin sewer districts, State and local agencies, and others are concerned with the potential impact that the wastewater facilities within the Lake Tahoe Basin have on Lake Tahoe. These stakeholders are in discussion to develop a Capital Replacement Program (CRP) for the Lake Tahoe Basin sewer infrastructure. This CRP could serve sewer infrastructure in the same manner that the Environmental Improvement Program (EIP) serves basin restoration. This workplan represents initial programmatic steps that can be implemented by a partnership of sewer districts in furtherance of this goal to a CRP.

This workplan is an appendix to the Letter Report titled "Establishment of a Programmatic Approach to Lake Tahoe Wastewater Infrastructure Capital Improvement and Replacement, Lake Tahoe Basin, Nevada & California". The letter report describes the method of development of this workplan.

1.1 Workplan/Scope of Work Development: The development of the workplan was based upon several meetings with the Lake Tahoe Wastewater Infrastructure Partnership (LTWIP), made up of the eight Tahoe Basin sewer districts, and a survey that was distributed to the LTWIP. The scope of this work effort included the following tasks:

- 4 meetings with the sewer districts, regulatory agencies, and the Corps
- Development and issuance of a survey to the sewer districts
- Summary and presentation of the survey
- Sewer district voting on issues to be included in a program management/capital replacement plan
- Develop workplan based on the above information

This workplan and the LTWIP presently is limited to addressing the needs of the sewer districts but could be expanded to address the needs of other infrastructure disciplines. Regulations for each discipline are different, therefore the workplan would need to be adapted if the LTWIP were expanded.

1.2 Stakeholders The study area addressed in this workplan is the Lake Tahoe Basin, which is located along the California-Nevada State line, east of Sacramento, California, and south of Reno, Nevada. The area includes portions of Alpine, El Dorado, and Placer counties in California and portions of rural Carson City, and Douglas and Washoe counties in Nevada. Currently, eight sewer districts operate within the Lake Tahoe Basin. These include:

- South Tahoe Public Utility District (STPUD),
- Tahoe City Public Utility District (TCPUD),
- North Tahoe Public Utility District (NTPUD),
- Incline Village General Improvement District (IVGID),
- Kingsbury General Improvement District (Kingsbury GID),
- Round Hill General Improvement District (Round Hill GID),
- Tahoe Douglas District, and
- Douglas County Sewer Improvement District No.1 (DCSID).

The eight districts serve approximately 55,000 customers with approximately 900 miles of sewer lines within the basin. IVGID, STPUD, and DCSID operate wastewater collection, treatment facilities, and effluent export lines within the Lake Tahoe Basin. Kingsbury GID, Round Hill GID, and Tahoe Douglas District wastewater is treated and exported by DCSID. NTPUD and TCPUD export raw sewage to the Tahoe-Truckee Sanitation Agency in Truckee, California, for treatment outside the basin.

Most of the urban development in the Lake Tahoe Basin occurred in the 1960's and 1970's, therefore, much of the sewer system is approaching 30 to 40 years old. The age of a sewer pipe is often an indication of its condition. The service life of sanitary sewer pipe of various materials is generally accepted as 50 years. The service life of sanitary sewer pump station components is generally accepted as 30 years. After these time periods, the need for major rehabilitation or replacement can be expected. As such, exfiltration and/or sewage overflows and releases pose a threat to Lake Tahoe. Sewer pipe may last longer than 50 years, but increased monitoring and inspection should take place to ensure that lines are functional.

Regulatory support exists to minimize the potential threat posed by the sewer system serving the Lake Tahoe Basin. TRPA ordinances require that Lake Tahoe's sewer districts "shall have in place and vigorously implement plans for detecting and correcting sewage exfiltration problems in their collection and transport facilities" (TRPA Code of Ordinances, 1987).

The Lahontan Regional Water Quality Control Board (Lahontan) is responsible for enforcing both Federal and State regulations set forth under the Clean Water Act, California Code of Regulations and several other laws intended to control solid, toxic, and hazardous wastes. These acts and laws grant Lahontan authority to set and revise water quality standards and discharge prohibitions, implement the Water Quality Control Plan for the Lahontan Region, and issue permits including Federal National Pollutant Discharge Elimination System (NPDES) permits, Section 401 Water Quality Certifications, and State waste discharge requirements or waivers of waste discharge requirements. Planning and permitting actions taken by Lahontan are required to comply with California Environmental Quality Act (CEQA).

The Lahontan Basin Plan also addresses the need for Lahontan to “fully utilize its regulatory authority” to ensure the quality of Lake Tahoe’s sewer systems. The Basin Plan sets water quality standards for the surface and ground waters of the Lahontan Region, which include narrative and numerical objectives that must be maintained or attained. Additionally, the U.S. Environmental Protection Agency (EPA) is developing new sanitary sewer overflow (SSO) regulations. These new regulations would require sewage collection utilities to develop capacity assurance, management, operations, and maintenance (CMOM) programs. At the present time, the EPA has suspended work on CMOM, but the State of California is developing Sanitary Sewer Management Plan (SSMP) Regulatory Requirements that is similar to CMOM, but can direct sewer districts in the implementation of the reduction of SSOs.

1.3 Tahoe Basin Collection System Program Survey: To determine the status of the wastewater collection system programs in the Tahoe Basin, a questionnaire was developed to determine the basic status of each utility’s current wastewater collection system processes and systems. A summary of the Tahoe Basin wastewater collection system districts’ survey results is included in Attachment A.

1.4 Capital Program Elements: The key capital program elements, identified by industry experts, include the following processes, practices and systems:

- Technical Standards and Research,
- Program Planning and Administration,
- Program Tools and Systems,
- Geographic Information System (GIS)
- Permitting and Regulatory Compliance,
- Property Rights Acquisition,
- Communication,
- Peer Review

- Financial Planning, and
- Operations and Maintenance Program Elements.

Additional discussions with the districts identified an additional element:

- Shorezone Infrastructure.

Each of these key collection system capital program elements is described in more detail under Section 1.6 - Workplan Tasks.

1.5 Program Priorities – LTWIP Input: After presenting the key wastewater collection program elements and the current status of the wastewater collection system programs located in the Tahoe Basin, the Corps wanted to gain input from the stakeholders (e.g., the LTWIP) about project priorities and phasing. This input process included a workshop where each agency was allowed to vote on the collection system program elements that were of highest priority to each agency.

The discussion with the LTWIP revealed a critical understanding that all of the elements are important to the LTWIP. Table 1 presents the results of the prioritization exercise based on the current status of the wastewater collection system programs in the Tahoe Basin.

Table 1 LTWIP Priorities for Workplan Program Elements		
Program Element Description	Number of Votes Received from LTWIP	Relative Priority
Technical Standards and Research	13	1
O&M Programs	12	2
Program Tools and Systems	10	3
Permitting and Regulatory Compliance	9	4
Program Planning and Administration	6	5
Communication	4	6
Property Rights Acquisition	3	7
Financial Planning	2	8

Subtasks exist within each of the program elements listed in Table 1 above. These subtasks are described in more detail under Section 1.6 – Workplan Tasks. The collection system program experts, contracted by the Corps to assist with development of this workplan, discussed the need for a phased approach to setting up collection system programs with an early focus on technical standards and research and program

planning (to identify and prioritize projects and to estimate the cost of the program), and a secondary focus on program funding and financial planning (to identify how much of the program can be implemented). The experts pointed out that there is not a need to schedule and control projects until after the projects have been identified, prioritized and funded. The approaches are based on previous work with sanitary sewer collection systems within California and other locations throughout the country.

1.6 Workplan Tasks: The workplan tasks have been grouped into three phases based on the priorities of the LTWIP. The first phase includes activities that can begin immediately and be completed within 18 months. Phase II tasks can occur between 18 months to 3 years from implementation of the workplan. Phase III tasks can occur after 3 years from the start of the workplan. These phase timeframes are approximate; durations can be compressed or extended depending on funding, staffing, etc.

Following each of the key elements below, the phasing for each task is listed in the Deliverables and Milestones.

1.6.1 **Technical Standards and Research:** Rather than have several districts develop sewer system standards independently for each project, it would be most efficient and more effective to develop basin-wide standards. If these standards are developed, the LTWIP members could pool their collective experience and could share the cost of developing standards. These standards could then be used by all districts, with modifications when necessary.

For wastewater collection system capital programs, the technical standards that are typically developed include:

CCTV Inspection and Defect Coding Standards

Defects are typically identified by internal inspection using Closed Circuit Television (CCTV). There are several defect coding standards used for identifying internal sewer pipeline defects. There are significant advantages to having standardized defect codes including:

- Allows the utilities to efficiently merge data from several CCTV contractors to support standardized condition assessment and project identification efforts. Otherwise, a condition assessment and project identification process must be developed for every coding system.
- Since all data and scores are collected in the same format, projects can be efficiently prioritized based on consistent, objective scoring criteria. Otherwise, it is very difficult to objectively prioritize projects based on differing defect coding systems and coding standards.

Deliverables and Milestones - Technical memorandum stating the codes to be utilized by CCTV contractors. Phase I Implementation.

Condition Assessment for Sewer Collection System

Using the defect coding established for use by the sewer districts, perform sewer pipeline inspections using CCTV. This data will be used to prioritize repair and rehabilitation based on the prioritization process developed in Task 1.6.2.

Deliverables and Milestones – Data from CCTV including codes, video, and still photos to be delivered to respective sewer district. Phase I Implementation.

Design and Construction Guidelines

To ensure that quality materials and appropriate design standards are utilized in the construction, rehabilitation or replacement of sewers, most successful collection capital programs establish some standardized design and construction guidelines that are appropriate for the level of service, soil conditions, climate, and construction period. These standards should be modified to address issues that are unique to the region where the program will be executed.

Deliverables and Milestones - Develop pamphlet of design and construction guidelines focused on gravity sewers and manholes. Design guidelines focus on acceptable locations for sewers, capacity requirements, minimum slope, location of access points and cleanouts, redundant forcemains, bypass pumping, emergency generators, etc. Construction guidelines focus on inspection during construction and prior to acceptance. Phase I Implementation.

Standard Drawings and Details

In addition to standardized design and construction guidelines, it is also advantageous to have a set of standard drawings and details tailored for the specific conditions in the region where the program will be executed. When developing standardized drawings and details, the LTWIP should focus on repetitive projects that will be implemented during the collection system program including sewer rehabilitation, manhole rehabilitation, and surface restoration projects.

Deliverables and Milestones - Develop standardized drawings to accompany design guidelines. Drawings would include standard manhole, manhole frame and manhole cover, cleanout standards, sewer and force main standards, air/vacuum relief valve standards, grease interceptors, backwater valves, lateral connections, etc. Phase I Implementation.

1.6.2 Program Planning and Administration: One challenge often encountered during the planning of wastewater collection system capital programs is managing the large number of sewer line segments that are included in the program. To address this issue, it is advantageous to develop a few key capital program planning and administration processes. The key processes that should be considered include:

Project Identification Process

To create an objective (rather than subjective) way to identify collection system rehabilitation and replacement projects, projects can be identified by the use of standardized Condition Assessment Decision Flow Diagrams for different asset classes (such as manholes, pipe material, etc.). These decision flow diagrams examine the type, severity and number of defects in each line segment to objectively identify when sewer lines should be scheduled for a point repair, rehabilitation or replacement.

Deliverables and Milestones – Develop a Decision Flow Diagram based on input from the Districts. This flow diagram will examine type, severity, and number of defects in each sewer line. Draft and final versions of the Sewer Repair, Rehabilitation and Replacement Project Identification Process Technical Memorandum will be issued. Phase 1 Implementation.

Project Identification Implementation by Districts

Once the Project Identification Process has been developed, each sewer district will be responsible for identifying project and populating the project database.

Deliverables and Milestones – Sewer districts will keep track of expenditures required for the implementation of this task. Expenditures will be submitted to the Corps. Phase 1 Implementation.

Project Prioritization Process

In most aging wastewater collection systems, there is a greater need for projects than for what can be completed in a short duration. This creates the need to prioritize projects based on objective prioritization criteria. Each prioritization criteria will have a score that is aligned with each agency's priorities. Most prioritization systems will also have a weighting factor associated with each criterion to further align the prioritization system with the goals of each utility. A factor might also be added to infrastructure located within sensitive areas such as stream crossings or near the shores of Lake Tahoe.

Deliverables and Milestones –Develop relevant prioritization criteria for manhole and sewer rehabilitation projects. Criteria will include a scoring system and appropriate weighting factor. Draft and final versions of the Sewer Repair, Rehabilitation and Replacement Project Prioritization Process Technical Memorandum will be issued. Phase 1 Implementation.

Project Prioritization Implementation by Districts

Once the prioritization process has been developed, each sewer district will be responsible for the prioritization of projects and for populated the project database.

Deliverables and Milestones – Sewer districts will keep track of expenditures required for the implementation of this task. Expenditures will be submitted to the Corps. Phase 1 Implementation.

Project Justification and Cost Estimate

Each project should be justified at some level to show that the cost of the project is less than or equal to the benefits derived from the project. This can be a very formal process such as a Business Case Evaluation for each project, or it can be less formal with a narrative description of the justification for each project.

Deliverables and Milestones - Based on the developed risk analysis, prepare justification for project(s) and develop preliminary cost estimates. Phase II Implementation.

Program Monitoring and Control Process

To ensure timely completion of projects, most successful programs include a structured process to forecast and secure adequate staffing and financial resources. These programs also have a structured process to monitor progress towards not only high level activities (such as planning, design and construction) but also specific intermittent project milestones (such as right-of-way acquisition and earthwork requirements). A program typically has a program master schedule to support the successful implementation of these processes.

Deliverables and Milestones - Monthly schedule exception reports. Monthly cash flow projection updates based on schedule changes. Phase III Implementation.

1.6.3 Program Tools and Systems: Most successful capital programs include structured systems to manage data and to support the analyses necessary for planning and implementation of the programs. The basic systems that are implemented in most successful capital programs include:

Project Databases

Due to the large number of assets that are inspected and assessed during wastewater collection system capital programs, it is important to have a comprehensive database of all assets that may require repair, rehabilitation or replacement. Since it would be inefficient to generate a project for every asset that required attention, this list is typically used to group individual assets that could be efficiently bid as a capital project. This project database gives each utility the ability to overview the total quantity of outstanding projects that must be addressed during a multi-year capital program. A comprehensive project database also allows districts to prioritize and re-prioritize projects as additional inspection data is collected and as budgets are defined and re-defined. Phase I Implementation.

Deliverables and Milestones - Develop a database to summarize all collection system projects in the Tahoe Basin. This database could be used to collectively submit and justify funding requests for collection system upgrades. Phase I Implementation.

Asset Databases for non-gravity Sewer Systems

This task will collect data for all non-gravity sewers such as: forcemains, pump stations, buildings, etc.

Deliverables and Milestones – Develop a database to summarize all non-gravity system projects in the Tahoe Basin. Phase II Implementation.

Program Master Schedule

To assist in the management of a program's schedule, resource requirements and cash flow, most successful programs with multiple projects include some form of a program master scheduling system. Program master schedules begin with a model schedule for typical project types. Model schedules typically include interim milestones for different project activities.

Deliverables and Milestones - Prepare and/or update selected database with current project(s) descriptions, cost estimate, and justification. Master schedule should include interim milestones for each project. Phase II Implementation.

1.6.4 **Geographic Information System:** The most efficient way to track attributes and to track other data associated with these assets, is a (GIS). These systems collect not only the attributes associated with each collection system asset, GIS systems also include spatial information that allows for very powerful analyses of collection system data.

GIS Implementation Plan

This plan will lay out the necessary hardware, software, training, data model, network design, data collection plan, QA/QC plan, tools to collect data, and additional data to prepare a GIS plan.

Deliverables and Milestones - Prepare memorandum based on GIS needs of the utility districts. Items to be included in memorandum are the recommended software, hardware, training, and other information necessary for a comprehensive GIS Implementation plan (does not include the purchase of hardware/software). Phase I Implementation.

Hardware, Software, and Training

Based on the GIS Implementation Plan, purchase the appropriate hardware and software for each district. Prepare standardized training for all sewer districts in the Lake Tahoe Basin.

Deliverables and Milestones - Provide licensed copies of necessary software to the appropriate districts. Purchase the recommended computers and server as recommended in the GIS Implementation Plan. Prepare memorandum for the training of staff for the use of GIS as related to needs of the districts. Provide GIS training for the LTWIP. Phase II Implementation.

Data Collection

Based on the GIS Implementation Plan, data must be collected to populate the GIS. Collected data may include: segments of sewer pipe, manholes, pump stations, etc. This data should be referenced using a consistent coordinate system (northing, and elevation).

Deliverables and Milestones - Collect the necessary data to populate GIS. This collection will include field work, collecting as-built plans, and verifying all information is on the same coordinate system. Phase II Implementation.

Management of GIS System During Data Collection Phase

This task includes data input and the continuous management and control of the GIS system during the collection of data.

Deliverables and Milestones – Continuous data input into the GIS system from the data collection effort. Prepare memorandum regarding the management and control of the GIS system. Phase II Implementation.

1.6.5 Permitting and Regulatory Compliance: One of the key logistical issues that must be addressed, particularly in environmentally sensitive areas such as the Tahoe Basin, is the application for, review and approval of permits for collection system projects. The level of effort and duration required to obtain these permits is often longer than initially anticipated by districts, resulting in project delays and disruptions to staffing resource and cash flow projections.

Program-Level Regulatory Permitting Process for Repetitive Project

In a program level permitting process, districts work with the permitting authorities and resource agencies to identify appropriate activities for implement action before construction, during construction and after construction to mitigate the impacts of projects. If there are several types of habitat in the program area, this may require multiple sets of activities to address each area. Once all parties have agreed to the activities required before, during and after construction, the permitting process can progress quickly once the location and type of habitat existing in each project location has been identified. Phase I Implementation.

Deliverables and Milestones - Prepare memorandum that identifies the types of common construction practices and required permitting related to the Lake Tahoe sewer districts. Meet with the sewer districts and regulatory agencies to determine activities (or

permits) required before, during, and after construction to ensure expedited permitting. Memorandum will include the required construction activities per the regulatory agencies and sewer districts' direction. Phase I Implementation.

Development of Standard Permit Submittal Forms

When multiple utilities are submitting permit applications to the same permitting authorities, the process can be slowed as the permitting authorities try to review and develop a response to the differing permit application formats. By standardizing permit submittal forms, the utilities should be able to further streamline and expedite the permit review process with the permitting authorities.

Deliverables and Milestones - Prepare memorandum standardizing permit forms. Meetings with the sewer districts and the regulatory agencies will be required for this task. Phase II Implementation.

Shared Staff Among Districts to Assist with Regulatory Compliance

Sewer districts to share the cost of staff positioned within the regulatory agencies to assist the districts with permitting.

Deliverables and Milestones - Prepare memorandum that identifies the regulatory agencies that would best suit the sewer districts. Develop probable costs to fund positions within the regulatory agencies. Phase II Implementation.

1.6.6 Property Rights Acquisition: Another key logistical issue that can cause delays in a program once projects have been identified is the acquisition of the property rights required to construct and maintain the facilities included in the project. Typical property rights that must be obtained include right-of-way, permanent easements, right of entry to gain access to permanent easements for ongoing maintenance, and temporary construction easements. Districts should have a structured property rights acquisition process and should allow adequate duration for the completion of property rights acquisition.

One of the key property rights acquisition issues associated with the Tahoe Basin is the fact that much of the land in the basin is owned and/or managed by public agencies. To address this issue, it may be advantageous for the utilities in the basin to establish standard conditions for the acquisition of property rights with each public land management authority. It is also beneficial to develop standards with public agencies for existing easements and the relinquishments of such easements to private ownership.

Deliverables and Milestones - Design and conduct two workshops—one for standardized land use conditions and the other for relinquishment of property to private ownership. Prepare memorandum that documents standardized land use conditions and relinquishment of property to private ownership that are created during the workshop for review by legal counsel. Phase II Implementation.

1.6.7 **Communication:** Beyond technical issues such as design guidelines and standard detail drawings, and beyond logistical issues such as property rights acquisition and permitting, a successful program will also have both internal and external communication plans. Internal communications or semi-annual LTWIP conferences may facilitate shared experiences, technical information, and construction costs. The external public education plans are important to educate and gain support from the community at large, and internal communications are necessary to keep staff members informed about the goals and schedules for the programs.

Public Education Programs

Developing structured programs to educate community stakeholders about the status of each utility's infrastructure and the plans to implement upgrade programs in the future is essential to the success of most programs, particularly if public support is required for increased rates to fund portions of the programs. The best method to accomplish this goal is unique to each program and the community in which the program is located, so communication programs should be tailored to address specific local issues.

Deliverables and Milestones - Prepare memorandum tailored to educate the public on sewer infrastructure and the design, construction, and permitting. Also include the need for easements for the sewer districts. Attend and participate in a community meeting regarding sewer issues (if necessary). Phase I Implementation.

Public Outreach Program

Another important element to a successful communication program is to have a structured outreach program to solicit stakeholder input. This gives stakeholders a constructive way to engage in the program and to solve issues before they result in conflict. It is important to gain this input before conflict results as conflicts with stakeholders will typically cause delays in the program.

Deliverables and Milestones - Prepare memorandum tailored to educate the stakeholder on sewer infrastructure and the design, construction, and permitting. Also include the need for easements for the sewer districts. Attend and participate in a community meeting regarding sewer issues (if necessary). Phase I Implementation.

Semi-annual LTWIP Meetings

These meetings will keep the sewer districts informed regarding other district activities within the Lake Tahoe Basin. Discussions on permitting, design, construction, and other issues are possible meeting topics. The purpose of these meetings is for communications between the individual districts to learn from each others successes as well as problems that have hindered progress.

Deliverables and Milestones - This task will be developed by the sewer districts. Phase II Implementation.

1.6.8 **Peer Review:** A rationale for peer review is that it is rare for an individual or team to spot every mistake or flaw in a complicated design or permit application. An opportunity for improvement may stand out only to someone with special expertise or experience. Showing work to others increases the probability that weaknesses will be identified, and with advice and encouragement, fixed.

Peer Review - Lake Tahoe Science Consortium

Sewer districts to collaborate with the Lake Tahoe Science Consortium regarding design issues, permitting issues, etc.

Deliverables and Milestones - This task will be coordinated between the sewer districts and the Lake Tahoe Science Consortium. Phase II Implementation.

1.6.9 **Financial Planning:**

Comparison of Tahoe Basin Sewer Rates

An understanding of service rates of wastewater utilities in the Tahoe Basin as they relate to the cost of exporting waste outside the basin is important. Identifying potential financial and rate setting implications is also critical. Comparing district rates with one another and with other districts in the U.S. will help provide an indication of whether or not the Tahoe Basin rates are in line with districts with similar challenges.

Deliverables and Milestones - Prepare financial analysis report. Phase I Implementation.

Review of Potential Funding Sources

Wastewater collection system repair, rehabilitation and replacement programs are particularly challenging because many districts across the country do not have a mechanism to fund large-scale system rehabilitation and replacement. The initial facilities are often donated by developers, or the initial facilities are sometimes funded via impact fees or capacity charges collected from developers or home builders. For rehabilitation and replacement programs, the districts should conduct a review of potential sources of funding. This includes looking at the full range of funding sources such as rate increases, grant funding, bond sales, and loans (including the State Revolving Fund).

Deliverables and Milestones - Prepare a memorandum identifying the needs of each utility to modify its current rates. Included in the memorandum will be other potential sources of funding for sewer rehabilitation projects. Phase I Implementation.

Periodic Rate Assessments

Benchmarking of Tahoe Basin sewer utility residential class rates provides some information on comparability, but definitive conclusions about the comparability should not be drawn. Far too many factors affect a final rate to know for certain whether they are truly comparable. The development of any service rate or identification of needed rate change should be supported by a comprehensive examination of the cost to provide that service. Periodic rate assessments (every 3 to 5 years) help indicate whether a particular rate is in line with cost incurrence and whether adjustments are required to correct that alignment.

Deliverables and Milestones - Conduct periodic rate assessments for each district. Phase II Implementation.

Cost of Service Analysis

Inter-class subsidies such as determining whether commercial class customers subsidize residential class customers and vice versa or whether new customers are being subsidized by existing customers and vice versa is not possible without knowing how much it costs to provide service to each class or type of customer and whether rates are designed to recover those costs. Incremental costs should be reflected in the charges to new customers, either through hookup fees, different rates, or both. A comprehensive analysis of the cost to provide service to new customers (i.e., a cost of service analysis) will ensure that any subsidies in this regard are established by intent rather than by chance.

Deliverables and Milestones - Conduct a Cost of Service Analysis for each district. Phase III Implementation.

1.6.10 **Operations and Maintenance Programs:** Operation and Maintenance (O&M) programs are key elements required in successful collection systems.

Coordination of Sewer Overflow Response to Minimize Severity of SSOs

It is very difficult to eliminate all sewer overflows from a wastewater collection system. In the event that there is a sewer overflow, districts need to have a structured Sewer Overflow Response Plan.

Deliverables and Milestones - Prepare a memorandum to include the identification of standardized response procedures for sewer spills. Recommendations such as pooling resources for sewer districts to minimize staff and equipment needed to respond to sewer overflows should be included in memorandum. Phase I Implementation.

Standard Operating Procedures and Staff Training

Once programs have been planned, districts must develop standard operating procedures for use as a training tool for staff members.

Deliverables and Milestones - Prepare a training guide for response procedures for sewer spills. Provide training (2 seminars) to the districts. Phase II Implementation.

1.6.11 Shorezone Infrastructure: Several of the sewer districts located in the Lake Tahoe Basin have many miles of gravity sewer lines, forcemains, and pump stations located within the shores of Lake Tahoe. Many of these lines lay beneath the water surface making it very difficult for inspection and rehabilitation. Relocating the sewer infrastructure from the shorezone to other locations outside the shorezone could be a benefit to both maintenance issues and environmental concerns.

Analysis of Shorezone Engineering Alternatives

Perform analysis of engineering methods, materials, geotechnical and geomorphic site conditions, cost, and public acceptance to develop and rank alternative solutions to move wastewater lines out of the shorezone and near shorezone and relocate to other locations.

Deliverables and Milestones - Technical memorandum, draft and final versions, which will address appropriate shorezone engineering alternatives. Phase I Implementation.

1.7 Workplan Phasing and Initiatives: Based on the stakeholder priorities and also based on input from the collection system program experts, a three-phase workplan was developed. Since it would be difficult and disruptive to implement all components associated with every program element simultaneously, the components of each element that are recommended for each phase of the program have been identified in the table below.

1.8 Workplan Schedule and Milestones: See Appendix A for the planning and implementation schedule and milestones for the Lake Tahoe Wastewater Infrastructure Capitol Improvement and Replacement Program.

**Table 2
Workplan Phasing and Initiatives**

Program Element	Phase I Components (Planning)	Phase II Components (Funding & Pre-Design)	Phase III Components (Design & Construction)
<p align="center">Technical Standards and Research</p>	<ul style="list-style-type: none"> • CCTV inspection and defect coding standards • Condition Assessment for Sewer Collection System • Design and construction guidelines • Standard drawings and details 		
<p align="center">Program Planning and Administration</p>	<ul style="list-style-type: none"> • Project Identification and Prioritization Process • Project Identification and Prioritization Implementation by Districts 	<ul style="list-style-type: none"> • Project justification and cost estimates 	<ul style="list-style-type: none"> • Program monitoring and control processes
<p align="center">Program Tools and Systems</p>	<ul style="list-style-type: none"> • Asset Database for non-gravity Sewer Systems • Project database 	<ul style="list-style-type: none"> • Program master schedule implementation 	
<p align="center">Geographic Information System</p>	<ul style="list-style-type: none"> • Implementation plan 	<ul style="list-style-type: none"> • Hardware, Software, Training • Data Collection • GIS System Management 	

Table 2
Workplan Phasing and Initiatives

Program Element	Phase I Components (Planning)	Phase II Components (Funding & Pre-Design)	Phase III Components (Design & Construction)
Permitting and Regulatory Compliance	<ul style="list-style-type: none"> • Program-level regulatory permitting process for repetitive projects 	<ul style="list-style-type: none"> • Develop standard permit submittal forms • Shared staff among districts to assist with regulatory compliance 	
Property Rights Acquisition		<ul style="list-style-type: none"> • Land Use and Property Relinquishment 	
Communication	<ul style="list-style-type: none"> • Public education programs • Public outreach program 	<ul style="list-style-type: none"> • Semi-annual meetings among districts 	
Peer Review		<ul style="list-style-type: none"> • Peer Review – Lake Tahoe Science Consortium 	
Financial Planning	<ul style="list-style-type: none"> • Identification of funding sources for projects • Comparison of Tahoe Basin Sewer Rates 	<ul style="list-style-type: none"> • Determine need for rate change 	<ul style="list-style-type: none"> • Prepare cost of service analysis for each utility and modify rate structure to support program cost (if necessary)
O&M Programs	<ul style="list-style-type: none"> • Coordination of sewer overflow response programs 	<ul style="list-style-type: none"> • Standard Operating Procedures and Staff Training 	
Shorezone Infrastructure	<ul style="list-style-type: none"> • Analysis of Shorezone Engineering Alternatives 		

1.9 Qualifications of Preparers: This work was performed by Eric Wessels and Blake Johnson of HDR Engineering, Inc. (HDR) in coordination with the Corps. Listed below are the qualifications of Mr. Wessels and Mr. Johnson.

Eric A. Wessels, P.E.

Mr. Wessels is a Vice President and the National Technical Director for Asset Management and Operations Services for HDR Engineering, Inc. He is a registered civil engineer with experience in utility management, master planning, capital improvement program management, and the development and implementation of asset management strategies and systems for public agencies and private corporations.

Mr. Wessels' representative experience includes:

- The planning and/or implementation of wastewater collection system management plans for several utilities including the City of San Diego Metropolitan Wastewater Department, the City and County of Honolulu, the City of Los Angeles and the Clark County Water Reclamation District.
- Program Management Services Director for a \$1 Billion wastewater system capital improvement program.
- Second in command of a wastewater collection system operations and maintenance department at a major California public utility.
- Prepared a nationwide asset management and maintenance study for approximately 10,000 facilities for Exxon Company, USA. This study included pipelines and pumping systems.

Blake Johnson, P.E.

Mr. Johnson is a Project Manager for HDR Engineering, Inc. He is a registered civil engineer with experience in sanitary sewer systems, development of capital improvement projects, and has worked in the Lake Tahoe Basin for several years on a variety of projects.

Mr. Johnson's experience includes:

- Assisted the Corps with the Lake Tahoe Basin Framework Study, Wastewater Collection System Overflow/Release Reduction Evaluation.
- Assisted the Corps with the Technical Project Management Plan for the Lake Tahoe Urban Stormwater Management Study.

- Prepared and evaluated Capital Improvements Projects for Yolo County Department of Public Works.
- Utility improvements for the City of South Lake Tahoe.

APPENDIX A

Final Workplan
Lake Tahoe Wastewater Infrastructure Partnership
Capital Improvement and Replacement Program
Workplan Schedule and Milestones

**Appendix A
Final Workplan
Lake Tahoe Wastewater Infrastructure Partnership
Capital Improvement and Replacement Program**

Workplan Schedule and Milestones				
Tasks, Deliverables and Milestones	Phase Implementation (I, II, or III)	Time Frame	Estimated Hours of Effort	Estimated Cost*
Technical Standards and Research				
CCTV Inspection and Defect Coding Standards	I	Start: Month 1 Finish: Month 3	120	\$15,000
Condition Assessment for Sewer Collection System	I	Start: Month 4 Finish: Month 18	8,000	\$1,000,000
Design and Construction Guidelines	I	Start: Month 1 Finish: Month 3	240	\$30,000
Standard Drawings and Details	I	Start: Month 1 Finish: Month 3	280	\$35,000
Program Planning and Administration				
Project Identification Process	I	Start: Month 4 Finish: Month 8	240	\$30,000 (process development)
Project Prioritization Process	I	Start: Month 4 Finish: Month 8	160	\$20,000 (process development)
Project Identification Implementation by Districts	I	Start: Month 8 Finish: Month 12	640	\$80,000 (for all districts)
Project Prioritization Implementation by Districts	I	Start: Month 12 Finish: Month 16	640	\$80,000 (for all districts)
Project Justification and Cost Estimate	II	Start: Month 18 Finish: Month 22	160	\$20,000

Workplan Schedule and Milestones				
Tasks, Deliverables and Milestones	Phase Implementation (I, II, or III)	Time Frame	Estimated Hours of Effort	Estimated Cost*
Program Monitoring and Control Process	III	Start: Month 36 Finish: Month 48	160	\$20,000 (process development)
Program Tools and Systems				
Asset Databases for non-gravity Sewer Systems	I	Start: Month 4 Finish: Month 8	320	\$40,000 (process development,) see GIS for additional costs
Project Databases	I	Start: Month 4 Finish: Month 8	280	\$35,000 (process development)
Program Master Schedule	II	Start: Month 18 Finish: Month 22	200	\$25,000 (process development)
Geographic Information System				
GIS Implementation Plan	I	Start: Month 2 Finish: Month 8	1,200	\$150,000 or 15% of GIS costs
Hardware, Software, Training	II	Start: Month 18 Finish: Month 36	100	\$2,000/ computer, \$10,000 for Server, \$12,500/ district/ training, \$2,000/ license for software
Data Collection	II	Start: Month 18 Finish: Month 36	6,120	\$765,000

Workplan Schedule and Milestones				
Tasks, Deliverables and Milestones	Phase Implementation (I, II, or III)	Time Frame	Estimated Hours of Effort	Estimated Cost*
GIS System Management During Data Collection Phase	II	Start: Month 18 Finish: Month 36	1,200	\$150,000 or 15% of GIS costs
Permitting and Regulatory Compliance				
Program-Level Regulatory Permitting Process for Repetitive Projects	I	Start: Month 8 Finish: Month 12	160	\$20,000
Development of Standard Permit Submittal Forms	II	Start: Month 24 Finish: Month 30	160	\$20,000
Shared Staff Among Districts to Assist with Regulatory Compliance	II	Start: Month 18 Finish: Month 36	120	\$15,000
Property Rights Acquisition				
Land Use and Property Relinquishment	II	Start: Month 30 Finish: Month 36	400	\$50,000
Communication				
Public Education Programs	I	Start: Month 15 Finish: Month 18	120	\$15,000
Public Outreach Program	I	Start: Month 12 Finish: Month 18	240	\$30,000
Semi-Annual Meetings among Districts	II	Start: Month 18 Finish: Month 30	40	\$5,000
Peer Review				
Peer Review - Lake Tahoe Science Consortium	II	Start: Month 18 Finish: Month 36	160	\$20,000

Workplan Schedule and Milestones				
Tasks, Deliverables and Milestones	Phase Implementation (I, II, or III)	Time Frame	Estimated Hours of Effort	Estimated Cost*
Financial Planning				
Comparison of Tahoe Basin Sewer Rates against other utility rates in the Western Region and the U.S.	I	Start: Sept. 2005 Finish: Dec. 2005	320	\$40,000
Review Potential Funding Source	I	Start: Month 2 Finish: Month 4	80	\$10,000
Determine Need for Rate Change for each utility	II	Start: Month 33 Finish: Month 36	400	\$50,000
Prepare Cost of Service Analysis for each utility	III	Start: Month 36 Finish: Month 44	1280	\$160,000
Operation and Maintenance Programs				
Coordination of Sewer Overflow Response to Minimize Severity of SSOs	I	Start: Month 12 Finish: Month 18	240	\$30,000 (process development)
Standard Operating Procedures and Staff Training	II	Start: Month 19 Finish: Month 24	500	\$95,000
Shorezone Infrastructure				
Analysis of Shorezone Engineering Alternatives	I	Start: Month 3 Finish: Month 12	2,200	\$275,000

*Estimated costs are direct costs and exclusive of coordination, project management, and contingencies. Coordination includes meetings, preparation for meetings, etc.