Asset Management Plan

Prepared for:

Sheep Creek Water Company
4200 Sunnyslope Rd
Phelan, CA 92371

Date

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Prepared by:
Infrastructure Engineering Corporation
1401 Commercial Way, Suite 100
Bakersfield, CA 93309

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1.0 Introduction

a. Background

The Sheep Creek Water Company (SCWC) is a private shareholder owned water company which was formed in 1913. The SCWC system is recognized as Water System No. CA3610109 by the State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW). There are a total of 8,000 shares in the company, the shares are held by approximately 1,400 shareholders.

The SCWC supplies water to unincorporated areas of San Bernardino County in Phelan, CA. The service area is approximately 7,000 acres and serves approximately 1,200 connections. In March 2020, the SCWC received a Compliance Order (Order No. 05-13-18R-002A1) Source Capacity Violation, an amendment to the initial Compliance Order received in 2018 from the State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). Under this order, the state established directives to be met by the SCWC. One of the Directives, Directive 2b, consists of the preparation of an Asset Management Plan (AMP) as part of the requirements that need to be met for the SCWC to comply.

b. Purpose

Asset Management Planning is beneficial to water companies as their implementation can help meet service expectations and regulatory requirements, prolong the life of assets, improve response to emergencies, improve security and safety, and reduce the overall costs for operations and capital expenditures. Infrastructure Engineering Corporation (IEC) has prepared this Asset Management Plan (AMP) for the SCWC Water System. The purpose of the AMP is to provide an initial framework for the SCWC to establish a Capital Improvements Program (CIP) that prioritizes projects for the water system. Some of the goals of the Asset Management Plan are summarized as follows:

1. Create an inventory of all current existing water system facility assets.
2. Identify capital improvement-based projects
3. Provide estimated capital expenditures
4. Provide recommendation of future asset management implementation and funding strategies

c. Approach

In accordance with EPA guidance, AMP addresses five core questions:

1. What is the current state of the system's assets?
2. What is the required "sustainable" level of service?
3. Which assets are critical to sustained performance?
4. What are the minimum life cycle costs?
5. What is the best long-term funding strategy?

There are several ways to address these questions and it can vary from agency to agency, below is a description of how the AMP will address these five questions.

Current State of System's Assets

To answer the first question, IEC has developed an inventory of the existing water system assets. This is based on existing water system records provided by the SCWC as well as the Engineering Report dated May 2019, prepared by the California Rural Water Association (CRWA). Please see **Figure 1** for a map of the existing water system facilities. To prepare the inventory, IEC reviewed the following records provided by the SCWC:

- Pipeline and appurtenances
  - Leak and Main Break Reports
  - Line Flushing logs
  - Logs of Dead Ends
  - New water main installations and costs
  - Water main footage inventories
  - Pipeline markup maps
- Property information
  - Well 11 records
- Tanks/Reservoirs
  - Reservoir inspection reports
- Well and Pumps
  - Well and Pump rehabilitation and completion reports
  - Pump curves
  - Well graphs
- Well production and billing
  - Daily production data
  - Consumption records
  - Operating budgets
  - Billing register data

Some of the data required for the inventory was unavailable, therefore IEC made reasonable assumptions about dates of installation and conditions of the assets based on conversations with the SCWC staff. IEC also reviewed reports and information developed by the California Rural Water Association (CRWA). This includes the Engineering Report prepared in 2019 and inspection reports that were developed as part of the Engineering Report. In general, based on the records reviewed to complete the inventory, most the infrastructure in the system is old. Most of the distribution system was installed in the late 1950's and the tunnel which is one of the water supply sources was constructed around the 1930's. Lists of inventories are provided in **Section 2** of this report.

Required Level of Service

To answer the second question, the AMP will address desired Levels of Service (LOS) for the SCWC's water system assets. According to the EPA, a level of service can be defined as characteristics or attributes of a service that describe required levels of performance. Below is a summary of minimum Level of Service (LOS) standard for the assets in the SCWC water system, these standards are consistent with other public water systems.

Table 1.1 Level of Service Standards

Asset	LOS Standard
Water Supply Sources	System must have adequate source capacity to meet the system's max. day demand (MDD) per California Code of Regulations (CCR) Monitor Water Quality per CCR
Wells and Pumps	Comply with California Drinking Water Regulations: Conduct regular inspections to ensure adequacy of systems
Tanks/Reservoirs	Comply with AWWA Standards and California Drinking Water Regulations: Adequate storage to meet system demands Adequate storage to meet additional system demands during emergencies, for example fires or power outages Conduct regular inspections to ensure adequacy of systems
Distribution System	Comply with materials and installation standards per AWWA and California Drinking Water Regulations: Ensure that there is redundancy within system Minimize number of inconvenienced customers when doing repairs Repair fire hydrants as required Add blow off for flushing at all dead ends per California Drinking Water Regulations

IEC developed a LOS rating scale, see **Table 1.2** below. The LOS rating is based on assets meeting the minimum levels of service as described above.

Table 1.2 Level of Service Rating

Level of Service Rating	Description
1	Exceeds all LOS Requirements
2	Exceeds some LOS Requirements
3	Meets all LOS Requirements
4	Fails some LOS Requirements
5	Fails all LOS Requirements

Identifying Critical Assets

A critical asset is that which has the highest consequences if they fail. IEC developed a Likelihood of Failure (LoF) scale dependent of the percentage of useful life consumed for each asset. This scale will range from 1 to 4, 1 representing the highest likelihood of failure and 4 representing the lowest probability of failure. Refer to **Table 1.3** for the Likelihood of Failure (LoF) Ratings .

Table 1.3 Likelihood of Failure as related to Percentage of Life Consumed

Likelihood of Failure (LoF) Rating	Percentage of Useful Life Consumed (%)[1]
1	0 to 25
2	25 to 50
3	50 to 75
4	75 to 100

[1] Where: Percentage of useful life consumed = age/adjusted useful life

Consequence of Failure (CoF) can be defined as the significance of impacts to customers, property, safety, and health. In this case, CoF can be measure by how failures in the water system affect the SCWC customers. IEC prepared a CoF scale, please refer to **Table 1.4** . The consequence of failure (CoF) rating scale will range from 1 to 3, with 1 representing low impacts and representing severe impacts.

Table 1.4 Consequence of Failure as related to Impacts

Consequence of Failure (CoF) Rating	Impacts	Impacts to SCWC Customers
1	Low Impacts	Water shutdowns lasting 2 hrs. or less
2	High Impacts	Water Shutdowns lasting 2 to 12 hrs.
3	Severe Impacts	Water shutdowns lasting 12 to 24 hrs. or more and Property Damage

To prioritize assets for inclusion as Capital Improvements Projects, IEC will consider a total score based on the LoF and CoF ratings as well as the LoS rating. Highest priority will be given to assets with a total score of 12. Lower priority will be given to assets will a rating of less than 12. The lowest priority will be given to assets with a rating of 3.

Minimum Life Cycle Costs and Long-Term Funding Strategies

The final part of this report will address the capital improvements plan and minimum life cycle costs as well as long-term funding strategies. IEC will calculate life cycle costs for the water system assets. Cost estimates are based on fiscal year budgets and operating revenue. IEC will calculate replacement cost of assets and recommend funding strategies.

2.0 Existing System Description

Water Supply Sources

The SCWC's sources of water are groundwater from the El Mirage Basin in the Swarthout Canyon of the San Gabriel Mountains and most recently groundwater from the Mojave Basin, Alto subarea. The SCWC has seven water supply facilities, this includes six wells and a tunnel, see **Table 2.1** for an inventory of the existing water supply sources and **Figure 1** for a map of the existing system.

In 2019, Infrastructure Engineering Corporation (IEC) prepared a Feasibility Report to address source capacity issues, refer to **Appendix B**. IEC conducted a water supply and demand analysis to determine if the SCWC would be able to meet customer demand with its existing and potential supply sources. IEC ran near- and long-term scenarios and concluded that based on existing conditions, and even with the addition of Well 11, the SCWC would not be able to meet demand in regulatory requirements unless it added additional water supply sources. Based on operational capacities determined by water production data, the SCWC water supply wells produce 1.09 MGD of water, see **Table 2.1** below, which is approximately half of the required 1.97 MGD for maximum day demand (MDD).

Table 2.1 Water Supply Source Inventory

Asset	Year of Installation	Depth	Rated Capacity (MGD)[1]	Operational Capacity (MGD)[1]	Expected Useful Life (yrs.)	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
Tunnel	1920	242'		0.18	100	Good	N/A	100	100	
Well 2A	2011	725'	0.58	0.04	25 to 35	Good	Casing Inspected in 2014 Casing rehab in 2017	35	9	26
Well 5	1993	495'	0.78	0.18	25 to 35	Good	Casing Repairs 2014	35	27	8

[1] Source: Final Feasibility Report

Asset	Year of Installation	Depth	Rated Capacity (MGD)[1]	Operational Capacity (MGD) [1]	Expected Useful Life (yrs.)	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
Well 3A	2001	500'	0.58	0.04	25 to 35	Good	Casing Inspection and Rehabilitation in 2019	35	19	16
Well 4A	2004	500'	1.15	0.09	25 to 35	Fair	Inspected in 2018	35	16	19
Well 8	2005	480'	0.75	0.2	25 to 35	Good	N/A	35	15	20
Well 11	2018	1500'	0.4	0.36	25 to 35	New	N/A	35	2	33
		Total	**4.24**	**1.09**						

Wells 3A and 4A were inspected by BESST Inc. Global Subsurface Technologies in 2019 as part of the Engineering Report by the CRWA. Although it was not possible to perform in depth inspections, both wells were recommended for rehabilitation because of deficiencies in the casing, **see Appendix A**.

Based on estimates by the EPA, most ground water supply wells have an expected useful life ranging from 25 to 35 years. Since the current water source supplies do not produce enough water to meet demand, the SCWC will need to add additional supply sources. Based on the feasibility report, the SCWC would need to drill at least four additional wells to meet required demand.

Well Pumps

Based on the records reviewed, most of the well pumps were installed in the last 30 years. **Table 2.2** provides an inventory of the existing water well pumps at the six well sites. Most water well pumping equipment has an expected useful life ranging from 10 to 15 years based on estimates by the EPA.

Table 2.2 Well Pumps Inventory

Asset	Year of installation	Depth	Expected Useful Life (yrs.)	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
Well 2A Pump	2011	505'	10 to 15	Good	Replaced in 2014 Rehab in 2017 Replaced in 2018	15	2	13
Well 5 Pump	1993	420'	10 to 15	Good	Replaced in 2014	15	6	9
Well 3A Pump	2001	460'	10 to 15	Good	Rehab in 2019	15	1	14

Asset	Year of installation	Depth	Expected Useful Life (yrs.)	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
Well 4A Pump	2004	440'	10 to 15	Unknown	N/A	15	16	0
Well 8 Pump	2005	440'	10 to 15	Unknown	N/A	15	15	0
Well 11 Pump	2018	1,100'	10 to 15	New	N/A	15	1	14

Wells 2A, 5, and 3A have been rehabilitated in recent years, based on these rehabilitation efforts it is assumed that these wells are in good condition. Well 5 was installed in 1993 and was rehabilitated in 2014. The pump at this well site was replaced and the casing received repairs and maintenance. The pump at the Well 2A site was replaced in 2014 and in 2017 it received repairs and maintenance. Well 3A was inspected in 2019 and after inspection the pump received repairs and maintenance. The pump at Well 11 is the newest pump and currently has no issues.

Tanks/Reservoirs

The SCWC currently owns seven storage tanks. All tanks are above ground and most of them were installed in late 1970's and early 1980's. There are currently five bolted steel tanks and two welded steel tanks.

The seven tanks are located at various sites and different elevations throughout the system, see **Figure 1**. Water is pumped directly from the wells into Tank 7. Tank 5 feeds from Tank 7, but it can also feed from water pumped directly from the wells through a bypass line. From this point, water flows through gravity to the rest of the system.

Table 2.3 provides an inventory of existing tanks. Based on manufacturer's data and estimates by the EPA, the expected useful life for storage tanks is between 30 to 60 years depending on maintenance. The useful life of tanks can be extended if tanks are correctly and routinely maintained. Based the installation year of each tank, it is assumed that most of the tanks are in fair condition. Tank 8, which was installed in 2008 is in good condition.

Table 2.3 Tanks/Reservoirs Inventory

Asset	Type	Year of Installation	Capacity (Gal)	Diameter	HWL	Expected Useful Life (yrs.)	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
Tank 2	Bolted Steel	1979	428,000	55'	23'	30-60	Fair	Inspected in 2018	50	41	9
Tank 3	Bolted Steel	1983	210,000	47'-3"	15'-6"	30-60	Fair	Inspected in 2018	50	37	13
Tank 4	Bolted Steel	1984	428,000	55'	23'	30-60	Fair	Inspected in 2018	50	36	14
Tank 5	Bolted Steel	1985	141,000	38'-7"	15'	30-60	Fair	Inspected in 2018	50	35	15
Tank 6	Bolted Steel	1989	912,000	80'-2"	23'-2"	30-60	Fair	Inspected in 2018	50	31	19
Tank 7	Welded Steel	1993	1,000,000	103'	15'-1"	30-60	Fair	Inspected in 2018	50	27	23
Tank 8	Welded Steel	2008	3,040,408	150'	23'	30-60	Good	Inspected in 2018	60	12	48

Tanks 2 through 8 were visually inspected by Associated Construction and Engineering in October 2018 as part of the condition assessment efforts by the California Rural Water Association (CRWA), refer to **Appendix A**. The purpose of this inspection was to determine if there were any coating issues. Based on this inspection, Associated Construction Engineering recommended relining the interior of Tanks 2, 3, 5 and 6, the exterior of these tanks is in fair condition based on their observations. Their report also recommended relining the interior and recoating the exterior of Tank 7. The exterior and interior coatings of Tank 8 were found to be in excellent condition and only had recommendations for spot repairs. Based on this inspection report, it was recommended that the SCWC perform visual inspections at least once every year.

In November 2018, LiquiVision Technology Diving Services performed underwater inspections on Tanks 2 through 7, see **Appendix C** . During these inspections it was discovered that all the tanks inspected have some deficiencies, including signs of corrosion and rust. The reports included recommendations for maintenance and improvements needed at each tank. LiquiVision Technology Diving Services recommended that all tanks be inspected every 2 – 3 years. Based on the underwater inspections, only Tanks 5 and 6 were recommended for interior relining.

Based on the conditions of the tanks and the inspections, the useful life for tanks 2 thru 7 was adjusted to 50 years, according to the SCWC staff none of thanks have been relined or recoated since they were installed. The remaining useful life of the tanks can be extended by conducting regular inspections and periodic recoating and relining of the tanks. The American water Works Association (AWWA) recommends steel tanks to be inspected every 3 to 5 years. Steel tanks typically require recoating and interion relining (for non-glass line tanks) every 15 years.

Distribution System

The SCWC water distribution system consists of approximately 73 miles of pipelines. Appurtenances include pressure regulating valves and isolation valves, there are approximately 240 dead end and in-line fire hydrants/blow offs, and approximately 1,200 service connections in the system. Refer to **Figure 1** for a map of the existing system and service area.

Table 2.4 provides an inventory of the existing pipelines, including materials, sizes, and quantity. The inventory also includes approximate year of installation, expected useful life, condition, service history, adjusted useful life, age, and remaining useful life.

Table 2.4 Pipelines Inventory

Material	Size	Year of Installation*	Total Length (LF)	Expected Useful Life	Condition	Service History	Adjusted Useful Life (yrs.)	Age (yrs.)	Remaining Useful Life (yrs.)
AC Pipe	4"	1965	4235	50-100yrs	Unknown	Repairs due to being hit and cracks in mains (2000 - 2020)	80	55	25
AC Pipe	6"	1965	5280	50-100 yrs	Unknown	Repairs due to being hit and cracks in mains (2000 - 2020)	80	55	25
AC Pipe	10"	1965	9643	50-100yrs	Unknown	Repairs due to being hit and cracks in mains (2000 - 2020)	80	55	25
PVC C900 Pipe	4"	1975	77	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	45	55
PVC C900 Pipe	6"	1985	31135	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	35	65
PVC C900 Pipe	8"	1985	96317	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	35	65
PVC C900 Pipe	10"	2000	4589	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	20	80
PVC C900 Pipe	12"	1996	7226	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	24	76
PVC Pipe SCH 40	4"	1975	67423	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	45	55
PVC Pipe SCH 40	6"	1975	42199	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	45	55
PVC Pipe SCH 40	10"	1978	8368	60-100 yrs	Unknown	Repairs due to breaks and holes in mains (2000 - 2020)	100	42	58
Steel Pipe	4"	1956	60793	35-40yrs	Poor	Repairs due to breaks and pin holes in mains (2000 - 2020)	35	64	0
Steel Pipe	6"	1956	27717	35-40yrs	Poor	Repairs due to breaks and pin holes in mains (2000 - 2020)	35	64	0
Steel Pipe	8"	1956	8050	35-40yrs	Poor	Repairs due to breaks and pin holes in mains (2000 - 2020)	35	64	0
Steel Pipe	10"	1956	6065	35-40yrs	Poor	Repairs due to breaks and pin holes in mains (2000 - 2020)	35	64	0
Steel Pipe	12"	1956	2555	35-40yrs	Poor	Repairs due to breaks and pin holes in mains (2000 - 2020)	35	64	0
Galvanized Pipe	1 1/4"	1956	330	35-40yrs	Poor	Repairs due to breaks and holes in mains (2000 - 2020)	35	64	0
Galvanized Pipe	1 1/2"	1956	700	35-40yrs	Poor	Repairs due to breaks and holes in mains (2000 - 2020)	35	64	0
Galvanized Pipe	2"	1956	275	35-40yrs	Poor	Repairs due to breaks and holes in mains (2000 - 2020)	35	64	0
Concrete Pipe	14"	1930	2730	100	Good	Inspected in 2000	100	90	10
HDPE	10"	2005	350	35-50yrs	Unknown	N/A	50	15	35
HDPE	12"	2005	828	35-50yrs	Unknown	N/A	50	15	35

*Pipelines which have been installed recently and are identified by year of installation in Figure 1 are not included for replacement.

The specific date of installation of pipelines in most of the system is unknown. Based on information available to us about the formation of SCWC, it is assumed that most of the distribution system was installed in the 1950's and the system has had only a few replacements and new installations in the last 20 years. Replacements in the system have been done by the SCWC as well as developers and customers. There have been new installations of pipelines in the system, these installations were done by the SCWC, Caltrans, or customers and developers. Below is a table with a total linear footage of new and replaced pipelines in the last 20 years. Most of the new installation and replacements are PVC C900 with some HDPE and include the installation of new hydrants and valves as needed.

Table 2.5 Pipeline Replacements and New Installations

Type	Total Length (LF)
SCWC Replacement	13,260
Customer or Developer Replacement	4,070
Total	17,330
SCWC New Installation	7,652
Cal-Trans New Installation	1,350
Customer or Developer New Installation	29,245
Total	38,247

The exact conditions of the pipelines are unknown but based on the material types and year of installation it can be assumed that some of the pipelines are in poor condition and need to be replaced. Based on leak and break data recorded by the SCWC staff, in the last three years and part of 2020, the three materials which have had the most breaks/failures are steel pipe, PVC pipe and AC pipe. **Table 2.6** summarizes the total number of breaks/repairs per material from 2017 to 2020. From 2017 to 2020, steel pipe has had a total of 32 of breaks/repairs, followed by PVC Pipe with a total 20 and AC Pipe with one, refer to **Table 2.6**

Table 2.6 Breaks/Repairs from 2017 to 2020

Description	2017 Breaks/Repairs	2018 Breaks/Repairs	2019 Breaks/Repairs	2020 Breaks/Repairs	Total
Steel Pipe	5	9	13	5	32
PVC Pipe	5	9	4	2	20
AC Pipe	0	1	0	0	1

Flushing has not been done regularly in the last ten years, regularly flushing dead ends helps with water quality issues and build up in pipes. There are also approximately 27 dead end locations within the system which currently have no way to flush water. Most of the SCWC distribution system is looped, but there are dead ends in the system could cause issues with water quality, redundancy, and pressure. Based on AWWA standards, the benefits of having a looped distribution system include improved water quality, redundancy, and reliability, as well as improved pressure within the system.

There are approximately 80 dead end hydrants/blow offs, and most of them were installed approximately ten years ago. The expected useful life for blow offs is 35 to 40 yrs., based on estimates by the EPA. Since the blow offs were installed more recently it is assumed that they are in good condition and have approximately 30 years of remaining useful life.

There are also approximately 375 in-line fire hydrants in the SCWC system. Approximately 284 of the hydrants are three-way dry barrel and were installed in the 1980's. The rest of the hydrants are standpipe/jones head and were installed between the 1950's and early 1980's. . The expected useful life of fire hydrants is between 40 to 60 years based on manufacturer data and estimates by the EPA. The exact condition of the fire hydrants is not known, in 2018 the Rural Water Association conducted a leak detection survey which detected leaks at two hydrant locations. Based on the year of installation, the in-line hydrants are approximately 50 to 70years old and some are past their useful life.

The SCWC system has approximately 1200 service connections. The exact year of installation is unknown, but it is assumed that most of the service meters were installed in the 1970's and there have been only a few replacements. These meters are manually read, the SCWC currently does not have an automated system to read the meters.

The SCWC has recorded water losses based on water production and consumption. From 2015 to 2019, the average water loss per year was 15%. The EPA considers 10 to 15% as an acceptable range for water losses within a system, but it is important to implement better technologies such as AMR to control and prevent leaks.

Table 2.7 Inventory of Meter and Appurtenances

Description	Qty	Year of Installation
In-line Fire Hydrants	155	1950
Hydrants/Blowoffs	80	2010
Meters	1,200	1970

3.0 Prioritizing Critical Assets

Water Supply Sources:

Currently, the most critical asset to the SCWC System is its water supply sources. The SCWC will need to add four additional water supply wells to meet demand and regulatory requirements established by the State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW). Adding four new water supply wells to the system is the highest priority.

Wells Pumps:

Below is a table of prioritization for the existing well pumps, see **Table 3.1**. The prioritization is based on a score from 3 to 12, with 3 being low priority and 12 being highest priority. For the methodology behind the ratings and the score refer to **Section 1** of this report.

Table 3.1 Well Pumps Prioritization

Asset	Percentage of Useful Life Consumed	LOS Rating	LoF Rating	CoF Rating	Score
Well 2A Pump	13%	4	1	1	6
Well 5 Pump	40%	4	2	2	8
Well 3A Pump	7%	4	1	1	6
Well 4A Pump	100%	4	4	1	9
Well 8 Pump	100%	4	4	2	10
Well 11 Pump	7%	1	1	3	5

Based on the score, well 8 pump has the highest priority in this category, this pump is past its expected useful life. Well 8 pump currently has one of the highest operational capacities, refer to **Section 2** for the inventory and capacities. Following order of priority well 4A pump is next, this pump is also past it's expected useful life. The rest of the pumps received lower scores and based on remaining useful life can be phased for improvements after the pumps at well 8 and 4A.

Tanks/Reservoirs

The table show the prioritization of the existing reservoirs, the prioritization score is based on the score provided, see Table **3.2**. A high score means a higher priority, for the methodology behind the ratings shows in the table and the score, refer to **Section 1** of this report.

Table 3.2 Tanks/Reservoirs Prioritization

Asset	Percentage of Useful Life Consumed	LOS Rating	LoF Rating	CoF Rating	Score
Tank 2	82%	4	4	1	9
Tank 3	74%	4	3	2	9
Tank 4	72%	4	3	1	8
Tank 5	70%	4	3	3	10
Tank 6	62%	4	3	2	9
Tank 7	54%	4	3	3	10
Tank 8	20%	3	1	1	5

Tanks 5 and 7 have the highest priority in this category, followed by tanks 2, 3, 6, and 4. Tank 8 is the newest tank and therefore has the lowest priority. As mentioned in **Section 2**, based on the inspections conducted in 2018, all tanks need maintenance. Maintaining the tanks can extend their useful life. Tanks need to be regularly maintained and inspected for sanitary and structural integrity. Based on AWWA M42, tanks should be inspected at least once every 3 to 5 years or as required by state and regulatory agencies and consideration for recoating and relining every 15 years.

Distribution System

The table below provides a summary of the prioritization of the pipelines in the distribution system, see **Table 3.3**.

Table 3.3 Pipelines Prioritization

Material	Size	Percentage of Life Consumed	LOS Rating	LoF Rating	CoF Rating	Score
AC Pipe	4"	69%	4	3	1	8
AC Pipe	6"	69%	4	3	1	8

Material	Size	Percentage of Life Consumed	LOS Rating	LoF Rating	CoF Rating	Score
AC Pipe	10"	69%	4	3	1	8
PVC C900 Pipe	4"	45%	3	2	1	6
PVC C900 Pipe	6"	35%	3	2	1	6
PVC C900 Pipe	8"	35%	3	2	2	7
PVC C900 Pipe	10"	20%	3	1	1	5
PVC C900 Pipe	12"	24%	3	1	2	6
PVC Pipe SCH 40	4"	45%	3	2	2	7
PVC Pipe SCH 40	6"	45%	3	2	1	6
PVC Pipe SCH 40	10"	42%	3	2	2	7
Steel Pipe	4"	100%	4	4	2	10
Steel Pipe	6"	100%	4	4	2	10
Steel Pipe	8"	100%	4	4	2	10
Steel Pipe	10"	100%	4	4	2	10
Steel Pipe	12"	100%	4	4	2	10
Galvanized Pipe	1 1/4"	100%	4	4	1	9
Galvanized Pipe	1 1/2"	100%	4	4	1	9
Galvanized Pipe	2"	100%	4	4	1	9
Concrete Pipe	14"	90%	4	4	3	11
HDPE	10"	30%	3	2	1	6
HDPE	12"	30%	3	2	1	6

Steel pipe has the highest priority in this category. Steel pipe has required more repairs in the last three years than most of the other pipes in the system. Steel pipe is prone to corrosion; corrosion can occur due to poor maintenance or naturally over time. Based on existing data, steel pipe makes up approximately 27% of the SCWC distribution system, which is another reason why steel pipe should have a higher priority for replacement due to its widespread presence in the system.

Based on the score for prioritization of assets, Concrete pipe has the highest score, but it will not be considered for replacement at this time. Based on information provided by the SCWC, the existing segment of concrete pipe in the system was inspected in the early 2000's and was found to be in good condition. According to the year of installation, the 14-inch pipeline is approximately 90 years old and it is recommended that the SCWC conduct another inspection to ensure that the pipeline remains in good condition. Galvanized pipe is used in service connections, therefore the cost for replacement is included in the water service reconnections.

Based on the prioritization of the assets, the next section of this report will describe the capital improvements projects for the SCWC. The SCWC's current budget for capital improvements projects is very limited. This means that they will have to phase the CIP projects and consider additional funding sources.

4.0 Summary of Capital Expenditures

Based on the prioritization from Section 3, the projects with the highest priority under each category are described in this section along with a planning level cost estimate. **Table 4.1** provides a list of the projects with a total cost a per project and a cost per fiscal year. The SCWC's fiscal year starts in January and ends in December.

Table 4.1 CIP Costs per Fiscal Year

Category	Project	Project Cost	Cost Per Year																			
			FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040
Water Supply	New Well No 12	$ 1,387,400	$ 693,700	$ 693,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Well No 13	$ 1,387,400	$ 693,700	$ 693,700	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Well No 14	$ 1,387,400	-	-	$ 1,387,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	New Well No 15[1]	$ 1,387,400	-	-	-	$ 1,387,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Wells & Pumps	Rehab Well 8	$ 84,500	-	-	-	-	$ 84,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rehab Well 4A	$ 84,500	-	-	-	-	$ 84,500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Water Storage	Rehab tank 5	$ 112,613	-	-	-	-	$ 112,613	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rehab Tank 7	$ 600,600	-	-	-	-	-	$ 600,600	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rehab tank 2	$ 300,300	-	-	-	-	-	-	$ 300,300	-	-	-	-	-	-	-	-	-	-	-	-	-
	Rehab Tank 3	$ 150,150	-	-	-	-	-	-	-	$ 150,150	-	-	-	-	-	-	-	-	-	-	-	-
	Rehabd Tank 6	$ 525,525				-	-	-	-	-	$ 525,525	-	-	-	-	-	-	-	-	-	-	-
	Rehab Tank 4	$ 300,300	-	-	-	-	-	-	-	-	-	$ 300,300	-	-	-	-	-	-	-	-	-	-
Distribution System[2]	Replace Steel Pipe	$ 3,526,750	-	-	-	-	-	-	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911	$ 251,911
	Water Service Reconnections and AMR System conversion	$ 358,800	-	-	-	-	-	-	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629	$ 25,629
		Total	**$ 1,387,400**	**$ 1,387,400**	**$ 1,387,400**	**$ 1,387,400**	**$ 281,613**	**$ 600,600**	**$ 577,839**	**$ 427,689**	**$ 803,064**	**$ 577,839**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**	**$ 277,539**

[1] SCWC will need to request and extension from the DDW due to budget shortfalls

[2] Environmental related costs not included, cost will be applied at a programmatic level

Install 4 New Water Supply Wells

This project includes the installation of four new wells required to meet demand per regulatory requirements. For a breakdown of the planning level Capital Cost Estimate, see **Table 4.2** below. Per the DDW compliance order, the SCWC should have constructed the first well by June 2022, the second well by November 2022, the third well by June 2023 and the fourth well by November 2023. The total estimated planning level cost for the construction of the four wells is approximately $5,420,000.

Table 4.2 Planning Level Cost Estimate for the installation of Four New Wells

Construction Costs				
	Unit	Quantity	Cost/unit	Subtotal
Drill 1,500 foot 16" Well	EA	4	$ 500,000	$ 2,000,000
150 HP Submersible Motor & Pump 1	EA	4	$ 125,480	$ 501,900
Electrical and Instrumentation 1	LS	4	$ 94,535	$ 378,100
Well Head and Site Work 1	LS	4	$ 44,839	$ 179,400
Well Offsite Piping	LS	4	$ 150,000	$ 600,000
			Subtotal	$ 3,659,400
			30% Contingency[1]	$ 1,097,800
			Construction Costs	**$ 4,757,200**
				Additional Services
Administration, Engineering, CM (10%)				$ 475,700
CEQA (Combine Projects)				$ 113,200
Property Acquisition for Four Well Site Locations				$ 70,000
			Additional Services	**$ 658,900**
Total Estimated Planning Level Cost				***$ 5,420,000***
Annual Operation and Maintenance Cost[2]				***$ 129,600***

[1] Advancement for Cost Engineering International, Class 4, Study or Feasibility

[2] See Appendix D

Rehabilitate Wells

This project includes the rehabilitation of wells 4A and 8. The total estimated planning level cost for the rehabilitation of the two wells is approximately $169,000. The estimated cost to rehabilitate the wells includes repairs to casing and replacement of the existing pumps.

Table 4.3 Planning Level Cost Estimate for the Rehabilitation of Wells 2A and 8

Construction Costs				
	Unit	Quantity	Cost/unit	Subtotal
Well 2A Rehabilitation	LS	1	$ 65,000	$ 65,000
Well 8 Rehabilitation	LS	1	$ 65,000	$ 65,000
			Subtotal	$ 130,000
			30% Contingency[1]	$ 39,000
			Construction Costs	**$ 169,000**
Total Estimated Planning Level Cost				***$ 169,000***
Annual Operation and Maintenance Cost[2]				***$ 38,410***

[1] *Advancement for Cost Engineering International, Class 4, Study or Feasibility*

[2] *See Appendix D*

Rehabilitate Tanks

This project includes the rehabilitation of Tanks 2 through 7. The rehabilitation includes recoating and relining the tanks. The total estimated planning level cost for the rehabilitation of the tanks is approximately $1,990,000.

Table 4.4 Planning Level Cost Estimate for the Rehabilitation of Tanks

Construction Costs				
	Unit	Quantity	Cost/unit	Subtotal
Tank 2 Rehabilitation	LS	1	$ 231,000	$ 231,000
Tank 3 Rehabilitation	LS	1	$ 115,500	$ 115,500
Tank 4 Rehabilitation	LS	1	$ 231,000	$ 231,000
Tank 5 Rehabilitation	LS	1	$ 86,625	$ 86,625
Tank 6 Rehabilitation	LS	1	$ 404,250	$ 404,250
Tank 7 Rehabilitation	LS	1	$ 462,000	$ 462,000
			Subtotal	$ 1,530,400
			30% Contingency[1]	$ 459,100
			Construction Costs	**$ 1,989,500**
Total Estimated Planning Level Cost				***$ 1,990,000***
Annual Operation and Maintenance Cost[2]				***$ 22,845***

[1] Advancement for Cost Engineering International, Class 4, Study or Feasibility

[2] See Appendix D

Pipeline Replacements

This project includes the replacement of pipelines in the distribution system, including appurtenances. Most of the labor under this category can be done by the SCWC crews, the SCWC has used their own crews to make new installations and replacements in their system. Having the SCWC replace their own pipelines is the least expensive option, the cost of installation per linear foot is based on data from past projects. The total planning level cost estimate is approximately $3,920,000.

Table 4.5 Planning Level Cost Estimate for the Replacement of Pipelines

Construction Costs				
	Unit	Quantity	Cost/unit	Subtotal
Replace 4-inch steel pipe	LF	60793	$ 25	$ 1,519,825
Replace 6-inch steel pipe	LF	27717	$ 25	$ 692,925
Replace 8-inch steel pipe	LF	8050	$ 30	$ 241,500
Replace 10-inch steel pipe	LF	6065	$ 30	$ 181,950
Replace 12-inch steel pipe	LF	2555	$ 30	$ 76,650
Convert to AMR System	EA	1200	$ 130	$ 156,000
Water Service Reconnections	EA	1200	$ 100	$ 120,000
			Subtotal	$ 2,988,900
			30% Contingency[1]	$ 896,700
			Construction Costs	**$ 3,885,600**
Additional Services				
Environmental Services				$ 30,000
			Additional Services	**$ 30,000**
Total Estimated Planning Level Cost				***$ 3,920,000***
Annual Operation and Maintenance Cost[2]				***$ 120,900***

[1] Advancement for Cost Engineering International, Class 4, Study or Feasibility

[2] See Appendix D

5.0 Conclusion and Recommendations

Based on the SCWC's limited availability of budget for capital improvements, the best option is to start with the installation of the required water supply wells for the first 4 to 5 years. The AMP should be updated at least every 5 years and the projects will need to be reprioritized as needed. The EPA also recommends creating and Asset Management Steering Committee within agencies to review and update the AMP periodically. One of the benefits of having an AMP plan is cost savings over time if the plan is tracked and updated periodically.

FIGURE 1

Infrastructure
1401 Commercial Way, Suite 100
Bakersfield, California 93309
T 661.529.2190
www.iecorporation.com

SHEEP CREEK WATER COMPANY (SCWC)

SCWC WATER SYSTEM MAP

FIGURE 1