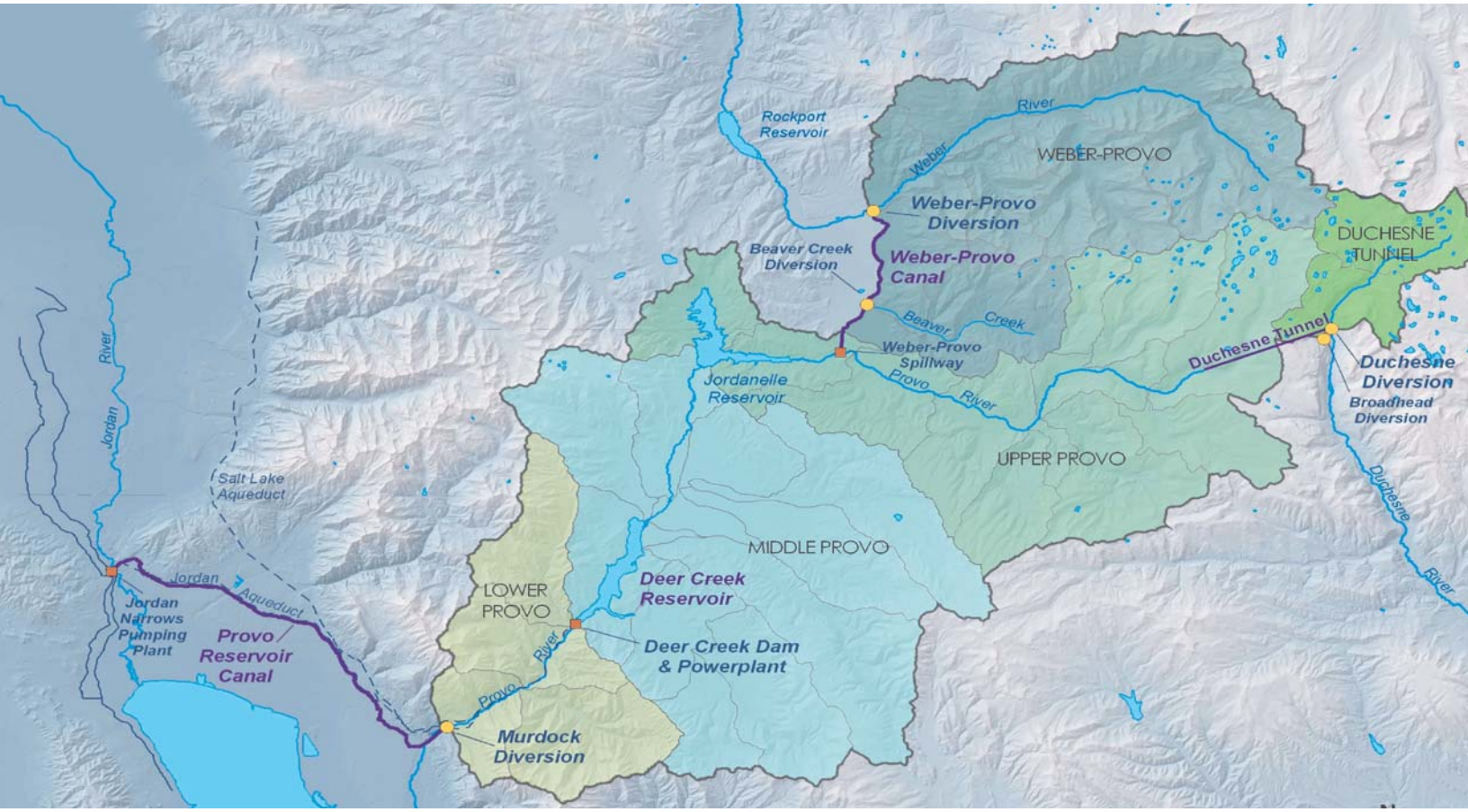
Provo River Water Users Association

Master Plan Update

PROVO RIVER
WATER USERS
ASSOCIATION



Prepared by

Bowen Collins & Associates

November 2014

Bowen Collins
& Associates, Inc.
CONSULTING ENGINEERS

Provo River Water Users Association

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Consultant Job No. 006-14-04-02

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CHAPTER 1
INTRODUCTION

INTRODUCTION AND PURPOSE

The Provo River Water Users Association (Association) operates the Deer Creek Division of the Provo River Project (PRP). This project delivers water from the Weber, Provo, and Duchesne River Basins, into Summit, Wasatch, Utah and Salt Lake counties for irrigation, domestic, and municipal and industrial purposes. The purpose of this study effort is to develop a document to guide the Association in future planning for capital improvements.

BACKGROUND

The Deer Creek Division of the PRP consists of five main areas or features shown on the attached Figure 1-1 and described briefly below.

- ***Duchesne Collection System Facilities*** divert and transport water from the Duchesne River to the Provo River. Features include the Duchesne Diversion Dam, Broadhead Diversion Dam and pipeline, the Duchesne Tunnel, and associated control and monitoring facilities.
- ***Weber-Provo Canal System Facilities*** divert and transport water from the Weber River to the Provo River. Features include the Weber-Provo Diversion Dam, the Weber-Provo Canal, the Beaver Creek Diversion Structure, the Francis spillway and associated control and monitoring facilities.
- ***Provo River Channel Revision Features*** include dikes and flood easements. Due to water imported by the Association from the Weber and Duchesne River drainages during runoff, when the natural Provo River flow is high, provisions were needed to protect adjoining lands from the increased flows. In some locations, dikes were constructed to protect the adjoining lands from flooding. Flood easements were also obtained to allow for flooding from the increased flows to occur without liability to the Association.
- ***Deer Creek Dam and Reservoir Features*** are used for water storage and delivery. Facilities include Deer Creek Dam (including spillway), Deer Creek Reservoir and lands, Deer Creek Power plant, and operations building.
- ***Provo River Aqueduct System Facilities*** divert and deliver project water from the Provo River to water users in northern Utah County and Salt Lake County. Facilities include the Murdock Diversion Dam, the Provo River Aqueduct (PRA), and the Jordan Narrows/Point of Mountain (JNPOM) facilities. JNPOM facilities include the PRA siphon, Jordan Narrows Penstock, and the Jordan Narrows Turbine/Pump Station.

STUDY OBJECTIVE

The objective of the Master Plan is "**to provide a long-range plan of necessary improvements to ensure that the water supply developed by the Project based on existing water rights and water ownership interests will be maximized and reliable at the lowest cost possible to the Association Shareholders. The Master Plan should include not only improvements to existing facilities, but also recommendations related to construction of new facilities to meet the stated objective.**

To meet the stated objective, the Master Plan Update will include:

- Recommendations for improvements to existing facilities
- Recommendations on construction of new facilities. Recommendations will be implemented by the Association as determined through appropriate evaluation and budgeting processes.

SCOPE OF SERVICES

The scope of services for the 2014 Master Plan Update includes the tasks outlined below.

Task 1 – Data Gathering and Review of Master Plan Objectives with Staff and Board. Available pertinent data will be gathered from PRWUA, the 2003 Master Plan and other sources. Meetings with staff and the Board will be held to review overall project objectives, review the scope of work, and discuss the individual Board and staff members' concerns and desires for the project.

Task 2 – Progress and Review Meetings. Regular monthly meetings will be held with PRWUA staff to report progress on the study. Review meetings will be held with the PRWUA Engineering Committee and staff to deliver the draft report and to present the final report. Presentations of the draft and final reports will be presented at two separate Board meetings.

Historical Information

Task 3 – PRP Description. This task will update the PRP description provided in the 2003 Master Plan and will include a description of existing management, staffing, and facilities of the Association. This task will also include updating information on shareholders of the Association. We will also review the latest water rights master plan report and conservation plan for input into the study.

Task 4 – Review of Historical Water Use, Storage, and Deliveries. This task will look at historic information on water use, storage, water deliveries and update information presented in the 2003 Master Plan on historical water use.

Assessment of Existing Project

Task 5 –Condition Assessment of PRP. A field review of the project will be performed, including the following:

- Duchesne Tunnel and Diversion
- Upper Provo River
- Weber-Provo Canal and Diversion
- Deer Creek Dam and Powerhouse
- Murdock Diversion
- Provo River Aqueduct
- Jordan Narrows/Point of the Mountain Facilities.

The condition of each of these facilities will be assessed and existing problems and inefficiencies documented.

Future Needs of the Association

Task 6 – Evaluation of Existing and Future Demands of the PRP. The focus of this task will be to analyze and determine what demands and requirements are and will be placed on the staff, facilities and resources through the year 2030. These demands may fall in areas such as water delivery, water storage, water quality, endangered species, environmental regulations, recreation, land use, trespass, encroachment and safety. Existing and future regulatory requirements that will affect the PRP and its operation will be examined and impacts to the PRP determined. This will include shareholders, affiliated agencies, local, state and federal agencies.

Task 7 – Capability of the PRP to Meet Identified Demands. Each aspect of the PRP will be analyzed to determine its efficiency in meeting the identified demands.

Recommendations for Upgrades and Improvements

Task 8 –System Improvements. Based on Tasks 6 and 7, recommendations will be made for improvements to facilities. These recommendations will be those required for continued operation and or to meet future operation needs. Conceptual plans for replacement or rehabilitation will be developed.

Task 9 –Cost Estimates for Recommended Improvements. Cost estimates will be prepared for system improvements recommended in Task 8.

Task 10 – Prioritization of Improvements. The recommended improvements will be prioritized based on a set of criteria developed in conjunction with Association staff and the Board. Water supply, liability, and safety concerns at Association facilities will be major components in the prioritization process. Improvements will be categorized as being part of identified Master Plan Improvements, Operation and Maintenance, or Non-Master Plan Capital Improvements.

Task 11 –Potential Funding Alternatives for Recommended Improvements. Available sources for funding recommended improvements will be analyzed. This will include USBR loan programs, State of Utah Water Resource Board funding, bonding, capital improvement assessments, general assessments, and other available funding sources.

Task 12 –Implementation Schedule. Based on the priority of recommended improvements and the availability of funding, a proposed implementation schedule will be developed.

Task 13 –Master Plan Report. A Master Plan Draft Report (25 copies) will be prepared for Association review, which will summarize the results of Tasks 1-12. After Association review, 50 copies of a Final Master Plan will be prepared. Fifty (50) copies of a bound Executive Summary of the report will also be prepared after final review by the Association. Copies of the report, including tables and graphs will be transmitted to the Association in electronic format along with an unbound copy.

ACKNOWLEDGEMENTS

The BC&A team would like to thank Association Board of Directors and staff for their cooperation and assistance in preparing the 2014 Master Plan Update. The Association's Board of Directors and staff include the following individuals:

Board of Directors

Board Member	Position on Board
Michael L. Wilson	President, Director
Leroy W. Hooton	Vice President, Director
Genevieve Atwood	Director
Tom Godfrey	Director
Merril L. Bingham	Director
Christopher R. Tschirki	Director
Donald Y. Milne	Director
Jeff Niermeyer	Director
Jeffrey J. Bryant	Director
Patricia Comarell	Director
Shane E. Pace	Director

The Association's Staff

G. Keith Denos	General Manager
Jeff Budge	Operations and Engineering Manager
Steven H. Cain	Facilities and Lands Manager
Charlene Lenkart	Office Administrator

OTHER STUDIES OF INTEREST

Three other studies of interest in relationship to this report are as follows:

- Water Rights Management and Drought Mitigation Plan, Bowen Collins and Associates, January 2014
- Water Conservation Plan, Henrie Engineering, November 2014
- Upper Provo Easement Maintenance Plan, CH2M Hill, March 2001

N

NOT TO SCALE

Weber-Provo Canal System

WATER RIGHT:
173,700 AC-FT
DESIGN CAPACITY:
1,000 CFS
AVERAGE ANNUAL DIVERSION:
1995-2011: 33,915 AC-FT
PEAK RUNOFF:
April-June
FACILITIES:
(1) Weber-Provo diversion
(2) 9 mile Weber-Provo canal
(3) Beaver Creek diversion
(4) 3 automated check structures
(5) Spillway and Stilling Basin
(6) 2 Gaging stations

Jordan Narrows/ Point of the Mountain Facilities

FACILITIES
(1) Jordan River wasteway
(2) Maintenance building
(3) 72" siphon
(4) 60" penstock
(5) Jordan Narrows turbine/pump station

JORDAN AQUEDUCT
(JVWCD/MWDSLS)
To Jordan Valley WTP
Capacity: 270 CFS

Jordan River
Welby Canal
UL Dist (No.)
JA-1
Wasteway
TURBINE PUMP STATION
Jacob Canal
UL Dist (So.)
Siphon
Penstock

Point of The Mountain Aqueduct (MWDSLS) to POMWTP
Capacity: 119.5 CFS

Point Of The Mountain Aqueduct

Salt Lake Aqueduct (MWDSLS) To Little Cottonwood WTP
Capacity: 175 CFS

PROVO RIVER AQUEDUCT

Weber River
WEBER-PROVO DIVERSION
WEBER-PROVO CANAL
BEAVER CREEK STRUCTURE
Beaver Creek
CHECK (TYP)
SPILLWAY
Jordanelle Reservoir
Provo River

Middle Provo River

O&M of this reach of the river has become the responsibility of USBR

PROVO RIVER RIGHTS
WATER RIGHT:
103,400 AC-FT

Duchesne Collection System

WATER RIGHT:
53,788 AC-FT Primarily High Flood Flows
DESIGN CAPACITY:
621 CFS
AVERAGE ANNUAL DIVERSION:
1995-2011: 27,026 AC-FT
PEAK RUNOFF:
April-June
FACILITIES:
(1) Broadhead Diversion Dam
(2) Duchesne Diversion Dam
(3) Duchesne Tunnel

DUCHESNE TUNNEL
DUCHESNE DIVERSION
BROADHEAD DIVERSION
Duchesne River

Upper Provo River Easements/Dikes

DESIGN CAPACITY:
3,300 CFS Below Duchesne Diversion
4,300 CFS Below Weber-Provo Diversion
FACILITIES:
(1) Dikes along 25 miles of the river
(2) Flood easements where dikes don't exist

Deer Creek Dam & Reservoir

DESIGN CAPACITY:
153,445 AC-FT
150,161 AC-FT Active Pool
3,284 AC-FT Dead Pool
50,161 AC-FT Carry Over
100,000 AC-FT Association Shares
FACILITIES:
(1) Dam
(2) Land around reservoir
(3) Outlet Works and Spillway
(4) Salt Lake Aqueduct Intake (MWDSLS facility)
RECREATION USE:
Managed by Utah State Parks & Recreation
OUTLET WORKS CAPACITY:
2 Tube Valves
SPILLWAY CAPACITY:
12,000 CFS

Deer Creek Reservoir

ULS Intake

DESIGN CAPACITY:
120 CFS

Deer Creek Powerhouse

DESIGN CAPACITY:
4.95 MW
FACILITIES:
(1) 2-2,475 kW Generators

Provo River Aqueduct

DESIGN CAPACITY:
626 CFS Head
562 CFS End
FACILITIES:
(1) 21 miles of 10.0-10.5' diameter pipeline
(2) Turnouts
(3) Measure Unit Station at 800 North

OLMSTED TUNNEL

Utah Lake

Murdock Diversion

DESIGN CAPACITY:
550 CFS
FACILITIES:
(1) Diversion Dam including Inlet Screening

ULS PIPELINE (CUWCD Facility)

Bowen Collins & Associates, Inc.
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PROVO RIVER WATER USERS ASSOCIATION

Figure 1-1
PROVO RIVER SCHEMATIC

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CHAPTER 2
PROJECT DESCRIPTION

HISTORY

The Deer Creek Division of the Provo River Project (Project) provides a domestic water supply for communities in northern Utah County and the Salt Lake Valley and supplemental water supply for irrigation of farmlands in Utah, Salt Lake, Summit, and Wasatch Counties. The key feature of the Project, the Deer Creek Dam, is located on the Provo River approximately 16 miles northeast of Provo City. The dam stores water from the Weber River diverted through the Weber-Provo Diversion Canal, water from the headwaters of the Duchesne River diverted through the Duchesne Tunnel, and Provo River water. Other major structures of the Project include the power plant at the dam, Weber-Provo Diversion and Canal, Duchesne River Diversion and Tunnel, Murdock Diversion Dam, Provo River Aqueduct, and Jordan Narrows Siphon Penstock and Pumping Plant. The following sections briefly describe each of the major features of the Project.

WEBER RIVER FEATURES

Weber-Provo Diversion Structure

The Weber-Provo Diversion diverts water from the Weber River to the Weber-Provo Canal. The diversion is located on the Weber River approximately one mile east of Oakley, Utah. The original diversion structure was constructed in 1930 and consisted of a concrete ogee weir, two bypass slide gates, and six diversion slide gates. In 1992, the diversion was reconstructed. The reconstruction included the installation of a new radial bypass gate, new diversion intake screens, and two new radial canal gates.

The concrete diversion has a weir crest length of 150 feet. The two radial gates control the forebay elevation and the canal flow. The diversion structure has a hydraulic height of 19 feet and a diversion capacity of 1,000 cubic feet per second (cfs). The overflow capacity of the diversion dam is approximately 12,000 cfs. The Association currently has the ability to monitor the water surface elevation at the diversion forebay and in the canal just downstream of the structure through its supervisory control and data acquisition (SCADA) system. The SCADA system allows the Association to remotely monitor and operate the radial gates.

Weber-Provo Canal Diversion

Weber-Provo Canal

Weber-Provo Canal Check Structure

The Weber-Provo Canal runs from the diversion structure generally south to the Provo River. The Weber-Provo Canal is approximately nine miles in length and consists of unlined, earth-lined, and concrete-lined sections. The Weber-Provo Canal was originally constructed in 1929-1930 as part of the Weber River Project and was enlarged in 1941-1947 under the Project.

The canal has a bottom width ranging from 12 to 24 feet with side slopes ranging from 1.75:1 to 2:1 based on the type of lining. Three check structures are located along the canal to control the water surface elevation in the canal. When the canal was originally constructed, there were concerns that the canal would lower the ground water adjacent to the canal. These check structures maintain a constant water surface elevation in the canal to allow groundwater levels adjacent to the canal to be in balance with the surrounding groundwater level. The check structures are automatically controlled and are tied into the Association's SCADA system.

Weber-Provo Canal Spillway

Flow is measured at the head and end of the canal. The Oakley parshall flume located just south of the Weber-Provo Diversion Structure measures flow at the head of the canal. There is also a parshall flume structure located at the end of the canal, just prior to the canal's convergence with the Provo River. Prior to the convergence with the Provo River, flow is conveyed through a spillway and stilling basin. The spillway drops the canal flow from the Kamas Valley down into the Provo River Valley.

The Beaver Creek Diversion Structure

The Beaver Creek Diversion Structure is located at the intersection of Beaver Creek and the Weber-Provo Canal in Kamas. The concrete structure was designed to divert all of the flow in Beaver Creek into the Weber-Provo Canal, except for a small diversion downstream. The structure allows water to be diverted from Beaver Creek to the Weber-Provo Canal, from the Weber-Provo Canal to Beaver Creek, from Beaver Creek to the Beaver Shingle Creek Irrigation Company canal, and to

Beaver Creek Diversion Structure

pass Beaver Creek flows under the Weber-Provo Canal. The structure was upgraded in 2005. The structure consists of slide gates to control flows into and out of Beaver Creek. Figure 2-1 is a design drawing of the Beaver Creek Diversion Structure from the 2005 upgrade.

DUCHESNE RIVER FEATURES

Duchesne Diversion Dam and Inlet

The Duchesne Diversion Dam is located on the north fork of the Duchesne River approximately 21 miles east of Kamas, Utah, and diverts Duchesne River water directly into the Duchesne Tunnel. The dam was constructed in 1952 and has a diversion capacity of 621 cfs. The dam consists of a rockfill weir with a concrete-core wall.

The weir length of the dam is 270 feet and contains a concrete sluiceway with a radial gate to bypass flow. The Association monitors the forebay water level and remotely operates the radial gates through its SCADA system.

Duchesne Tunnel Inlet

Broadhead Diversion Dam

The Broadhead Diversion Dam is located on Little Deer Creek approximately 21 miles east of Kamas, Utah. The dam diverts Little Deer Creek water through a pipeline to the Duchesne River, upstream of the Duchesne Diversion Dam. At this point, the water is combined with flow from the north fork of the Duchesne River and is diverted through the Duchesne Tunnel. The Broadhead Diversion Dam was originally constructed in 1953, but had to be reconstructed in 1964 as a result of the Little Deer Creek Dam failure. The structure was modified in 2008 by modifying the intake screen, enlarging the pipeline to the Duchesne Diversion, and upgrading the automation. The concrete structure has a weir length of 15 feet and a diversion capacity of 75 cfs. The headworks include a screened 42-inch HDPE pipe controlled by a slide gate. The dam also includes a 3-feet by 4-feet slide gate sluiceway to bypass flow.

Broadhead Diversion Dam

Duchesne Tunnel

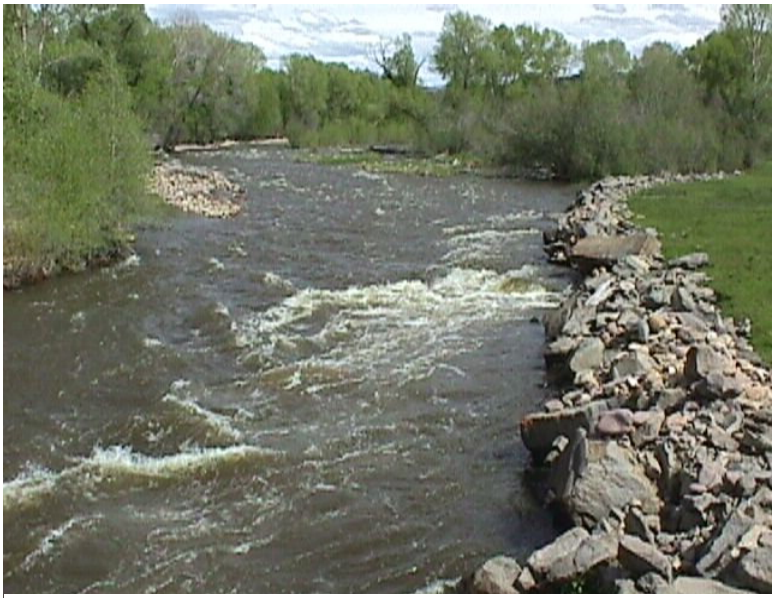
The Duchesne Tunnel conveys water from the Duchesne Diversion Dam generally west six miles into the Provo River drainage. The tunnel is horseshoe shaped and has an approximate diameter of nine feet with a conveyance capacity of 621 cfs. Construction was initiated in 1940 and was completed in 1952 after a seven-year delay due to World War II. Flows through the tunnel are measured via a parshall flume located several feet downstream of the tunnel exit. Flows are monitored through the Association's SCADA system.

Duchesne Tunnel Outlet

PROVO RIVER FEATURES

Upper Provo River

The Upper Provo River is considered to be the reach from the Duchesne Tunnel outlet to the Jordanelle Dam and is approximately 25 miles in length. Following the completion of the Duchesne Tunnel in 1952, the Association, in addition to importing water via the Weber-Provo Canal, began to import water from the Duchesne River for storage in Deer Creek Reservoir (this was prior to the construction of Jordanelle Reservoir). With the addition of this import water to the natural Provo River flows came the necessity to create flood mitigation facilities. Flood easements were obtained from property owners adjacent to the river or flood control dikes were constructed. The United State Bureau of Reclamation (USBR) designed the dikes and easements to convey 3,300 cfs in the Provo River Channel between the Duchesne Tunnel and the Weber-Provo Canal, and 4,300 cfs from the Provo River below the Weber-Provo Canal convergence.



Upper Provo River

The flood easements purchased by the Association grant the right to affect the properties in every possible manner without limitation, except for permanent reservoir storage. The easements do not require maintenance to protect subject lands from damage; in fact, they give the Association full right to pass water from whatever source through these easement boundaries. Erosion and other damage are inherent parts of the flow of water across subject properties. In the past, the Association has performed channel improvements such as realigning the river within the dikes, removal of deadfall, and stabilization of banks with riprap material. Because these improvements are not required, the Association has completed these improvements on a "good neighbor" basis.

The Association completed an Upper Provo River Easement Maintenance Plan in 2001. In that plan, it was recommended that the Association rely on existing flood easements and dikes for passage of import water through the Upper Provo River and discontinue performing unnecessary channel maintenance. These recommendations were based on the fact that the flood easements and dikes were originally purchased and constructed for the purpose of allowing the Association to pass imported flows through the Upper Provo River without further liability for changes resulting from transporting these flows. Since that time, the Association has limited its maintenance of the river channel.

Middle Provo River

The Middle Provo River is considered to be the reach of river between the Jordanelle Dam and Deer Creek Reservoir. Flood easements and/or dikes were also obtained or constructed for this reach of river to allow for imported flows. Historically, the Association also maintained several canal diversions in this reach of river on a "good neighbor" basis. As a result of negotiations with the USBR and Department of Interior, it was determined that the USBR would assume operations and maintenance responsibility for all Project features along the Middle Provo River. Therefore, the Association is not currently responsible to maintain any facilities along the Middle Provo River.

DEER CREEK FACILITIES

Deer Creek Dam and Reservoir

Deer Creek Dam is located on the Provo River approximately 16 miles northeast of Provo, Utah. The dam was constructed in 1938-1941 and consists of 2.81 million cubic yards of fill. The dam is a zoned earth-fill structure 235 feet high with a crest length of 1,304 feet. Deer Creek Reservoir, the impoundment created by the dam, is the only storage feature of the Project. The reservoir capacity is 153,445 ac-ft. The spillway is a concrete chute at the right abutment controlled by two radial gates with a capacity of 12,000 cfs. The

Deer Creek Dam and Reservoir

outlet works through the left abutment consists of a concrete-lined tunnel from the trash rack to the gate chamber. Two steel pipes run from the gate chamber to the Deer Creek Power Plant. Two tube valves control releases. The outlet works has a capacity of 1,500 cfs.

Deer Creek Reservoir covers a surface area of approximately 2,700 acres at full capacity and is used extensively for recreation, including boating, fishing, and swimming. The State of Utah Division of Parks and Recreation administers the recreational activities on the reservoir, including two concessions located on the shore of the reservoir. In 2001, the State of Utah entered into a new 20-year contract with the USBR for operation of all of the recreational facilities. The Project also owns several thousand acres around the reservoir. These lands are managed in accordance with the Deer Creek Resource Management Plan.

Deer Creek Power Plant

The Deer Creek Power Plant was constructed at the base of Deer Creek Dam by USBR in 1958 and consists of two 2,475 kW generators. Releases through Deer Creek Dam are used to generate power to benefit the Association and USBR. Since the plant was placed in operation, the plant has had an average power generation over 25.8 million kwh per year. As part of the Deer Creek Reservoir/ Jordanelle Reservoir Operating Association (DJOA), a marketing plan has been adopted by the Western Area Power Administration (WAPA) to govern the marketing of the surplus power and energy generated at the Deer Creek Power Plant to Utah Municipal Power Agency (UMPA), Utah Association of Municipal Power Systems (UAMPS), and Heber Light and Power (Heber). Separate contracts have been executed to implement the marketing plan, which provides that UMPA, UAMPS, and Heber pay a portion of the cost of operation, maintenance, and repair of the Deer Creek Power Plant and to assist the Association with its repayment obligation for the Project.

Deer Creek Power Plant and Salt Lake Aqueduct Intake

PROVO RIVER AQUEDUCT (PRA) FACILITIES

Murdock Diversion Dam

The Murdock Diversion Dam diverts water from the Provo River to the PRA. The dam is located in Provo Canyon approximately nine miles below Deer Creek Dam. Construction of the diversion dam was completed in 1950. The structure was modified as part of the Provo Reservoir Canal Enclosure Project (PRCEP).

A new trash screen and rake were added, new intake traveling screens were added, a new operations building was constructed, and structural improvements were made throughout the structure. The diversion dam consists of a 22-feet concrete ogee weir with a crest length of 100 feet. The sluiceway is a concrete-gated structure with a 16-feet by 14-feet radial gate located at the left side of the dam. The diversion is a 16-feet by 13-feet radial gate with a diversion capacity of 550 cfs.

Provo River Aqueduct

The PRA runs for approximately 21.5 miles (113,690 feet) from the Murdock Diversion in Provo Canyon, northwest along the foothills of the Wasatch Front to the Point of the Mountain (POM) near the Utah County/Salt Lake County boundary. The Provo Reservoir Canal (PRC) was originally built in the early 1900's by the Provo Reservoir Company, and had a capacity of 180 cfs. In the 1940's, the USBR bought the canal and right-of-way as part of the Project and increased its capacity to 550 cfs. The PRC was enlarged in order to deliver water developed in the Project from Deer Creek Reservoir to irrigation and municipal water users in Utah and Salt Lake Counties. During this time period, the canal traversed through farmland and open areas for most of its length. In 2010, the Association, in conjunction with several other stakeholders, enclosed the PRC. The enclosed PRC, now the Provo River Aqueduct or PRA, is a 120-126-inch diameter pressure pipeline that delivers water from the Murdock Diversion in Provo Canyon to the POM. The PRA has a design capacity of 550 cfs at the Murdock Diversion to the mouth of Provo Canyon and then varies from 626 cfs at that point to 550 cfs at the POM.

Provo River Aqueduct Intake

Provo River Aqueduct Corridor

JORDAN NARROWS FACILITIES/POINT OF THE MOUNTAIN FACILITIES

The Association has several facilities at the terminus of the PRA at the Point of the Mountain (POM). These include the siphon feeding the Welby Jacob Canals, a wasteway, a penstock feeding a turbine/pump station that then feeds the Utah Lake Distributing Company. The POM is also the terminus for Reach 4 of the Jordan Aqueduct. This site includes turnouts to Jordan Aqueduct Reach No. 1 and the Point of the Mountain Aqueduct. Figure 2-2 shows a schematic of the various facilities at the POM and Jordan Narrows.

Siphon

At the terminus of the PRA near the Jordan Narrows, the Association has several facilities associated with the delivery of water. The 72-inch diameter, Jordan Narrows Siphon delivers water under the Jordan River to the Welby-Jacob Canals on the west side of the Jordan River. At this point, a diversion structure diverts water north to the Welby Canal or south to the Jacob Canal.

Wasteway

A wasteway designed to waste water from the PRA down a concrete chute to the Jordan River is also at the POM. This wasteway operates when changes in flow in the PRA would require a wasting of water at the POM. Before the PRA was enclosed, it was used to balance changes in delivery along the canal. The wasteway capacity is 350 cfs.

Provo River Aqueduct Wasteway

Jordan Narrows Penstock and Turbine/Pump Station

As part of the original Project, a turbine/pump facility was built along the Jordan River at the base of the Jordan Narrows Penstock. This facility uses the excess head from the water diverted through the Jordan Narrows Penstock to drive a turbine. The turbine then drives a pump delivering water from the Jordan River, to the north branch of the Utah Lake Distributing Company on the west side of the river.

Jordan Narrows Pump Station

Jordan Narrows Turbine

Water is delivered from the PRA to the turbine/pump through a 60-inch diameter penstock pipeline. The spent water passing through the turbine is then delivered to the south branch of the Utah Lake Distributing Company on the west side of the Jordan River. In 1958, Metropolitan Water District of Salt Lake & Sandy (MWDSLS) obtained Association shares from the Utah Lake Distributing Company in exchange for water pumped from the Jordan River. MWDSLS constructed its own pump station adjacent to the Project turbine/pump station to pump this water to the Utah Lake Distributing Company. The original Project turbine/pump station is operated during periods of adequate water supplies in order to provide water to the Utah Lake Distributing Company without electrical pumping costs. The turbine/pump station is not used during periods of low water supplies so that stored Deer Creek water can be treated and delivered for municipal and industrial use. The Association currently operates and maintains the pump station/turbine facility.

JVWTP and MWDSLS Water Treatment Plant Deliveries

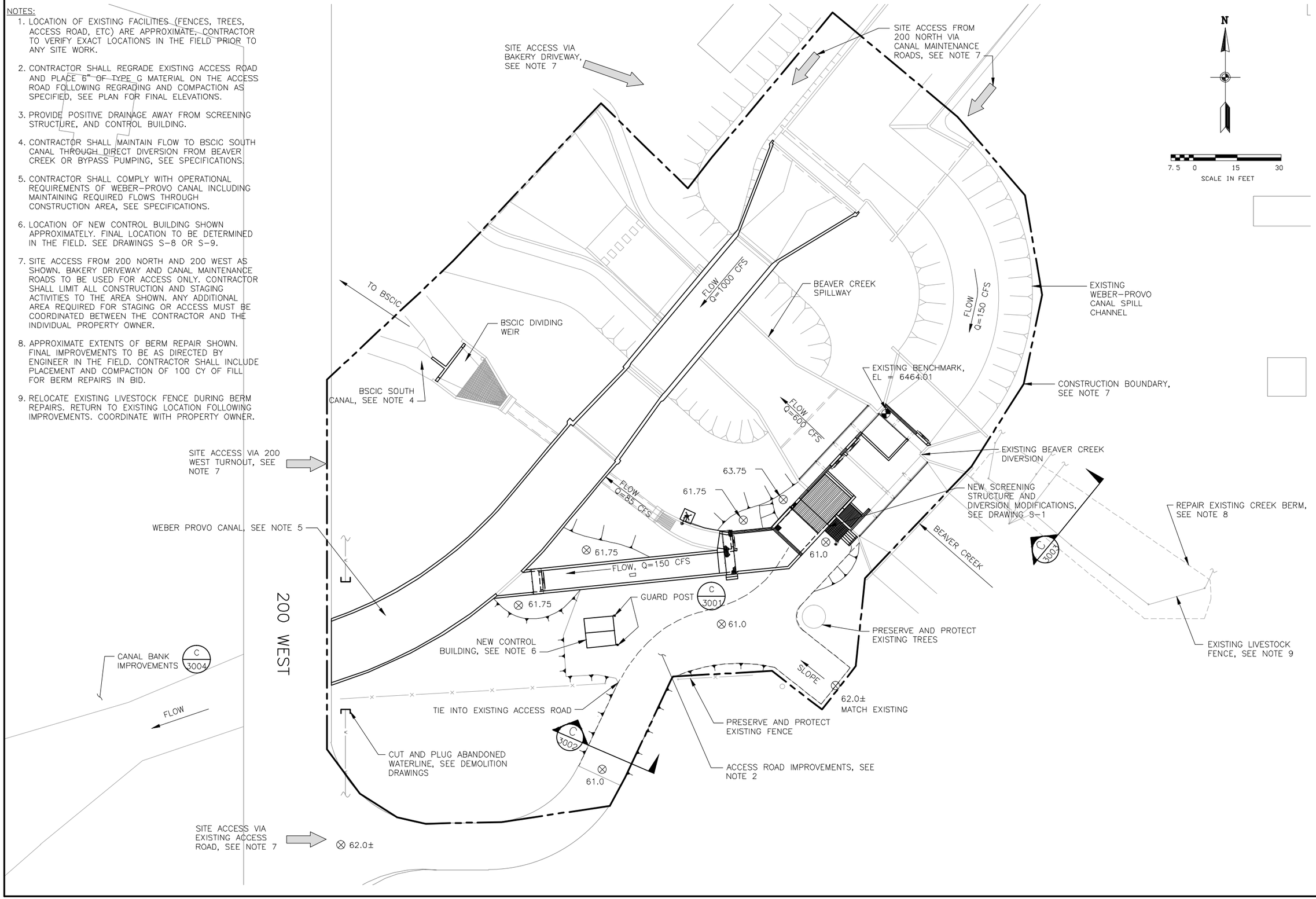
At the end of the PRA at the POM, water can also be delivered into the 69-inch diameter Reach 1 of the Jordan Aqueduct for delivery to the Jordan Valley Water Treatment Plant which is owned by Jordan Valley Water Conservancy District and MWDSLS. In addition, water can be delivered to the Point of the Mountain Aqueduct for delivery to the Point of the Mountain Water Treatment Plant. A 48-inch diameter pipeline from the PRA delivers water east of I-15 where it intersects the POMA. This facility is owned by the MWDSLS.

SALT LAKE AQUEDUCT

The Provo River Project was divided into the Aqueduct and Deer Creek Divisions. The Salt Lake Aqueduct (SLA) and Terminal Reservoir were part of the Aqueduct Division. All other features previously discussed are included in the Deer Creek Division. The Association delivers water to the SLA just below Deer Creek Dam. The SLA was part of the Project, but is owned, operated, and maintained by MWDSLS. The SLA is a 69-inch diameter concrete pipeline, 41.7-miles long, with a capacity of 175 cfs. The pipeline supplies domestic water for Salt Lake and Sandy cities. The SLA was not evaluated as part of this Master Plan Update.

NOTES:

1. LOCATION OF EXISTING FACILITIES (FENCES, TREES, ACCESS ROAD, ETC) ARE APPROXIMATE. CONTRACTOR TO VERIFY EXACT LOCATIONS IN THE FIELD PRIOR TO ANY SITE WORK.
2. CONTRACTOR SHALL REGRADE EXISTING ACCESS ROAD AND PLACE 6" OF TYPE G MATERIAL ON THE ACCESS ROAD FOLLOWING REGRADING AND COMPACTION AS SPECIFIED, SEE PLAN FOR FINAL ELEVATIONS.
3. PROVIDE POSITIVE DRAINAGE AWAY FROM SCREENING STRUCTURE, AND CONTROL BUILDING.
4. CONTRACTOR SHALL MAINTAIN FLOW TO BSCIC SOUTH CANAL THROUGH DIRECT DIVERSION FROM BEAVER CREEK OR BYPASS PUMPING, SEE SPECIFICATIONS.
5. CONTRACTOR SHALL COMPLY WITH OPERATIONAL REQUIREMENTS OF WEBER-PROVO CANAL INCLUDING MAINTAINING REQUIRED FLOWS THROUGH CONSTRUCTION AREA, SEE SPECIFICATIONS.
6. LOCATION OF NEW CONTROL BUILDING SHOWN APPROXIMATELY. FINAL LOCATION TO BE DETERMINED IN THE FIELD. SEE DRAWINGS S-8 OR S-9.
7. SITE ACCESS FROM 200 NORTH AND 200 WEST AS SHOWN. BAKERY DRIVEWAY AND CANAL MAINTENANCE ROADS TO BE USED FOR ACCESS ONLY. CONTRACTOR SHALL LIMIT ALL CONSTRUCTION AND STAGING ACTIVITIES TO THE AREA SHOWN. ANY ADDITIONAL AREA REQUIRED FOR STAGING OR ACCESS MUST BE COORDINATED BETWEEN THE CONTRACTOR AND THE INDIVIDUAL PROPERTY OWNER.
8. APPROXIMATE EXTENTS OF BERM REPAIR SHOWN. FINAL IMPROVEMENTS TO BE AS DIRECTED BY ENGINEER IN THE FIELD. CONTRACTOR SHALL INCLUDE PLACEMENT AND COMPACTION OF 100 CY OF FILL FOR BERM REPAIRS IN BID.
9. RELOCATE EXISTING LIVESTOCK FENCE DURING BERM REPAIRS. RETURN TO EXISTING LOCATION FOLLOWING IMPROVEMENTS. COORDINATE WITH PROPERTY OWNER.



Bowen Collins & Associates, Inc.
CONSULTING ENGINEERS

REVISIONS

NO.	DATE	REV. BY	DESCRIPTION

BEAVER CREEK DIVERSION REHABILITATION PROJECT
PROVO RIVER WATER USERS ASSOCIATION
PLEASANT GROVE, UTAH

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING

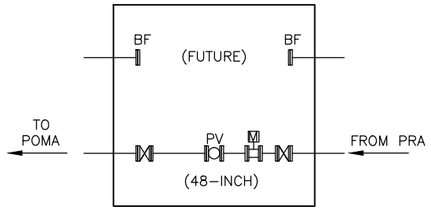
DESIGN K. LARSON
DRAWN P. COLOSIMO
REVIEW B. MAYERS
CHECKED M. COLLINS
APPROVED

CIVIL SITE PLAN

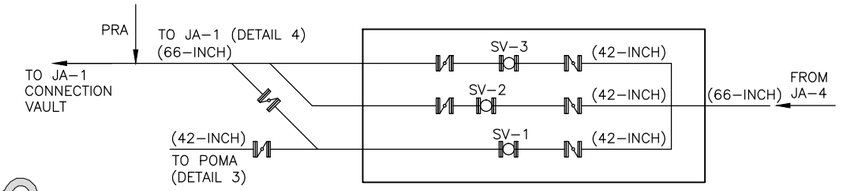
DATE: DECEMBER 2004
PROJECT NUMBER 06-04-02

DRAWING NO. 2-1
SHEET 6 OF 39

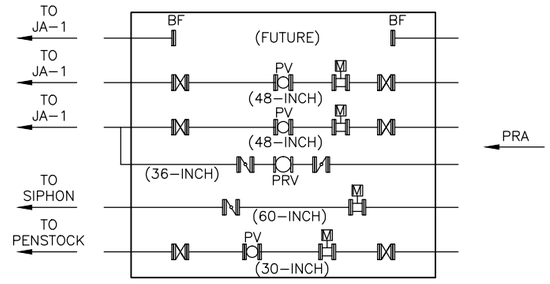
P:\Provo River WUA\Beaver Creek Diversion\Drawings\sht\06-04-02_C-02.dwg Oct13,2014 - 4:41pm



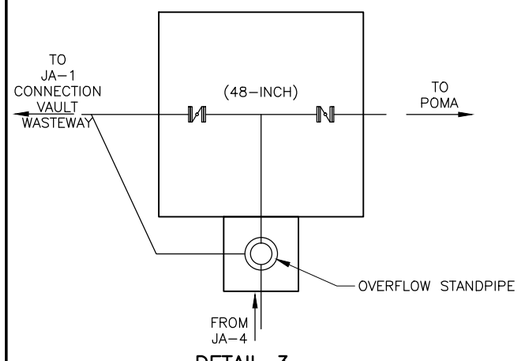
DETAIL 1
POMA TURN OUT FROM PRA



DETAIL 5
JA–4 SLEEVE VALVE STRUCTURE



DETAIL 2
POTM FLOW CONTROL VAULT ON PRA



DETAIL 3
POMA CONNECTION VAULT FROM JA–4

DETAIL 4
JA–1 CONNECTION VAULT

SYMBOLS
- N – GATE VALVE
- PV – PLUNGER VALVE (PRESSURE REDUCING)
- SV – SLEEVE VALVE
- M – FLOW METER
- N – BUTTERFLY VALVE

Figure 2–2
POINT OF THE MOUNTAIN FACILITIES

Metropolitan Water District of Salt Lake & Sandy
Provo River Water Users Association
Jordan Valley Water Conservancy District

Bowen Collins & Associates, Inc. Consulting Engineers

C:\Users\jcollins\Desktop\NEW_POM Fac. Figure 1.dwg Nov24,2014 – 5:01pm

CHAPTER 3
PROJECT CONDITION ASSESSMENT

INTRODUCTION

The Project consists of approximately 70 miles of natural river channel, as well as pipelines, open canals, tunnels, river diversions, and Deer Creek Dam and reservoir. The Project was constructed primarily between 1938 and 1951, with the addition of the hydroelectric powerhouse at Deer Creek Dam in 1958. Since the early 1990s, the Association has upgraded several of its facilities as part of its master plan efforts. The most recent was the construction of the Provo River Aqueduct. In May 2014, the master plan team visited a majority of the facilities throughout the Project to assess the condition and deficiencies of each facility. The following summarizes the condition and deficiencies of each facility.

WEBER RIVER FEATURES

Weber-Provo Diversion Structure

The Weber-Provo Diversion enables water from the Weber River to enter the Weber-Provo Canal. The diversion is located on the Weber River approximately one mile east of Oakley, Utah. The following summarizes the condition assessment and deficiencies that were identified:

- There are problems with debris clogging the screening structure at this location during high runoff periods. The Association removes a large amount of debris from the forebay during years of high flows. A majority of the debris is large root balls and trees and is difficult to remove. This debris prevents the Association from diverting its available water rights because the capacity is reduced when the debris clogs the screens.
- There are safety issues associated with the removal of debris from the existing screening structure. Debris must be removed manually because large equipment cannot access this part of the structure. Debris that is too large to be removed manually can cause reduced diversions for the remainder of the spring runoff and adversely affect the Association's water supplies.
- A radial gate structure downstream of the original sluice gates was installed in the early 1990s. Some consideration was given to removing the old sluice gate structure at that time but staff was hesitant to remove the old gates. Present plans call for removing the old sluice gate structure and installing new intake screens and constructing a bridge platform that will allow Association personnel to use equipment to safely remove large debris from the screens.
- There are some icing problems at the radial gate structure in the winter. It was noted that the structure includes heat-tracing conduits that could heat the perimeter seals of the radial gates. However due to the energy costs to maintain the perimeter seals and ice bonding to the face of the gates, it has been determined that this method of winter operation would be impractical.

- Some consideration has been given to providing a small underwater wintertime diversion into the canal. Present plans call for installing a low flow gate and conduit that would allow the Association to divert flows in the winter without having to operate the radial gates.
- There are problems with vandalism at this location. The following was discussed, in order to prevent the vandalism:
    - Provide remote video monitoring
    - Provide protection for power meter and breaker panel. A building to house power equipment, SCADA equipment and an emergency generator is planned at the site as part of the proposed improvements.

Weber-Provo Canal Oakley Gage (Parshall Flume)

The Oakley Gage utilizes a parshall flume to measure flow at the head of the Weber-Provo Canal. The following summarizes the condition assessment and deficiencies that were identified at the Oakley Gage:

- This flume is often flooded by a downstream check structure, causing inaccuracies in the flow measurement at this location.
- Options were discussed regarding an upgrade of this flow measuring structure to improve accuracy (specifically during low flows) and to eliminate hydraulic/flooding problems associated with the existing structure. Options included raising the existing flume or modifying the channel to allow ultrasonic flow monitoring.
- The concrete walls of the flume are severely weathered (freeze-thaw damage). Walls of the structure need to be repaired regardless of the future method of flow monitoring.
- A new concrete or block building is required at this location.

Weber-Provo Canal Glen Gibbons Check Structure

There are three check structures located along the Weber-Provo Canal. The Glen Gibbons Check Structure is the first of the three. The following summarizes the condition assessment and deficiencies that were identified at the Glen Gibbons Check Structure, but the same deficiencies apply to all three check structures:

- Need to replace covers on radial gate actuator. The existing cover is difficult to open/close and is not weatherproof.
- The level meter wet well needs to be relocated to allow monitoring of low forebay levels.
- The radial gate needs general maintenance (predominantly recoating for corrosion control).
- There is an old manual check structure located a few hundred feet upstream that is no longer utilized. There was discussion on the need to remove the old check structure.

Weber-Provo Canal Concrete Drop Structure

The concrete drop structure is located just north of Kamas where the flow line of the Weber-Provo Canal drops 10-15 feet in elevation. The following summarizes the condition assessment at this location:

- The structure appears to be in good condition, although the floor of the drop structure has not been inspected for some time.
- Fencing and other reasonable protective measures are recommended at this site.

Beaver Creek Diversion Structure

The Beaver Creek Diversion Structure is located at the intersection of Beaver Creek and the Weber-Provo Canal in Kamas. The concrete structure was designed for several purposes including: to divert all of the flow in Beaver Creek into the Weber-Provo Canal except a small diversion downstream and to divert Weber-Provo Canal water back into the Beaver Creek. Parts of the structure were rehabilitated in 2008. The following summarizes the condition assessment and deficiencies that were identified at the Beaver Creek Diversion:

- There is an existing bridge just downstream of the Beaver Creek Diversion Structure. The bridge is owned by Kamas City and was installed over the flow restricting reach of the canal. In order to enlarge this section of canal, the entire bridge structure would have to be replaced. Due to an agreement that was assumed when the Association took over responsibility for the Weber-Provo Canal from the Weber River Water Users Association, the Association has full responsibility for the replacement or upgrades on this bridge.
- The Wagstaff Check Structure backs water into this section of canal, at times.
- The undershot below the Weber-Provo Canal needs to be replaced. The approach section of the floor and sidewalls was replaced in 2005??- when the floor section failed, but the rest of the structure is significantly deteriorated and needs to be replaced.

Weber-Provo Canal Wagstaff Check Structure

The Wagstaff Check Structure is the second of three check structures located on the Weber-Provo Canal. The deficiencies identified for the Glen Gibbons Check Structure also apply for this check structure.

Weber-Provo Canal Walden Lambert Check Structure

The Walden Lambert Check Structure is the third of the three check structures. The deficiencies identified for the Glen Gibbons Check Structure also apply for this check structure, with the following addition:

- There is vibration occurring in the radial gate at this structure when water is flowing over the top of the gate. The cause needs to be determined and addressed as soon as possible to prevent damage to the gate.

Weber Provo Spillway and Stilling Basin

The Weber Provo Spillway and Stilling Basin is located near the end of the Weber-Provo Canal. The spillway drops the canal flow from the Kamas Valley into the Provo River flood plain. Historically, the Association has had problems with tumbling rocks and debris eroding the stilling basin. The following summarizes the existing condition assessment and deficiencies that were identified for the Weber Provo Spillway and Stilling Basin:

- A rock trap was constructed just upstream of the spillway to collect rocks and debris in the canal. Erosion of the stilling basin floor should continue to be monitored. Any rocks that end up in the basin should be removed prior to each water season. The rock trap should prevent large rocks from entering the basin from upstream.
- Modifications may be considered at the downstream toe of the stilling basin to prevent rocks and gravel from entering the basin from downstream.
- A review and assessment of the stilling basin should be conducted to monitor the effectiveness of the rock trap and to see if any damage has occurred since the rock trap was installed

Weber-Provo Canal Francis Gage (Parshall Flume)

- The gaging station, located just downstream of the stilling basin, needs to be relocated away from the highway. The measurement structure needs to be modified to allow for high and low flow measurement without staff having to access the channel.
- The existing building structure is in poor condition and needs to be replaced.

DUCHESNE RIVER FACILITIES

Duchesne Diversion Dam

The Duchesne Diversion Dam is located on the north fork of the Duchesne River approximately 21 miles east of Kamas, Utah and diverts Duchesne River water directly into the Duchesne Tunnel. The following summarizes the condition assessment and deficiencies that were identified at the Duchesne Diversion:

- The bypass radial gate walls have settled and do not allow the radial gate to open completely.
- The Association needs emergency facilities at the diversion to allow for several nights stay during an emergency. The diversion is very remote and difficult to access; it would be beneficial to have emergency supplies such as food, bedding, heat, etc. at this site in case Association personnel need to spend the night.
- The main weir across the river has never been rated. It would be advantageous for the Association to know, based on level measurement, how much flow is going over the weir in periods of high flows.
- There needs to be a better means of providing low flow measurement at the outlet of the tunnel. The existing flume cannot accurately measure low winter flows due to the fact that it was designed to measure high flows in the spring.
- The building at the outlet needs to be upgraded. The existing generator is located outside and the propane tank is not buried. Recommendations include relocating the building higher up on the slope to allow for easier access and more exposure for the solar panels that supply power to the structure.

Broadhead Diversion Dam

The Broadhead Diversion Dam diverts Little Deer Creek water through a pipeline to the Duchesne River upstream of the Duchesne Diversion Dam. At this point, the water is combined with flow from the north fork of the Duchesne River and is directed through the Duchesne Tunnel. The diversion screens and gates were updated as part of a project by the Association in 2008 last few years. The pipeline from the diversion to the Duchesne Diversion Dam was also replaced. There were no deficiencies identified.

UPPER PROVO RIVER FACILITIES

There are several diversions along the Upper Provo River that divert Project water. In addition, the Association maintains a series of dikes constructed as part of the Project to allow for imported flows from the Duchesne to be transported in the river.

- Both the Speed Creek and Carlisle diversions need to be replaced.
- A survey needs to be performed on the Project dikes and easements along the river and the information incorporated into the Association's GIS.
- The top of the dikes need to be maintained to ensure access for operations and maintenance.

DEER CREEK FACILITIES

Deer Creek Dam and Reservoir

Deer Creek Dam is located on the Provo River approximately 16 miles northeast of Provo, Utah. The earth filled structure was constructed in 1938-1941. The following summarizes the condition assessment and deficiencies that were identified at the Deer Creek Dam and Reservoir:

- The use of Project lands around the reservoir should be reviewed in the context of the Association's Real Property Management policy. Impacts from encroachments, livestock grazing, recreation, etc. need to be reviewed.
- The existing spillway plunge pool from the reservoir needs to be assessed and may need to be rehabilitated. The original spillway floor from just downstream of the radial gates to just above the stilling pool was rehabilitated as part of the Safety of Dams work from 2003-2005Accurate flow measurement over the spillway is desired by the Association operations staff and the Provo River Commissioner.
- The dam control gates, guard gates and tube valves need to be programmed for replacement. If replacement is approved by USBR, they would pay 50% of this cost.
- The small diameter piping (fire, water, lubrication systems) in the gate chamber needs to be replaced.

Deer Creek Power Plant

The Deer Creek Power Plant, completed in 1958, is located at the base of Deer Creek Dam. Releases from Deer Creek Dam are used to generate power. The power plant consists of two 2,475 kW generators. The following summarizes the condition assessment and deficiencies that were identified at the Deer Creek Power Plant:

- The access road to the dam needs to be improved. It has settled in several locations, needs larger turning radii, and needs to address surface drainage issues.
- It would be beneficial to integrate the power plant with the Association's SCADA system.
- It would be beneficial to have controls for penstock guard gates located in the control building so controls could be operated from this building during an emergency.
- The hillside south of the power plant is a concern. The hillside has potential for a landside that could damage the power plant. Also, the avalanche chute and its possible effects need to be reviewed. Association personnel have recently modified the chute to allow easier snow flow down the chute to the bottom of the dam, bypassing the power plant.

PROVO RIVER AQUEDUCT FACILITIES

Murdock Diversion Dam

The Murdock Diversion Dam diverts water from the Provo River to the PRA The dam is located in Provo Canyon approximately seven miles below Deer Creek Dam. The following summarizes the condition assessment and deficiencies that were identified at the Murdock Diversion:

- The radial gate needs to be rehabilitated and recoated.

PRA

- The JA-1 turnout needs to have an additional valve installed to bring the capacity up to the required design flow of 270 cfs.
- The Savage property siphon discharge needs to be resolved.
- The American Fork and Dry Creek siphon blow offs need to be investigated for increasing the flow capacity for the blow off at each location.
- There are numerous encroachment issues along the PRA. Staff needs to work on resolving these issues after title transfer.

Point of the Mountain

The Association recently completed the PRA which included almost entirely new facilities at the Point of the Mountain (POM). The following summarizes the condition assessment and deficiencies that were identified at the POM.

- The South branch of the Utah Lake Distributing Company pipeline will need replacement in the next few years.
- The wasteway spillway will need rehabilitation in the next few years.

Jordan River Turbine Pump Facility

As part of the original Project, a turbine pump facility was built adjacent to the Jordan River at the base of the Jordan Narrows Penstock. This facility uses the excess head from water diverted through the Jordan Narrows Penstock to drive a turbine. The spent water from the turbine feeds the South Branch of the Utah Lake Distributing Company canal. The turbine is directly connected by a common shaft to a pump which delivers water from the Jordan River to the North Branch of the Utah Lake Distributing Company canal. These canals are on the west side of the Jordan River.

ADMINISTRATION AND MAINTENANCE BUILDINGS

The following improvements were identified for the administration and maintenance buildings.

- The landscape plan needs to be implemented for the office building.
- The HVAC systems on the buildings needs to be improved.
- A study needs to be completed to determine the feasibility of installing solar power on the buildings.

KAMAS VALLEY BRIDGES

The Association has contracts with Kamas City and Wasatch County to repair/replace bridges that were installed when the original Weber-Provo Canal was constructed. The Association replaced two bridges in Kamas City in 2007. The following bridges could be required to be replaced by the two entities.

- Kamas City
    - 200 West
- Wasatch County
    - Upper Loop Road (north and south branches)
    - Lambert Lane
    - Boulderville Road

SUMMARY

The facilities throughout the Project are generally in good physical condition. A majority of the issues identified in this chapter would improve the operation and maintenance of these facilities. Chapter 6 identifies Master Plan Projects that will resolve a majority of the issues discussed in this chapter.

CHAPTER 4
PREVIOUS MASTER PLAN PROJECTS

BACKGROUND

The Project was completed in the 1950s but the Association did not complete its first master plan until 1995. That master plan examined the Association's water rights, operation, performed a condition assessment of Project facilities, and proposed a capital improvement plan. The plan identified twenty projects to be completed. Major projects identified in the master plan were the Provo Reservoir Canal Enclosure, a new office/shop complex, and rehabilitation of the Beaver Creek Diversion. Each of these projects has been completed along with a majority of the other projects that were identified in that plan. In 2003, the Association completed an update to the master plan. As part of the update, forty projects were identified for implementation. Major projects identified included:

- Provo Reservoir Canal Enclosure
- Combined Office/Shop Facilities
- Beaver Creek Diversion
- Deer Creek Foundation Improvements (completed by USBR, 15% funded by the Association)
- SCADA Implementation throughout the system
- Broadhead Diversion Structure Upgrades
- Several projects related to improvements to the Provo Reservoir Canal before enclosure including:
    - Screening at the siphons
    - Provo Reservoir Canal survey

In addition to these projects, the Association dealt with several major projects that were either by agreement or projects where the opportunity for outside funding presented itself. These projects were not identified in the 2003 Master Plan. These projects included:

- Constructing a screening facility for the I-15 sihpon in conjunction with the turnout for the Point of the Mountain Aqueduct as part of MWDSLS's project to bring water to the Point of the Mountain Water Treatment Plant.
- Replacement of two bridges in Kamas City required by contract as a result of the original Weber-Provo Canal construction.
- Replacement of the Siphon and Penstock at the Point of the Mountain in response to a gravel/sand operator (Staker Parsons) desire to mine gravel from the area traversed by the existing siphon and penstock.

- Replacement of the Deer Creek Dam operations building as part of the construction of upgrades to the Salt Lake Aqueduct by the MWDSLS. The Association paid for a third of the cost of the new facility which houses the operators for the dam.

The Association has historically funded these projects through the annual capital assessment charged to shareholders. This capital assessment has funded the majority of the projects without any required long term financing. Two projects have required financing. The Provo River Aqueduct costs are being repaid by those shareholders and non-shareholders with capacity in the PRA. The Association also has a long term payment to the USBR for the Deer Creek Foundation improvements completed in 2008. This annual payment is $246,480. This payment will run through fiscal year 2024. The payment presently represents a major portion of the capital assessment of the Association.

Table 4-1 lists the master plan projects completed since 1995, and the total expended on each project. Projects from the 1995 and 2003 master plans that have not been completed and are still deemed necessary have been incorporated into the recommendations of this master plan update and can be found in chapter 8.

Table 4-1
Completed Master Plan Projects
Provo River Water Users Association

Project	Project Feature	Project Participant	Total Expended
Access Vehicles	Overall Project	None	$11,600
Provo Reservoir Canal Survey	Provo Reservoir Canal	None	$242,155
Upper Provo River Plan	Upper Provo River	None	$179,312
SCADA	Overall Project	None	$986,713
Combined Office/Shop	Overall Project	None	$2,984,370
POTM Screening Facility	Provo Reservoir Canal	None	$274,623
Geographic Info. System	Overall Project	None	$150,000
Deer Creek Penstock Recoating	Deer Creek Dam	USBR	$111,375
Deer Creek Operations Building	Deer Creek Dam	MWDSLS	$110,096
Master Plan Update-2003	Overall Project	None	$71,522
Water Conservation Plan	Overall Project	USBR	$24,593
Dry Creek Screens	Provo Reservoir Canal	Highland City	$183,540
POTM Screens SCADA Integration	Provo Reservoir Canal	None	$22,630
Beaver Creek Diversion	Weber Provo Canal	USBR	$502,156
Dry Creek SCADA	Provo Reservoir Canal	None	$15,541
Weber-Provo Canal Survey	Weber Provo Canal	None	$143,105
Broadhead Diversion	Duchesne	USBR	$599,607
Deer Creek Dam Spillway Repair	Deer Creek Dam	USBR	$78,884
POMA Project	Provo Reservoir Canal	MWDSLS	$270,365
Kamas Bridges (Box Culverts)	Kamas Bridges	None	$848,757
Narrows Cathodic Protection	Point of the Mountain Facilities	MWDSLS, JVWCD	$31,266
Beaver Creek Channel Repair	Weber Provo Canal	None	$23,814
Siphon and Penstock Replacement	Point of the Mountain Facilities'	Staker Parsons	$6,801,560
Provo Reservoir Canal Enclosure	Provo Reservoir Canal	CUWCD, JVWCD, PRWUCO	$150,200,000
Utah Lake Distributing North Branch Repair	Point of the Mountain	None	$188,721.95
Water Rights Management and Drought Mitigation Plan	Overall Project	USBR	$136,345
Water Conservation Plan Update	Overall Project	None	$29,478
Total Expenditures			**$165,222,128**

CHAPTER 5
ABILITY OF PROJECT TO MEET EXISTING AND FUTURE CHALLENGES

INTRODUCTION

This chapter identifies existing and future challenges that have or will have an effect on the Project's ability to deliver water to its shareholders. This chapter also reviews the ability of the Project and the Association to meet those challenges.

BACKGROUND

Project facilities were originally constructed by the USBR for the benefit of the Association shareholders. Although USBR retains overall responsibility and title to the Project (with the exception of the Provo River Aqueduct), USBR has delegated the responsibility of operating and maintaining Project facilities to the Association. The Association has overall ownership and responsibility for the PRA and its right of way. USBR and the Association work together to develop standards to which facilities are maintained or improved.

The area served by the Project has evolved over the years. The Project once served areas dominated by open farmlands. Today, the Project serves an area that is increasingly identified by residential and commercial developments. These changes have affected the nature of the Project facilities and operations. It is expected that the operations of the Project will continue to evolve in the future. This chapter helps identify some of the existing and future challenges to the Project and its ability to meet these challenges.

PROJECT CHALLENGES

As the operation of the Project evolves, the challenges and requirements placed upon the Project are likely to change. These challenges have been categorized into five areas including requirements/demands on water, facilities, lands, operations, and from regulatory agencies.

Water Demands

Water Supply. The Project's water supply has not been able to meet the Association's full allotment during extended dry periods. In addition, a single dry year event, as was experienced in 1977, has been known to require allocation reductions. Extended dry periods such as 1987 to 1992, 2000-2003, and the current period beginning in 2012 may require the Association to make significant reductions in allocations. This is evident in the 2013 stockholder allocation of 43.5 percent, the lowest allocation on record.

It is recommended that the Association continue to maximize its existing water rights and implement the recommendations of the Water Rights Management and Drought Mitigation Plan completed in 2014.

This plan developed recommendations for ways to maximize the Associations water rights. Many of these recommendations are included in the proposed projects to be completed in this report.

Water Delivery

The primary purpose of the Association is to efficiently deliver water to its shareholders. Although Project delivery facilities have historically been able to satisfy shareholder demands and significant improvements to facilities have been made, demands will require the Association to optimize the use of each Project feature. Chapter 8 identifies projects that will help the Association optimize its use of delivery facilities and will improve the Association's ability to effectively meet the demands of its shareholders. The following paragraphs briefly discuss some of the recommended Master Plan Projects that will help optimize the delivery facilities.

Weber-Provo Canal – The Weber-Provo Diversion diverts water from the Weber River to the Provo River. Currently, diversions from the Weber River are restricted due to flow limitations in the Weber-Provo Canal. Some of the Master Plan Projects identified include improvements to the Weber Provo Diversion Structure, improvements to the check structures, and restoring the capacity of the Weber-Provo Canal. Completion of these Master Plan Projects will increase the flow capacity in the Weber-Provo Canal, thus maximizing the ability to make diversions from the Weber River to the Project.

Duchesne River Diversion Facilities – The Duchesne River Diversion Facilities divert water from the Duchesne River to the Provo River. Master Plan Projects include improvements to flow measurement and improvements to the outlet from the Duchesne Tunnel.

Upper Provo River – The Upper Provo River is considered the reach from the Duchesne Tunnel outlet to the Jordanelle Reservoir. The Association has purchased flood easements which allow for import water to be conveyed through this reach. The easements do not require maintenance to protect surrounding lands from damage; in fact they give the Association full right to pass water from whatever source through these easement boundaries. The Upper Provo River facilities should meet the future needs of the Association shareholders.

Provo River Aqueduct – The PRA delivers water to shareholders as it traverses northern Utah County. The PRA was recently constructed to enclose the Provo Reservoir Canal and should allow the Association to deliver needed water from the Murdock Diversion to its shareholders in Utah and Salt Lake County. Several smaller projects have been identified for the PRA.

Water Quality. There is a tremendous amount of growth in Wasatch, Summit and Utah Counties. This continued growth may impact the quality of Project water. Continued development around Project facilities increases the potential of polluted water being discharged into Project supplies. As these developments continue, the Association will need to rely on its sister agencies that are involved in managing water quality in the Provo River watershed and around the Weber-Provo Canal to ensure that degradation of water does not affect its shareholders.

The Provo River Watershed Council (PRWC) monitors water quality in the Provo River watershed. The PRWC is made up of representatives from Metropolitan Water Districts of Salt Lake and Sandy, Provo, and Orem. Also the Central Utah Water Conservancy District, Jordan Valley Water Conservancy District, and Wasatch County. Historically the Association has had a limited role in that organization although the watershed's water quality has a direct impact on the Association's ability to deliver quality water to its shareholders. As the Heber Valley further develops, there will be more nutrient loading into Deer Creek Reservoir. The Heber Valley Special Service District wastewater treatment plant presently uses lagoons and is proposing to use a rapid infiltration basin to dispose of its wastewater. The nutrient loading from this plant will affect the water quality in Deer Creek. In addition, the wastewater treatment plant owned and operated by the Jordanelle Special Services District will someday be another source of nutrient loading in the Provo River system upstream of Deer Creek Reservoir. An emerging concern relates to invasive species, namely Quagga mussel.

The water released below Deer Creek Dam is generally high in dissolved phosphorus during the summer and fall. Deer Creek Reservoir at times has low Dissolved Oxygen and high phosphorus concentrations at the bottom of the reservoir. This water, because the outlet of the reservoir is at the bottom of the reservoir, is passed through the dam to the lower Provo River and into the diversions downstream. One of the projects identified would be to construct an inlet tower at Deer Creek Dam to allow for water to be taken from different levels in the reservoir. This would not only help with water quality, but also with temperature of the water released which would help with the treatment of the water downstream for municipal deliveries.

Facilities and Lands Demands

Encroachments. Growth in Wasatch, Summit and Utah Counties will result in more requests to impact or cross existing Project facilities. The Association has established a license agreement process to help protect the Project's interests. The agreement process requires all agencies that desire to cross, excavate, or otherwise impact Project facilities, easements and rights-of-way to meet general guidelines and specifications established by the Association and/or USBR. Through this process the Association ensures that encroachments on Project lands and facilities are compatible with present and future uses of the lands and facilities. The license agreement process also provides a method to document each of the approved encroachments.

The Association has also established a GIS database to help inventory all Project lands. GIS provides a graphical way to access stored information in a database. The Association's GIS database includes mapping, ownership records, boundary descriptions, land uses, easements, etc. for each parcel of land within the Project. The GIS allows users to quickly identify and verify status of Project lands and features, and has been extremely valuable in Association efforts to resolve right-of-way encroachment and other issues. Continued maintenance and administration of the GIS database and the license agreement process will continue to require the Association staff time, as well as technical support. Project features that have not been input into the GIS system are the dikes and flood easements along the Upper Provo River. These will need to be added to the GIS database.

Facility Maintenance and Improvements. As part of this 2014 Master Plan Update, the Master Plan Team visited a majority of the facilities throughout the Project to assess the condition and deficiencies of each facility. Chapter 5 summarizes these condition assessments. In general, despite their age, the facilities throughout the Project are in fairly good condition. However, a majority of the features are over 50 years old and with additional maintenance and minor improvements would increase the Association's ability to efficiently operate the Project. Chapter 8 identifies the recommended maintenance and improvement projects for the various facilities. The recommended improvements range from minor repair to existing structures to major restoration of the Weber-Provo Canal. It is estimated that it will take several years to complete all of the projects identified on the Master Plan Projects list. Completion of these projects will require time of the Association staff along with the assistance of outside contractors.

Trespassing/Security. Trespassing and security is a problem at many of the facilities throughout the Project. For example, the Murdock Diversion which is completely fenced off is a popular swimming location in the summer months. Trespassers cut through or climb the fence to swim in the forebay of the diversion. The Association has installed No Trespassing signs and has cut down trees that are commonly used for swinging into the forebay. These measures have not significantly reduced the amount of trespassers. It is recommended that security be evaluated at each of the Project features. The Master Plan Projects identify the need for a vulnerability assessment of the Project. This assessment will evaluate the vulnerability of the Project, including identifying critical assets, threat assessment, likelihood of attack, and security system effectiveness. The project will also make recommendations for improvements to the security procedures.

Operations Demands

Conversion from Irrigation to Municipal Deliveries. The demands on how the Association operates the Project have changed and will continue to change. Some examples of demand changes include the need for non-irrigation season deliveries, increased water quality concerns, differing water use patterns (higher peaks), and requirements for quicker flow changes.

Safety. Safety is always of concern to the Association. Safety includes the general welfare of the Association's staff, shareholders, and the general public. As development continues to encroach upon Project facilities, safety will continue to be an important issue.

Regulatory Demands

Environmental. The country as a whole and the water industry in particular are facing ever increasing environmental and regulatory requirements. This will not diminish in the future. The requirements include the mandate from the Endangered Species Act to not cause further harm to the endangered June sucker in the Provo River and the four endangered species in the Colorado River. Continued Association diversions from the Provo River and the Upper Duchesne River depend on working with the environmental and regulatory community to develop solutions for recovering these species.

Another environmental regulatory demand that will affect construction of new features within the Project is the National Environmental Protection Act (NEPA). NEPA requires that all Federal agencies prepare a detailed environmental analysis for "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of human environment". Recent examples of how NEPA regulations have affected the Association include the completed Environmental Assessment (EA) for the PRC Enclosure Project and the EA for the PRC Title Transfer Project. The EA for the PRC Enclosure Project was required as part of NEPA regulations to document and analyze impacts of the PRC Enclosure Project and the quality of the human environment. The EA examined the Proposed Action and provided sufficient evidence and analysis for determining that an EIS was not needed. The transfer of title of the PRA will eliminate the need for performing NEPA studies for projects related to the PRA.

Environmental and regulatory requirements will continue to be enacted, and as a result, the Association will spend time dealing with these issues.

Water Rights. It is essential that the Association continue to monitor the status of its existing water rights and continually look for methods to maximize available water supply. Some Association water rights require that certain criteria be met before utilizing the right. For example, certain water rights are based on high flows in the river, elevation in Utah Lake, other rights having been met, etc. The recommendations of the the Water Rights Management and Drought Mitigation Plan needed to be implemented.

Other Demands

Technology/Automation. The Association has developed a SCADA system for remote control of Project facilities and monitoring flows and water levels throughout the Project. Automation within the Association's system is required to optimize the Association water supplies.

Title Transfer

As part of the PRA project, the Association negotiated with the USBR and other project participants to transfer the title of the PRA, its right-of-way, and the office/shop complex to the Association upon completion of the PRC Enclosure Project. The PRA and the office/shop complex were transferred from the USBR to the Association on October 31, 2014. This will have an effect on the management of the facilities by the Association. Lands could be adversely possessed by an adjacent landowner without the protection of the federal ownership. As a result, Association staff will need to be more vigilant in monitoring any encroachments on Association lands.

SUMMARY

As growth continues in Wasatch County, Summit County and along the Wasatch Front, the operational methods of the Project will evolve. This evolution may require changes to the operation of the Project and the Association. The following table summarizes these changes and identifies recommendations.

Table 5-1
Existing and Future Challenges of the Association

Demands	Recommendations
Water Demands	
Water Rights	▪ Maximize utilization of existing water rights
Water Delivery	▪ Optimize use of existing facilities ▪ Implement Master Plan Projects
Water Quality	▪ Be aware of needs of others related to water quality management
Facilities and Lands Demands	
Encroachments	▪ Continue to facilitate GIS and license agreement process
Facilities Maintenance/Improvements	▪ Implement Master Plan Projects
Trespassing/Security	▪ Complete vulnerability assessment ▪ Improve security procedures
Operations Demands	
Deliveries	▪ Upgrade/modernize Project operations to be more responsive to quicker flow changes and other requirements of municipal deliveries
Safety	▪ Implement safety measures
Regulatory	
Environmental	▪ Become more fully aware of environmental issues
Water Quality	▪
Water Rights	▪ Continue involvement in maximizing use of and protecting existing rights
Other	
Technology/Automation	▪ Continue appropriate implementation of technological solutions ▪ Monitor Association lands and rights-of-way transferred to Association ownership through title transfer

CHAPTER 6
NEEDED SYSTEM IMPROVEMENTS

OVERALL OBJECTIVES

The overall objectives of the study effort were to identify needed improvements to the Project facilities to continue or more efficiently deliver the Associations' water supply to shareholders, to identify the costs of those improvements, and to develop an affordable funding plan. This chapter describes how the needed improvements were identified, their description by Project feature, and benefits of each of the Projects to the shareholders.

IDENTIFICATION OF PROJECTS

BC&A met with Association management to review past master plans and the status of the overall Project in February 2014. Because of that meeting, an initial list of needed projects was developed. In March 2014, BC&A met with an expanded group of Association staff that included operations and maintenance personnel to review the list developed by management, add or delete projects, and otherwise refine the list of needed improvements. These two meetings and subsequent discussions with staff and the Board of Directors led to the proposed improvements identified in this Chapter.

BACKGROUND

The Association completed its initial master plan in 1995. All of the projects identified in that master plan have been completed. The Association developed an update to that master plan in 2003. All of the projects identified in that master plan have been completed except the following:

- The lowering of Glen Gibbons check structure
- The modifications to the Weber-Provo Diversion intake
- The Deer Creek Power Plant generation and revenue analysis
- Improvements to the Weber-Provo Canal drop structure
- A Project Lands Inventory (GIS), (partially complete)
- An overall Vulnerability Assessment for the Association
- Constructing a retaining wall South of Deer Creek Power Plant
- Fixing, repairing, or replacement of the guard gates at Deer Creek Dam

The modifications to the Weber-Provo Diversion intake are planned for 2015. The project lands inventory has been ongoing but has not yet been completed. Each of the other projects has not yet been scheduled for completion.

PROJECTS

In the following sections each of the identified improvements are described. These are organized by project feature.

Duchesne Collection System

The Duchesne Collection System consists of the Duchesne and Little Deer Creek (Broadhead) Diversion, the Duchesne Tunnel, and the measurement facilities at the outlet of the Duchesne Tunnel. Each of the following projects has been identified.

Bypass Radial Gate Wall Repair. The bypass radial gate allows water to be diverted past the main river weir downstream. The top of the walls have settled inward into the bypass channel, which does not allow the radial gate to be fully opened. This project would restore the walls to their original position

Evaluate and Rate The Main Weir Across The Duchesne River. Presently there is no way to measure flow over the main channel weir at the diversion. The weir should be rated so that flow over the weir can be determined based on elevation measurements at the Duchesne Tunnel inlet.

Fiber in Duchesne Tunnel. The Association monitors and controls features at the Duchesne Diversion. Installation of fiber in the Duchesne Tunnel would allow for communication between the diversion and the facilities at the outlet of the tunnel.

Low Flow Measurement at Outlet. There is a Parshall flume at the outlet that measures flows from the tunnel. The flume is accurate at higher flows but does not provide accurate measurements at the lower flows that occur for much of the year. The project would consist of installing a weir upstream of the existing flume to provide for low flow measurement.

Upgrade Outlet Building. The existing building at the outlet houses the level sensor and equipment for measuring and transmitting flow information from the Parshall flume. The outlet building is problematic in that the backup generator is located outside. In addition, the building is at the bottom of a steep slope that makes access difficult. The propane tank that powers the generator is not buried. The project would relocate the building higher up the slope and bury the propane tank. Relocation of the building would allow the solar panels that presently are located on the north side of the channel to be located on the top of the new building. This would allow the solar panels to be placed higher resulting in reduced tree interference, which would assist in the recharge of the batteries at the outlet and reduce the run time for the generator. The access pathway to the outlet building also needs to be improved.

Weber-Provo Canal

The Weber-Provo Canal system includes the Weber-Provo Diversion, the nine-mile long Weber-Provo Canal, three check structures, the Beaver Creek Diversion, the spillway from the Kamas Valley to the Provo River, and the measurement facilities at the end of the canal.

Restore Capacity in the Weber-Provo Canal. The Weber-Provo Canal was originally designed to deliver 1,000 cfs from the Weber River to the Provo River. Presently the capacity of the canal is estimated to be no more than 800 cfs. The project would consist of enlarging the canal to carry 1,000 cfs either through expanding the cross section of the canal, lining the canal, or by piping. The project would require the relocation or extension of the numerous overshots of the canal.

Weber-Provo Intake Project. This project would remove the original slide gates, replace that structure with a new bridge to allow a track hoe access to clean the screens, install screens on the face of the bridge, make delivery improvements, provide for low flow measurement, and construct a new building to house control and telemetry functions.

Weber-Provo Intake Weber River Bypass. This project would provide a low flow bypass pass the main river weir to the Weber River downstream of the diversion that would allow for measurement of low flows to the river. Present flows are measured by estimating flow under the bypass radial gate.

Gate Operators on Weber-Provo Diversion. The radial gate structure at the Weber-Provo diversion was installed in the early 1990s. The gate operators have not been replaced since their original installation. A review of the condition of the operators and a recommendation of possible replacement or rehabilitation is needed.

Glen Gibbons Check Structure Lowering. The Glen Gibbons check structure was rebuilt in the early 1990s. The floor of the check structure was installed too high, results in backing of flows into the Parshall flume downstream of the Weber-Provo Diversion, and limits the flow capacity of the canal. The structure would be modified to lower the floor or increase its capacity at a lower water surface elevation.

Rehabilitate Undershot of Weber-Provo Canal by Beaver Creek. The Weber-Provo Canal crosses the old channel of Beaver Creek at the Beaver Creek diversion. A concrete box runs under the Weber-Provo Canal at this location. When the overflow channel of the Beaver Creek structure between the diversion and the canal undershot failed several years ago, it was discovered during the investigation and replacement of the failed section of waterway that the concrete of the undershot had deteriorated similarly to the section that had failed. The floor and wall section of the undershot between the diversion and the canal was replaced, but the rest of the structure under the canal needs to be replaced to ensure continued use. The project would consist of building new walls, floor, and canal support structure for the undershot. This can be done within the existing structure thus minimizing costs and the need to take the Weber-Provo canal out of service.

Fencing Along the Weber-Provo Canal. By contract, the Association is required to maintain the fencing along the Weber-Provo Canal. Over the years, the Association has worked with several landowners to transfer this responsibility. The project would consist of working with remaining landowners to develop a program where the fencing is replaced and then turned over to the landowner.

Rock Drop. Just before the canal enters Kamas, a concrete structure drops the canal several feet. This drop structure presently has no fencing to restrict access. The project would consist of fencing around the structure to prevent access.

Fiber Along Canal. The Association monitors and controls features along the Weber-Provo Canal from the diversion on the Weber River to the measurement station at Francis. The communication with these facilities would be enhanced by the installation of fiber along the canal to allow for better communication. This could be done as part of the expansion of canal capacity or as a separate project. The need for this or another communication system will need to be evaluated as part of any canal rehabilitation.

Spillway at Francis Rehabilitation. The floor of the spillway at Francis has eroded and required repair several times in the past. The spillway pool needs to be dewatered and inspected to determine the need for repairs.

Flow measurement structure at Francis on Weber-Provo Canal. The flow measurement structure at the end of the Weber-Provo Canal is located next to Utah State Route 32. The existing structure is subject to damage from snowplows along the highway in the winter as a result of being located very close to the roadway. In addition, for much of the year, in order to measure low flows during the non-runoff season, staff must install a temporary weir almost under the bridge crossing the canal. The project would consist of constructing a building to house measurement and monitoring equipment upstream from the roadway, and designing and constructing a measurement structure that would not require staff to install a temporary weir each year for low flow measurement.

Upper Provo River

The Upper Provo River facilities consist of a series of dikes and easements along the Provo River downstream of the Duchesne Tunnel outlet to Jordanelle Reservoir. These dikes and easements allow the Association to deliver flows from the Duchesne and Weber rivers into the Provo River during high flows. In addition, the Association is responsible for two diversions from the river in this reach. The "Speed Creek" Diversion diverts Project water to the South Kamas and Washington Irrigation Companies who are shareholders of the Association. The Carlisle Diversion was constructed as part of the diking along the river and as such is the responsibility of the Association to maintain.

GIS Input of Dikes and Easements. The dikes and easements along the Upper Provo River that allow the Association to deliver the flows from the Duchesne and Weber rivers have not been surveyed since their original construction, and no record of the survey exists. This project would survey the dikes and easements and incorporate them into the Association's GIS system.

Dike Road Maintenance. The roads on top of the dikes that allow for access and maintenance have not been maintained over the years. The brush and trees on these roads need to be cleared and the road surfaces graded to allow for access.

Replace Speed Creek Diversion. The South Kamas/Washington irrigation diversion from the Provo River (referred to as Speed Creek) needs replacement. Presently Association staff use a track hoe to pile up rocks in the river to serve as a weir to allow for diversion of water. In addition, the control gate consists of a series of planks that are difficult to operate. The project would consist of replacement of the control gates and possibly raising an existing concrete weir in the river channel to back water up to allow for diversion of the flow.

Replace Carlisle Diversion. The existing control gate for the Carlisle irrigation diversion from the Provo River consists of a series of planks that are difficult to operate. The project would consist of determining if a replacement of the diversion is needed based on long-term plans of the water right holder and its replacement if required.

Deer Creek Dam & Reservoir

Deer Creek Dam is a zoned earth-fill structure. Deer Creek Reservoir, the impoundment created by the dam, is the only storage feature of the Project. The reservoir capacity is 153,445 ac-ft. The spillway is a concrete chute at the right abutment controlled by two radial gates. The outlet works through the left abutment consist of a concrete-lined tunnel from the intake to the gate chamber. Two steel pipes run from the gate chamber to the Deer Creek Power Plant. Deer Creek Reservoir covers a surface area of approximately 2,700 acres at full capacity and is used extensively for recreation, including boating, fishing, and swimming. The Project also owns several thousand acres of land around the reservoir.

Lands Opportunities. The Association owns and/or manages lands throughout the Project. The largest amount of land surrounds Deer Creek Reservoir. Approximately 1400 acres of land owned by the Project around the reservoir is presently leased to the State of Utah. The project would consist of inventorying the lands of the Association and the Project and examining ways to maximize the value of those lands to the Association.

Rehabilitate Spillway. The spillway structure containing the radial gates was rehabilitated as part of the USBR's safety of dam's project several years ago. The floor of the spillway from the radial gates to the plunge pool was also rebuilt several years ago. The radial gates were also recoated as part of a project by the Association. What has not been examined is the spillway plunge pool. This project would investigate the plunge pool and recommend rehabilitation measures.

Spillway Flow Measurement. There is presently no way for the Association to measure flows through the spillway. In high flow years, there can be significant water passed over the spillway. The project would consist of developing a plan for flow measurement of the spillway.

Dam Control Gates. The outlet of Deer Creek Dam is controlled by guard gates and needle valves or tube valves. The tube valves control flow through the dam that bypasses the power plant turbines. The guard gates are located in the valve chamber under the dam and upstream of the tube valves. These gate valves are used to isolate the power plant penstocks and control flow from the reservoir in case of an emergency. The guard gates must be able to be closed under full head in case of an emergency downstream. One of the gates failed a recent test by USBR.

The gates would most likely be replaced as two separate projects. The project would consist of determining an approach to replacement or rehabilitation of the guard gates and tube valves.

Dam Outlet Intake Tower. One of the challenges of operating Deer Creek Dam is that the outlet works only diverts water from the bottom of the reservoir. One option to resolve the guard gate issue is to construct an intake tower in the reservoir and relocate the guard gates to this tower. The tower would also allow for diversion of flows from different levels in the reservoir. This would be advantageous to the water treatment plants downstream as the intake could adjust for temperature and water quality at different levels of the reservoir. The project would consist of construction of a new intake tower.

Gate Chamber Small Diameter Piping. The small diameter piping in the gate chamber was installed in the 1930's when the dam was built and needs to be replaced. This piping consists of lubrication systems, hydraulic control lines, and small diameter water conduits.

Recoating of Penstock No.1. The Association has been planning for several years to recoat penstock No. 1 from the guard gates to the power plant.

Gate Operators on Deer Creek Spillway. The radial gate structure at the top of Deer Creek Dam was rehabilitated to address seismic concerns as part of the overall dam safety improvements project completed by the USBR. The Association also recoated the radial gates. The gate operators have not been replaced since the original installation. A review of the condition of the operators and assessment for possible replacement is needed.

Deer Creek Power Plant

The Deer Creek Power Plant is owned by the USBR and consists of two 2,475 kW generators. Releases through Deer Creek Dam are used to generate power, and the energy generated is marketed to the Utah Municipal Power Agency (UMPA) and Utah Association of Municipal Power Systems (UAMPS) by the Western Area Power Administration (WAPA) on behalf of USBR. The agreement with the agencies provides that UMPA and UAMPS pay a portion of the cost of operation, maintenance, and repair of the Deer Creek Power Plant. The Association receives $76,000 per year towards its Provo River Project construction repayment obligation from the power plant revenues.

Access Road Improvements. The access road from US highway 189 to the dam operations building and power plant has several issues. It was constructed as part of the USBR dam safety project in the mid 2000s. The roadway has settlement issues, there is limited turning radius for the large vehicles that need to access the site, and there are issues with drainage across the roadway. The project would consist of improvements to resolve these issues.

Tube Valve Replacement (see above)

Guard Gates (see above)

Gate on Highway to Dam Crest. There is presently no gate on the access road to the dam crest.

Provo River Aqueduct

The Provo River Aqueduct (PRA) traverses Utah County approximately 21 miles from the Murdock Diversion in Provo Canyon to the Point of the Mountain on the Utah County and Salt Lake County line. The PRA is a steel pipe 10-10.5 feet in diameter and was installed in 2010-2012.

Rehabilitate Murdock Diversion Radial Gates. The radial gates at the Murdock diversion need to be rehabilitated. There are two radial gates, the inlet gate to the PRA, and the bypass gate past the main weir. This would require a removal of the gates and shipment to a local fabrication shop for replacement of corroded or damaged members and recoating.

American Fork and Dry Creek Blow Offs. Each of these blow offs can deliver water to the creeks. The blow offs have a limited capacity. This becomes an issue when the PRA needs to be emptied in an emergency. The project would consist of enlarging each of the turnouts to increase flow capacity from the PRA to the creeks.

Second Point of the Mountain Aqueduct (POMA) Valve. The POMA turnout vault at the point of the mountain has one plunger valve that controls flow into the POMA. The design of the POMA included two plunger valves. One additional valve will need to be added in the future when the capacity of the Point of the Mountain Water Treatment Plant (POMWTP) is expanded.

Access Catwalks in POMA Turnout Vault. The POMA turnout vault needs additional catwalks installed to facilitate better operation and maintenance of the outlet isolation valves. The project would consist of installation of these catwalks that would allow operations and maintenance staff to access the gate operators in the vault.

Jordan Aqueduct Reach No. 1 (JA-1) Turnout Bypass Valve. Currently, two plunger valves control flow to JA-1 in the turnout vault at the point of the mountain. The original design of the PRA included three plunger valves. The valves have a capacity of approximately 120 cfs, considering the effects of cavitation on the valves. The required capacity of the turnout is 270 cfs. The project would consist of installing a high performance butterfly valve and associated piping in the vault that would allow for the full capacity required.

Point of the Mountain/Jordan Narrows

The facilities at the Point of the Mountain (POM)/Jordan Narrows include the terminus vaults of the PRA, the spillway from the PRA to Jordan River, the siphon and penstock which deliver water from the PRA to facilities west of the Jordan River, the turbine driven pump on the penstock, and pipelines which deliver water from the penstock and siphon to irrigation canals on the west side of the Jordan River. These irrigation canals include the north and south branches of the Utah Lake Distributing Company (ULDC) and the Welby and Jacob canals.

South Branch ULDC Repair. A report by BC&A recommended replacing a 280-foot section of alternating reinforced concrete pipe and welded steel pipe of the South Branch of the ULDC as part of JVWCD's Central Pipeline Project which will be built in 2014-2015. This reach of the South Branch is located downstream of the standpipe immediately above the Jordan Narrows. The Central Pipeline and the new South Branch section can be installed parallel to each other at the same time, therefore preventing potential conflicts and possible damages to the Central Pipeline in the future. It is anticipated that this short section of pipeline would be bid as a separate line item in the overall Central Pipeline Project. In addition, BC&A recommends that PRWUA budget for replacement of the existing welded steel pipeline from the turbine pump to the existing stand pipe within the next five years.

Turbine/Pump Station. In the Jordan Narrows, the flow from the penstock drives a turbine, which pumps water from the Jordan River to the North Branch of the ULDC. Spent flow from the turbine is delivered to the South Branch of the ULDC. The turbine was installed in the 1940s and has required ongoing maintenance from the Association. MWDSLS built a pump station adjacent to the turbine to allow pumping of water from the Jordan River in lieu of using the turbine. This was done as part of an exchange agreement with ULDC in 1958.. At some point in time, the turbine/pump station will need to be replaced/upgraded. In addition, the siphon and penstock piping under the Jordan River and the piping from the turbine/pump station to the recently replaced section of the North Branch of the ULDC will need to be replaced.

An interim project would be the installation of remote monitoring and control facilities for the Turbine Pump Station to allow for remote control and monitoring of the facility. We have included this as a separate project in the project listing at the end of this chapter.

Siphon. The siphon that transports water from the PRA to the JVWCD and the Welby-Jacob canals needs to be evaluated to determine if any rehabilitation or replacement is needed. The Siphon and Penstock east of the Jordan River were replaced recently and part of the project for relocation around the Staker Gravel Pit.

Kamas Valley Bridges

When the Weber-Provo Canal was built in the early 1900s, it crossed several existing Summit County and Kamas City roadways that required bridge structures. In its agreements with the City and County to build the canal, the Weber River Project agreed to maintain and replace these bridges as needed. When the Association acquired the canal from the Weber River Project, these agreements were transferred as well. Bridges in Kamas City include 200 North, 100 West, and 200 West. The Association replaced the 200 North and 100 West bridges several years ago. The 200 West Bridge will have to be replaced at some point. This bridge restricts the flow in the Weber-Provo Canal at higher flows and would have to be replaced to increase flow capacity in the canal. The County bridges are located at the Upper Loop Road (both north and south roads), Lambert Lane, and Boulderville Road. These bridges should be functional for several years. However, the County can call for their replacement at any time.

Office/Shop

Landscape Plan. The Association has developed a landscape plan for the office/shop site. This landscape plan is limited but would enhance the appearance of the site and emphasize water conservation.

HVAC Rehabilitation. The office/shop building HVAC systems are problematic, cold in the winter, hot in the summer and very temperamental. The project would retain an HVAC contractor to review the system and make recommendations for improvement.

Solar Power Study to Determine Feasibility. The buildings on the office/shop site have a large roof area that could be used for solar power panel installation. The Association uses a large amount of energy and this could be offset by a solar installation. The project would consist of a study of solar power potential at the site to determine its financial feasibility.

Overall Provo River Project

A number of projects affect the overall system. These projects are described below.

SCADA Master Plan Update. The Association installed its initial SCADA System in the late 1990s and completed its SCADA master plan in the early 2000s. Since that time, technology has changed greatly, and new features/hardware/software have become available. The project would consist of a review of the control and monitoring systems of the Association with recommendations for improvements.

Security Review. This project would conduct a security review to examine all aspects of security including physical security at each of the Project sites. The security review may provide recommendations such as fencing, alarm systems, and additional security cameras at remote sites.

Cyber Security Upgrades. Based on recent breaches of the Associations computer systems and cyber security review and upgrades need to be completed. The Association staff is in the process of this review.

Improve Flow Measurement and Record Keeping. The efficient operation of the PRP depends on good flow measurement and record keeping. While the Association does currently receive data from several different sources, it does not appear all data is collected, stored, and analyzed in a central location or database. Acquisition of data from additional sources would assist the Association in management decisions and increase the Association's understanding of how the PRP water rights relate to water rights in each drainage. This project would consist of a number of flow measurement and data collection improvements.

Table 6-1
Needed System Improvements
Provo River Water Users Association
Water Master Plan Update-2014

Project	Description	Location	Project Type
Duchesne Collection System			
Bypass Radial Gate Wall Repair	Repair bypass channel walls to allow for full operation of bypass radial gate.	Duchesne Diversion	O&M
Evaluate and Rate the Main Weir Across the Duchesne River	Determine flow measurement over the weir.	Duchesne Diversion	O&M
Fiber in Duchesne Tunnel	Fiber connection from outlet to inlet improving communication from PRWUA SCADA system.	Duchesne Diversion	O&M
Low Flow Measurement at Outlet	Provide for low flow weir to accurately measure low flows during the winter months.	Duchesne Diversion	O&M
Upgrade Outlet Building	Construct new outlet control building, relocate gas supply for generator, relocate solar panels.	Duchesne Diversion	CIP
Weber Provo Canal			
Increase Capacity of the Weber Provo Canal	This project would increase the capacity of the canal to 1000 cfs.	General Weber Provo Canal	CIP
Weber Provo Canal Lining	Project would line the canal with concrete thus increasing capacity and stopping seepage.	General Weber Provo Canal	CIP
Weber Provo Canal Seepage Analysis	Determine amount of loss in canal	General Weber Provo Canal	CIP
Weber Provo Canal Intake Project	The project would consist of removing the old slide gates at the diversion, installing a new bridge structure upstream of the radial gates, and installing new screens.	General Weber Provo Canal	CIP
Weber Provo Intake Weber River Bypass	This project would provide for a low flow bypass past the main channel diversion weir that could be measured.	General Weber Provo Canal	CIP
Gate Operators on the Weber Provo Diversion	This project would replace the gate operators.	General Weber Provo Canal	O&M

Project	Description	Location	Project Type
Reconstruction of Glen Gibbons Check Structure	The Glen Gibbons Check Structure was constructed at the wrong elevation which causes water to back up to the flume, potentially limiting flow in the Weber-Provo Canal.	Weber Provo Check Structures	CIP
Rehabilitate the Undershot of the Weber Provo Canal by Beaver Creek	The existing undershot has concrete that is failing and could impact the Weber Provo Canal.	Beaver Creek Diversion Structure	CIP
Fencing Along the Weber Provo Canal	Develop Long Term Program to Replace Fencing and Transfer to Adjacent Landowners	General Weber Provo Canal	O&M
Weber-Provo Canal Drop Structure Evaluation	This evaluation would identify potential safety hazards and would make annual operation and maintenance recommendations.	Weber Provo Canal Concrete Drop Structure	O&M
Fiber Along the Canal	Installation of Fiber Along Canal to Connect Control and Monitoring of Facilities	General Weber Provo Canal	CIP
Spillway at Francis Rehabilitation	Inspection and Possible Rehabilitation of Spillway Bottom at the Francis Spillway	General Weber Provo Canal	O&M
Upper Provo River			
GIS Input of Dikes and Easements	This Project Would Survey the Dikes and Easements and Input Them into the GIS System.	Upper Provo River	O&M
Dike Road Maintenance	Clearing and Grading of the Top of the Dikes	Upper Provo River	O&M
Replace Speed Creek Diversion	Diversion Would Be Upgraded by Replacing Control Gates and Raising Diversion Weir	Upper Provo River	CIP
Replace Carlisle Diversion	Diversion Would Be Upgraded by Replacing Control Gates	Upper Provo River	CIP
Deer Creek Dam and Reservoir			
Review of Deer Creek Land Use	This Project Would Examine the Possible Ways of the Shareholders Benefiting From the Land Holdings Around the Reservoir.	Deer Creek Dam and Reservoir	CIP

Project	Description	Location	Project Type
Deer Creek Dam Spillway	The Spillway has Been Rehabilitated Except the Lower Plunge Pool. This Project Would Inspect the Plunge Pool and Review Rehabilitation Options	Deer Creek Dam and Reservoir	O&M
Deer Creek Dam Spillway Flow Measurement	This Project Would Develop a Way to Measure Flows Over the Spillway During Periods of High Flows	Deer Creek Dam and Reservoir	O&M
Deer Creek Dam Guard Gates	This Project Includes the Replacement of the Guard Gates at the Intake to the Dam	Deer Creek Dam and Reservoir	O&M
Deer Creek Dam Tube Valves	This Project Includes the Replacement of the Tube Valves Controlling the Flow Through the Dam	Deer Creek Dam and Reservoir	O&M
Deer Creek Dam Intake Tower	This Project Consists of Installation of an Intake Tower on the Upstream Face of the Dam and Replacement of the Guard Gates as Part of the Intake Tower	Deer Creek Dam and Reservoir	CIP
Gate Chamber Small Diameter Piping	The Small Diameter Piping in the Gate Chamber Which Includes Lubrication Systems, Hydraulic Systems, and Water Conduits Need to be Replaced.	Deer Creek Dam and Reservoir	O&M
Gate Operators on Spillway	Replacement of Operators on the Spillway Gates	Deer Creek Dam and Reservoir	O&M
Deer Creek Power Plant			
Deer Creek Power Plant Power Generation and Revenue Analysis	This Analysis Will Evaluate the Current Power Generation and Will Make Recommendations for Future Power Plant Operation and Revenue Sharing.	Deer Creek Power Plant	CIP
Recoating of Penstock No. 1	Recoating of the penstock to ensure continued operation of the penstock, planned for several years.	Deer Creek Power Plant	O&M
Retaining South Hill near Deer Creek Power Plant	The hillside south of the Power Plant has potential for landslide. This Project will provide a geotechnical evaluation of the hillside.	Deer Creek Power Plant	O&M
Access Road Improvements	Project Would Upgrade the Road Access to the Plant	Deer Creek Power Plant	O&M
Provo River Aqueduct			
Rehabilitate Murdock Diversion Radial Gates	This Project Would Rehabilitate the Gate Controlling Flow Into the PRA and the Bypass Radial Gate.	Provo River Aqueduct	PRA Capacity Right Holders

Project	Description	Location	Project Type
American Fork and Dry Creek Blow Offs	This Project Would Examine the Ways to Increase Flow Capacity From the Blowoffs	Provo River Aqueduct	PRA Capacity Right Holders
Second POMA Control Valve	This Project Would Install the Second POMA Control Valve When Needed	Provo River Aqueduct	PRA Capacity Right Holders
Access Catwalks in POMA Vault	Installation of Catwalks to Allow Operation and Maintenance of Isolation Gate Valves	Provo River Aqueduct	PRA Capacity Right Holders
Jordan Aqueduct Reach No. 1 Control Valve	This Project Would Install A Third Control Valve on the Turnout to the Jordan Aqueduct Reach No. 1	Provo River Aqueduct	PRA Capacity Right Holders
Point of the Mountain/Jordan Narrows			
South Branch of the ULDC Repair	Replacement of Sections of Piping to the South Branch of the Utah Lake Distributing Canal	Point of the Mountain/Jordan Narrows	CIP
Turbine Pump Station	Installation of Remote Control and Operation Equipment	Point of the Mountain/Jordan Narrows	CIP
Siphon	Evaluate Condition of Siphon and Determine Needed Improvements	Point of the Mountain/Jordan Narrows	CIP
Turbine Pump Station	Replacement of Turbine Pump Station.	Point of the Mountain/Jordan Narrows	CIP
Office/Shop			
Landscape Plan	Implement the Landscape Plan Around the Office	Office/Shop	O&M
HVAC Rehabilitation	Upgrade the HVAC System in the Office and Shop.	Office/Shop	O&M
Solar Power Study	Determine Financial Feasibility of Installing Solar Panels on Office/Shop	Office/Shop	CIP
Overall Provo River Project			
SCADA Master Plan Update	Examine Needed Upgrades to System Considering Changes Since the Late 1990's	Overall Project	O&M
Security Review	This project will assess the vulnerability of the Project including; identifying critical assets, threat assessment and likelihood of attack, security system effectiveness, and make recommended improvements.	Overall Project	O&M

Project	Description	Location	Project Type
Cyber Security Upgrades	Installation of Protections for Computer and SCADA Systems	Overall Project	O&M
Improve Flow Measurement and Record Keeping	This Project Will Improve Flow Measurement and the Storage of Measurement Records	Overall Project	O&M

CHAPTER 7
COST ESTIMATES

This chapter develops cost estimates for the projects identified in Chapter 8. Cost estimates are conceptual in nature considering the level of development of the projects. The costs are based on quantities and typical unit costs experienced in the Utah market and are also based on previous bids on similar projects. Where existing cost estimates were available on the several projects that have been studied or planned previously, these estimates were used.

COST ESTIMATING

The conceptual costs for the projects presented in this chapter are mostly considered a combination of Class 5 and Class 4 estimates for planning purposes by the Association for the Advancement of Cost Engineering—International (AACE). A few of the projects have been developed to Class 3. The class estimates are defined as follows:

Class 5. This estimate is prepared based on limited information, where little more than proposed facility type, its location, and the capacity and operating characteristics are known. This class of estimate includes, but is not limited to, market studies, assessment of viability, evaluation of alternate schemes, project screening, location and evaluation of resource needs and budgeting, and long-range capital planning. Examples of estimating methods used would be cost/capacity curves and factors, scale-up factors, and parametric modeling techniques. Little time is expended in the development of this estimate. The typical expected accuracy range for this class estimate is -20 to -50 percent on the low side and +30 to +50 percent on the high side.

Class 4. This estimate is prepared based on information where the preliminary engineering is from 1 to 15 percent complete. Examples of estimating methods used would include equipment and system process factors, scale-up factors, and parametric and modeling techniques. This estimate requires more time expended in its development. The typical expected accuracy range for this class estimate is -15 to -30 percent on the low side and +20 to +50 percent on the high side.

Class 3. These estimates are generally prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored. Typically, engineering is from 10% to 40% complete, and would comprise at a minimum the following: process flow diagrams, utility flow diagrams, preliminary piping and instrument diagrams, plot plan, developed layout drawings, and essentially complete engineered process and utility equipment lists. Typical accuracy ranges for Class 3 estimates are -10% to -20% on the low side, and +10% to +30% on the high side, depending on the technological complexity of the project, appropriate reference information, and other risks

PROJECT COST ESTIMATES

Table 7-1 details the cost estimates for each of the projects identified in the master planning process. The costs vary from as little as a few thousand dollars for preliminary studies on several projects to as much a $5-10 million for the Deer Creek Intake Tower Project.

Table 7-1
Project Conceptual Cost Estimates
Provo River Water Users Association
2014 Master Plan Update

Bypass Radial Gate Repair					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Mobilization	1	LS	$ 5,000	$ 5,000
2	Wall Bracing	1	LS	$ 10,000	$ 10,000
3	Concrete Repair	25	CY	$ 500	$ 12,500
	Subtotal				$ 27,500
	Contingency	1	25%		$ 6,875
Total					$ 34,375
Rate Main Weir on Across Duchesne River					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Engineering Analysis	10	HR	$ 106	$ 1,060
2	Survey	15	HR	$ 120	$ 1,800
	Subtotal				$ 2,860
	Contingency	1	25%		$ 715
Total					$ 3,575
Fiber in Duchesne Tunnel					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Fiber	31680	FT	$ 1.50	$ 47,520
2	Anchors and Clamps	11000	EA	$ 3.00	$ 33,000
3	Splices	10	EA	$ 3,500.00	$ 35,000
4	Installation (one month three men)	480	HR	$ 45.00	$ 115,520
	Subtotal				$ 231,040
	Contingency	1	25%		$ 57,760
Total					$ 288,800
Low Flow Measurement at Tunnel Outlet					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Weir(Based on USBR submittal)	1	LS	$ 10,000	$ 10,000
2	Conduit	50	FT	$ 45	$ 2,250
3	Level Sensor	1	LS	$ 1,500	$ 12,250
	Subtotal				$ 24,500
	Contingency	1	25%		$ 6,125
Total					$ 30,625
Upgrade Outlet Building					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Building	150	SF	$ 150	$ 22,500
2	Reinstallation of Equip	120	HR	$ 50	$ 6,000

3	New Propane Tank	1	LS	$ 1,000	$ 1,000
	Subtotal				$ 29,500
	Contingency	1	25%		$ 7,375
Total					$ 36,875

Restore Capacity of Weber Provo Canal

No.	Item	Quantity	Units	Unit Cost	Cost
1	New Access Road	10560	CY	$ 15	$ 158,400
2	Widen Canal	380160	CY	$ 5	$ 1,900,800
3	Misc. Structure Repair	1	LS	$ 500,000	$ 500,000
4	Undershot/Overshot Extensions	35	EA	$ 25,000	$ 875,000
	Subtotal				$ 3,434,200
	Contingency	1	25%		$ 858,550
Total					$ 4,292,750

Weber Provo Canal Lining

No.	Item	Quantity	Units	Unit Cost	Cost
1	Concrete Liner	1900800	SF	$ 2.50	$ 4,752,000
	Subtotal				$ 4,752,000
	Contingency	1	25%		$ 1,188,000
Total					$ 5,940,000

Weber Provo Canal Intake

No.	Item	Quantity	Units	Unit Cost	Total Cost
1	Mobilization	1	LS	$ 25,000.00	$ 25,000
2	Demolition of Existing Structure	1	LS	$ 30,000.00	$ 30,000
3	Dewatering	1	LS	$ 25,000.00	$ 25,000
	Civil/Site Work				
4	Misc. Site Work	1	LS	$ 25,000.00	$ 25,000
5	Concrete	225	CY	$ 700.00	$ 157,500
6	Building to House Operations	220	SQFT	$ 200.00	$ 44,000
7	Low Flow Bypass to Canal	75	FT	$ 200.00	$ 15,000
8	Rip Rap	240	CY	$ 50.00	$ 12,000
9	Earthwork	300	CY	$ 15.00	$ 4,500
10	Stilling Well	1	LS	$ 10,000.00	$ 10,000
	Equipment				
	Gates				
11	Weber Provo Low Flow Bypass	1	LS	$ 5,000.00	$ 5,000
	Meters				
12	Weber Provo	1	LS	$ 18,000.00	$ 18,000
13	Debris Rack	1	LS	$ 30,000.00	$ 30,000
	Electrical and Instrumentation				
14	Generator	1	LS	$ 20,000.00	$ 20,000
15	PLC	1	LS	$ 25,000.00	$ 25,000
16	Conduit	1	LS	$ 20,000.00	$ 20,000

17	Enclosure Unit	1	LS	$ 10,000.00	$ 10,000
18	Misc. Electrical Work	1	LS	$ 30,500.00	$ 30,500
	Subtotal Construction Costs				$ 506,500
	Contingency	10%			$ 50,650
	Total Construction Costs				$ 557,150

Gate Operators on Weber Provo Diversion

No.	Item	Quantity	Units	Unit Cost	Cost
1	Gate Operators	3	EA	$ 9,500.00	$ 28,500
	Subtotal				$ 28,500
	Contingency	1	25%		$ 7,125
Total					$ 35,625

Weber Provo Canal Intake Weber River Low Flow Bypass

No.	Item	Quantity	Units	Unit Cost	Cost
1	Slide Gate	1	EA	$ 4,500.00	$ 4,500
	Actuator for Slide Gate	1	EA	$ 5,100.00	$ 5,100
	36-inch HDPE Pipe	80	LF	$ 205.00	$ 16,400
	Meter Vault	1	EA	$ 60,000.00	$ 60,000
	Headwall, Screen, Riprap	1	EA	$ 3,800.00	$ 3,800
	Subtotal				$ 89,800
	Contingency	1	25%		$ 22,450
Total					$ 112,250

Reconstruction of Glen Gibbons Check Structure

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	$ 5,000	$ 5,000
2	Wall Bracing	1	LS	$ 10,000	$ 10,000
3	Existing Structure Tie In	1	LS	$ 15,000	$ 15,000
4	Concrete Removal and Replacement	50	CY	$ 750.00	$ 37,500
	Subtotal				$ 67,500
	Contingency	1	25%		$ 16,875
Total					$ 84,375

Rehabilitate the Undershot of the Weber Provo Canal at Beaver Creek

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	$ 5,000	$ 5,000
2	Wall Bracing	1	LS	$ 10,000	$ 10,000
3	Existing Structure Tie In	1	LS	$ 15,000	$ 15,000
4	Concrete Removal and Replacement	35	CY	$ 750.00	$ 26,250
	Subtotal				$ 56,250
	Contingency	1	25%		$ 14,063
Total					$ 70,313

Determine Long Term Fencing Approach Along The Weber Provo Canal

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	120	HR	$ 45	$ 5,400

2	Consultant	24	HR	$ 120	$ 2,880
	Subtotal				$ 8,280
	Contingency	1	25%		$ 2,070
Total					$ 10,350

Weber Provo Drop Structure Evaluation

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	24	HR	$ 120	$ 2,880
	Subtotal				$ 3,960
	Contingency	1	25%		$ 990
Total					$ 4,950

Fiber Along Canal

No.	Item	Quantity	Units	Unit Cost	Cost
1	Fiber	47520	FT	$ 2	$ 71,280
2	Conduit	47620	FT	$ 8	$ 357,150
3	Installation	47520	FT	$ 15	$ 712,800
4	Splices and Pull Boxes	25	EA	$ 7,500	$ 187,500
	Subtotal				$ 1,328,730
	Contingency	1	25%		$ 332,183
Total					$ 1,660,913

Weber Provo Canal Seepage Analysis

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	12	HR	$ 45	$ 540
2	Consultant	12	HR	$ 120	$ 1,440
	Subtotal				$ 1,980
	Contingency	1	25%		$ 495
Total					$ 2,475

Inspection and Rehabilitation of Francis Spillway Pool

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	12	HR	$ 45	$ 540
2	Consultant	12	HR	$ 120	$ 1,440
3	Existing Structure Tie In	1	LS	$ 15,000	$ 15,000
4	Concrete Removal and Replacement	25	CY	$ 750.00	$ 18,750
	Subtotal				$ 35,730
	Contingency	1	25%		$ 8,933
Total					$ 44,663

Flow Measurement Structure at End of Weber Provo Canal

No.	Item	Quantity	Units	Unit Cost	Cost
1	Mobilization	1	LS	$ 5,000	$ 5,000
2	Excavation	150	CY	$ 10	$ 1,500
3	Level Sensors	3	EA	$ 1,500	$ 4,500

4	SCADA and Controls	1	LS	$ 25,000	$ 25,000
5	Building	150	SF	$ 150	$ 22,500
6	Electrical Equipment	1	LS	$ 25,000	$ 25,000
7	Structure	100	CY	$ 750.00	$ 75,000
	Subtotal				$ 158,500
	Contingency	1	25%		$ 39,625
Total					$ 198,125

GIS Input of Dikes and Easements

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	120	HR	$ 85	$ 10,200
	Subtotal				$ 11,280
	Contingency	1	25%		$ 2,820
Total					$ 14,100

Dike Road Maintenance

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	480	HR	$ 45	$ 21,600
2	Equipment	480	HR	$ 100	$ 48,000
	Subtotal				$ 69,600
	Contingency	1	25%		$ 17,400
Total					$ 87,000

Replace Speed Creek Diversion

No.	Item	Quantity	Units	Unit Cost	Cost
1	Raise River Weir	75	CY	$ 500	$ 37,500
2	New Control Gate at Diversion	1	EA	$ 15,000	$ 15,000
3	New Handrail	25	FT	$ 75	$ 1,875
4	New Bridge Deck	25	CY	$ 750	$ 18,750
	Subtotal				$ 73,125
	Contingency	1	25%		$ 18,281
Total					$ 91,406

Replace Carlisle Diversion

No.	Item	Quantity	Units	Unit Cost	Cost
1	New Control Gate at Diversion	1	EA	$ 15,000	$ 15,000
2	New Handrail	25	FT	$ 75	$ 1,875
3	New Bridge Deck	25	CY	$ 750	$ 18,750
	Subtotal				$ 35,625
	Contingency	1	25%		$ 8,906
Total					$ 44,531

Review of Deer Creek Land Use

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	80	HR	$ 45	$ 3,600
2	Consultant	120	HR	$ 85	$ 10,200

	Subtotal				$ 13,800
	Contingency	1	25%		$ 3,450
Total					$ 17,250

Deer Creek Dam Spillway

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	48	HR	$ 45	$ 2,160
2	Consultant	16	HR	$ 85	$ 1,360
	Subtotal				$ 3,520
	Contingency	1	25%		$ 880
Total					$ 4,400

Deer Creek Dam Spillway Flow Measurement

No.	Item	Quantity	Units	Unit Cost	Cost
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	40	HR	$ 120	$ 4,800
	Subtotal				$ 5,880
	Contingency	1	25%		$ 1,470
Total					$ 7,350

Project-Deer Creek Dam Guard Gates

No.	Item	Quantity	Units	Unit Cost	Cost
1	Isolation of Guard Gates	1	LS	$ 50,000	$ 50,000
2	Demolition and Removal	1	LS	$ 25,000	$ 25,000
3	New Guard Gates	2	EA	$ 200,000	$ 400,000
4	Gate Installation	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 525,000
	Contingency	1	25%		$ 131,250
Total					$ 656,250

Project-Deer Creek Dam Tube Valves

No.	Item	Quantity	Units	Unit Cost	Cost
1	Demolition and Removal	1	LS	$ 50,000	$ 50,000
3	New Tube Valves	2	EA	$ 250,000	$ 500,000
4	Valve Installation	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 600,000
	Contingency	1	25%		$ 150,000
Total					$ 750,000

Project-Recoating of Penstock No.1

No.	Item	Quantity	Units	Unit Cost	Cost
1	Recoating of Penstock	1	LS	$ 160,000	$ 160,000
	Subtotal				$ 160,000
	Contingency	1	25%		$ 40,000
Total					$ 200,000

Project-Deer Creek Dam Intake Tower Study					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	360	HR	$ 120	$ 43,200
	Subtotal				$ 44,280
	Contingency	1	25%		$ 11,070
Total					$ 55,350
Project-Deer Creek Dam Intake Tower Construction		1	LS		$5-10 million

Project-Gate Chamber Small Diameter Piping					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Demolition and Removal	1	LS	$ 25,000	$ 25,000
2	New Piping	200	FT	$ 150	$ 30,000
3	Misc. Valving	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 105,000
	Contingency	1	25%		$ 26,250
Total					$ 131,250

Project-Gate Operators on Spillway					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Gate Operators	2	EA	$ 25,000	$ 50,000
3	Installation	1	LS	$ 15,000	$ 15,000
	Subtotal				$ 65,000
	Contingency	1	25%		$ 16,250
Total					$ 81,250

Project-Deer Creek Power Plant and Revenue Analysis					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	80	HR	$ 150	$ 12,000
	Subtotal				$ 13,080
	Contingency	1	25%		$ 3,270
Total					$ 16,350

Project-Retaining South Hill Near Deer Creek Power Plant					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Consultant	160	HR	$ 150	$ 24,000
	Subtotal				$ 24,000
	Contingency	1	25%		$ 6,000
Total					$ 30,000

Project-Access Road Improvements					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Storm Drain Piping	100	FT	$ 150	$ 15,000
2	Road Widening (equip)	100	HR	$ 250	$ 25,000
3	Paving	300	SY	$ 30	$ 9,000

	Subtotal				$ 49,000
	Contingency	1	25%		$ 12,250
Total					$ 61,250

Project-Rehabilitate Murdock Diversion Radial Gates

No.	Item	Quantity	Units	Unit Cost	Cost
1	Gate Refurbishment	2	EA	$ 30,000	$ 60,000
	Subtotal				$ 60,000
	Contingency	1	25%		$ 15,000
Total					$ 75,000

Project-American Fork and Dry Creek Blow Offs

No.	Item	Quantity	Units	Unit Cost	Cost
2	Consultant	80	HR	$ 150	$ 12,000
	Subtotal				$ 12,000
	Contingency	1	25%		$ 3,000
Total					$ 15,000

Project-Second POMA Control Valve

No.	Item	Quantity	Units	Unit Cost	Cost
1	New Isolation Gate Valves	2	LS	$ 50,000	$ 100,000
3	New Piping	50	FT	$ 500	$ 25,000
3	Plunger Valve	1	LS	$ 250,000	$ 250,000
4	Installation	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 425,000
	Contingency	1	25%		$ 106,250
Total					$ 531,250

Project-Access Catwalks in POMA Vault

No.	Item	Quantity	Units	Unit Cost	Cost
1	Catwalks and Handrails	1	LS	$ 25,000	$ 25,000
2	Installation	1	LS	$ 15,000	$ 15,000
	Subtotal				$ 40,000
	Contingency	1	25%		$ 10,000
Total					$ 50,000

Project-Jordan Aqueduct Reach No. 1 Pressure Reducing Valve

No.	Item	Quantity	Units	Unit Cost	Cost
1	New Isolation Gate Valves	2	LS	$ 50,000	$ 100,000
3	New Piping	50	FT	$ 500	$ 25,000
3	High Performance Butterfly Valve	1	LS	$ 75,000	$ 75,000
4	Installation	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 250,000
	Contingency	1	25%		$ 62,500
Total					$ 312,500

Project-South Branch of ULDC Repair					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Mobilization and Demobilization (10%)	1	LS	$17,840	$17,840
2	Supply and Installation of 48" HDPE Pipe	276	LF	$357	$98,532
3	Supply and Installation of 30" HDPE Pipe	60	LF	$285	$17,100
4	Connections to Existing 48-inch and 30-inch Pipelines	3	EA	$16,000	$48,000
5	48-inch Connection to Existing Stand Pipe	1	EA	$7,200	$7,200
6	Structural Concrete for Thrust Block	50	CY	$150	$7,500
	Subtotal				**$196,172**
	Contingency	1	25%		$49,043
Total					**$245,215**

Project-Turbine Pump Station Replacement					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Crossflow Turbine	1	LS	$ 500,000	$ 500,000
2	Demolition	1	LS	$ 25,000	$ 25,000
3	Concrete Foundation	200	CY	$ 500	$ 100,000
4	New Piping	100	FT	$ 750	$ 75,000
5	High Performance Butterfly Valve	4	LS	$ 25,000	$ 100,000
6	Misc. Piping	1	LS	$ 35,000	$ 35,000
7	Building	900	SF	$ 150	$ 135,000
8	Electrical/Controls	1	LS	$ 100,000	$ 100,000
9	Installation	1	LS	$ 50,000	$ 50,000
	Subtotal				$ 1,120,000
	Contingency	1	25%		$ 280,000
Total					$ 1,400,000

Project-Turbine Pump Station Remote Control and Monitoring					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Equipment and Installation	1	LS	$ 100,000	$ 100,000
2	Consultant	240	HR	$ 150	$ 36,000
	Subtotal				$ 136,000
	Contingency	1	25%		$ 34,000
Total					$ 170,000

Project-Siphon					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	60	HR	$ 45	$ 2,700
2	Consultant	80	HR	$ 120	$ 9,600
	Subtotal				$ 12,300
	Contingency	1	25%		$ 3,075
Total					$ 15,375

Project-Landscape Plan					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Landscape (based on existing plan)	1	LS	$ 57,500	$ 57,500
2	Consultant	120	HR	$ 150	$ 18,000
	Subtotal				$ 75,500
	Contingency	1	25%		$ 18,875
Total					$ 94,375

Project-HVAC Rehabilitation of Office Building					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	HVAC Upgrades	1	LS	$ 50,000	$ 50,000
2	Consultant	160	HR	$ 150	$ 24,000
	Subtotal				$ 74,000
	Contingency	1	25%		$ 18,500
Total					$ 92,500

Project-Solar Power Study					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	160	HR	$ 150	$ 24,000
	Subtotal				$ 25,080
	Contingency	1	25%		$ 6,270
Total					$ 31,350

Project-SCADA Master Plan Update					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	480	HR	$ 150	$ 72,000
	Subtotal				$ 73,080
	Contingency	1	25%		$ 18,270
Total					$ 91,350

Project-Security Review					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	24	HR	$ 45	$ 1,080
2	Consultant	160	HR	$ 150	$ 24,000
	Subtotal				$ 25,080
	Contingency	1	25%		$ 6,270
Total					$ 31,350

Project-Cyber Security Upgrades					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	80	HR	$ 45	$ 3,600
2	Equipment(Jim Reed)	1	LS	$ 35,000	$ 35,000
	Subtotal				$ 38,600
	Contingency	1	25%		$ 9,650
Total					$ 48,250

Project-Improve Flow Measurement and Record Keeping					
No.	**Item**	**Quantity**	**Units**	**Unit Cost**	**Cost**
1	Staff Time	480	HR	$ 45	$ 21,600
2	Consultant	80	HR	$ 150	$ 12,000
	Subtotal				$ 33,600
	Contingency	1	25%		$ 8,400
Total					$ 42,000

CHAPTER 8
MASTER PLAN PROJECTS PRIORITIZATION

MASTER PLAN PROJECTS IDENTIFICATION

The Project consists of approximately 70 miles of natural channel, as well as pipelines, open channels, tunnels, siphons, and Deer Creek Dam. The Project was originally constructed primarily between 1938 and 1951, with the addition of the hydroelectric powerhouse at Deer Creek Dam in 1958. In 2014, the Master Plan Team visited a majority of the facilities throughout the Project to assess the condition and deficiencies of each facility. Chapter 5 summarizes the condition assessment of each facility. Based on the condition assessment and further discussions with Association personnel, potential Master Plan projects were identified. These projects range from simple repair of existing facilities to construction of new facilities. Table 8-1 summarizes the potential Master Plan projects.

PROJECT PRIORITIZATION PROCESS

All of the Master Plan projects identified Chapter 8 will be beneficial, however, the Association does not have the budget to complete all of the projects at once. It will likely take years to complete all of the projects. Therefore, a prioritization process has been established to help identify the projects that are most critical to the Association. The prioritization process was identified by the Master Plan Team through various discussions with Association Engineering Committee and Board Members.

The prioritization process includes scoring each project based on weighted criteria. The following paragraphs further describe the prioritization process.

Evaluation Criteria

A set of criteria was established to help evaluate each of the potential projects. The Master Plan Team, along with Association Board Members had many discussions regarding prioritization criteria and which criteria were most important to the Association. The criteria listed below are a result of a number of studies and experience in estimating and assessing master plan projects.

1. Service Disruption
2. Safety
3. Water Development
4. Regulatory or Contractual Requirements
5. Improved Operations
6. Water Quality Improvement

Each of these criteria are discussed in the following paragraphs.

Service Disruption–This criteria examines a project's impact on the ability of the Association to deliver water to its customers, what would happen to project deliveries if the project was not completed.

Safety–Each project was evaluated on its impact to the safety of the Association employees that operate the Project, the safety to others, and protection of property.

Maximizing Existing Water Resources – As growth continues in the service area of the Project, the demand for additional water by some Association shareholders may continue to grow. This demand may or may not be met by Association resources. The Association should continually be looking for methods to shore up or maximize utilization of its existing water resources. Each project will be evaluated based on this potential. Water conservation is considered to evaluated within this criteria.

Regulatory or Contractual Requirements–Projects are sometimes required to be completed because of regulatory requirements or because of contractual commitments that the Association has entered into.

Improved Operations and Maintenance – Each project will be evaluated based on its ability to improve the operation and maintenance of Project facilities. Improved operations and maintenance practices provide for more efficient use of the Association's resources, thus saving time and money.

Improved Water Quality– A large portion of Project water is used for M&I water. The use of Project water for M&I proposes requires the Association to continue to deliver high quality water. Therefore, each project will be evaluated based on its ability to help preserve or enhance the existing high water quality.

Weighting Factors

With the criteria established, a weighting factor was then assigned to each criterion based on its relative importance to the Association. Criteria more important to the Association have a higher weighting factor. The weighting factors were established through Master Plan Team discussions and assistance of Association Board Members. Weighting factors will be assigned to each criterion. Criteria more important to PRUWA will have a higher weighting factor. The following list summarizes the weighting factors.

Table 8-1
Weighting Factors

Criteria	Weighting Factor
Service Disruption	20%
Safety	25%
Maximize Existing Water Resources (cost per acre-foot)	10%
Water Quality	20%
Regulatory or Contractual Requirements	5%
Improved Operations	20%

Assigned Value for Project Criteria

With the criteria and weighting factors established, each of the projects were evaluated and assigned a value from 1 to 5 for each of the criteria. Each member of the Master Plan Team evaluated the projects and assigned a value to each of the criteria based on the project's potential benefit. A value of 5 was assigned to projects that are most necessary and a value of 1 was assigned to projects least necessary. The average of the Master Plan Team member's assigned values was then multiplied by the criteria weighting and then summed to determine the overall score.

PROJECT RANKING

The potential master plan projects were ranked based on the overall score. Projects with the highest overall score were determined to be the most critical and the most beneficial to the Association. Table 8-2 lists the Master Plan projects in order, with the highest overall score being ranked number one. It should be recognized that this list was established to help identify projects that will be beneficial to the Association. The list will be beneficial for planning and budgeting purposes. It is only a guide and other factors such as funding and construction sequencing may influence which of these projects will be completed first. In general, all remaining projects should be evaluated for priority on a regular, periodic basis (e.g., annually).

SUMMARY

Based on a condition assessment of existing Project facilities and through conversations with Association personnel, potential master plan projects were identified. The projects were then evaluated and assigned a value based on the above mentioned criteria. Projects with the highest evaluated score are ranked as being most beneficial to the Association. The prioritized list of projects provides a guide for future planning and budgeting. Following chapters identify potential funding and propose an implementation schedule for the most beneficial projects.

Table 8-2
Prioritization Scores
Provo River Water Users Association
Water Master Plan Update-2014

						Prioritization Factors, Weight							
						20%	25%	10%	5%	20%	20%		
No.	**Project**	**Description**	**Location**	**Staff Construction Possible**	**Project Type**	**Service Disruption**	**Safety**	**Water Development**	**Regulatory or Contractual Requirements**	**Improved Operations**	**Water Quality**	**Estimated Project Costs**	**Total Score**
1	Weber Provo Canal Intake Project	The project would consist of removing the old slide gates at the diversion, installing a new bridge structure upstream of the radial gates, and installing new screens.	General Weber Provo Canal		CIP	1	5	5	3	5	1	$ 557,000	3.3
2	Deer Creek Dam Intake Tower	This Project Consists of Installation of an Intake Tower on the Upstream Face of the Dam and Replacement of the Guard Gates as Part of the Intake Tower. Study to determine feasibility is first step. Total construction cost estimated at $5-10 million	Deer Creek Dam and Reservoir		CIP	3	5	1	1	3	3	$ 55,000	3.2
3	Replace Speed Creek Diversion	Diversion Would Be Upgraded by Replacing Control Gates and Raising Diversion Weir	Upper Provo River	**x**	CIP	5	4	1	2	3	1	$ 91,000	3
4	Deer Creek Dam Guard Gates	This Project Includes the Replacement of the Guard Gates Controlling the Flow Through the Dam	Deer Creek Dam and Reservoir		O&M	3	5	1	1	2	1	$ 660,000	2.6
5	Turbine Pump Station	Replacement of Turbine Pump Station.	Point of the Mountain/Jordan Narrows		CIP	5	2	1	2	3	1	$ 1,400,000	2.5
6	Remote Monitoring and Control of Turbine Pump Station	Allow for remote operation and control of existing facility	Point of the Mountain/Jordan Narrows		CIP	3	3	1	1	3	1	$ 170,000	2.3
7	Replace Carlise Diversion	Diversion Would Be Upgraded by Replacing Control Gates	Upper Provo River	**x**	CIP	5	2	1	2	2	1	$ 45,000	2.3
8	Siphon at POM	Evaluate Condition and Replacement/Rehabilitation Needs	Point of the Mountain/Jordan Narrows	**x**	CIP	4	3	1	1	2	1	$ 15,000	2.3
9	Deer Creek Dam Tube Valves	This Project Includes the Replacement of the Tube Valves Controlling the Flow Through the Dam	Deer Creek Dam and Reservoir		O&M	3	2	1	1	4	1	$ 750,000	2.25
10	SCADA Master Plan Update	Examine Needed Upgrades to System Considering Changes Since the Late 1990's	Overall Project		O&M	4	2	1	1	3	1	$ 91,000	2.25
11	Restore Capacity of the Weber Provo Canal	This project would restore the capacity of the canal to 1000 cfs.	General Weber Provo Canal	**x**	CIP	1	1	5	2	5	1	$ 4,300,000	2.25
12	Rehabilitate the Undershot of the Weber Provo Canal by Beaver Creek	The existing undershot has concrete that is failing and could impact the Weber Provo Canal.	Beaver Creek Diversion Structure		CIP	3	4	1	1	1	1	$ 70,000	2.15
13	Gate Chamber Small Diameter Piping	The Small Diameter Piping in the Gate Chamber Which Includes Lubrication Systems, Hydraulic Systems, and Water Conduits Need to be Replaced.	Deer Creek Dam and Reservoir		O&M	3	3	1	1	2	1	$ 131,000	2.1
14	Retaining South Hill near Deer Creek Power Plant	The hillside south of the Power Plant has potential for landslide. This Project will provide a geotechnical evaluation of the hillside.	Deer Creek Power Plant		O&M	1	5	1	1	1	1	$ 30,000	2
15	Weber Provo Canal Lining/Enclosure	This project would either line or pipe the canal to prevent seepage	General Weber Provo Canal	**x**	CIP	1	1	5	3	3	1	$ 5,900,000	1.9
16	Flow Measurement Structure at End of Weber-Provo Canal	This Project Would Replace the Existing Measurement Structure and Control Building at the End of the Canal	Weber Provo Spillway and Stilling Basin		CIP	1	3	1	1	3	1	$ 198,000	1.9

						Prioritization Factors, Weight							
						20%	25%	10%	5%	20%	20%		
No.	**Project**	**Description**	**Location**	**Staff Construction Possible**	**Project Type**	**Service Disruption**	**Safety**	**Water Development**	**Regulatory or Contractual Requirements**	**Improved Operations**	**Water Quality**	**Estimated Project Costs**	**Total Score**
17	Spillway at Francis Rehabilitation	Inspection and Rehabilitation of Spillway Bottom at the Francis Spillway	General Weber Provo Canal		O&M	2	3	1	1	2	1	$ 45,000	1.9
18	Weber Provo Canal Seepage Analysis	Determine Amount of Loss and Possible Means to Recover	General Weber Provo Canal	**x**	CIP	1	1	5	3	3	1	$ 2,500	1.9
19	Access Catwalks in POMA Vault	Installation of Catwalks to Allow Operation and Maintenance of Isolation Gate Valves	Provo River Aqueduct	**x**	PRA Capacity Right Holders	1	3	1	1	3	1	$ 5,000	1.9
20	Gate Operators on Spillway	Replacement of Operators on the Spillway Gates	Deer Creek Dam and Reservoir	**x**	O&M	2	2	1	1	3	1	$ 81,000	1.85
21	Weber Provo Canal Intake Weber River Bypass	Project would install a low flow bypass of the main diversion weir in the river that would be metered.	General Weber Provo Canal		CIP	1	1	3	5	3	1	$ 100,000	1.8
22	Cyber Security Upgrades	Installation of Protections for Computer and SCADA Systems	Overall Project	**x**	O&M	3	1	1	1	3	1	$ 48,000	1.8
23	South Branch of the ULDC Repair	Replacement of Sections of Piping to the South Branch of the Utah Lake Distributing Canal	Point of the Mountain/Jordan Narrows		CIP	3	2	1	1	1	1	$ 245,000	1.65
24	Upgrade Outlet Building	Construct new outlet control building, relocate gas supply for generator, relocate solar panels.	Duchesne Diversion		CIP	2	2	1	1	2	1	$ 37,000	1.65
25	Fiber in Duchesne Tunnel	Fiber connection from outlet to inlet improving communication from PRWUA SCADA system.	Duchesne Diversion		O&M	1	1	1	1	4	1	$ 290,000	1.6
26	Low Flow Measurement at Outlet	Provide for low flow weir to accurately measure low flows during the winter months.	Duchesne Diversion	**x**	O&M	1	1	3	1	3	1	$ 31,000	1.6
27	Fiber Along the Canal	Installation of Fiber Along Canal to Connect Control and Monitoring of Facilities	General Weber Provo Canal		CIP	1	1	1	1	4	1	$ 1,700,000	1.6
28	Bypass Radial Gate Wall Repair	Repair bypass channel walls to allow for full operation of bypass radial gate.	Duchesne Diversion	**x**	O&M	3	1	1	1	2	1	$ 35,000	1.6
29	Rehabilitate Murdock Diversion Radial Gates	This Project Would Rehabilitate the Gate Controlling Flow Into the PRA and the Bypass Radial Gate.	Provo River Aqueduct		PRA Capacity Right Holders	3	1	1	1	2	1	$ 75,000	1.6
30	Jordan Aqueduct Reach No. 1 Control Valve	This Project Would Install A Third Control Valve on the Turnout to the Jordan Aqueduct Reach No. 1	Provo River Aqueduct		PRA Capacity Right Holders	1	1	1	3	3	1	$ 312,000	1.5
31	Second POMA Control Valve	This Project Would Install the Second POMA Control Valve When Needed	Provo River Aqueduct		PRA Capacity Right Holders	1	1	1	3	3	1	$ 531,000	1.5
32	Access Road Improvements	Project Would Upgrade the Road Access to the Plant	Deer Creek Power Plant	**x**	O&M	1	2	1	1	2	1	$ 61,000	1.45
33	American Fork and Dry Creek Blow Offs	This Project Would Examine the Ways to Increase Flow Capacity From the Blowoffs	Provo River Aqueduct		PRA Capacity Right Holders	1	2	1	1	2	1	$ 15,000	1.45
34	Recoating of Penstock No. 1	Provide for recoating, agreement with USBR to complete	Deer Creek Dam and Reservoir		O&M	1	1	1	5	2	1	$ 160,000	1.4

						Prioritization Factors, Weight							
						20%	25%	10%	5%	20%	20%		
No.	**Project**	**Description**	**Location**	**Staff Construction Possible**	**Project Type**	**Service Disruption**	**Safety**	**Water Development**	**Regulatory or Contractual Requirements**	**Improved Operations**	**Water Quality**	**Estimated Project Costs**	**Total Score**
35	HVAC Rehabilitation	Upgrade the HVAC System in the Office and Shop.	Office/Shop		O&M	1	1	1	1	3	1	$ 92,500	1.4
36	Deer Creek Power Plant Power Generation and Revenue Analysis	This Analysis Will Evaluate the Current Power Generation and Will Make Recommendations for Future Power Plant Operation and Revenue Sharing.	Deer Creek Power Plant		CIP	1	1	1	1	3	1	$ 16,000	1.4
37	Gate Operators on the Weber Provo Diversion	This study would review the condition of the gate operators and make recommendations for rehabilitation if required.	General Weber Provo Canal	**x**	O&M	1	1	1	1	3	1	$ 36,000	1.4
38	Review of Deer Creek Land Use	This Project Would Examine the Possible Ways of the Shareholders Benefiting From the Land Holdings Around the Reservoir.	Deer Creek Dam and Reservoir	**x**	CIP	1	1	1	3	1	2	$ 17,000	1.3
39	Reconstruction of Glen Gibbons Check Structure	The Glen Gibbons Check Structure was constructed at the wrong elevation which causes water to back up to the flume, potentially limiting flow in the Weber-Provo Canal.	Weber Provo Check Structures		CIP	1	1	2	1	2	1	$ 84,000	1.3
40	GIS Input of Dikes and Easements	This Project Would Survey the Dikes and Easements and Input Them into the GIS System.	Upper Provo River	**x**	O&M	1	1	1	2	2	1	$ 14,000	1.25
41	Weber-Provo Canal Drop Structure Evaluation	This evaluation would identify potential safety hazards and would make annual operation and maintenance recommendations.	Weber Provo Canal Concrete Drop Structure		O&M	1	2	1	1	1	1	$ 5,000	1.25
42	Security Review	This project will assess the vulnerability of the Project including; identifying critical assets, threat assessment and likelihood of attack, security system effectiveness, and make recommended improvements.	Overall Project	**x**	O&M	1	2	1	1	1	1	$ 31,000	1.25
43	Dike Road Maintenance	Clearing and Grading of the Top of the Dikes	Upper Provo River	**x**	O&M	1	1	1	1	2	1	$ 87,000	1.2
44	Evaluate and Rate the Main Weir Across the Duchesne River	Determine flow measurement over the weir.	Duchesne Diversion	**x**	O&M	1	1	2	1	1	1	$ 3,600	1.1
45	Deer Creek Dam Spillway	The Spillway has Been Rehabilitated Except the Lower Plunge Pool. This Project Would Inspect the Plunge Pool and Review Rehabilitation Options	Deer Creek Dam and Reservoir		O&M	1	1	1	1	1	1	$ 5,000	1
46	Fencing Along the Weber Provo Canal	Develop Long Term Program to Replace Fencing and Transfer to Adjacent Landowners	General Weber Provo Canal	**x**	O&M	1	1	1	1	1	1	$ 10,000	1
47	Deer Creek Dam Spillway Flow Measurement	This Project Would Develop a Way to Measure Flows Over the Spillway During Periods of High Flows	Deer Creek Dam and Reservoir		O&M	1	1	1	1	1	1	$ 7,500	1
48	Improve Flow Measurement and Record Keeping	This Project Will Improve Flow Measurement and the Storage of Measurement Records	Overall Project	**x**	O&M	1	1	1	1	1	1	$ 42,000	1
49	Landscape Plan	Implement the Landscape Plan Around the Office	Office/Shop		O&M	1	1	1	1	1	1	$ 95,000	1
50	Solar Power Study	Determine Financial Feasibility of Installing Solar Panels on Office/Shop	Office/Shop		CIP	1	1	1	1	1	1	$ 31,000	1

CHAPTER 9
POTENTIAL FUNDING ALTERNATIVES

BACKGROUND

In 2014, the Master Plan Team visited a majority of the facilities throughout the Project to assess the condition and deficiencies of each facility. Chapter 5 summarizes the condition assessment for each Project facility. Based on the condition assessment and further discussions with Association personnel, approximately 50 potential Master Plan Projects were identified. These projects range from simple repair of existing facilities to construction of new facilities. Chapter 8 identifies these projects and Chapter 10 prioritizes them based on the overall benefit to the Association. The projects were prioritized in two categories: O&M Projects and CIP. The two categories were established to help identify the type of project and to assist in funding and implementing projects. The cost to implement all of the Master Plan Projects is estimated to be approximately $30.0 million.

FUNDING SOURCES

A Master Plan Project could consist of several phases including evaluation, preliminary design, final design, and construction. The funding source for each project could vary based on the phase and the type of the project. Also, the required funding amount and the funding source for each project will be affected by other projects that are being completed at the time. The following sections identify funding sources available for the Master Plan Projects. However, a funding source is not specifically identified for each project. Potential funding sources include the following categories:

- **Assessments –** This method would use annual stockholder assessments to pay for projects as they are implemented.
- **Financing –** Financing would borrow money from State, Federal or private organizations to fund each of the projects with repayment over a specified period. Repayments would come from annual stockholder assessments.
- **Cost-Sharing –** Cost sharing would distribute costs among all parties that benefit from the project.
- **Grants –** Grants could come from federal or state agencies and would require no repayment.

The following sections further discuss each of these funding categories.

Assessments

This method utilizes annual stockholder assessments to pay for projects. This method of funding would require that the projects be implemented as funds become available from annual assessments. Currently, funds from two assessments are used to complete Master Plan Projects.

These assessments are discussed in the following paragraphs. There are 100,000 shares of Association stock outstanding that are assessed each year.

- **General Project Operation and Maintenance Assessment** – This assessment is collected to cover the operating cost of the Association along with the costs of maintaining all of the facilities (other than the PRA) within the Project. Revenue generated from this assessment is generally used to cover the cost of routine operation and maintenance of existing facilities within the Project and rarely used to construct new facilities.
- **Capital Improvements Assessment** – The Capital Improvements Assessment was created in 1995 as a funding source for the Association's Capital Improvements Program. The revenue generated from this assessment is primarily used for new capital improvements and extraordinary maintenance or rehabilitation of existing facilities.

In addition to these existing assessments, there is the potential of establishing a new special assessment for a specific project. For example, a special assessment was established to help fund the PRC Enclosure Project. Also, there is the potential to increase or combine the existing assessments to produce more revenue to complete the identified Master Plan Projects or to establish a more comprehensive and complete budgeting process. If assessments are combined, an O&M budget and a capital improvement budget could be established as part of the annual budgeting process. This may lead to incentive to increase O&M efficiencies in order to provide funding for capital improvement projects. It may lead to more stable and predictable assessment patterns to aid shareholders and the Association with financial planning.

This method will require a financial plan and schedule to implement the Master Plan. The plan must identify revenues available to fund the improvements and a cash flow schedule to implement the plan over a predetermined length of time. Revenues could come from existing assessments, increased assessments or new special assessments.

OUTSIDE FINANCING

Using the financing method, the Association can borrow money to complete Master Plan Projects and repay the money over a specified period of time. There are several sources that can provide financing for projects. In the past these sources included the federal and state government. Funds from the federal government have diminished and are not considered a viable source of funding. Sources available include the Utah Board of Water Resources (BOWR) and various private financing entities. The following paragraphs discuss these potential financing sources.

Utah Board of Water Resources

The BOWR of the Utah Department of Natural Resources provides revolving funds to give technical and financial assistance to water users to achieve the highest beneficial use of water resources within the state. Funding is available for projects that conserve, protect, or more efficiently use present water supplies, develop new water or provide flood control.

BOWR administers three revolving loan funds: the Revolving Construction Fund, the Cities Water Loan Fund, and the Conservation and Development Fund (CDF). The Revolving Construction Fund is generally used to finance agricultural projects that cost less than $500,000. The Cities Water Loan Fund finances the construction of municipal water facilities for political subdivisions of the state. The CDF may finance the construction of water projects sponsored by incorporated groups, political subdivisions of the state, another state, the federal government, or Indian tribes. Each of these funds loan money at low interest rates (generally 1-5 percent) with variable repayment periods.

BOWR staff has indicated that of the three loan funds, financing for the Association Master Plan Projects could come from the CDF. The CDF has approximately $6-7 million available annually to finance new projects. Applications for CDF are submitted directly to the board member residing in the river district where the project is located. The Board, along with BOWR staff, then determines the feasibility and evaluates the request. BOWR funds projects based on the following prioritization system:

1. Projects which involve public health problems, safety problems or emergencies.
2. Municipal water projects that are required to meet an existing or impending need.
3. Agricultural water projects that provide significant economic benefit for the local area.
4. Projects which will receive a large portion of their funding from other sources.
5. Projects not included in items 1 through 4, but which have been authorized by the BOWR, are funded on a first-come first-served basis.

BOWR is also willing to assist in alternative project funding methods such as letters of credit, bond insurance, and various methods of interest buy-downs, in addition to directly funding construction of project features.

Security required for BOWR loans depends on the type of organization sponsoring the project and the type of project. Much of the loan for the PRA was obtained from the BOWR and will be repaid by the PRA capacity right holders over the next 24-years. Competition for funding from this source is intensifying based on the BOWR's need to fund state water projects.

Private Financing

Private financing could occur through obtaining revenue bonds. Revenue bonds are issued against the revenue generated by the project financed. Since the Association's primary method of generating revenue is through assessments, a revenue bond would probably require that a new special assessment be created or that the existing assessments be increased to cover the repayment of the bond. At the present time, fixed taxable 20-year bond interest rates are approximately 6.0 percent. Lower interest can be reached utilizing variable interest programs or by obtaining tax exempt bonds. The Association does not qualify for tax exempt bonds; however, it may be possible for certain projects to obtain tax exempt bonds through associated agencies.
Lower interest rates can also be obtained by repaying the loan over a shorter repayment period.

COST-SHARING

Cost-sharing is another method to fund Master Plan Projects. Cost-sharing would help fund projects by distributing costs to those organizations that benefit from the project. For example, the Association constructed a screening structure at the Dry Creek siphon on the PRC. The screening structure benefited the Association and Highland City. An agreement was established for sharing the cost of the structure. Both organizations agreed to pay 50 percent of the cost. This and other projects have been constructed by the Association using cost sharing in the past.

Deer Creek Power Plant

The USBR provides funds for the maintenance of the Deer Creek Power Plant. These funds have been used in the past to reline and recoat the penstocks, to service the turbines, etc. These funds could potentially be tapped in the future to help pay for the projects that involve the dam. Gate repair or replacement on the outlet works, a new intake tower, may qualify for partial funding from the USBR.

GRANTS

The Association has been successful in obtaining grants from the USBR through their Water Smart and conservation funds programs. The Association presently has a grant through the USBR for the Weber Provo Canal Intake Project for $300,000. The Association has received almost $1,000,000 in grants from these programs for several projects including the Beaver Creek Diversion upgrades, the Little Deer Creek Intake and Piping Project, and for development and updates to the Association water conservation plans.

SUMMARY OF FUNDING ALTERNATIVES

There are various methods of funding for Association Master Plan Projects. These methods include:

- **Assessments**
  - Raise existing assessments
  - Create a new special assessment
  - Combine assessments
- **Financing**
  - Utah Board of Water Resources
  - Private Financing (Revenue Bonds)
- **Cost-Sharing**
  - USBR Power Plant Funds

- **Grants**
  - USBR

RECOMMENDATIONS

It is recommended that a combination of the identified funding methods be used to implement the Master Plan Projects. As previously stated, the estimated cost to implement all of the Master Plan Projects is approximately $30.0 million. Reference Chapter 6, 7, and 8 for descriptions and cost estimates for each of the Master Plan Projects. It is recommended that grants and cost sharing be utilized as the first method of financing these projects. Once grants and cost sharing possibilities have been identified and utilized it is then recommended that the Association use revenue from assessments to implement the remaining Master Plan Projects. Implementing the remaining Master Plan Projects over a 20-year period with no grants or cost sharing would require annual revenue of $1,500,000 or $15.00 per share. The Board of Directors will determine how fast projects are implemented based on the ability of the shareholders to fund the projects.

CHAPTER 10
IMPLEMENTATION SCHEDULE

BACKGROUND

The 2014 Master Plan Update has identified potential Master Plan Projects. These projects were identified to improve the Association's overall operations, and range from simple repair of existing facilities to construction of new facilities. Chapter 8 describes each of the projects, whether O&M Projects or CIP.

The implementation schedule developed in this chapter includes those projects identified as part of the 2014 Master Plan Update and other projects already in progress. For the purpose of this evaluation it is assumed that Projects will be funded either through the annual General Project O&M Assessment or Capital Improvement Assessment and implemented as those budgets allow.

IMPLEMENTATION SCHEDULE

Table 10-1 shows the recommended implementation schedule for the CIP Master Plan Projects through fiscal year 2020. The schedule generally implements the projects based on their priority as identified in Chapter 8. The table identifies the project title, the estimated cost, and the priority ranking for each project. In addition, the summary of yearly expenditures, the reserve balance at the end of each year, and the annual Capital Improvements Assessment based on the 2014-15 budget.

The implementation schedule presented in Table 10-1 allows the Association to begin implementation of the Master Plan Projects while maintaining a positive reserve balance at the end of each year. The schedule also allows the Association to fund the projects utilizing its annual assessment. Funding of the CIP as outlined in Table 10-1 will require many years to complete. Because of the repayment on the Deer Creek Safety of Dams Project to the USBR, there are limited funds available for projects.

CONCLUSION

It is recognized that there are many items that will affect the order in which the Master Plan Projects will be implemented and that the schedule will need to be modified, as necessary.

Table 10-1
Capital Improvement Implementation Schedule
2014-2019 Fiscal Years
Provo River Water Users Association

		SUMMARY OF YEARLY REVENUES					STATUS	2013	2014	2015	2016	2017	2018	2019
		Capital Assessments							$ 350,000	$ 350,000	$ 350,000	$350,000	$ 350,000	$350,000
		Outside Revenue												
		Interest[3]							$ 2,625	$ 2,625	$ 2,625	$ 2,625	$ 2,625	$ 2,625
		Deer Creek Dam Foundation Improvements Reimbursement (CUWCD)							$ 41,902	$ 41,902	$ 41,902	$ 41,902	$ 41,902	$ 41,902
		Reclamation Grant Revenue												
		Weber Provo								$ 147,500	$ 147,500			
		TOTAL OUTSIDE REVENUES							$ 44,527	$ 192,027	$ 192,027	$ 44,527	$ 44,527	$ 44,527
		TOTAL REVENUES							$ 394,527	$ 542,027	$ 542,027	$394,527	$ 394,527	$394,527

No.	PLANNING YEARS	PROJECT	DESCRIPTION	SYSTEM PART	TYPE OF PROJECT	ESTIMATED COST	STATUS	2013	2014	2015	2016	2017	2018	2019
1	**2014-2016**	Weber Provo Canal Intake Project	The project would consist of removing the old slide gates at the diversion, installing a new bridge structure upstream of the radial gates, and installing new screens.	General Weber Provo Canal	CIP	$ 557,000	**Final Design**			$ 300,000	$ 300,000			
2		Deer Creek Dam Intake Tower	This Project Consists of Installation of an Intake Tower on the Upstream Face of the Dam and Replacement of the Guard Gates as Part of the Intake Tower. Study to determine feasibility is first step. Total construction cost estimated at $5-10 million	Deer Creek Dam and Reservoir	CIP	$ 55,000								
3		Replace Speed Creek Diversion	Diversion Would Be Upgraded by Replacing Control Gates and Raising Diversion Weir	Upper Provo River	CIP	$ 91,000								
4		Deer Creek Dam Guard Gates	This Project Includes the Replacement of the Guard Gates Controlling the Flow Through the Dam	Deer Creek Dam and Reservoir	O&M	$ 660,000								
5		Turbine Pump Station	Replacement of Turbine Pump Station.	Point of the Mountain/Jordan Narrows	CIP	$ 1,400,000								
6		Remote Monitoring and Control of Turbine Pump Station	Allow for remote operation and control of existing facility	Point of the Mountain/Jordan Narrows	CIP	$ 170,000								
7		Replace Carlise Diversion	Diversion Would Be Upgraded by Replacing Control Gates	Upper Provo River	CIP	$ 45,000								
8		Siphon at POM	Evaluate Condition and Replacement/Rehabilitation Needs	Point of the Mountain/Jordan Narrows	CIP	$ 15,000								
9		Deer Creek Dam Tube Valves	This Project Includes the Replacement of the Tube Valves Controlling the Flow Through the Dam	Deer Creek Dam and Reservoir	O&M	$ 750,000								
10		SCADA Master Plan Update	Examine Needed Upgrades to System Considering Changes Since the Late 1990's	Overall Project	O&M	$ 91,000								
11		Restore Capacity of the Weber Provo Canal	This project would restore the capacity of the canal to 1000 cfs.	General Weber Provo Canal	CIP	$ 4,300,000								
12		Rehabilitate the Undershot of the Weber Provo Canal by Beaver Creek	The existing undershot has concrete that is failing and could impact the Weber Provo Canal.	Beaver Creek Diversion Structure	CIP	$ 70,000								
13		Gate Chamber Small Diameter Piping	The Small Diameter Piping in the Gate Chamber Which Includes Lubrication Systems, Hydraulic Systems, and Water Conduits Need to be Replaced,	Deer Creek Dam and Reservoir	O&M	$ 131,000								

No.	PLANNING YEARS	PROJECT	DESCRIPTION	SYSTEM PART	TYPE OF PROJECT	ESTIMATED COST	STATUS	2013	2014	2015	2016	2017	2018	2019
14		Retaining South Hill near Deer Creek Power Plant	The hillside south of the Power Plant has potential for landslide. This Project will provide a geotechnical evaluation of the hillside.	Deer Creek Power Plant	O&M	$ 30,000								
15		Weber Provo Canal Lining/Enclosure	This project would either line or pipe the canal to prevent seepage	General Weber Provo Canal	CIP	$ 5,900,000								
16		Flow Measurement Structure at End of Weber-Provo Canal	This Project Would Replace the Existing Measurement Structure and Control Building at the End of the Canal	Weber Provo Spillway and Stilling Basin	CIP	$ 198,000								
17		Spillway at Francis Rehabilitation	Inspection and Rehabilitation of Spillway Bottom at the Francis Spillway	General Weber Provo Canal	O&M	$ 45,000								
18		Weber Provo Canal Seepage Analysis	Determine Amount of Loss and Possible Means to Recover	General Weber Provo Canal	CIP	$ 2,500								
19		Access Catwalks in POMA Vault	Installation of Catwalks to Allow Operation and Maintenance of Isolation Gate Valves	Provo River Aqueduct	PRA Capacity Right Holders	$ 5,000								
20		Gate Operators on Spillway	Replacement of Operators on the Spillway Gates	Deer Creek Dam and Reservoir	O&M	$ 81,000								
21		Weber Provo Canal Intake Weber River Bypass	Project would install a low flow bypass of the main diversion weir in the river that would be metered.	General Weber Provo Canal	CIP	$ 100,000								
22		Cyber Security Upgrades	Installation of Protections for Computer and SCADA Systems	Overall Project	O&M	$ 48,000								
23		South Branch of the ULDC Repair	Replacement of Sections of Piping to the South Branch of the Utah Lake Distributing Canal	Point of the Mountain/Jordan Narrows	CIP	$ 245,000								
24		Upgrade Outlet Building	Construct new outlet control building, relocate gas supply for generator, relocate solar panels.	Duchesne Diversion	CIP	$ 37,000								
25		Fiber in Duchesne Tunnel	Fiber connection from outlet to inlet improving communication from PRWUA SCADA system.	Duchesne Diversion	O&M	$ 290,000								
26		Low Flow Measurement at Outlet	Provide for low flow weir to accurately measure low flows during the winter months.	Duchesne Diversion	O&M	$ 31,000								
27		Fiber Along the Canal	Installation of Fiber Along Canal to Connect Control and Monitoring of Facilities	General Weber Provo Canal	CIP	$ 1,700,000								
28		Bypass Radial Gate Wall Repair	Repair bypass channel walls to allow for full operation of bypass radial gate.	Duchesne Diversion	O&M	$ 35,000								
29		Rehabilitate Murdock Diversion Radial Gates	This Project Would Rehabilitate the Gate Controlling Flow Into the PRA and the Bypass Radial Gate.	Provo River Aqueduct	PRA Capacity Right Holders	$ 75,000								
30		Jordan Aqueduct Reach No. 1 Control Valve	This Project Would Install A Third Control Valve on the Turnout to the Jordan Aqueduct Reach No. 1	Provo River Aqueduct	PRA Capacity Right Holders	$ 312,000								
31		Second POMA Control Valve	This Project Would Install the Second POMA Control Valve When Needed	Provo River Aqueduct	PRA Capacity Right Holders	$ 531,000								
32		Access Road Improvements	Project Would Upgrade the Road Access to the Plant	Deer Creek Power Plant	O&M	$ 61,000								
33		American Fork and Dry Creek Blow Offs	This Project Would Examine the Ways to Increase Flow Capacity From the Blowoffs	Provo River Aqueduct	PRA Capacity Right Holders	$ 15,000								
34		Recoating of Penstock No. 1	Provide for recoating, agreement with USBR to complete	Deer Creek Dam and Reservoir	O&M	$ 160,000								
35		HVAC Rehabilitation	Upgrade the HVAC System in the Office and Shop.	Office/Shop	O&M	$ 92,500								

No.	PLANNING YEARS	PROJECT	DESCRIPTION	SYSTEM PART	TYPE OF PROJECT	ESTIMATED COST	STATUS	2013	2014	2015	2016	2017	2018	2019
36		Deer Creek Power Plant Power Generation and Revenue Analysis	This Analysis Will Evaluate the Current Power Generation and Will Make Recommendations for Future Power Plant Operation and Revenue Sharing.	Deer Creek Power Plant	CIP	$ 16,000								
37		Gate Operators on the Weber Provo Diversion	This study would review the condition of the gate operators and make recommendations for rehabilitation if required.	General Weber Provo Canal	O&M	$ 36,000								
38		Review of Deer Creek Land Use	This Project Would Examine the Possible Ways of the Shareholders Benefiting From the Land Holdings Around the Reservoir.	Deer Creek Dam and Reservoir	CIP	$ 17,000								
39		Reconstruction of Glen Gibbons Check Structure	The Glen Gibbons Check Structure was constructed at the wrong elevation which causes water to back up to the flume, potentially limiting flow in the Weber-Provo Canal.	Weber Provo Check Structures	CIP	$ 84,000								
40		GIS Input of Dikes and Easements	This Project Would Survey the Dikes and Easements and Input Them into the GIS System.	Upper Provo River	O&M	$ 14,000								
41		Weber-Provo Canal Drop Structure Evaluation	This evaluation would identify potential safety hazards and would make annual operation and maintenance recommendations.	Weber Provo Canal Concrete Drop Structure	O&M	$ 5,000								
42		Security Review	This project will assess the vulnerability of the Project including; identifying critical assets, threat assessment and likelihood of attack, security system effectiveness, and make recommended improvements.	Overall Project	O&M	$ 31,000								
43		Dike Road Maintenance	Clearing and Grading of the Top of the Dikes	Upper Provo River	O&M	$ 87,000								
44		Evaluate and Rate the Main Weir Across the Duchesne River	Determine flow measurement over the weir.	Duchesne Diversion	O&M	$ 3,600								
45		Deer Creek Dam Spillway	The Spillway has Been Rehabilitated Except the Lower Plunge Pool. This Project Would Inspect the Plunge Pool and Review Rehabilitation Options	Deer Creek Dam and Reservoir	O&M	$ 5,000								
46		Fencing Along the Weber Provo Canal	Develop Long Term Program to Replace Fencing and Transfer to Adjacent Landowners	General Weber Provo Canal	O&M	$ 10,000								
47		Deer Creek Dam Spillway Flow Measurement	This Project Would Develop a Way to Measure Flows Over the Spillway During Periods of High Flows	Deer Creek Dam and Reservoir	O&M	$ 7,500								
48		Improve Flow Measurement and Record Keeping	This Project Will Improve Flow Measurement and the Storage of Measurement Records	Overall Project	O&M	$ 42,000								
49		Landscape Plan	Implement the Landscape Plan Around the Office	Office/Shop	O&M	$ 95,000								
50		Solar Power Study	Determine Financial Feasibility of Installing Solar Panels on Office/Shop	Office/Shop	CIP	$ 31,000								
51	**2014**	**Utah Lake Distribution Canal North Branch Pipeline Repair**		**Point of the Mountain**		**$ 200,000**	**Complete**		**$235,179**					
52	**2008-2023**	**Deer Creek Dam Foundation Improvements[1]**		**Deer Creek Dam**	**USBR**	**$ 30,000,000**	**Ongoing**		**$246,480**	**$246,480**	**$246,480**	**$246,480**	**$246,480**	**$246,480**
		SUMMARY OF YEARLY EXPENDITURES				$ 30,375,500			**$(481,659)**	**$(546,480)**	**$(546,480)**	**$(246,480)**	**$(246,480)**	**$(246,480)**
		YEARLY MASTER PLAN ACCOUNT END OF YEAR BALANCE						**56,945.89**	**$ (30,187)**	**$(34,640)**	**$(39,093)**	**$108,954**	**$257,001**	**$405,048**
		YEARLY CAPITAL IMPROVEMENTS ASSESSMENT ($/PER SHARE)[2]							$ 3.50	$3.50	$3.50	$3.50	$3.50	$3.50

Notes:

1 - Costs are included for PRWUA's share of the Deer Creek Dam upgrade costs based on 15% of $24,112,000. PRWUA share financed over fifteen years at 0% interest. CUWCD participates at 17%.

2 - The assessment identified in this table is only an estimate and would be set by PRWUA directors.

3 - Interest calculated at 1.5% of one half annual assessments

Shading indicates future years that may be revised based on the results of the master plan update in 2014.