South Canal Hydropower Development Project: Drop 5
Uncompahgre Project, Colorado

Montrose, Colorado

A PROJECT GRANT PROPOSAL SUBMITTED TO:

WaterSMART
Water and Energy Efficiency Grant
Fiscal Year 2016

Funding Opportunity Announcement: R16-FOA-DO-004

On Behalf of:

Uncompahgre Valley Water Users Association

601 North Park Avenue
Montrose, Colorado 81401

Steve Fletcher, UVWUA General Manager
Phone: 970-249-3813 Fax: 970-249-6830
Email: sfletcher@montrose.net

Table of Contents

IV.D.4 TECHNICAL PROPOSAL & EVALUATION CRITERIA

IV.D.4.1 Executive Summary

January 20, 2016

Applicant: Uncompahgre Valley Water Users Association
Federal Facility: Uncompahgre Project Area
City: Montrose
County: Montrose
State: Colorado

Project Start Date: July 1, 2016
Project Completion Date: July 31, 2017

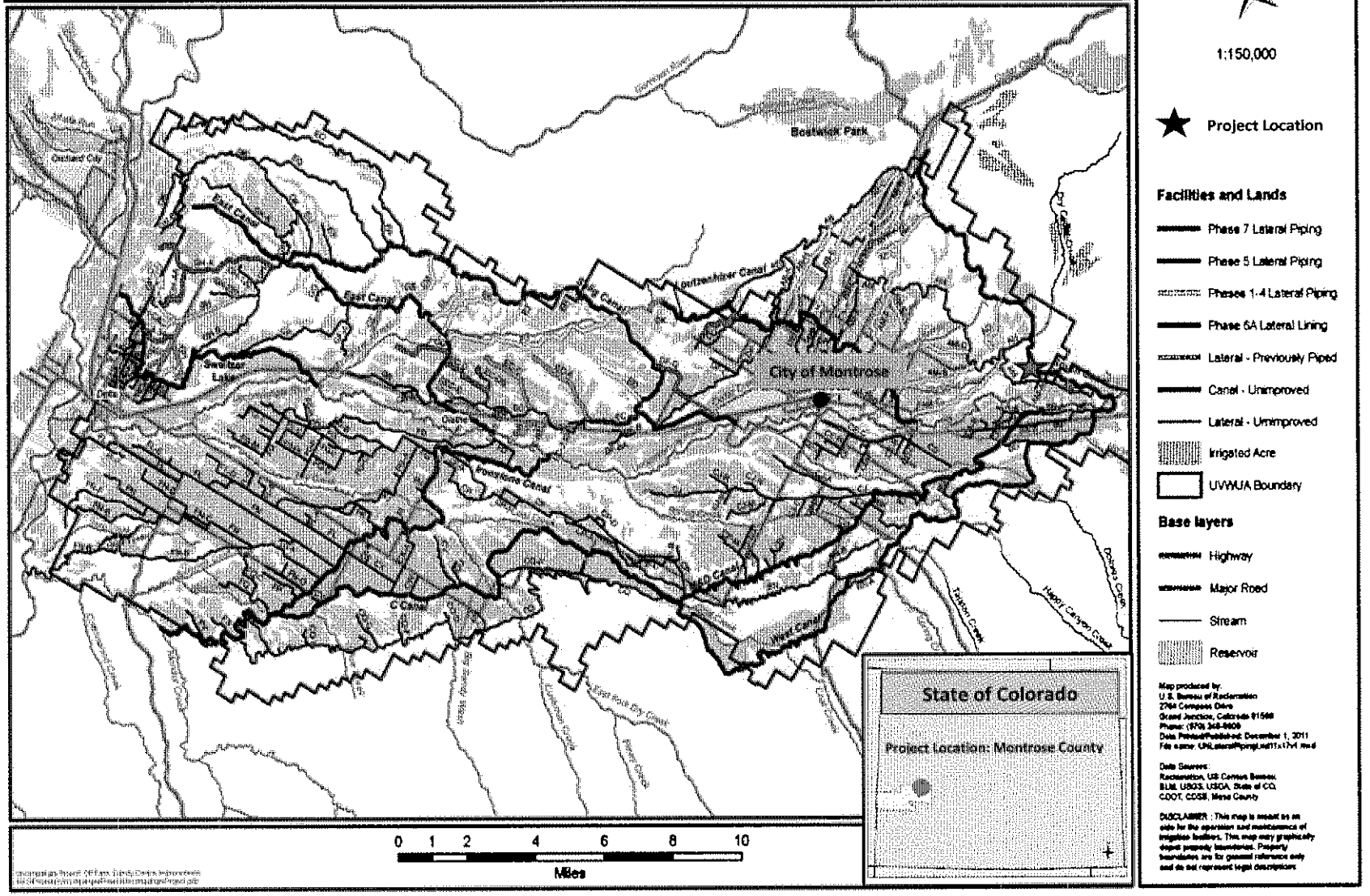
The Uncompahgre Valley Water Users Association (UVWUA) proposes to construct a 2.4 MW hydroelectric facility on an existing irrigation canal drop structure known as "Drop 5". Drop 5 is located on the South Canal in the federal Uncompahgre Project Area, approximately 4.3 miles southeast of the town of Montrose, Colorado (Figure 1). WaterSMART Grant Program funds will be used in support of hydroelectric facility construction. The *Uncompahgre Hydropower Development Project: Drop 5*, hereinafter referred to as the *Drop 5*, meets the following goals of the WaterSMART FOA by responding to the need for projects that: 1) Result in improved irrigation water management (Task A) by installing automation and remote monitoring components, 2) creates an Energy-Water Nexus (Task B) by implementing a *Renewable Energy Project Related to Water Management and Delivery* via the construction of a small-scale hydroelectric facility for the production of clean, renewable energy and the reduction in use of fossil fuels, and 3) provides *Benefits to Endangered Species* (Task C) via regulation and better control of water flowing from the Aspinall Unit through the Uncompahgre Project Area for the benefit of endangered river fish species occupying critical habitat in the Lower Gunnison and Colorado Rivers.

IV.D.4.2 Background Data

The Uncompahgre Project Area (UPA) is one of the oldest Reclamation projects, stretching across much of western Colorado in Delta and Montrose counties (Figure 1). It was one of the first projects funded by President Roosevelt under the newly formed Reclamation Service in 1902. Under the provisions of the Reclamation Act, the Uncompahgre Project was authorized for construction by the Secretary of the Interior on March 14, 1903 and subsequently authorized to allow for the sale of hydroelectric power under the Reclamation Act of 1938 (52 Stat. 941, Sale of Surplus Power, Uncompahgre Valley Project).

The Uncompahgre Project operates in Reclamation's Upper Colorado Region and contains one storage dam at Taylor Park Reservoir in Gunnison County, 7 diversion dams, 128 miles of canals, 438 miles of laterals and 216 miles of drains. Diversion dams in Montrose County include the

Figure 1. Project Location Map: Uncompahgre Hydropower Development – Drop 5



East Portal of the Gunnison Tunnel on the Gunnison River, and the East, Loutzenhizer, Montrose/Delta (M&D), Ironstone and Selig Canal Diversions all of which are on the Uncompahgre River. Delta County is home to the Garnet Canal Diversion Dam also on the Uncompahgre River. The UPA currently has three small-scale hydroelectric facilities located on the South Canal at Drops #1, #3 and #4, and one on the M&D Canal at Drop #6 (Shavano Falls). Drop #1 produces 3.4 MW, Drops #3 and #6 each produce approximately 2.8 MW, and Drop #4 produces 4.8 MW.

The UPA draws water from the Uncompahgre River and from the Gunnison River. Water from the Gunnison River is brought to the UPA via a 5.8 mile long trans-mountain tunnel (Gunnison Tunnel) which begins below Crystal Reservoir and feeds the South Canal which exits to the Uncompahgre River. The UPA includes mesa and valley land at elevations ranging between 5,000 and 6,000 feet above sea level. Water is delivered to approximately 85,000 irrigated acres with approximately 3,500 shareholders utilizing water for irrigation (agricultural and municipal), stock water, and power generation. The UVWUA projects a total water demand of approximately 865,574 ac-ft for 2016 (2003-2012 average diversion).

Water resources serving the UPA include the 1913 Gunnison Tunnel Water Right from the Gunnison River (1300 cfs), the 1882 Uncompahgre River Right (1225.64 cfs), and the 1937 Taylor Park Reservoir Storage Right of 106,230 ac-ft. Total direct flow water rights are therefore 2,525.64 cfs. The 10 year average annual water supply for 2003-2012 was 865,574 ac-ft (UVWUA, 2013).

Shortfalls in water supply affect the UVWUA during periods of drought and when senior water right holders place calls on the rivers. In certain areas of the UP, there may be shortfalls in water supplies for landowners at the end of the lateral/canals due to uneven flows at the headgate or in the canal/lateral due to fluctuating river flows/levels.

The 2.4 MW hydropower project at Drop 5 is located in the South Canal approximately 4.0 miles downstream from the existing Drop 4 hydropower project completed in 2015. The South Canal is located at the opening of the Gunnison Tunnel, approximately 5.2 miles southeast of the town of Montrose, Colorado as shown on Figure 1. The Drop 5 hydropower plant is located entirely on Reclamation withdrawn lands. Upstream segments of the South Canal will require modification to raise the height of the flumes in order to back water up in the canal and increase head on the flumes. This portion of the South Canal is located on lands administered by the Bureau of Land Management Uncompahgre Project Field Office (BLM-UFO). The Drop 5 reach has approximately 38.5 feet of fall over 2,900 linear feet.

The South Canal was the first large-volume canal built to transport water from the Gunnison Tunnel for distribution throughout the Uncompahgre Valley. Construction of the South Canal took place in divisions between 1904 and 1909 (Reclamation Draft EA, 2014). It is 11.4 miles long and was designed to carry 1300 cfs. The South Canal has an absolute decreed water right for 1,175 cfs, a conditional water right for 125 cfs, and an appropriation date of June 1, 1901, for irrigation, municipal and stock water.

The South Canal currently carries up to 1,175 cfs of which approximately 850 cfs reaches Drop 5 after upstream deliveries obligations are met. Water comes directly from the opening of the Tunnel on the Gunnison for about 11.4 miles to the Uncompahgre River and the West Canal System. The South Canal System consists of the Highline-Cedar Valley Lateral and the AB Lateral (UVWUA Water Management Plan, 2013). On average, the South Canal diverts 367,300 ac-ft/year (Reclamation Final Environmental Assessment, 2015) of which approximately 70% reaches the Uncompahgre River for distribution throughout the entire UPA. There are six direct lateral water diversions off the South Canal serving 320 water users and irrigating 13,600 acres in the southeast part of the UPA (UVWUA personal comm., 2014). In addition, the South Canal provides 172 cfs to the West Canal (Alpine Archeological Consultants, 2013; UVWUA personal comm., 2014).

Technically speaking, the South Canal functions to move water from the Gunnison Tunnel for distribution throughout the *entire* Uncompahgre Project Area and provides half of the irrigation water supply needed.

The Uncompahgre Valley Water Users Association (UVWUA), a 501(c)(12) not for profit entity, was incorporated in 1903 and is contracted with Reclamation to operate and maintain the UPA facilities. The UVWUA maintains a professional staff of organizational and fiscal managers, water masters, office staff, ditch riders and skilled laborers. As of December 2015 the UVWUA has completed 92.1 miles of canal and lateral lining and piping with a total of 119.6 miles expected to be completed through Phase 9 of the East Side Laterals Piping Projects (UVWUA, personal communication 2016). Upon completion of Phase 9, the UVWUA will have prevented an estimated total of 33,302 tons/year of salt and an estimated range of 1,332 to 3,330 pounds/year of selenium from entering the Colorado River with an average 50-year cost-effectiveness value of $39 per ton and a total cost of $27,986,360.

The Uncompahgre Valley is a high mountain desert with rainfall averaging less than 10 inches per year. Average high temperatures are 87 degrees Fahrenheit and average lows are 15 degrees. The growing season in the UPA extends from approximately April 1 to October 31.

Principal crops produced within the area include corn, sweet corn, alfalfa, beans, peppers, onions, broccoli, potatoes, apples, pears, cherries, apricots, grass hay, pasture forages, wheat, barley, and oats. Livestock operations include beef cattle, dairy cattle, sheep, hogs, horses, and chickens.

Soils on the east side of the UPA are derived primarily of Mancos Shale which has naturally high concentrations of salts and selenium. The underlying bedrock in the region consists predominantly of crystalline and sedimentary rocks, with alluvial deposits in the valleys. The application of water to these soils via seepage from open earthen canals and laterals and on-farm irrigation deep percolation, mobilizes salts and selenium and creates hydraulic gradients that result in the discharge of saline and seleniferous groundwater into irrigation drains and local waterways. According to the Colorado Geologic Survey (2008), Mancos Shale soils are best exposed on the east side of the Uncompahgre River, except along the mesa edges on the west side of the Uncompahgre River. Within the UPA, there are approximately 27,278 irrigated acres in Mancos Shale adobe soils and 56,953 acres in Mesa soils.

The UVWUA has significant prior experience working successfully with Reclamation, primarily through the Salinity Control Program and has contracted to carry out 9 phased, large lateral piping projects. In addition, the UVWUA has worked with Reclamation on other irrigation delivery system efficiency projects including the Headgate Automation, SCADA and Remote Monitoring Project on the M&D and Ironstone Canals, Uncompahgre Project System Optimization Study Review, and multiple hydroelectric development projects. UVWUA staff work directly with Reclamation designers, engineers, surveyors, grant officers, and environmental compliance staff to carry out multiple aspects of on-going projects. In addition, the UVWUA has served alongside Reclamation on stakeholder groups working to increase public awareness about critical water resource, water-quality and endangered species concerns.

Salinity Control Projects include the:

- •LOWER GUNNISON BASIN WINTER WATER PROGRAM - This program was funded through the Colorado River Basin Salinity Control Program for the construction of stock water taps which were provided in lieu of water being diverted through the Gunnison Tunnel from October 15 through April 15 of each year with an estimated 41,330 tons/year of salt controlled and an estimated range of 1,653 to 3,306 lbs/year of selenium controlled.

- •PHASE I - MONTROSE ARROYO DEMONSTRATION PROJECT (Contract No. 98-FC-40-1300). The project involved piping 7.5 miles of open, earthen laterals for salinity control during the period 9/23/98 to 12/31/01. Salt controlled = 2,520 tons.

- •PHASE II – EAST SIDE LATERALS PIPING PROJECT (Contract No. 04-FC-40-2243). The project involved piping 21 miles of open, earthen laterals for salinity control during the period 9/27/04 to 12/31/09. Salt controlled = 6,139 tons.

- •PHASE III – EAST SIDE LATERALS PIPING PROJECT (Contract No. 07-FC-40-2568). The project involved piping 10.5 miles of open, earthen laterals for salinity control during the period 5/15/07 to 12/31/11. Salt controlled = 2,292 tons.

- •PHASE IV – EAST SIDE LATERALS PIPING PROJECT (Agreement No. 09AP40866). The project involved piping 11.4 miles of open, earthen laterals for salinity control during the period 5/15/07 to 12/31/12. This project was jointly funded by the Basinwide Salinity Control Program and the State of Colorado Non-Point Source Program. Salt controlled = 3,651 tons.

- •PHASE V – EAST SIDE LATERALS PIPING PROJECT (Agreement No. R11AC40020). This project involved piping 19 miles of open, earthen laterals for salinity control during the period 8/09/11 to 12/31/15. Salt controlled = 5,034 tons.

- •PHASE VI (A) – EC LATERAL LINING PROJECT (Agreement No. – See contract No.'s below). The goal of the project was to demonstrate that a new canal lining technology could be employed in the UPA to reduce selenium and salt loading to the lower Gunnison and Colorado River systems. A total 2.0 miles were lined on the EC Lateral. Salt controlled = 1,374 tons.

Funding partners:

•State of Colorado Species Conservation Trust Funds: "EC Canal Lining Demonstration Project" (Agreement No. C-154160) (Construction Period: 02/09/10 to 6/30/13)

•Salinity Program Parallel Funds (Colorado Department of Agriculture): (Contract No. 22911) (Construction Period: 10/01/10 to 09/30/12)

•Colorado River District Grant (Agreement No. CG09019) (Construction Period: 08/27/09 to 04/30/12)

•PHASE VII – East Side Laterals Piping Project (Agreement No. R11AC40025). The goal of this project was to pipe 12.7 miles of open, earthen laterals for salinity control during the period 8/09/11 to 12/31/16. Salt controlled = 3,029 tons.

•PHASE VIII – East Side Laterals Piping Project (Agreement No. – R14AP00005). The goal of the project is to pipe 14.08 miles of open, earthen laterals for salinity control benefit during the period 06/01/13 to 05/30/17. Salt controlled = 3,307 tons.

•PHASE IX – East Side Laterals Piping Project (Agreement No. – In progress/TBD). The goal of the project is to pipe 15.5 miles of open, earthen laterals, construct a new feeder lateral of 5,617 ft, and abandon 26,611 ft of existing earthen lateral during the period 10/01/17 to 02/28/20. Salt controlled = 6,030tons.

At the completion of Phase 9, a total of 119.6 miles of laterals will be piped or lined, with 33,302 tons/year of salt and an estimated range of 1,332 – 3,330 lbs/year of selenium controlled.

The UVWUA worked closely with Reclamation to develop and obtain a Lease of Power Privilege (LOPP), has regular minimum monthly communication at scheduled construction meetings, and works closely with Reclamation staff to ensure that all environmental review and compliance processes are followed.

Hydropower projects include the:

•HYDROPOWER DROP 1 – A 3.8 MW hydroelectric plant was constructed on the South Canal and completed May 2013. LOPP No. 12-07-40-P0310.

•HYDROPOWER DROP 2 – A 1.0 MW hydroelectric plant will be constructed on the South Canal at an existing structure known as Drop 2. Construction is expected to commence on October 2016 and continue through April 2017. This project is unique in that it involves the use of the first Archimedes Screw for hydroelectric production in the United States. LOPP No. 15-07-40-P0360.

•HYDROPOWER DROP 3 – A. 3.4 MW hydroelectric plant was constructed on the South Canal and was completed July 2013. LOPP No. 12-07-40-P0310.

•HYDROPOWER DROP 4 – A 4.8 MW hydroelectric plant has been constructed on the South Canal. Construction was complete by June 2015. LOPP No. 14-07-40-P0350.

•HYDROPOWER DROP 5 – A 2.4 MW hydroelectric plant is currently under construction on the South Canal. Construction began November 5, 2015 and is expected to be complete by September 2016. LOPP No. 15-07-40-P-0370.

•HYDROPOWER DROP 6 – A 2.8 MW hydroelectric plant has been constructed on the M&D Canal and is supported by a WaterSMART Grant entitled *Shavano Falls Hydropower Development Project* (Agreement No. R14AP001007). Construction was complete May 2015. LOPP No. 14-07-40-P0340.

Irrigation water management projects include the:

•*Uncompahgre Project Headgate Automation, Remote Monitoring & SCADA System* – (WaterSMART Agreement No. R13AP40030). The purpose of the project was to implement headgate automation, remote monitoring and SCADA on the M&D and Ironstone Canal during the period 05/01/13 to 12/31/14 to improve irrigation water management (202,457 ac-ft/year).

System Optimization Review/Study plans include the:

•*Integrated Assessment, Comprehensive Implementation Planning and System Optimization Analysis for Agricultural Improvements to Reduce Selenium and Salinity Loading in the Uncompahgre Project Area* – (Colorado River District Contract No. C154206). The purpose of the project was to perform a comprehensive analysis, review and systematic plan for integrated on-farm and off-farm efficiency improvement opportunities while minimizing water losses to deep percolation which results in selenium and salinity transport. The plan also incorporated the UVWUA's plans for taking advantage of hydroelectric development opportunities.

IV.D.4.3 Technical Project Description

The UVWUA proposes to construct a 2.4 MW hydroelectric facility on an existing irrigation drop structure on the South Canal known as "Drop 5" in the UPA in Montrose, Colorado. The Uncompahgre Project was authorized for construction by Congress in 1903 and subsequently the Reclamation Act of 1938 (52 Stat. 941) which authorized the Secretary of Interior to enter into contracts for the sale or development of surplus power generated as part of the project. The Drop 5 hydropower development project is therefore under the jurisdiction of Interior (Reclamation) and is exempt from Federal Energy Regulatory Commission (FERC) requirements. In addition, recently passed Public Law 113-24 provides the UVWUA with first rights to issuance of a Lease of Power Privilege (LOPP)."

The project includes the construction of an intake channel to convey flows of approximately 825-850 cfs from the existing canal to the proposed 2.4 MW facility. Flow will then be returned to the existing channel. The design will allow for a parallel bypass of water and will not alter irrigation deliveries. A summary of the hydropower project features are summarized below:

• **Canal System:** The portion of the South Canal in the project area is a concrete flume structure which serves the UVWUA. Water will be backed up through the first upstream tunnel (Tunnel 5)

and inverted siphon to attain an increased head. This will require capping the existing canal flume for approximately 330 feet upstream of the Tunnel 5 inlet.

• **Intake Channel:** The intake channel will be approximately 200 feet long, conveying water from the existing canal to the intake/power house structure. A bypass structure will be constructed at the upstream end of the intake channel.

Level sensors (differential pressure) in the forebay will be utilized to provide information to the powerhouse Programmable Level Control (PLC) to maintain constant head in the upstream forebay and thus in the feeder canal.

• **Bypass Structure:** The bypass structure will be located upstream of the intake channel. An approximately 12-foot wide by 18-foot high roller gate will be set in the existing concrete canal to divert water into the intake channel. This gate will also be used as a bypass to direct flow back into the South Canal in the event they hydropower plant is not functioning. Five (5) 10-foot wide automatic trip gates (ATG) will function as a redundant safe guard in the event the plant shuts down for any reason and they bypass gate is not able to divert flows back into the South Canal.

• **Intake/Power House Structure:** The intake portion of this steel reinforced concrete structure will be approximately 80-feet long by 23-feet wide by 50-feet high. This will convey water from the intake channel to the scroll case in the powerhouse. A steel bar trash screen will be installed in the structure to remove debris.

The power house portion of this steel reinforced concrete structure will be approximately 50-feet wide by 36-feet long with a metal roof. The power house foundation will embed the turbine housing steel draft tube and tailrace stop gates. The tailrace stop gates will be used to dewater the unit during maintenance. The building will house the generator and mechanical/electrical auxiliaries. The building will be equipped with a roof access hatch to facilitate future maintenance. The tailrace will be approximately 100 feet long.

• **Powerhouse Electrical Controls:** Powerhouse controls will be utility grade. The switchgear will be backed by a 125 volt DC service system for operation of essential features during power outages, specifically turbine shutdown and maintenance of flow in the canal system including the bypass roller gates.

• **Turbine:** The turbine will be a vertical double regulated Kaplan. The turbine is an American/European design built in China, as is the generator. The turbine manufacturer is represented by Far East Engineering of Boise, Idaho. Nearly identical units were installed on the South Canal Drops 1, 3, and 4 hydropower projects.

The turbine wicket gates will be operated hydraulically. The hydraulic power unit will be of American make with accumulators for black shutdown. The governor will be digital.

• **Substation and Transmission Line:** Delta Montrose Electric Association (DMEA) has an underground 12.4 kV line approximately 200 feet from the power house location. A new overhead line and 5 power poles will be installed for this 200-foot span. A switchyard will be constructed

at the powerhouse with transformer capable of stepping up the power generated to 4,160 V to the interconnection voltage of 12.4kV.

• **Hydrology:** Daily flow data is available for the South Canal from 1991 through 2013. These daily flows were adjusted by 10% due to recalibration from an ultrasonic flow meter installed at the South Canal Drop 1 hydroelectric facility. According to flow records from UVWUA, approximately 85 cfs is removed between the flow meter and the Drop 5 hydroelectric facility. The flow going through the Drop 5 site is therefore 825-850 cfs. The total number of irrigate acres below the Drop 5 hydroelectric facility has remained constant over the past and is projected to remain constant in the future.

• **Operation and Maintenance:** UVWUA will own, operate and maintain the Drop 5 hydropower facility. The facility will be controlled by an automated computer (unmanned) system located at the plant, fitted with dial-in signal to allow remote monitoring of the plant, including critical variables (e.g., temperature, voltage, etc.), from any telephone. The Drop 5 site will eventually tie into the future SCADA system being planned by the UVWUA and currently under analysis. In addition, the control panel will be fitted with an automatic telephone dialer to alert the UVWUA of unsatisfactory conditions, such as the generator turning on or off, changes in temperature of bearings, generator, and cooling water, and canal water intake levels above or below trash racks. The facilities will be equipped with a battery system for operation of essential features during power outages. The facilities would be designed and equipped with structures to protect the canal and irrigation flows. When the hydropower facility goes off-line, flows would be immediately diverted back into the canal to prevent any disruption to irrigation supply and delivery.

The hydropower project will only use normal irrigation flows in the South Canal. The Uncompahgre Project was constructed as an irrigation project and irrigation will remain its primary purpose will all other uses playing secondary roles. The hydropower project would be operated as a run-of-canal plant. At the beginning of each irrigation season, water would be discharged through the irrigation system and power plant to exercise the gates and make certain all systems associated with the project are in working order. During the irrigation season, the Project would divert irrigation flow from the canal, pass it through the power plant, and return the water to the canal immediately below the power plant. No increase in diversions from the Gunnison River through the Gunnison Tunnel to the South Canal would be permitted under the LOPP for this project. Hydropower production would occur in the March through October irrigation period.

• **General Construction Information**: The hydropower project is a private venture of the UVWUA; however UVWUA has applied for and received approval for a loan from the State of Colorado Water Conservation Board (CWCB) and is applying for federal assistance from Reclamation's WaterSMART grant program as evidenced by this application.

Construction of the facility is expected to take approximately 10 months at a cost of $6.8 million dollars. Construction activities will be coordinated with canal operations and on-going irrigation delivery. Normal irrigation deliveries would be maintained throughout construction.

Construction storage and staging areas would be adjacent to the South Canal and existing roads would be used for construction access. UVWUA will be responsible for obtaining any required federal, state, or local permits to construct and operate the Drop 5 project.

IV.D.4.4 Evaluation Criteria

V.A.1 Evaluation Criterion A: Water Conservation (28 points)

Not applicable.

V.A.2 Evaluation Criterion B: Energy Water Nexus (16 points)

The development of renewable energy generation is a core component of Reclamation's mission and long-term strategic objective as demonstrated below. For example:

•The Department of Interior's Strategic Plan for 2011-2016 points to the development of "renewable energy potential as a strategy supporting the Department's goal of securing America's energy resources."

•The 2010 Sustainable Hydropower Memorandum of Understanding (MOU) outlines and promotes shared goals for the development of clean, reliable, cost-effective, and sustainable hydropower generation in the United States. The MOU outlines the challenge for Reclamation and other signatories to identify, "new ways to develop clean, renewable hydropower energy that not only increases energy generation capacity, but also leads to improvements in ecosystem function and health". This project addresses that challenge by producing clean, renewable energy and providing by assisting Reclamation in avoiding water and endangered species conflicts by having better measurement, control and management of Aspinall-Unit water flowing through the federal Uncompahgre Project Area for the benefit of endangered species in the Lower Gunnison and Colorado Rivers.

•In March of 2011, Reclamation released a report entitled, "Hydropower Resource Assessment at Existing Reclamation Facilities." The report provided a reconnaissance level evaluation of hydropower development potential at Reclamation facilities. A total of 70 sites showed some economic potential for hydropower development. Of the 70 sites identified, 10 are in the federal Uncompahgre Project including the South Canal Drop 5 structure (http://www.usbr.gov/power/AssessmentReport/index.html).

•In March 2012 a more detailed supplement report was released entitled, "Site Inventory and Hydropower Energy Assessment of Reclamation Owned Conduits." Table 3 and 4 in that report rank the top 25 sites based upon their energy production potential and installed capacity, respectively. The Drop 5 site ranked #7 for both energy production and installed capacity potential (http://www.usbr.gov/power/CanalReport/FinalReportMarch2012.pdf). Please note that the report incorrectly identifies Drop 5 as "Drop 6".

•Finally, Reclamation has developed six long-term strategic objectives to further Reclamation's sustainable energy mission including *Strategic Objective #1 - Increase Renewable Energy Generation from Reclamation Projects*. On-going Reclamation activities in support of the objective specifically include the use of WaterSMART grants to "provide cost-share assistance to support the development of renewable resources" (http://www.usbr.gov/power/Reclamation%20Sustainable%20Energy%20Energy%20Strategy%20.pdf).

SUBCRITERION NO. B.1: Implementing Renewable Energy Projects Related to Water Management & Delivery

Describe the amount of energy capacity (state the amount of capacity in kW of the system. Provide sufficient detail supporting the stated estimates, including calculations in support of the estimate.

The energy capacity of the proposed facility is 2,400 KW. Detailed modeling of the stated estimate and associated calculations can be found in Figure 2.

Describe the amount of energy generated in kWh/year (provide calculations in support of estimate).

Sorenson Engineering estimates an average annual energy generation of 8,623,000 kWHr (Figure 2). The energy generation estimate was derived by modeling estimated daily flows in the South Canal for the period 1991-2012. Flows were then adjusted by 10% based upon recalibration data from an ultrasonic flow meter and decreased by 85 cfs to account for deliveries between the flow meter and the proposed Drop 5 hydroelectric facility location.

Approximately 825-850 cfs will be directed to the Intake structure during the months of March through October and will drop a vertical distance of 38.5 feet. Approximately 2000' of the existing upstream canal will be enlarge to back-up water and increase pressure for energy production potential (There will be no penstock). This section of canal will convey water to the intake/power house structure. Flow will then be returned to the existing canal via a parallel bypass of water and will not affect irrigation users.

The Drop 5 hydroelectric facility will utilize a vertical double regulated Kaplan turbine connected to a vertical shaft three phase AC synchronous generator.

Power generated by the Drop 5 facility will be sold to Delta Montrose Electric Association (DMEA). DMEA has an underground 12.4kV line next to the South Canal and approximately 200 feet from the power house location. A new overhead line will be constructed across this span. A switchyard will be constructed at the powerhouse with a transformer capable of stepping up the power generated to 4,160 V to the interconnection voltage of 12.4 kV.

Figure 2. Power Generation Analysis – Drop 5

Drop 5 Parameters

Headwater Elevation	36.5-38.5 Feet
Tailwater Elevation	0 Feet
Max Turbine Flow	837 CFS
Min Turbine Flow	30% of Max flow
Max Generator Output	2.19 MW
Flow gauge adjustment	-63 CFS
Average Generator Efficiency	95.0%
Average Turbine Efficiency	89.0%
Transformer and Line Loss	0.50%

Drop 5 Hydro Energy in Megawatt Hours

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1991	-	-	-	243	1,125	1,443	1,459	1,417	1,051	811	-	-	7,549
1992	-	-	-	194	1,378	1,352	1,456	1,447	1,263	885	26	-	8,001
1993	-	-	-	665	886	994	1,456	1,491	1,265	985	141	-	7,883
1994	-	-	191	1,232	1,467	1,465	1,502	1,458	1,148	667	-	-	9,128
1995	-	-	-	640	1,016	792	872	1,483	1,365	717	115	-	6,999
1996	-	-	191	1,392	1,508	1,486	1,526	1,508	1,317	712	22	-	9,663
1997	-	-	-	-	691	866	1,442	1,405	1,106	695	-	-	6,205
1998	-	-	392	928	1,191	1,430	1,466	1,478	1,303	967	-	-	9,154
1999	-	-	305	1,358	1,346	1,434	1,480	1,486	927	649	21	-	9,006
2000	-	-	248	1,259	1,362	1,425	1,531	1,495	1,366	1,051	-	-	9,737
2001	-	-	264	1,288	1,453	1,418	1,484	1,483	1,384	913	-	-	9,686
2002	-	-	170	1,312	1,498	1,453	1,495	1,457	889	432	-	-	8,706
2003	-	-	107	1,133	1,250	1,158	1,538	1,509	1,147	820	-	-	8,663
2004	-	-	-	885	1,224	1,359	1,618	1,618	1,371	524	-	-	8,600
2005	-	-	92	1,185	1,352	1,302	1,482	1,405	1,363	910	-	-	9,092
2006	-	-	-	1,156	1,479	1,440	1,412	1,336	1,190	908	-	-	8,921
2007	-	-	-	729	1,264	1,161	1,427	1,388	1,247	865	-	-	8,081
2008	-	-	-	461	1,325	1,075	1,350	1,502	1,420	1,074	-	-	8,207
2009	-	-	154	918	1,327	1,377	1,552	1,558	1,466	1,181	-	-	9,533
2010	-	-	-	917	1,473	1,275	1,591	1,524	1,411	1,196	-	-	9,387
2011	-	-	-	910	1,510	1,386	1,332	1,529	1,431	1,212	-	-	9,310
2012	-	-	-	1,212	1,534	1,484	1,437	1,201	1,059	-	-	-	7,926
2013	-	-	-	735	1,608	1,542	1,573	1,465	1,165	809	-	-	8,895
Average	-	-	106	895	1,281	1,285	1,457	1,472	1,250	848	16	-	**8,623**

Describe any other benefits of the renewable energy project. Please describe and provide sufficient detail on any additional benefits expected to result from the renewable energy project, including:

- Expected environmental benefits to the renewable energy system:

Environmental Benefit #1: Clean energy generated from the Drop 5 hydroelectric facility can replace energy generated from fossil fuel or coal. The Drop 5 site is an ideal location to ***"increase the use of renewable and clean energy sources in the management and delivery of water"*** in the Uncompahgre Project ***(Task B).*** According to the U.S. Energy Information Administration (EIA), in 2012 "the average annual electricity consumption for a U.S. residential utility customer was 10,837 kWh..." (http://www.eia.gov/tools/faqs/faq.cfm?id=97&t=3).

With an average annual energy generation of 8,623,000 kWHr, the Drop 5 hydroelectric facility would provide enough clean energy to power 796 homes each year. In addition, approximately 17,900,000 to 18,800,000 lbs of CO_2 would be removed per year depending upon the specific fuel and specific type of generator. Table 1 below has been modified to demonstrate the number of pounds of CO_2 that could be removed annually for the average U.S. household utilizing steam-electric generators in 2012 for the specific fuels identified (http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11).

Table 1. South Canal Drop 5 Hydroelectric Development: Associated Carbon Reduction

Fuel	**Lbs of CO_2 per Million Btu**	**Heat Rate (Btu per kWh)**	**Lbs CO_2 per kWh**	**Lbs of CO2 removed when using clean energy**
Coal				
Bituminous	205.300	10,107	2.08	17,935,840
Sub-bituminous	212.700	10,107	2.16	18,625,680
Lignite	215.400	10,107	2.18	18,798,140

Last updated: April 17, 2014 (http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11)

- Any expected reduction in the use of energy currently supplied through a Reclamation project.

No.

- Anticipated beneficiaries, other than the applicant, of the renewable energy system.

Transmission line loss is avoided when outside energy does not have to be brought in to an area. Energy generated by the Drop 5 Hydroelectric Facility will be utilized and provided locally to the surrounding area of Montrose County, Colorado.

Future revenues derived from the power plant will off-set operation and maintenance costs throughout the entire UPA and benefit Uncompahgre Project water shareholders.

- Expected water needs of the renewable energy system.

Hydro power generation is a non-consumptive use so there are no water needs associated with the project.

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management

Not applicable

V.A.3 Evaluation Criterion C: Benefits to Endangered Species (12 points)

For projects that will directly benefit *federally-recognized candidate species*.
Not applicable.

For project that will directly accelerate the recovery of *threatened or endangered species or address designated critical habitats*, please include the following elements:

(1) How is the species adversely affected by a Reclamation project?

The Federal UPA receives the majority of its water supply from the Gunnison River via the Gunnison Tunnel below the federal Aspinall Unit. The lower Gunnison (below the confluence of the Uncompahgre River) and the Colorado Rivers, serve as critical habitat to four listed endangered fish species (razorback sucker, humpback chub, bonytail chub, and Colorado pikeminnow).

The application of water to natural geologic sources of Mancos Shale derived soils via the application of irrigation water to urban landscaping or agricultural fields and the leaking of canals or laterals, mobilizes selenium and salts and creates hydraulic gradients that can result in the discharge of non-point source polluted surface and groundwater into irrigation drains and local waterways.

High selenium concentrations have been shown to cause reproductive failure and deformities in aquatic birds and fish. The lower Gunnison (from the confluence of the Uncompahgre River) and Colorado Rivers, serves as critical habitat to four listed endangered fish species (razorback sucker, humpback chub, bonytail chub, and Colorado pikeminnow). The federal UPA and the Uncompahgre River Basin have been identified as the source of 60% of the selenium loading in the lower Gunnison River (Reclamation, 2006). The Uncompahgre River currently violates Clean Water Act (CWA) chronic water-quality standards of 4.6 ppb which are said to be protective of aquatic dependent life. Selenium concentrations in the Uncompahgre River above the confluence with the Gunnison are 14.8 ppb.

In 2009, an Environmental Impact Statement (EIS) was prepared for re-operation of the Aspinall Unit to mitigate for the effects of depletions in the Gunnison and Dolores River Basins on endangered river fish. A Biological Assessment (BA) found that there would be impacts to endangered fish as a result of the proposed re-operation. The FWS prepared a

Programmatic Biological Opinion (PBO) which stated that on-going irrigation activities in the Lower Gunnison would continue to negatively impact selenium levels and that a Selenium Management Program (SMP) would have to be developed as part of the conservation measures utilized to mitigate impacts from the flow modifications and historical depletions.

(2) Is the species subject to a recovery plan or conservation under the ESA?

Yes. The Colorado River Endangered Fish Recovery Program.

(3) What is the extent to which the proposed project would reduce the likelihood of listing or would otherwise improve the status of the species?

Benefits to Gunnison Basin Programmatic Biological Opinion (PBO) for Endangered Fish Species: Headgate automation and remote monitoring associated with the proposed hydroelectric facility may make the operation of the Aspinall Unit easier for the benefit of endangered species because it allows Reclamation, UVWUA, and the State of Colorado to have better control of water going through the Uncompahgre Project Area (UPA) for the benefit of endangered fish. This project increases the resiliency of the UVWUA and Reclamation should they have to respond to a potential water and endangered species conflict in an area of the western United States prone to frequent and prolonged droughts.

V.A.4 Evaluation Criterion D: Water Marketing (12 points)

Not applicable.

V.A.5 Evaluation Criterion E: Other Contributions to Water Supply Sustainability (14 points)

Subcriterion E.1. Addressing Adaptation Strategies in a WaterSMART Basin Study
Up to 14 points may be awarded for projects that address an adaptation strategy identified in a completed WaterSMART Basin Study.

(a) Identify the specific WaterSMART Basin Study where this adaptation strategy was developed. Describe in detail the adaptation strategy that will be implemented through this WaterSMART Grant project and how the proposed WaterSMART Grant project would help implement the adaptation strategy.

According to the 2012 *Colorado River Basin Water Supply and Demand Study*, all portfolios developed to address water supply and demand imbalances involved adaptation strategies like **Conveyance System Efficiency Improvements** identified in Technical Report F (Appendix F10).

According to the report, "Improvements in conveyance system efficiency through ***delivery canal lining, canal to pipe conversion, improved canal control*** and/or ...***are included in this option***" (emphasis added).

The following irrigation lateral and canal conveyance system improvements associated with the proposed hydropower project will help implement the Conveyance System Efficiency Improvement adaptation strategy as follows:

1) *Automation, remote monitoring and trash screens* associated with the hydroelectric facility improve canal control and irrigation delivery system efficiency by creating clean, stable and reliable flows which often result in improved on-farm irrigation water management and reductions in delivery system water loss due to the elimination of canal spills; and

2) *Automation and remote monitoring* allow the UVWUA to have better control of water during storm events by allowing water to pull behind the intake and slowly release rather than having it race down the South Canal and cause spills/overtopping and flooding in residential areas which has been a public health and safety issue downstream of Drop 5.

The following related adaptation strategies were found in the Basin Study that relate to hydropower development.

Appendix F12 - **Option Characterization for System Operations** discusses the effect of *Option 4 - Modifying Operations of Existing Reservoirs* to decrease demand, reduce evaporation loss, and improve efficiency with the Basin. Several sub-options were identified including sub-option 4.3 **Maximize Hydropower Generation.** This option is focused on improving power generation efficiency at existing reservoirs in the basin that do not operate at optimal capacity. The option does not explore the benefits of new hydropower development at federally owned facilities such as conduits, but later studies such as the *Site Inventory and Hydropower Energy Assessment of Reclamation Owned Conduits* published in March 2012 clearly demonstrate the goal and intent of Reclamation "to provide the nation with affordable, reliable and environmentally sustainable hydropower."

(b) Describe how the adaptation strategy and proposed WaterSMART Grant project will address the imbalance between water supply and demand identified by the Basin Study.

The implementation of automation, remote monitoring and trash screens at Drop 5 will reduce operational spills thus keeping water in the system to meet on-going demands. Automation and monitoring of the conveyance system reduces "bounces" in the delivery system, improves canal control on a daily basis and during storm events, and provides reliable and stable water supplies that result in better on-farm irrigation water management. It also increases the UVWUA's ability to control water going through the UPA for environmental concerns (Clean Water Act and Endangered Species Act).

(c) Identify the applicant's level of involvement in the Basin Study (e.g., cost-share partner, participating stakeholder, etc.).

The UVWUA was a participating stakeholder and worked with Reclamation staff to provide input, data and information relevant to the Colorado River Basin Water Supply and Demand Study.

(d) Describe whether the project will result in further collaboration among Basin Study partners.

The Drop 5 hydropower development project has resulted in significant collaboration among Basin Study partners.

Over the past year, the UVWUA has been working closely with the Colorado River Water Conservation District and the U.S. Bureau of Reclamation Grand Junction to implement various aspects of the East Side Uncompahgre Project System Optimization Study. The purpose of the study was to perform a comprehensive analysis of efficiency improvement opportunities on the east side of the UPA. This comprehensive study takes into account existing and potential hydropower development sites in the UPA while also addressing operational issues associated with a modernized delivery system including a comprehensive assessment of canal control via automation, remote monitoring, SCADA, and regulating reservoirs, for example.

The UVWUA works with multiple stakeholder groups to evaluate and address water supply and demand issues. The UVWUA regularly participates in Gunnison Basin Roundtable meetings and the Inter-Basin Compact Committee focused on evaluating and addressing issues associated with water supply and demand in the Gunnison Basin and the 7 Colorado River Basin states.

Subcriterion E.2: Expediting Future On-Farm Irrigation Improvements

Up to 14 points may be awarded for projects that describe in detail how they will directly expedite future on-farm irrigation improvements, including future on-farm improvements that may be eligible for NRCS funding.

If the proposed projects will help expedite future on-farm improvements please address the following:

Not directly explored.

Subcriterion E.3: Other Water Supply Sustainability Benefits

Up to 14 points may be awarded for projects that include other benefits to water supply sustainability.

• Will the project make water available to alleviate water supply shortages resulting from drought?

(a) Explain in detail the existing or recent drought conditions in the project area. Describe the impacts that are occurring now or are expected to occur as a result of drought conditions.

Over the past 15 years, the Lower Gunnison Basin has experienced several intense droughts, and associated water supply shortages with the last occurring in 2012. During 2002 and 2003,

the UVWUA experienced shortages and their agricultural water users were forced to survive with significantly diminished allocations (50% of their annual water allocations) which in turn resulted in curtailment calls being placed on junior water-right holders, including agriculturalists in the Lower Gunnison River Basin. In fact, during the drought of 2012, an emergency agreement was required to protect other agricultural water users from to avoid a potentially damaging water rights curtailment.

This project will better enable UVWUA to weather such shortages due to drought, by proving a new income stream to fund much needed water efficiency projects.

(b) Describe the severity and duration of drought conditions in the project area.

The project area typically only receives 12-15 inches of precipitation per year and thus the UVWUA relies upon reservoir-storage to augment their water supplies to meet their irrigation demand. In dry years when the reservoirs cannot be filled with snowmelt-derived waters, allocations are decreased and irrigators may need to fallow fields causing declines in agricultural production and impacting the regional economy.

This project will better enable UVWUA to weather such shortages due to drought, by providing a new income stream to fund much needed water efficiency projects that can 'stretch' available supplies by minimizing water losses. In addition, climate models and water supply outlooks published by the USBR and CBRFC, suggest that in the near future there is an increasing propensity for droughts and associated water shortages, in both frequency and magnitude.

(c) Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by drought.

Although the Uncompahgre Project has diverse and multiple water surface water sources with senior water rights and reservoir storage; all water supplies are fed by snowpack and are at significant risk of shortage due to seasonal and long-term drought. Additionally, the irrigation water demands by the project cropping patterns can be adversely affected by climate trends. As the climate is projected to warm, the growing season is projected to lengthen and the irrigation water demand is certain to increase.

(d) Provide a detailed explanation of how the proposed WaterSMART Grant project will improve the reliability of water supplies during times of drought.

The canal automation and remote monitoring aspects associated with this hydropower project respond to climate variability by improving the UVWUA's ability to accurately measure, monitor and control water supplies coming directly from the Gunnison River through the federal Aspinall Unit and into the South Canal for distribution throughout the UPA. Instead of water rushing through the South Canal delivery system the water is held upstream of the intake structures at the multiple hydroelectric sites on the canal and steadily released back into the irrigation system. The Drop 5 facility is the last of four hydroelectric plants in a series on the South Canal system all carefully coordinated using technology enabled by this project; this results in better operation and management of water entering the Uncompahgre Project and conserving water and energy.

•Will the project make water available to address a specific concern?

(a) Will the project directly address a heightened completion for finite water supplies and over-allocation (e.g., population growth)?

After 2002, the Gunnison Basin's driest period in recorded history, the Colorado Department of Water Resources declared the Gunnison Basin, a sub-basin of the Colorado River Basin, – was over-appropriated. This designation means that the legal demands for water outstrip the water supplies in dry years.

In addition, the Colorado River is also over-appropriated within the State of Colorado and within the context of the entire Colorado River Basin. Therefore there is significant pressure on the Gunnison and Colorado River Basins within the state to address issues with water shortages that also affect water supplies and water users on the eastern slope of Colorado on that export Colorado River water to the Front Range via trans-basin diversions. All projects that conserve water supplies help to address regional water resource shortages and potentially provide benefits to the entire basin.

(b) Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by climate variation.

The Lower Gunnison Basin has experienced several intense droughts over the past 15 years (2002, 2003, and 2012) which has resulted in curtailments being placed on junior water right holders on the Gunnison River and significant negotiations to avoid water supply curtailments. This has led to adverse impacts to agricultural water supplies with shortages and involuntary fallowing and associated decreased agricultural yields in portions of the Gunnison and Colorado River Basins. Climate variability is projected to increase and as such, shortages may also be more prevalent and harder to address in the future.

(c) Will the project help to address an issue that could potentially result in an interruption to the water supply if unresolved?

The proposed project will address several items related to maintaining water supply security. In addition to water supply shortages, there are several significant legal issues that pose threats to water supply certainty. In 2012, a federal Record of Decision (ROD) required Gunnison Basin water users and stakeholders to address both water quality and quantity. Specifically flow targets were established (quantity) and desired selenium reductions were defined (quality) to help meet the recovery goals for federally-listed endangered fish species in the Lower Gunnison Basin. During times of drought when there is less dilution water available, selenium concentrations increase in critical habitat. Water users within the basin are very concerned about potential ESA conflicts that would impact water deliveries for agricultural and commercial operations. This project will result in better water management through automation and SCADA that may increase the ability to meet flow and concentration targets. Furthermore, this project will provide a stable hydropower revenue stream to enable the UVWUA to continue to modernize their water distribution system while helping to meet federal regulations and providing better water supply security.

•Will the project make additional water available for Indian tribes?

No.

•Will the project make more water available for rural or economically disadvantaged communities?

No.

•Does the project promote and encourage collaboration among parties?

a) Is there widespread support for the project?

Yes.

b) What is the significance of the collaboration/support?

There is widespread support for the Drop 5 Hydroelectric Project. Uncompahgre Project water users strongly support renewable energy development and on-going system optimization efforts as evidenced by the attached Board Resolution. The community has shown a strong interest in renewable energy development as there are frequent requests for public presentation and tours to existing hydro sites. In addition, the Drop 5 facility creates revenues that help to offset expenses related to the operation and maintenance of this large federal irrigation facility.

The Delta Montrose Electric Association (DMEA) supports the development of local sources of renewable energy to communities because of the efficiency.

The Colorado Small Hydro Association (COSHA) promotes the development of small hydro power in Colorado.

Colorado Congressman Scott Tipton has been a champion of the development of small hydro hydroelectric projects and sponsored H.R. 678 which will help lead to job creation in Colorado.

The UVWUA, along with other lower Gunnison basin stakeholders, was notified in 2015 that they were selected from among 210 applicants for a Natural Resource Conservation Service (NRCS) – Regional Conservation Partnership Program (RCPP) grant. This grant encourages and supports implementation strategies that create stable and clean irrigation water deliveries that result in natural resource and endangered species benefits.

c) Will the project help to prevent a water-related crisis or conflict?

Yes, the project will help to prevent water-related crisis due to shortages of water supply during times of drought by:

•Making more water available in the delivery system through associated piping of flows in the canals which prevents seepage losses (and selenium and salt loading to the Colorado River System); and

•Improving control of water flowing through the UPA from Aspinall Unit re-operations for the benefit of endangered fish species occupying the lower Gunnison and Colorado Rivers.

d) Is there frequently tension or litigation over water in the basin?

Yes, there is frequent tension over calls placed on junior water right holders in water short years. There is also fear of over-allocation of water throughout the state and western Colorado especially during periods of drought.

e) Is the possibility of future water conservation improvements by other water users enhanced by completion of this project?

No.

•Will the project increase awareness of water and/or energy conservation and efficiency efforts?

Yes.

a) Will the project serve as an example of water and/or energy conservation and efficiency within a community?

Absolutely. This project will serve as an example of how system optimization and hydropower development can result in a local source of clean and renewable energy while also creating stable irrigation deliveries. The South Canal Drop 5 Hydropower Development Project is also important in that the power generated benefits the local community.

The UVWUA has received significant attention and/or support at local, regional, state and national levels with regard to their prior small-scale hydropower projects at Drop 1, 3, 4 and 6 (Shavano Falls).

b) Will the project increase the capability of future water conservation or energy efficiency efforts for use by others?

Yes. The project will increase the capability of future water conservation or energy efficiency efforts by others through on-going education and outreach. The UVWUA has hosted many tours and given numerous presentations to diverse individuals and organizations related to their efforts at generating hydropower and their efforts at optimizing and modernizing their irrigation delivery system in order to address water-resource, water-quality, and endangered species concerns. The UVWUA will continue to support local education and outreach efforts related to clean, renewable energy development.

c) Does the project integrate water and energy components?

Yes. This project integrates small scale hydroelectric power development with conveyance system improvements on an existing irrigation delivery system in the UPA.

V.A.6 Evaluation Criterion F: Implementation and Results (10 points)

Subcriterion No. F.1: Project Planning Does the project have a Water Conservation Plan, System Optimization Review (SOR), and/or district or geographic area drought contingency plans in place? Does the project relate/have a nexus to an adaptation strategy developed as part of a WaterSMART Basin Study? Please self-certify, or provide copies of these plans where appropriate, to verify that such a plan is in place.

The Uncompre Project Area is included in the upper basin wide contingency planning being currently developed as part of the Colorado Water Plan. All of the system optimization, water conservation and water quality plans identified below were developed with the purpose of increasing the resiliency of the UVWUA (and Reclamation) to respond to water demands in drought situations and are focused on improving the efficiency of on- and off-farm irrigation application and delivery efficiency.

Provide the following information regarding project planning:

1) Identify any district-wide, or system wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Basin Study, drought contingency plan, or other planning efforts done to determine priority of this project in relation to other potential projects.

A) UPA Water Management Plan (WMP) (2013)
B) UPA East Side System Optimization Review & SCADA Analysis (2014)
C) Reclamation's Sustainable Energy Mission
D) President's Climate Action Plan 2013
E) Reclamation's 2011-2016 Strategic Plan

2) Describe how the project conforms to and meets the goals of any applicable planning efforts, and identify any aspect of the project that implements a feature of an existing water plan(s).

UPA WATER MANAGEMENT PLAN (WMP): The UVWUA certifies that it has an up-to-date WMP. The plan has been submitted to the Western Colorado Area Office in Grand Junction. This project addresses water management goals and objectives identified in the WMP including: 1) continuing to develop hydropower in the Uncompahgre Project where feasible, and 2) implementing automation for improving water delivery and administration.

UPA EAST SIDE SYSTEM OPTIMIZATION REVIEW (SOR): The UVWUA certifies that an *Integrated Assessment and System Optimization Analysis* has been completed for the east side of the UPA. The study was conducted by the Irrigation Training and Research Center at

California Polytechnical. A final report was completed July 2014. The SOR analyses directly support conveyance system optimization and efficiency, canal control and small-scale hydropower development. Initially, all of the analyses were directed to the east side of the UPA. A modified SOW has been approved which incorporates additional analyses to provide for a comprehensive review and final recommendations for automation, remote monitoring and SCADA / alarming capabilities throughout the entire UPA. A copy can be provided upon request.

RECLAMATION'S SUSTAINABLE ENERGY MISSION: Reclamation has developed six long-term strategic objectives to further Reclamation's Sustainable Energy Mission including *Strategic Objective #1 – Increase Renewable Energy Generation from Reclamation Projects*. On-going Reclamation activities in support of the objective specifically include the use of WaterSMART grants to "provide cost-share assistance to support the development of renewable resources" (http://www.usbr.gov/power/Reclamation%20Sustainable%20Energy%20Energy%20Strategy%20.pdf).

PRESIDENT'S CLIMATE ACTION PLAN 2013: The President's Climate Action plan details the case for Federal action and leadership in response to climate change. Key elements of this strategy include accelerating and expanding the deployment of renewable energy projects, and implementing efficiency and conservation programs that can help reduce greenhouse gas emissions and prepare the nation for the impacts of climate change. This project directly accelerates and expands the implementation of the development of hydropower, a renewable energy project (http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf).

DEPARTMENT OF INTERIOR'S (DOI) STRATEGIC PLAN 2011-2016: The DOI plan points to the development of "renewable energy potential as a strategy supporting the Department's goal of securing America's energy resources" (http://www.doi.gov/pmb/ppp/upload/DOI_StrategicPlan_fy2011_2016.pdf).

Subcriterion No F.2 – Readiness to Proceed

• Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.

Please see Table 1 below.

Table 1. Timeline, Milestone & Implementation – Drop 5

TASK	2015 Q1	2015 Q2	2015 Q3	2015 Q4	2016 Q1	2016 Q2	2016 Q3	2016 Q4	2017 Q1	2017 Q2	Milestones & Dates
1. Project planning, design, engineering, etc.			→								Complete (November 2015)
2. Obtain a Lease of Power Privilege (LOPP) from the Reclamation			→								Complete (November 5, 2015)
a) Impact Studies			→								Oct-15
i) T&E Plant & Animal Surveys (NEPA)			→								Complete (September 2015)
ii) Environmental Assessment (NEPA)			→								Complete. October 2015.
iii) Cultural Survey (NHPA)			→								Complete. October 2015.
3. Secure Financing (CWCB Loan & WaterSMART Grant)				→							Complete. November 2015.
4. Financial & Grant Reporting							→	→	→	→	Quarterly Financial, Semi-Annual, Final
5. Approval to start construction				→							Approval letter received Nov. 5, 2015
6. Construction				→	→	→	→				Photo Documentation
a. Powerhouse				→	→	→	→				Aug-16
b. Tailrace						→	→				May-16
c. Intake/Forebay				→	→	→	→				Aug-16
d. Delivery of turbine/generator							→				Aug-16
f. Complete turbine/generator installation							→				Aug-16
g. Complete mechnical/electrial auxiliaries						→					Jun-16
h. Complete transformer, substation, transmission line structures				→	→	→					Jun-16
7. Testing							→				September 2016 (Successful five-day run)
8. Completion							→				Operation Date Letter (September 2016

[1] Areas shaded in gray are those activities are likely to have commenced prior to WaterSMART grant funding award.
[2] Timeline is represented by quarters in a year (Jan.-Dec.)

Subcriterion No. F.3: Performance Measures

The following performance measures are proposed in support of the documentation of benefits associated with the implementation of the Drop 5 hydroelectric development project:

- **Performance Measure No. A: Projects with Quantifiable Water Savings**

Performance Measure No. A.1: Canal Lining/Piping

Not applicable.

Performance Measure No. A.2: Measuring Devices – Not applicable.

Not applicable.

Performance Measure No. A.3: SCADA and GIS

Not applicable.

Performance Measure No. A.4: Automation

Although there are no quantifiable water savings associated with this project, the UVWUA will be able to enhance the management of water through the implementation of automation. The South Canal Drop 5 hydroelectric plant will be the fourth hydroelectric facility in operation on this canal stretch. If any of the other hydroelectric plant is off-line for maintenance, subsequent downstream facilities continue to help to regulate flow within the system. If the Drop 5 site goes off-line, irrigation flows would be immediately diverted back into the canal to prevent any disruption to irrigation supplies. In addition, during heavy rain events in this sparsely vegetated area, automation will assist in pooling water in the canal and then releasing it slowly rather than having the water rush down the canal and then having to respond to flooding and or canal overtopping in the lower portion of the system which results in system loss and/or potential for public health and safety issues from flooding.

a) Rationale of long-term automation plans: The UVWUA is currently implementing incremental, system-wide automation throughout the UPA. The rationale is to tie automation into a planned system wide optimization schedule that correlates with on-going modernization efforts occurring throughout the UPA. The system optimization review (SOR) or study of the east side of the Uncompahgre Project Area where this hydroelectric project is located was complete as of July 2014. In addition, a full automation and SCADA system analysis of the Uncompahgre Project is currently underway. A final report is expected by the summer of 2017.

b) Is there potential for automation occurring at the Drop 5 site to heighten operational issues in other parts of the system?

Water operations and management are carried out by UVWUA staff. All previous and currently proposed automation efforts have been evaluated in the SOR and are currently undergoing a detailed system wide SCADA review in order to prevent any potential negative operational issues.

c) Maintenance: Automation technology will likely be maintained through a combination of both in-house and third party expertise.

d) Benefits of Automation: Headgate automation at the Drop 5 facility will help with the availability of reliable and accurate delivery system data, maintain stable flows in the lower South Canal system, and improve public safety issues associated with canal overtopping/flooding during storm events. Because there is no data on delivery system operations spills or management in this area of the South Canal, pre-project performance will be difficult to document. Instead, the UVWUA is proposing to submit the *Uncompahgre Project automation and SCADA System Analysis* being performed under a separate contract with the Irrigation Training and Research Center at Cal Poly Technical Institute expected summer of 2017. The analyses will incorporate the benefits of automation along with developing a plan for remote monitoring of all headgates and hydroelectric units in the UPA.

Pre-project: Summary of historical irrigation water management challenges on the South Canal.

Post-project: Copy of Uncompahgre Project remote monitoring and SCADA system analysis and plan which will incorporate hydroelectric units.

Performance Measure No. A.5: Groundwater Recharge (Conjunctive Use) – Not applicable.

Performance Measure No. A.6: Irrigation Drainage Reuse Projects – Not applicable.

Performance Measure No. A.7: Landscape Irrigation Measures – Not applicable.

- **Performance Measure No. B1: Projects with Quantifiable Energy Savings**

Performance Measure No. B.1: Implementing Renewable Energy Improvements Related to Water Management & Delivery

1) Explain the methodology used for quantifying the energy generated from the renewable energy system.

Sorenson Engineering was hired to provide power generation calculations for the project. Daily flow data on the South Canal was available from 1991 through 2012. These daily flow were adjusted (lowered by 10%) due to recalibration from an ultrasonic flow meter installed at the South Canal Drop 1 hydroelectric facility. According to flow records from the UVWUA, approximately 85 cubic feet per second (cfs) is removed between the flow meter and proposed hydroelectric facility. Measured flows were then combined with UVWUA records of the turn-on and shut-off dates for the South Canal over the last 20 years.

Energy generation (kilowatts) from the hydroelectric unit is calculated as the weight of water (pounds/cubic foot) multiplied by the head (feet), the flow (cubic feet per second), and 0.746/550 (conversion factor) while also considering turbine efficiency, generator efficiency, friction loss and k-losses.

Model results for power Generation from the Drop 5 hydroelectric unit estimate annual energy generation as 8,623,000 kilowatts and can be found in Figure 2.

2) Explain the methodology for calculating the quantity of energy savings resulting from the activity.

By taking annual energy generation estimated at the Drop 5 hydroelectric unit (8,623,000 kWHr) and dividing that by the average annual energy consumption of a U.S. residential utility customer in 2012 (10,837 kWHr), it was determined that 796 residential homes could be supplied with renewable energy which is energy saved or unused from for example coal burning power plants.

There are also energy savings by providing local renewable energy for DMEA to market throughout Montrose and Delta Counties (i.e. less transmission line loss), which can help meet Renewable Energy Standards.

Finally, the energy of the water going over Drop 5 had not been harnessed and thus was being wasted. The construction of the hydroelectric unit will utilize this energy.

3) Explain the anticipated cost savings for the project.

By providing energy generated from the plant to the local community, there will be less energy transmission line loss (1%). DMEA estimates a 5% line loss for power brought in from outside the area.

4) Include an estimate of energy conserved.

The Drop 5 hydroelectric facility is harnessing existing unutilized energy and replacing an equal amount that would have to be generated through fossil fuel combustion (8,623 MWHrs).

Performance Measure:

a) Pre-project: The estimated power generation of the Drop 5 hydropower facility is 8,623,000 kWHr per year of clean, renewable energy.

Post-project: Power generation data/reports from the Drop 5 facility supporting the amount of clean energy produced.

b) Pre-project: Estimate pre-project CO_2 emissions for 8,623,000 kWHr of coal produced energy based upon accepted standards.

Post-project: Estimate post-project CO_2 emission reductions for 8,623,000 kWHr of hydroelectricity produced based upon accepted standards.

Performance Measure No. B.2: Increasing Energy Efficiency in Water Management

Not applicable.

•Performance Measure No. C: Projects that Benefit Endangered Species and/or Critical Habitat

For projects that benefit federally listed species (threatened and endangered), federally recognized candidate species, or designated critical habitat that are affected by a Reclamation facility, the applicant should consider the following:

The UVWUA and other stakeholders within the basin are concerned about the potential for water resource, water-quality and endangered species conflicts that may arise as a result of climate change, drought and projected population growth within areas served by the Colorado River in the Colorado River Basin, State of Colorado, and Delta and Montrose Counties.

•The methodology used for determining the recovery rate of the threatened and/or candidate species.

Determining the rate of recovery of endangered fish species directly associated with this project will not be feasible during this project timeline. The Colorado River Recovery Program issues an annual report documenting the status of the recovery of Colorado River endangered fish species which can be provided to Reclamation each year. In addition, the UVWUA can provide annual reports from the Gunnison Basin Selenium Management Program documenting trends in selenium concentration and load in the Gunnison Basin (Whitewater, Colorado, long-term water-quality trend monitoring site).

•How will the project address designated critical habitats, including acres covered, species present, and how the water savings or transfers are expected to benefit the habitat(s)?

There are no known endangered, threatened or candidate species occupying the South Canal Drop 5 site. Critical habitat for endangered fish species occurs downstream of the hydroelectric site in the Gunnison River below Delta, Colorado and in the Colorado River near Grand Junction, Colorado.

Benefits to endangered fish species will result from automation for control and improved measurement of water flowing through the Uncompahgre Project (Aspinall Unit Re-operations) should a water-resource and endangered species conflict occur.

• Unavoidable negative impacts to endangered, threatened, or candidate species and/or critical habitat(s).

There were no negative impacts identified by Reclamation with regard to endangered, threatened or candidate species and/or critical habitat.

- **VIII. A.3 Performance Measure No. D: Projects that Establish a Water Market**

Not applicable.

Subcriterion No. F.4: Reasonableness of Costs
Please include information related to the total project cost, annual acre-feet conserved, energy capacity, or other project benefits and the expected life of the improvement(s):

South Canal Drop 4 Hydroelectric Development Project

Total Project Cost: $6,814,258
Reclamation (federal cost): $1,000,000
In-kind (non-federal): $5,814,258

Energy Generated: 8,623,000 kWHrs

CO_2 Emissions Reduced: 17,900,000 – 18,800,000 lbs

Annual Acre Feet Conserved: 0

Life Expectancy of the Project: The U.S. Department of Energy estimates the average life-expectancy of a hydroelectric facility at 100 years (Energy Efficiency and Renewable Energy, July 2004).

V.A.7. Evaluation Criterion G: Additional Non-Federal Funding (4 points)

Non-Federal Funding / Total Project Cost = $5,814,258 / $6,814,258 = 85%

V.A.8. Evaluation Criterion H: Connection to Reclamation Project Activities (4 points)

(1) How is the proposed project connected to Reclamation project activities?

The proposed Drop 5 project is connected to Reclamation project activities in that it directly meets the mission of the U.S. Department of the Interior (DOI) which is to "protect America's *natural resources* and heritage, honor our cultures and tribal communities, and *supply the energy to power our future*" (emphasis added). The Uncompahgre Project was authorized for the sale of hydroelectric power under the Reclamation Act of 1938 (52 Stat. 941), Sale of Surplus Power, Uncompahgre Valley Project.

The hydropower project also works with the DOI's WaterSMART Program framework for "...integrating water and energy policies to support the *sustainable use of all natural*

resources, and coordinating the various water conservation activities of various Department bureaus and offices" (emphasis added).

This project is connected to the following Reclamation activities:
• Uncompahgre Project SOR: An UPA SOR has been carried out in cooperation with Reclamation. The SOR integrates off-farm delivery system optimization and efficiency planning and implementation with on- and near-farm water application efficiency goals, on-going hydropower generation, and water security.

•Gunnison Basin Selenium Management Program (SMP): The SMP is a conservation measure identified in the 2009 Gunnison Basin Programmatic Biological Opinion that must be implemented by Reclamation and all lower Gunnison Basin stakeholders to mitigate for the effects of on-going irrigation depletions on endangered species. The SMP Action Plan calls for "Encouraging and facilitating system optimization on the East Side of the Uncompahgre Project Area …". Headgate automation and remote control components of this project facilitate the accurate measurement and control of water flowing through the UPA.

•Aspinall Unit Operations Record of Decision (ROD) (April 2012): The proposed action of the Aspinall Unit Environmental Impact Statement (EIS) involves modifying reservoir operations that will result in higher and more natural downstream spring flows and moderate base flows. Flows released from the Aspinall Unit flow through the UPA. Headgate automation and remote control allows the UVWUA and Reclamation to better control and account for flows going through the UPA for the benefit of endangered species.

(2) Does the applicant receive Reclamation project water?

Yes, from the Gunnison River via the Gunnison Tunnel and the federal Aspinall Unit.

(3) Is the project on Reclamation lands or involving Reclamation facilities?

Yes, the project is located on Reclamation project lands and involves Reclamation facilities in the UPA.

(4) Is the project in the same basin as a Reclamation project or activity?

Yes. This project is located in the federal Uncompahgre Project Area in the lower Gunnison Basin.

(5) Will the proposed work contribute water to a basin where a Reclamation project is located?

No.

(6) Will the project help Reclamation meet trust responsibilities to Tribes?

No.

IV.D.6 Environmental and Cultural Resources Compliance

(1) Will the project impact the surrounding environment? Please briefly describe all earth disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.

Earth disturbing activities associated with the project include construction of a new powerhouse and switchyard and associated access road, the inlet and outlet work will occur within the canal.

•Soil (dust): Dust impacts associated with the earth disturbing activities described above will be temporary (during construction activity) and will be mitigated by having a water truck(s) on site. Any road dust problems associated with vehicle traffic during construction of the hydropower facility will also be temporary and can be mitigated with water trucks. Existing access roads will be used to access the construction areas.

•Air Quality: There are no air-quality impacts identified with the project.

•Water (quality and quantity): An evaluation conducted by Reclamation determined that CWA 402 and 404 permits would be required prior to implementation of the Drop 5 project. A 402 permit was required due to greater than one acre of ground disturbing activities associated with the project. A 404 permit was required by Reclamation and the Corps of Engineers associated with a headgate structure being constructed in the canal system.

Water quantity will be unchanged.

•Animal Habitat: Reclamation (WCAO) has conducted an Environmental Assessment which included an assessment of animals and animal habitat affected by the project. No significant impacts were identified.

(2) Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?

There are listed plant species present in some areas of the federal Uncompahgre Project Area, specifically clay-loving buckwheat and Colorado hookless cactus. There are no occurrences of clay-loving wild buckwheat or Colorado hookless cactus in the project's direct or indirect impact areas; however, there is a known population of clay-loving buckwheat near the project area and the lands near it may provide suitable habitat. To ensure project construction will have no impact on clay-loving buckwheat outside the project area, UVWUA and its contractors will fence or mark the entirety of the project action area prior to construction, to prevent vehicle access or disturbance outside the

fenced/marked areas during construction. With implementation of this environmental commitment, it was determined that the Drop 5 project would have no effect on clay-loving buckwheat (Reclamation, 2015)

The Bureau of Reclamation completed a *T&E animal* survey for the project as part of their NEPA Compliance assistance. It was determined that there would be no effects on endangered, threatened, or candidate animal species or their habitat due to the development of any features of the Drop 5 hydropower project (Reclamation, 2015).

(3) Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "waters of the United States?" If so, please describe and estimate any impacts the project may have.

There have been recent revised regulatory interpretations regarding the definition of "waters of the U.S.". The South Canal and adjacent wetlands could be interpreted as a direct connection between the Gunnison River and the Uncompahgre River. Based upon these recent draft interpretations, Reclamation required a NPDES Stormwater Discharge Permit associated with Construction Activity (CWA Section 402) and a 404 Permit No. 17 for Hydropower Projects.

In the Final Environmental Assessment (EA) for the Drop 5 project, it was determined by Reclamation that water-quality in the South Canal would not be affected during or after completion of construction.

There were no impacts to wetland habitat identified in the Drop 5 Final EA.

(4) When was the water delivery system constructed?

Construction of the South Canal took place in divisions between 1904 and 1909 (Reclamation Draft EA, 2014).

(5) Will the project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.

Yes. The Drop 5 hydropower project will need to install a headgate structure within the South Canal to divert water from the canal, just above Drop 5, and move the water approximately 80 feet downhill through an intake channel to a power plant, and then return the water to the canal.

A 330-foot portion of the South Canal, located approximately 400 feet upstream of the proposed hydropower plant will be permanently capped to compensate for raised water levels due to a backwater effect from the hydropower plant. In addition, the sides of the canal will be permanently raised 1-2 feet in a 435-foot segment approximately 1,600 feet upstream of the proposed hydropower plant location. A bypass structure will be

constructed at the upstream end of the intake channel to allow water to continue to move through the South Canal at Drop 5 in the event of a failure/outage.

The South Canal was the first large-volume canal built to transport water from the Gunnison Tunnel throughout the Uncompahgre Valley. Construction of the South Canal took place between 1904 and 1909.

(6) Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places?

Yes. Reclamation has determined that the project will have an adverse effect on three recorded segments of the South Canal (5MN1851.9, 5MN1851.12, and 5MN1851.13). These cultural resources have been determined by Reclamation, in consultation with the CO SHPO, to be eligible for inclusion on the National Register of Historic Places (NRHP) under Criteria A (5MN1851.9) and Criterion C (5MN1851.12 and 5MN1851.13. A Memorandum of Agreement (MOA) between Reclamation and SHPO which stipulates the requirement for Level II Documentation.

(7) Are there any known archeological sites in the proposed project area?

At this time, there are no known archeological sites in the proposed area. In the event of discovery of possible cultural or paleontological resources, the UVWUA will immediately cease all ground-disturbing activities in the vicinity and notify Reclamation. Work would not resume until approved by Reclamation.

(8) Will the project have a disproportionately high and adverse effect on low income or minority populations?

No.

(9) Will the project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?

No.

(10) Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?

No.

IV.D.7 Required Permits or Approvals

•Please explain any permits that will be required, along with the process for obtaining such permits. Identify and describe any engineering or design work performed specifically in support of the proposed project.

All environmental compliance and evaluation processes have been completed and the UVWUA has received an "Approval to Begin Construction" from Reclamation on November 5, 2015 contingent upon receiving a Corps of Engineers' 404 Permit.

In summary, the construction of the Drop 5 hydroelectric facility requires compliance with the following local, state and federal, environmental, cultural and paleontological resource protection and regulations including:

1) National Environmental Policy Act (NEPA) Compliance: The NEPA sets up procedural requirement for all federal agencies to assess environmental impacts associated with all federal actions. Reclamation served as the lead federal agency for determining NEPA compliance and evaluating all technical information.

•T&E Plant Survey: The UVWUA hired Bio-Logic, Inc. to complete endangered and/or threatened plant species surveys. There are no occurrences of clay-loving wild buckwheat or Colorado hookless cactus in the project's direct or indirect impact areas; however, there is a known population of clay-loving buckwheat near the project area and the lands near it may provide suitable habitat. To ensure project construction will have no impact on clay-loving buckwheat outside the project area, UVWUA and its contractors will fence or mark the entirety of the project action area prior to construction, to prevent vehicle access or disturbance outside the fenced/marked areas during construction. With implementation of this environmental commitment, it was determined that the Drop 5 project would have to effect on clay-loving buckwheat (Reclamation, 2015)

•T&E Animal Survey: The Bureau of Reclamation completed a T&E animal survey for the project as part of their NEPA Compliance assistance. It was determined that there would be no effects on endangered, threatened, or candidate animal species or their habitat due to the development of any features of the Drop 5 hydropower project (Reclamation, 2015).

•Environmental Assessment: The Bureau of Reclamation Western Colorado Area Office completed an environmental assessment for the Drop 5 Hydropower Development Project. A Categorical Exclusion Checklist (CEC) was completed by Reclamation.

2) Clean Water Act (CWA) Compliance: An evaluation was conducted by Reclamation and it was determined that CWA 402 and 404 permits would be required prior to implementation of the Drop 5 project.

• NPDES 402 Permit: A 402 permit was required due to greater than one acre of ground disturbing activities associated with the project. A certificate to discharge under the CO Discharge Permit System (CDPS) General Permit COR-0300000 for Stormwater Associated with Construction Activities (Certification Number COR-030668) was issued on November 12, 2015. A copy of the permit can be provided upon request.

• CWA 404 Permit: It was determined by the Corps of Engineers and Reclamation that because a headgate structure was being constructed in the canal system that a 404 permit would be

Appendix B. Board Resolution

Steve Anderson moved the adoption of the following resolution:

RESOLUTION

"Be it resolved, that for the purpose of its continued effort to pursue the development of hydro power in the Uncompahgre Valley. The Uncompahgre Valley Water Users Association does approve, ratify and confirm that:

1.) Steve Fletcher, Manager, and Ed Suppes, Assistant Manager have the legal authority to enter into an agreement with the Bureau of Reclamation for financial assistance provided under the WaterSMART Grant Program;
2.) Mr. Fletcher and/or Mr. Suppes will review and fully support the WaterSMART grant application submitted;
3.) UVWUA has the capability to provide the amount of funding and /or in-kind contributions specified in the funding plan; and
4.) The UVWUA will work with Reclamation to meet established deadlines for entering into a cooperative agreement.

Be it further resolved that the Board of Directors affirms that this resolution is adopted with knowledge of the written request.

The Motion was seconded by Doris Jutten and approved by a vote of 7 to 0.
Done this 21st day of December, 2015.

Attest:

Secretary

President

COPY

BORROWER: UNCOMPAHGRE VALLEY WATER USERS ASSOCIATION
REQUESTED LOAN AMOUNT: $6,930,000
LOAN ORIGINATION FEE: $69,300
TOTAL LOAN AMOUNT: $6,999,300

AGENCY NAME: COLORADO WATER CONSERVATION BOARD/PDA
CONTRACT TYPE: LOAN/PRIVATE
CWCB CMS:79864 /CORE:CT2015-174

LOAN CONTRACT

(STANDARD CONTRACT – WAIVER #160 – APPROVED NOVEMBER 10, 2003)

This contract ("CONTRACT" or "LOAN CONTRACT") is made between the State of Colorado for the use and benefit of The Department of Natural Resources, Colorado Water Conservation Board ("CWCB" or "State"), and Uncompahgre Valley Water Users Association, 601 N. Park Avenue, Montrose, CO 81401 ("BORROWER"), a Colorado nonprofit corporation.

FACTUAL RECITALS

1. CWCB authority exists in the law, and funds have been budgeted, appropriated and otherwise made available and a sufficient unencumbered balance thereof remains available for encumbering and subsequent payment of this CONTRACT; and

2. Required approval, clearance, and coordination have been accomplished from and with appropriate agencies; and

3. On May 21, 2015 the CWCB approved a loan request from the BORROWER for the Drop 5 Hydroelectric project ("PROJECT") to design and construct a 2.2 megawatt hydroelectric facility. The total estimated project cost is $7.7 million. The total loan amount of $6,999,300 which includes a one percent (1%) loan origination fee of $69,300 is payable over 20 years at an interest rate of 2.0%; and

4. The PROJECT SUMMARY, attached as APPENDIX 1 and incorporated herein, contains BORROWER Information (Section 1), the PROJECT Description (Section 2), CWCB's authority for making this loan (Section 3), and CWCB Approval and Legislative Authorization (Section 4), identifying the amount of the loan and the terms of repayment. The PROJECT SUMMARY also contains sections on BORROWER'S debt, collateral, procedures and eligible expenses.

5. The CWCB now desires, by this CONTRACT, to loan money to the BORROWER for this PROJECT upon mutually agreeable terms and conditions.

THEREFORE, in consideration of the mutual and dependent covenants contained herein, the parties agree as follows:

A. LOAN PROVISIONS

1. **Loan Origination Fee.** The amount of the loan (LOAN AMOUNT) shall include (1) the amount of the funds loaned by the CWCB to the BORROWER for the PROJECT and (2) a loan origination fee of one percent (1%) of the PROJECT amount. In the event that the BORROWER does not use the full LOAN AMOUNT authorized, the parties shall amend this CONTRACT to revise the LOAN AMOUNT including adjustment of the loan

Appendix D. CWCB Loan Confirmation Email

From: Jodie Tavares - DNR
Sent: Thursday, December 17, 2015 3:27 PM
To: Kirk Russell - DNR ; sfletcher@montrose.net
Subject: Notice to Proceed for CT2016-174

The contract for The Drop 5 Hydroelectric Project (CT2016-174) has been signed by the State Controller' office and we are now able to begin processing pay requests for this project.

A copy of the contract is being mailed to Steve Fletcher at the Uncompahgre Valley Water Users Association.

Thank you

–

Jodie Tavares
Loan Program Assistant

COLORADO
Colorado Water
Conservation Board

O 303-866-3441 x3247| F 303-866-4474
1313 Sherman St., Rm. 718, Denver, CO 80203
jodie.tavares@state.co.us | cwcb.state.co.us