City of Columbia Canal Head Gates Project
Eligible Activity: Public Facilities and Improvements
National Objective: Urgent Need
Activity Allocation: $15,550

Overview and Delivery
The Columbia Canal Head Gates are a critical component of the Columbia Canal facility, a multi-functional water supply utility. The Canal provides influent water to the City of Columbia Water Treatment Plant (WTP) for treatment and potable water supply to approximately 129,272 citizens as well as hospitals, universities, the State Capitol, Richland County and City municipal buildings, and police and fire stations. It also supplies potable water to the Fort Jackson military base, the McEntire Joint National Guard Base, and the hydro plant located at its southern end.

At its headwaters at the Canal's northern-most end, man-made Head Gates and a diversion dam function as a water inlet, channeling and controlling water from the Broad River into the Canal impoundment structure. The Head Gates' primary function is to control water levels within the Columbia Canal. Before the October 2015 storm, and under normal circumstances, the City operated the Head Gates to control water levels to ensure adequate water supply to both the WTP and the hydro plant. During high river flow, the Head Gates could be partially or completely closed to decrease water from the Broad River, allowing only enough to maintain adequate supply, but not so much as to inundate or damage the canal embankments. Under low river flows, the Head Gates would be opened to allow more water into the Canal to maintain critical water levels that sustain WTP and hydro plant operations. The Head Gates, along with ancillary components of the Columbia Canal, sustained severe damage during the October 2015 storm and have been inoperable since that time.

Connection to Disaster and Unmet Needs
The high precipitation and increased storm water drainage into the Columbia Canal during the October 2015 storm, created high velocity flows and a magnitude of debris that prevented the City from completely closing the Head Gates. Eventually, the only way to stop river flow into the Canal was to install bulkheads in front of the Head Gates. Despite the installation of the bulkheads, storm water flow and precipitation into the Canal was so high that the hydro plant was inundated and rendered inoperable and the Canal itself experienced a catastrophic breach below the intake to the Water Treatment Plant, just north of the hydro plant.

When the breach occurred, flows within the Canal suddenly increased and water rapidly drained into the Broad River. This high flow velocity out of the Canal damaged the Canal embankments and brought water in the Canal to critically low levels where water supply to the Water Treatment Plant could not be maintained. The City installed temporary pumps and piping to draw water directly from the Broad River and constructed a temporary cofferdam above the Canal embankment breach to restore water in the Canal to a level sufficient to operate the Water Treatment Plant. The cofferdam remains in place pending repair of the Canal embankment for which the City is in current discussions/negotiations with FEMA.

The temporary measures installed as a result of the October 2015 storm do not provide the City with an effective means to control water levels within the Canal, thus critically impacting the City's ability to provide a stable source of potable water to its residents and users. During high river

flows and with adequate precipitation, the water levels are just adequate to maintain supply through the WTP intake. During low flows and summer season, when precipitation is low, water levels in the Canal fall below critical intake levels, requiring the City to turn off WTP pumps and reducing the City's water supply. Replacement of two (of 12) Head Gates will accomplish the following:

- Increase by a minimum of 17% the operational control of the City's water supply;
- Improve the City's current resiliency against future adverse weather conditions, including drought and severe storms by 17%;
- Stabilize the entire system by installing rock anchors, an improvement that increases stability by 100%;
- New improved head gate technology will increase the life span of the Canal by 20-30 years.

The City proposes to use $997,000 in CDBG-DR Planning funds for engineering and design of the Head Gates Project. CDBG-DR funds will not be utilized for construction costs. ~~replace two of the 12 Head Gates, which will restore partial operational control of Canal water levels, enabling the City to provide critical water supply to residents during times of low water flow into the Columbia Canal. Specifically, the City proposes the following repairs and improvements to the Head Gate structure on the Columbia Canal:~~

1. ~~Design for the entire Head Gate structure and repair of Head Gates 1 and 2, replacing existing gear structure with industry standard screw technology to raise and lower gates, structural repairs~~
2. ~~Installation of submerged debris diversion structure upstream of the Head Gate structure~~
3. ~~Permanent blocking of the lock gate~~
4. ~~Upgrade of the sensor system, camera, lighting, with appropriate power supplies~~
5. ~~Raising of the head works east abutment embankment~~
6. ~~Rock anchors to stabilize the Head Gate structure~~

~~Estimated Cost~~

~~Head Gates (12)~~		-	**~~Head Gates (2)~~**
~~Repairs~~	**~~Cost~~**	-	**~~Cost~~**
~~Masonry~~	~~$368,000~~	-	~~$61,333~~
~~Stabilization Rock Anchors~~	~~$659,000~~	-	~~$659,000~~
~~Head Gate Replacement~~	~~$2,668,000~~	-	~~$444,666~~
~~New Winch System~~	~~$1,218,000~~	-	~~$203,000~~
~~Electrical Service~~	~~$154,000~~	-	~~$154,000~~
~~East Embankment Repairs~~	~~$30,000~~	-	~~$30,000~~
~~Remove Emergency Measures/Debris~~	~~$750,000~~	-	~~$125,000~~
~~Regulatory & Permitting~~	~~$104,000~~	-	~~$104,000~~
~~Design/Engineering~~	~~$954,335~~	-	~~$954,335~~
~~Subtotal~~	**~~$6,905,335~~**	-	**~~$2,735,334~~**
-	-	-	-
~~Mitigation~~	**~~Cost~~**	-	**~~Cost~~**
~~Tandem Screw Jacks~~	~~$688,000~~	-	~~$114,666~~
~~Trash Racks~~	~~$2,316,000~~	-	-

~~Trash Rake Dragline~~	~~$1,192,000~~	~~-~~	~~-~~
~~Submerged Debris Diverter~~	~~$300,000~~	~~-~~	~~$300,000~~
~~Debris Holding Area~~	~~$650,000~~	~~-~~	~~$650,000~~
~~Permanent Block of Lock Gates~~	~~$311,000~~	~~-~~	~~-~~
~~Permitting/Regulatory Approval~~	~~$104,000~~	~~-~~	~~-~~
~~Lighting, Sensors, Cameras~~	~~$200,000~~	~~-~~	~~$200,000~~
~~**Subtotal**~~	~~**$5,657,000**~~	~~-~~	~~**$1,264,666**~~
~~**Total Cost**~~	~~**$12,562,335**~~	~~-~~	~~**$4,000,000**~~

~~The cost estimate provided above originates from the FEMA PW 291 reversion for the repair of all twelve head gates. The columns on the right reflect the costs identified for the urgent repair of two head gates and the components needed to complete and protect the repairs.~~

Monitoring

Monitoring of program compliance will be performed by the Community Development compliance staff and the Internal Auditor in accordance with program policies and procedures and City of Columbia CDBG-DR Monitoring Plan.

Start and End Date: July 2018 – December 2021