

Meeting to Discuss Installation of Measuring Devices on the Blackfoot River

June 29, 1999

1:00 pm, Conference Room, Bingham County Courthouse, Blackfoot

Agenda

Welcome and Introductions

Article 8.3.3 of the 1990 Fort Hall Indian Water Rights Agreement

Snake River Basin Adjudication procedures, impacts and timing

Water Measurement Plan prepared for Bureau of Indian Affairs by MSE HKM
Engineering

Review of Plan

Funding *BIA*

Implementation Steps

Other Items for Discussion

Attachments:

Extract from the 1990 Fort Hall Indian Water Rights Agreement

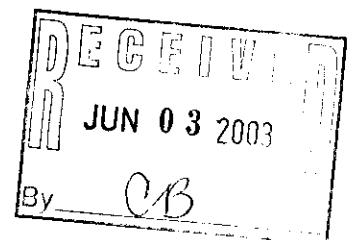
IDWR Processing Forecast for Irrigation and Other State-Based Claims

Water Measurement Plan

Text

Table 1 -- Cost Estimates

Table 2 -- Work Remaining



**THE 1990 FORT HALL INDIAN
WATER RIGHTS AGREEMENT**

* * *

By and Between

**THE SHOSHONE-BANNOCK TRIBES
OF THE FORT HALL INDIAN RESERVATION,
THE STATE OF IDAHO, THE UNITED STATES,
and CERTAIN IDAHO WATER USERS**

THE 1990 FORT HALL INDIAN WATER RIGHTS AGREEMENT

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the Reservation for those water rights administered under Article 8.2.6. The State may accompany the Tribes and the United States.

- .8 The Tribes or the United States shall install or cause to be installed monitoring devices for administration of Tribal water rights within the Reservation to the same extent as required of other water users in Idaho. The cost of these monitoring devices shall be paid from the funds authorized by Congress as required by Article 13.2. The United States, the Tribes and the State shall monitor those diversions that each party actually administers within the Reservation and report the diversion records each year to the Intergovernmental Board by March 1 of the year after each reporting year.
- 8.3 Although the water rights from the Blackfoot River have been delivered for over 100 years without any disputes arising between the Tribes, the United States, and the State over administration, the parties heretofore have been unable to agree upon their respective authority to administer water rights from the Blackfoot River. The parties agree to avoid litigation by continuing to administer the water rights decreed in the SRBA from the Blackfoot River as water rights from the Blackfoot River have been administered in the past. The parties also agree as follows:

- .1 To prepare and implement a Blackfoot River Water Management Plan to satisfy the purposes set forth in the Attachment;
 - .2 To install or cause to be installed monitoring devices on all present and future points of diversion from the Blackfoot River; and
 - .3 To provide access to inspect water monitoring devices and diversions on the Blackfoot River where necessary for administration of rights to divert water from the water system. A party requesting access to a monitoring device shall provide reasonable notice, and the party providing access to the monitoring device or diversion may accompany the inspecting party.
- 8.4 The parties agree to administer water rights from the Snake River as follows:
- .1 The State shall account for and administer the diversion of water from the Snake River by all water users, including the United States and the Tribes, in conformance with the SRBA decree. The State, in administering such waters, shall ensure the delivery to all water users, including the United States and the Tribes, their legal entitlement to water from natural flow and storage. The United States shall be solely responsible for the physical operation of its Snake River diversion facilities in accordance with the Snake River Watermaster's direction. In the event the United States disputes the Snake River

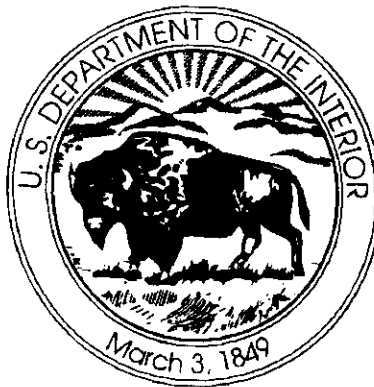
WATER MEASUREMENT PLAN

**BLACKFOOT RIVER NORTH SIDE USERS
WATER USE ANALYSIS**

**MODIFICATION NUMBER 11 TO INTER-AGENCY AGREEMENT
AGPOO 9976 89**

Prepared for:

**UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF INDIAN AFFAIRS**



Prepared by:



**2727 Central Avenue
P.O. Box 31318
Billings, MT 59107-1318
(406) 656-6399
Fax: (406) 656-6398**

BACKGROUND INFORMATION

The Blackfoot River separates the Fort Hall Indian Reservation to the South from non-Reservation lands on the north near the town of Blackfoot, Idaho. A series of surface water diversions and pumping plants serve Water District 27 to the North from the Blackfoot River. Conversely, a series of diversions to the South deliver water to the Fort Hall Irrigation Project on the Fort Hall Indian Reservation. The study area included in this analysis includes diversions to the District 27 water users on the north side of the Blackfoot River below Wolverine Creek and on diversions from selected tributaries of the Blackfoot River system upstream of Blackfoot Reservoir. The study area extends West to the last diversion by District 27, the Smith-Maxwell Ditch diversion.

Surface water diversions from the Blackfoot River are governed by two major water rights documents. The original decree states that the District 27 Water Master must measure and quantify all diversions (flow rates) to District 27 from the Blackfoot River. The 1990 Fort Hall Water Rights Agreement currently limits the total diversion volume to District 27, to 45,000 acre-feet (AF) annually. The latest decree is definitive and restrictive, as it places a volumetric limit to District 27 diversions.

The historical diversion records from the District 27 Water Master show large variations in total diversion volume, varying from 44,312 AF/year to nearly 106,000 AF/year. This extensive range of values raises questions concerning the accuracy of the diversion water measurement program and quantification of deliveries to District 27. In addition, the water rights analysis included in this work show that lands served by Blackfoot River water have Snake River water rights and are theoretically served by irrigation water from the Snake River, via inflows from Sand Creek, West Branch Canal and Corbett Slough. Quantification of these Snake River inflows is necessary to identify how many acres having Snake River exchange water rights can be served out of Blackfoot River sources.

PURPOSE AND OBJECTIVES

To better quantify future water deliveries to District 27 and to quantify Snake River exchange inflows to the Blackfoot River system, MSE-HKM proposes updating or replacing water measurement methods and/or installing new water measurement facilities on major District 27 diversions. This report outlines a conceptual plan for updating water measurement methods and implementing new water measurement structures on the Fort Hall North Side Users Water District 27 to automate and facilitate accurate water measurement records. MSE-HKM has identified specific sites for the water measurement facilities, based on the results of reconnaissance-level field investigations by an agricultural engineer and office analysis by a certified aerial photogrammetrist. Diversions from and major return flows into the Blackfoot River and major Snake River inflow sites have been identified via the field and office analysis. These key sites are the major locations identified for water measurement structures in this analysis. Other sites in the upper basin were identified, to help address the issue of whether diversions occur after July 1, as well as defining typical annual diversion volumes in the upper basin.

Funding sources to finance the water measurement structures and upgrades have not specifically been identified. It is assumed that capital resources and monitoring budget will be made available from a variety of sources, including Idaho Department of Water Resources (IDWR) and the United States (Bureau of Indian Affairs Fort Hall Irrigation Project).

In August 1997, MSE-HKM completed an inventory of diversions from the Blackfoot River to District 27 and tributary inflows into the Blackfoot River upstream of the town of Blackfoot. The field investigations were completed to assess water measurement methods used by the District 27 Water Master, to assess the existing condition of water measurement facilities and to identify where additional water measurement facilities are needed.

During the field investigation, tributary inflows to Blackfoot Reservoir were visited, in addition to the tributary inflows to the Blackfoot River downstream of Blackfoot Reservoir. A summary report of this field work, including photos of existing measurement sites, is on file at MSE-HKM Inc. and the Fort Hall Irrigation Project Office. In general, measurement methods and flow rates measured during MSE-HKM's field investigations corresponded well with those completed by the District 27 Water Master just prior to MSE-HKM's field visit.

WATER MEASUREMENT PLAN

The canal diversions to Water District 27 include: Just Canal, Eastern Idaho Slough, Little Butte Canal, Miner's Ditch, Stephens Ditch, Smith-Maxwell Ditch, Central Ditch and Riverton Ditch. There are also a number of pump diversions from the Blackfoot River to irrigated tracts of land to the North that are monitored by District 27.

The major diversions to Fort Hall Indian Reservation lands in the study area include: Little Indian Canal, Fort Hall Main Canal and Fort Hall North Canal. The Fort Hall Irrigation Project monitors irrigation diversions to these canal systems and thus, the southern diversions are **not** included in this water measurement plan. Also, the tributary inflow sites to the Blackfoot River between Blackfoot Reservoir and the lower basin are not included in this water measurement plan, as these sites are measured only upon request of the Fort Hall Irrigation Project.

LOWER BASIN WATER MEASUREMENT PLAN

The proposed water measurement plan in the lower basin includes upgrading all of the existing water measurement systems with new water measurement facilities, installing additional water measurement facilities at key locations and automating all facilities. For canal diversions, new flow measurement structures are proposed, including flumes and weirs. In general, each existing structure will be replaced with a newly constructed water measurement device, which will increase measurement accuracy and allow for simultaneous installation of automated recording equipment. Installing automated

recording stations with each canal measurement structure installation will minimize errors that have been in question concerning surface water measurements in the past. The automated equipment will also provide a much more complete record of diversions (ie. real-time, continuous recording versus point-in-time measurements taken every two weeks as is currently done). In addition, the automated equipment will eliminate the need for the District 27 Water Master to manually take measurements, except to spot check and verify the recording stations once or twice a year.

New flowmeters will be installed at all but one pumping plant location off of the Blackfoot River. The new flowmeters will not only provide instantaneous flow readings, but will also includes a total volume meter, which keeps track of cumulative volume diverted for a given time period. The following discussion includes a brief description of each of the new, proposed flow measurement stations. Figure 8 shows the approximate locations of water measurement facilities for the lower basin.

Canal Diversions

Smith-Maxwell Ditch. The District 27 Water Master, John Davidson, indicated that water diverted out of the Blackfoot River into the Smith-Maxwell Ditch is Snake River exchange water. In addition, Mr. Davidson stated that there is currently only one surface-water user out of the Smith-Maxwell Ditch. The remaining water users who have water rights out of the Smith-Maxwell Ditch have converted from surface water to groundwater as their irrigation source. This creates a water accounting problem, in that the acreage served out of Smith-Maxwell Ditch is included in the total acreage that is intended to be served with Blackfoot River surface water rights.

Due to the limited elevation head available in this ditch, it is proposed that a long-throated flume (sometimes referred to as a broad crested weir) be installed approximately 0.2 miles downstream from the Smith-Maxwell Ditch diversion point. Along with the long-throated flume, it is proposed to install an automated flow recorder. A suitable site was identified and agreed upon with IDWR during MSE-HKM's field tour on June 16, 1999. The approximate location of this structure is shown on Figure 1.

Riverton Ditch. It is proposed to install a long-throated flume, with automated flow recorder, at the location currently used for flow measurement by District 27. The canal grade (slope) appears minimal in the proposed reach of this ditch, which is located just downstream from the diversion point. The existing concrete structure is in good condition and should accommodate the installation of a prefabricated flume.

The proposed water measurement structure on Riverton Ditch will be located near the county road where potential public access and vandalism could occur. Therefore, it is proposed to bury the data recorder box in the canal bank at this location, to minimize the potential for damage due to vandalism.

Central Ditch. A 6-foot wide rectangular flume currently crosses a drain ditch approximately one-half mile downstream from the diversion point of the Central Ditch.

The flume is in good condition and can continue to be used as a flow measurement section, if a rating curve was developed for the channel section. Automated data recording equipment could then be installed to continuously monitor water depth (stage) at the location, which could be converted to flowrate.

Stephens Ditch. A 5-foot wide rectangular flume currently crosses a drain ditch approximately one-half mile downstream from the diversion point of the Stephens Ditch. The flume is in good condition and could be used as a measurement section, if a rating curve was developed for the channel section. Automated data recording equipment could then be installed to continuously monitor water depth (stage) at the location, which could be converted to flowrate.

Miners Ditch. Miners Ditch is located in the southwest corner of the town of Blackfoot, Idaho. Miners Ditch is currently served by two Town-owned pumps on the Blackfoot River, located where the Blackfoot River crosses under Highway 91. The existing pumps have flow metering equipment installed, but the equipment has had historical problems with moss from the river plugging the flowmeters and affecting accuracy of the measurements.

According to District 27 Water Master, John Davidson, the Town of Blackfoot is planning on abandoning their surface water rights from the Blackfoot River, served by the pumps to Miners Ditch. The Town will get water for future irrigation from a developed groundwater well, located on the west-end of Blackfoot. Upon development of the groundwater source, the Town will remove the pumps located on the Blackfoot River.

Currently, the flow from the Town-owned pumps discharges at three potential locations (open ditches). If flows are monitored at these three locations in the future, three surface water flow measuring devices would be required. Therefore, we propose installing two new, specialty flow meters at the pumps to monitor diversions, rather than three surface water flow measuring devices.

The two new flowmeters would be installed at the Town's pump house to replace the existing, inoperable flowmeters. It is proposed to use venturi-tube flowmeters, or similar non-clogging meters, to assure accuracy of the flow measurement even during high-moss periods. Although the specialty meters are more expensive than typical propeller meters, the accuracy gained from the specialty meters may outweigh the cost of installation (each of the Town's pumps is capable of pumping approximately 10 cfs). The flow meters should be purchased with automated data recording capabilities, to provide real-time measurements and to automatically store historical flow data.

Packer Ditch. Packer Ditch serves a small, contiguous acreage, owned by one property owner. A canal gate from the Blackfoot River diverts water into the Packer Ditch just upstream of the diversions to the Fort Hall Irrigation Project's North Canal. According to the District 27 Water Master, the Packer Ditch has a maximum capacity of about 4 cfs. A long-throated flume is proposed to measure flow in the Packer Ditch, which would be installed just downstream of the diversion. An automated data recorder is not proposed at

this location, as canal flow is intermittent and relatively small. The flow in the Packer Ditch can be read manually from a staff gage on the flume and recorded by the Watermaster.

Little Butte Canal. The Little Butte Canal diverts water from the Blackfoot River just below the Equalizer Reservoir in the southeast quarter of Section 12 (T3S, R35E). An existing Cipoletti weir measures the flow in the Little Butte Canal just below the diversion point. The existing concrete weir structure appears in sound condition. The sharp-crested weir plate is missing from the concrete structure and the staff gage is not mounted solidly. Therefore, a new weir crest and a new staff gage need to be installed to produce acceptable measurement accuracy. An automated data recorder is proposed at this location to provide real-time data collection.

Eastern Idaho Slough. The Eastern Idaho Slough water measurement structure currently consists of twin, 7-foot rectangular weirs, located just downstream of the diversion from the Blackfoot River. The canal section, canal bottom and sides, becomes extremely overgrown with moss and grass during the growing season. The overgrowth affects water flow through the section and subsequently affects the accuracy of the flow measurements. The staff gage is located in a sediment-affected area on the north bank of the canal, which also is extremely overgrown with vegetation. The staff gage needs to be replaced and relocated to provide measurement accuracy.

It is proposed to construct a new concrete base structure to support a new weir section across Eastern Idaho Slough at the same location as the existing structure. There appears to be adequate hydraulic head to provide accurate measurements using a sharp-crested weir. A new staff gage and automated recorder should be included in the installation.

Just Canal. The Just Canal diversion from the Blackfoot River delivers water to various pumping plants, before spilling wastewater back to the river. A rock/rubble diversion dam in the Blackfoot River is used to divert water into the Just Canal. A large culvert with flashboards is used as the water control structure for the inlet of the diversion. The rock/rubble diversion dam has historically been problematic and requires significant annual maintenance to keep the Just Canal operational.

Due to the apparent lack of available hydraulic head near the diversion, a flume is proposed to measure flow just downstream of the large culvert. A staff gage and automated recorder should be part of this installation to provide accurate, real-time flow measurement data.

Pump Diversions

Town Pumps (discussed previously as Miners Ditch). The Town Pumps, delivering water to Miners Ditch, were discussed previously in the "Canals" section of the "Lower Basin Plan".

Section 16 Pumps. Three pumping plants located in the northwest quarter of Section 16 (T2S, R37E) deliver water to lands north of the river. The pump flowmeters appear operable, but show extremely high variability in measurement accuracy and need to be replaced. Therefore, it is proposed to replace existing flow meters at this location with three new flowmeters, which read instantaneous flowrate and also store cumulative flow volume.

Section 12 Pumps. Three pumping plants located in the west half of Section 12 (T2S, R37E) deliver water to lands north of the river. The pump flowmeters are operable, but show significant variability in instantaneous flow measurement accuracy. These flowmeters should also be replaced with three new flowmeters. The new meters should be capable of accurately reading instantaneous flow as well as storing cumulative flow volume data.

Pump Across From Little Indian Ditch Diversion. A pump serving lands to the north of the Blackfoot River is located across the river and just downstream from the Little Indian Ditch Diversion. This pumping plant is located at the bottom of a steep cliff. It appears a flowmeter was once in place and has been removed from the pipeline at the top of the cliff. A new flowmeter should be installed at the top of the cliff with both instantaneous flow and cumulative flow volume capabilities.

Section 7 Pumps. Two large pumping plants are located in the northeast quarter of Section 7 (T2S, R38E). A flowmeter exists at the top of the cliff, but the flowrate appears to fluctuate significantly and measurements taken by District 27 Water Master are actually time measurements, rather than flow measurements. The electrical control boxes at the top of the cliff have time meters that indicate the time the pumps are running. Based on a pre-assumed flowrate and the time the pumps have operated, the Water Master estimates how much flow has been delivered by each pumping unit. The problem with this measurement method is that both time measurement devices can be turned off manually at any given time (the water user can turn the time meter on and off at will and could alter the accuracy of the flow estimate made by the Water Master).

It is proposed to install two new flowmeters in the pipelines at the top of the cliff. The flowmeters should be installed with both instantaneous flow and cumulative flow volume capabilities. There is an access road to the bottom of the cliffs at this location, as it is the location of the USGS flow measurement gaging station. Therefore, if it is determined that there is a high potential for vandalism at this site (located next to the road), the flowmeters could be installed just downstream of the pumping plants at the bottom of the cliff.

Wolverine Creek Pump. The District 27 Water Master currently monitors water use from Wolverine Creek, a tributary to the Blackfoot River, through one flow meter at a pumping plant along a diversion ditch from Wolverine Creek. The center pivots served by the Wolverine Creek Pump are located on bench lands in Section 17 (T2S, R38E). Unused tailwater traveling past the pump site is diverted back into Wolverine Creek over a cliff below the pump site. The ditch used to convey irrigation water from Wolverine

Creek to the pump site is approximately 2.5 miles long, from the diversion to the pump site. The Water Master does not measure or estimate seepage and other losses between the diversion and the pump site.

At the time of MSE-HKM's field investigation in 1998, a new pump, sediment filter and flow meter had been installed at the Wolverine Creek pump and thus, a new flow meter is not recommended at this site. However, since there are losses and incidental consumptive uses occurring from the diversion point to the pump, it may be more appropriate to locate a diversion measurement structure at the diversion point from Wolverine Creek, rather than at the downstream pump.

Snake River Inflows Into District 27

Town of Blackfoot

The Town of Blackfoot inflow site was deleted, due to information gathered in the field on June 16, 1999. The site was previously identified as a significant Snake River inflow location. However, during our site visit on June 16, we discovered that the tail water from the West Branch Blackfoot Canal discharges back into the Snake River and not into District 27. Therefore, the Town of Blackfoot inflow measurement site was deleted from this plan.

Corbett Slough Canal. Corbett Slough Canal ends and water is discharged into Eastern Idaho Slough and mixed with Blackfoot River water in Section 12 (T3S, R35E). This is a point of potentially large Snake River volumes that are added to District 27 facilities and should be monitored. It is proposed to install a weir, staff gage and automated data recorder to measure and store real-time and cumulative flow information.

West Branch Snake River Valley Canal. The West Branch Snake River Valley Canal discharges water into the Eastern Idaho Slough in Section 27 (T2S, R36E). Historically, Sand Creek tailwater discharged into the Eastern Idaho Slough at this location. However, Sand Creek currently discharges into the Reservation Canal. The West Branch Snake River Valley Canal currently delivers water into east and west branches near the east edge of Section 14 and the west edge of Section 15 (T2S, R36E). The east fork of the West Branch Snake River Valley Canal uses the old Sand Creek channel to deliver water south and eventually into Eastern Idaho Slough. It is proposed to install a weir, staff gage and automated data recorder, to measure and store real-time and cumulative flow information, at the discharge point into Eastern Idaho Slough.

Sand Creek at Reservation Canal. Sand Creek currently discharges water into the Reservation Canal in Section 7 (T2S, R37E). Flow is currently measured on Sand Creek (upstream of the discharge point into the Reservation Canal) and on the Reservation Canal (downstream of the discharge point of Sand Creek into Reservation Canal). BIA and the Tribe both measure flow at these two locations to determine the flow inputs from both the Reservation Canal and Sand Creek.

The BIA recently installed cans for IDWR to also place instrumentation in both measurement locations. However, during the June 16 site visit, discussion took place indicating that if data can be shared by the Tribe, BIA and IDWR, there wouldn't be a need for IDWR to install a third measuring device at both of these locations. Therefore, the water measurement devices initially proposed in this plan for Sand Creek have been deleted from this plan.

Idaho Canal. Idaho Canal discharges into the Blackfoot River in Section 17 (T2S, R36E). To quantify the flow contributed by the Idaho Canal into the Blackfoot River system, it is proposed to install a weir and instrumentation to monitor the inflows from the Idaho Canal. A suitable site is located in Section 8, just south of the county road. A drop structure already exists and, with some modifications, may facilitate the installation of a sharp-crested weir at that location.

UPPER BASIN WATER MEASUREMENT PLAN

The Upper Basin Water Measurement Plan consists of three measurement facilities on three "typical" diversions in the upper basin. The information derived from the three water measurement facilities in the upper basin will be used to estimate typical water delivery information (ie. diversion rates per acre, annual diversion volume, irrigation season length, etc.) for all upper basin lands. Due to cost constraints and manpower requirements to operate and maintain facilities, the number of structures to be installed in the upper basin was limited to three: Slug Creek Diversion, Blackfoot River Diversion Above Dry Valley Creek, and Blackfoot River Diversion Below Dry Valley Creek. Figure 10 shows the water measurement sites proposed for the upper basin.

Limited access to the potential water measurement sites during MSE-HKM's field investigations made it difficult to estimate the available hydraulic head at each of the locations. Therefore, it is difficult to estimate which type of water measurement structure to propose for each of these sites. For the purposes of this report, it is assumed that the available hydraulic head is minimal and that a flume will be used rather than a weir. Upon further field investigations, it may be possible to save some cost by using weirs, if the hydraulic head is available.

Canals

Slug Creek Diversion. The Slug Creek Diversion is located in Section 24 (T8S, R43E) and is typical for the upper basin area. Irrigation water serves grass pasture and hay via gravity/flood irrigation methods. It is proposed to install a flume at this location to monitor diversions at this location. A staff gage and data recorder are included in this structure to monitor real-time diversions and to store cumulative diversion volume data.

Blackfoot River Diversion Above Dry Valley Creek. The diversion to irrigated lands above the confluence of Dry Valley Creek and the Blackfoot River is located in Section 25 (T7S, R43E). It is proposed to install a flume at this location to monitor diversions at

this location. A staff gage and data recorder are included in this structure to monitor real-time diversions and to store cumulative diversion volume data. Depending on the available hydraulic head, it may be possible to install a sharp-crested weir to measure flow at this location.

Blackfoot River Diversion Below Dry Valley Creek. The diversion to irrigated lands below the confluence of Dry Valley Creek and the Blackfoot River is located in Section 35 (T7S, R43E). It is proposed to install a flume at this location to monitor diversions at this location. A staff gage and data recorder are included in this structure to monitor real-time diversions and to store cumulative diversion volume data. Again, depending on the available hydraulic head, it may be possible to install a sharp-crested weir to measure flow at this location.

COST ESTIMATES

The estimated cost of each of the flow measurement components proposed is summarized in Table 1. The costs shown in Table 1 estimate the labor required for installation of the water measurement structures and set-up of the automated controls (data-logger, housing, etc.). Table 1 also summarizes the type of structure proposed for water measurement and the major reason for including flow measurement at each site.

The estimated field costs for materials (structure and automation) and labor for installation of the water measurement facilities is approximately \$152,000. Applying a 25% contingency for unlisted items and miscellaneous equipment, the estimated project cost is approximately \$190,000.

TABLE 1: FORT HALL WATER MEASUREMENT PLAN COST ESTIMATES

TABLE 1: FORT HALL WATER MEASUREMENT PLAN COST ESTIMATES																
DIVERSION NAME	REASON FOR INSTALLATION	MAXIMUM EXPECTED FLOW (CFS)	MATERIALS					LABOR					ESTIMATED FIELD COST	CONTINGENCIES AT 25%	ESTIMATED PROJECT COST	
			PROPOSED MEASUREMENT STRUCTURE	ESTIMATED COST OF STRUCTURE	ESTIMATED COST OF AUTOMATION	CONCRETE @ \$250.00 PER C.Y.	STEEL @ \$0.50 PER LB.	GENERAL @ \$15.00 PER HOUR	GENERAL LABOR COST	SPECIALIZED @ \$30.00 PER HOUR	SPECIALIZED LABOR COST					
ABOVE RESERVOIR																
SLUG CREEK	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	10	PARSHALL FLUME	\$3,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$6,420	\$1,805	\$8,025		
UPPER BLACKFOOT	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	10	PARSHALL FLUME	\$3,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$6,420	\$1,805	\$8,025		
LOWER BLACKFOOT	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	10	PARSHALL FLUME	\$3,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$6,420	\$1,805	\$8,025		
BELOW RESERVOIR																
RIVERTON																
SMITH-MAXWELL	DIVERSION FROM THE BLACKFOOT RIVER	30	FLUMWEIR	\$4,000	\$1,500	\$4,500	\$300	32	\$480	32	\$960	\$11,740	\$2,835	\$14,675		
CENTRAL	DIVERSION FROM THE BLACKFOOT RIVER	20	FLUMWEIR	\$3,000	\$1,500	\$3,750	\$250	24	\$360	24	\$720	\$9,560	\$2,385	\$11,976		
STEPHENS	DIVERSION FROM THE BLACKFOOT RIVER	20	"		\$1,500			8	\$120	8	\$240	\$1,860	\$465	\$2,325		
WINNERS	DIVERSION FROM THE BLACKFOOT RIVER	20	"		\$1,500			8	\$120	8	\$240	\$1,860	\$465	\$2,325		
PACKER	DIVERSION FROM THE BLACKFOOT RIVER	30	"		\$1,500			24	\$360	24	\$720	\$9,560	\$2,385	\$11,976		
LITTLE BUTTE	DIVERSION FROM THE BLACKFOOT RIVER	5	FLUMWEIR	\$3,000	\$1,500	\$3,750	\$250	8	\$120	8	\$240	\$1,860	\$465	\$2,325		
EASTERN IDAHO	DIVERSION FROM THE BLACKFOOT RIVER	30	CIPOLLETTI WEIR	\$500	\$1,500	\$2,000	\$400	40	\$600	40	\$1,200	\$2,360	\$590	\$2,950		
JUST CANAL	DIVERSION FROM THE BLACKFOOT RIVER	50	CIPOLLETTI WEIR	\$5,000	\$1,500	\$6,000	\$400	40	\$600	40	\$1,200	\$14,700	\$3,675	\$18,375		
SHAKE RIVER RETURN																
FLOW SITES																
CORBETT SLOUGH	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	10	CIPOLLETTI WEIR	\$1,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$4,420	\$1,105	\$5,525		
IDAHO CANAL	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	50	CIPOLLETTI WEIR	\$5,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$8,420	\$2,105	\$10,525		
WEST BRANCH CANAL	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	20	CIPOLLETTI WEIR	\$1,000	\$1,500	\$1,000	\$200	16	\$240	16	\$480	\$4,420	\$1,105	\$5,525		
PUMP STATIONS																
MISC. PUMPS	DIVERSION FROM THE BLACKFOOT RIVER	00 1000 GPM	10 FLOW METERS	\$2,500	EACH			40	\$600	40	\$1,200	\$43,000	\$10,750	\$53,750		
TOWN PUMPS	DIVERSION FROM THE BLACKFOOT RIVER	4,000 GPM	2 FLOW METERS	\$4,500	EACH			40	\$600	40	\$1,200	\$12,800	\$3,150	\$16,750		
TOTALS												\$151,500	\$37,875	\$189,375		

• USE EXISTING RECTANGULAR FLUME SECTIONS

• MINERS DITCH WILL BE MEASURED WITH TWO FLOWMETERS AT THE CITY'S PUMPING PLANT

• *** NOT INCLUDING PROJECT OVERSIGHT

* USE EXISTING RECTANGULAR FLUME SECTIONS
 ** WINNERS DITCH WILL BE MEASURED WITH TWO FLOWMETERS AT THE CITY'S PUMPING PLANT
 *** NOT INCLUDING PROJECT OVERSIGHT

TABLE 2: FORT HALL WATER MEASUREMENT PLAN: WORK REMAINING

DIVERSION NAME	REASON FOR INSTALLATION	DESCRIPTION OF WORK REMAINING PRIOR TO CONSTRUCTION
SLUG CREEK		
UPPER BLACKFOOT	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
LOWER BLACKFOOT	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
	ESTIMATE TYPICAL UPPER BASIN DIVERSIONS	SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
RIVERTON		
SMITH-MAXWELL	DIVERSION FROM THE BLACKFOOT RIVER	
CENTRAL	DIVERSION FROM THE BLACKFOOT RIVER	
STEPHENS	DIVERSION FROM THE BLACKFOOT RIVER	
MINERS	DIVERSION FROM THE BLACKFOOT RIVER	
PACKER	DIVERSION FROM THE BLACKFOOT RIVER	NONE
LITTLE BUTTE	DIVERSION FROM THE BLACKFOOT RIVER	NONE
EASTERN IDAHO	DIVERSION FROM THE BLACKFOOT RIVER	SEE "TOWN PUMPS"
JUST CANAL	DIVERSION FROM THE BLACKFOOT RIVER	SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
	DIVERSION FROM THE BLACKFOOT RIVER	NONE
		NONE
		SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
CORBETT SLOUGH		
IDAHO CANAL	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	
WEST BRANCH CANAL	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	
	SNAKE RIVER INFLOW TO BLACKFOOT RIVER SYSTEM	
		SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
		SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
		SURVEY CHANNEL GRADE TO DETERMINE STRUCTURE TYPE
MISC. PUMPS		
TOWN PUMPS		
	DIVERSION FROM THE BLACKFOOT RIVER	
	DIVERSION FROM THE BLACKFOOT RIVER	
		FINALIZE FLOWMETER TYPE AND COST ESTIMATES
		FINALIZE FLOWMETER TYPE AND COST ESTIMATES