STATEMENT OF BASIS

PERMITTEE:	Shoshone Utility Organization
FACILITY:	Shoshone Utility Fort Washakie Membrane Filtration Water Treatment Plant
PERMIT NO:	WY-0044580
RESPONSIBLE PERSON:	Erin Martin, Director Office phone (307) 332-3458 Email: shoshonewater@hotmail.com
MAILING ADDRESS:	Shoshone Utility Organization P.O. Box 338 Fort Washakie, WY 82514
CONTACT PERSON:	Erin Martin
PERMIT TYPE:	Renewal, Minor Industrial, Indian Country

Background Information

This statement of basis is for the Shoshone Utility Organization's (SUO) membrane filtration water treatment plant (WTP), completed in 2008 and located across the river from the SUO's older conventional filtration WTP. The SUO's membrane filtration WTP is located in Fremont County, Wyoming on the Wind River Indian Reservation. It is approximately three miles due west of the Town of Fort Washakie and is in the SE ¼ of the NW ¼ of Section 1, Township 1 South, Range 2 West. The local address of the WTP is 21 Engavo Lane, Fort Washakie, WY. Outfall 001 is located at 43°00'12"N and 108°56'37"W and discharges to an irrigation ditch to the South Fork of the Little Wind River; Outfall 002 is located at 43°00'12"N and 108°56'37"W and also discharges to an irrigation ditch to the South Fork of the Little Wind River.

Water is obtained from the South Fork of the Little Wind River via an infiltration gallery consisting of slotted pipes under the river. The water goes to the WTP by gravity flow via a 16" pipeline. Just prior to the intake pipe going into the WTP building, there is a provision for bypassing the water in the intake pipe to an old irrigation drainage ditch on the south side of the WTP property. This bypass can be used to drain the intake pipe for repairs, etc. The water treatment process consists of influent screens followed by membrane filtration using the GE Water and Process Technologies ZeeWeed® - 1000 (ZW-1000) membrane filters. Presently the WTP consists of two membrane filtration basins containing one pump and three cassettes of membrane filter units each, operated in parallel with a common header (for a total of two basins and six cassettes). There are provisions for adding four more cassettes of membrane filter units in a third basin as needed. The capacity of the present system is intended to produce a maximum of 3.0 million gallons of per day (MGD) of finished water. Chlorination (12.5% sodium hypochlorite) of the treated water is provided to ensure disinfection following membrane filtration. Finished water goes to a nearby storage tank with a capacity of about 2 million gallons. From there the water goes to other storage tanks and the distribution system.

Wastewater will be generated by (1) the routine backwashing of the membrane units with filtered water approximately every 45 to 60 minutes up to 24 times a day; (2) the daily treatment of the membrane units with backwashing solution containing approximately 50 parts per million (ppm) of sodium hypochlorite; and (3) "recovery cleanings" using citric acid followed by neutralization with sodium hydroxide quarterly and cleaning with concentrated sodium hypochlorite solution (400 mg/L) followed by neutralization with sodium bisulfate; this takes place quarterly (four times per year). The facility was designed to recover 92% of the water that enters the facility from the intake, resulting in 8% of treated water going to "reject" flow. At design capacity, in order to produce 3 MGD of finished water, about 3.26 MGD will have to be treated, producing about 0.26 MGD of wastewater. However, the facility currently produces an average of 700,000 gpd, with peaks around 1.3 mgd during the summer months and dropping to approximately 500,000 gpd during the winter months.

The wastewater from the water treatment process goes by gravity flow via a 20" pipe through Vault No. 1 to the backwash pond located near the WTP building. According to the plans, the backwash pond is rectangular in shape with curved corners. The inside dimensions at the bottom are 55' wide by 200' long. The sides have a slope of 3 horizontal to 1 vertical. The planned operating depth is 6.5'. This writer estimates the effective storage capacity, with no adjustment for accumulated solids, to be about 795,000 gallons. The facility director indicates there is no accumulation of solids in the backwash pond due to physical separation inherent in membrane filtration. The backwash pond is drained twice a week. While there are provisions for adding a second backwash pond parallel to the first pond in the future if the facility expands, the facility director indicates that this is unlikely to occur in the near future as the facility is currently only operating at approximately 50% of design capacity. Previously, a decanter system was used to discharge water from the backwash pond; however this was damaged by ice and no longer in use. The discharge from the backwash pond goes via pipe to Vault No. 2.

Inside Vault No.2 the piping is arranged so that the water may be directed to the outfall line (Outfall 001) or to the adjacent irrigation pump station. Wastewater used for facility landscaping needs is directed through a 2" pipe; the director indicates that the volume of water used for this purpose is relatively minimal. It should be noted that water is not released into the vault unless there is a leak in the piping. There are electronically controlled butterfly valves on the discharge pipe and the pipe to the irrigation pump station for use in controlling where water goes. On the discharge pipe there is a magnetic flow meter for measuring the discharge flow rate. The irrigation pump station is a manhole with a submersible pump for pumping water to a subsurface irrigation system for the landscaping at the WTP. The backwash pond has an overflow outlet at 7.5' above the bottom of the pond. The overflow is connected by pipe to the piping in Vault No. 2.

The permit application identified four points where water can be discharged from the WTP property. Two of the discharge outfalls need to be covered under the permit and two do not require a permit. The four points where water can be discharged from the WTP property are:

No permit needed:

- The bypass of intake water before the intake pipe goes into the WTP building does not require permit coverage. No chemicals have been added to the water and the bypassed water is being returned to the same river from which it was obtained.

- There is a 4" diameter drain line that goes from the south entrance to the WTP building to the unnamed irrigation drainage ditch. The drain line extends approximately 270' straight south from the WTP building, then approximately 580' in a southeasterly direction to the unnamed irrigation drainage ditch. The coordinates at the point of discharge are approximately 43° 00' 12" N and 108° 56' 45" W. The drain line receives storm water runoff from the south entrance to the building. Initially the indoor pipe trench within the water treatment plant building was connected to the 4" drain pipe. After the permit application was received, the permittee decided to change the piping so that any drainage from the indoor pipe trench goes to the backwash pond. The permit application was modified by means of a letter dated April 4, 2008. Permit coverage is not needed for the storm water runoff from the south entrance to the WTP building.

Permit required:

- **Outfall 001:** This is the discharge from the backwash pond. When water is discharged from the backwash pond or overflows via the overflow line, it flows into and through Vault No. 2 via 8" pipes. After the piping goes into Vault No. 2, it is either routed through the vault to the outfall line or through the vault to the nearby irrigation pump station manhole. (Note: water is not released into Vault No. 2 unless there is a leak in the piping) The outfall line for Discharge 001is a 10" diameter DIP (ductile iron pipe) approximately 700' in length. This line goes in a southeasterly direction from Vault No. 2. The coordinates at the point of discharge are approximately 43° 00' 12" N and 108° 56' 37" W.

- **Outfall 002:** This is a 3" PVC pipe that is connected to floor drains in Vault No. 1 and Vault No. 2. From Vault No. 1 the pipe goes by Vault No. 2, where the floor drain from that vault is connected into the pipe. From Vault No. 2 the 3" pipe runs parallel to Outfall 001. The purpose of floor drains in the two vaults is to drain any water that may get into the vaults due to seepage, leakage during repair of the pipes going through the vaults, etc. It is anticipated that normally there will be no discharge from Outfall 002. This outfall was initially constructed to discharge directly into the irrigation drainage ditch. Subsequently, a pit (20' x 20' x 6.5') was dug near the end of the 3" pipe. If water were to get into the vaults, it would flow into the pit. Depending on the volume of water going into the pit, there may or may not be a discharge into the unnamed irrigation ditch at approximately the same point as Outfall 001. There has been no discharge from this pit over the last five years and it is anticipated that there will not likely be a discharge from the pit in the future. The coordinates at the point of discharge are approximately 43° 00' 12" N and 108° 56' 37" W.

Effluent limitations in the previous permit included Total Suspended Solids (30 mg/L 30-day average; 60 mg/L daily maximum), Total Residual Chlorine (0.01 mg/L Daily Maximum) and pH between 6.5 and 9.0 at any time. A summary of discharge monitoring data submitted by the facility over the last permit term is provided below:

Shoshone Utility Membrane Filtration WTP Max/Min Data, 2008-2013		
	Outfall 001	**Outfall 001**
pH	6.46/8.71	ND*
TSS (mg/L)	1.83/116	ND*
Flow (mgd)	0.045/1.22	ND*
TRC (mg/l)	0.06/0.1	ND*

*ND = No Discharge

Receiving Waters:

The outfalls discharge to the unnamed irrigation drainage ditch located on the south side of the WTP. The drainage ditch flows into the South Fork of the Little Wind River (SFLWR) just upstream of where Shoyo Lane crosses the river. It is approximately 0.6 miles from Outfall 001 to the confluence with the river. Flow in the SFLWR is regulated by the Washakie Reservoir located approximately 8 stream miles upstream of where the discharge from the backwash ponds goes into the SFLWR. Water can be diverted from the North Fork of the Little Wind River (NFLWR) to the SFLWR via the North Fork Diversion Canal. It flows into the SFLWR approximately 2 miles upstream of where Shoyo Lane crosses the river. Flow can be diverted from the SFLWR approximately ¼ mile downstream of Shoyo Lane via the Ray Canal. The SFLWR merges with the NFLWR at the north edge of the City of Fort Washakie, approximately 3 ½ miles downstream of Shoyo Lane.

The USGS had two gaging stations on the SFLWR until June 1, 2007, when the stations were discontinued. Station No. 06228350 was located on the SFLWR about 1.9 miles upstream of Washakie Reservoir. The period of record for that station is from 10-01-1976 to 05-31-2007, with no flow data for 11-01-2005 through 04-26-2006. Station No. 06228450 was located 0.7 of a mile downstream from Washakie Reservoir. Its period of record is from 10-01 1988 to May 31, 2007, with no flow data for 11-01-2005 through 05-01-2006.

An examination of the streamflow data for the two gaging stations indicates that the reservoir is normally operated to have a minimum release of about 10 cfs. From October 1988 to September 2005 there were three periods of time when the flow below the reservoir was significantly less that 10 cfs. Those time periods are listed in the table below. In addition, the ranges of flows downstream and upstream of the reservoir for those time periods are given in the table. There were about four other periods lasting 1-2 weeks with flows in the range of 9.0 to 9.9 cfs.

	Range of Flows, mean cfs	
Period	Downstream	Upstream
10-28-1988 to 03-29-1989	4.1 to 9.4	8.0 to 21
03-15-1991 to 05-09-1991	3.5 to 6.5	18 to 44 a/
03-21-1992 to 04-27-1992	7.4 to 9.9	17 to 85

a/ From 3-15-1991 to 05-06-1991. On May 7, 8, & 9, 1991 the flows ranged from 64 to 244 cfs upstream of the reservoir.

Water Quality Considerations:

The Wind River Environmental Quality Commission developed Surface Water Quality Standards (WQS) that apply to waters within the exterior boundaries of the Wind River Reservation. These WQS were adopted into tribal code as Water Quality Rules and Regulations effective September 25, 2007. The WQS were submitted to the EPA and returned to the Tribes with comments. The tribal WQS have not yet been formally approved by the EPA, however, the EPA is considering the WQS when determining reasonable potential and evaluating the need for any water quality based effluent limitations in this renewal permit. In the Tribe's WQS, designated uses were established in which the Tribe classified all waters upstream from the confluence of the South Fork of the Little Wind River and the North Fork of the Little Wind River to the Tribal Wilderness Boundary as Class 2AB waters. This would include all tributaries and associated wetlands to this segment of the SFLWR. Class 2AB waters include cold water aquatic life, drinking water, primary and secondary contact recreation, wildlife, industry, agriculture and aesthetic uses.

Generally, pollutants in WTP residuals come from two sources: 1) treatment chemical addition (including by-product formation); and 2) source water. WTPs remove pollutants from source water in order to meet maximum contaminant levels (MCLs) in the finished drinking water. In membrane systems such as the one used at this facility, contaminants tend to concentrate in the backwash waste stream. As such, source water quality directly affects the presence and concentration of pollutants that may be present in the waste stream. The removed pollutants are concentrated in the WTP residuals and become part of the residual waste streams along with the treatment chemicals used at the facility. Common source water contaminants include microorganisms, radionuclides, metals (e.g. arsenic, cadmium, chromium, lead, selenium, cadmium, mercury, thallium), nitrates/nitrites and fluoride (EPA Drinking Water Treatment Plan Residuals Management Technical Report 2011).

The backwash stream represent the majority (95-99%) of residuals generated from ultrafiltration treatment processes, with the remaining 1-5% of membrane residuals being generated by chemical cleaning procedures (estimated by EPA's 2011 Drinking Water Treatment Plant Residuals Management Technical Report). Typical characteristics of low-pressure membrane **backwash residuals** include algae, precipitated solids, chemical residues associated with chemical-enhanced backwash treatment of filters, total organic carbon concentration of 1-2 times the feed water concentration (if no coagulant or absorbent is used), total suspended solids and cryptosporidium concentration of 7-50 times the feed water (EPA Drinking Water Treatment Plant Residuals Management Technical Report, 2011). Typical characteristics of spent low-pressure membrane chemical cleaning solutions (e.g, sodium hypochlorite, citric acid) include chlorine residuals up to 1,000 mg/L as Cl_2, TSS up to 500 mg/L (neutralization may precipitate additional solids), TOC 10-30 times the feed water concentration and 5-day BOD5 up to 5,000 or 10,000 mg/L (if citric acid is used) (EPA Drinking Water Treatment Plant Residuals Management Technical Report, 2011).

The pollutants of potential water quality concern for the discharges from the WTP are total residual chlorine (TRC) and pH. The proposed water quality criteria for TRC for aquatic life is the same as EPA's recommend criteria (i.e. 11 ug/L, daily maximum) The proposed criterion for pH is 6.5-9.0 for aquatic life and the effluent limitation on pH will be 6.5-9.0.

The proposed criterion for TSS is a technology based effluent limitation of 30 mg/L (30-day average) and 60 mg/L (daily maximum). It appears the facility has had some difficulty meeting the daily maximum TSS limit over the previous permit cycle, with two instances over the last five years where

the facility exceeded the 60mg/L Daily Maximum limit (116 mg/L on 9/30/2008 and 85 mg/L on 3/31/2013).

It is difficult to estimate the possible loss of chlorine that would occur from the point of discharge to the confluence with the SFLWR. During the summer in the daytime there could be a significant loss, with possibly no chlorine reaching the river. However, during the winter at night there may be very little loss of chlorine. In order to be protective of water quality, it is assumed that there will be no loss of chlorine from the time the discharge enters the irrigation drainage ditch until it reaches the river.

The rate of discharge from the backwash pond is another variable to consider. Currently the facility allows the backwash pond to fill to capacity and then allows for the controlled discharge of wastewater in batches, from the pond via a valve system, at an approximate rate of 800 gpm. This discharge valve is open for approximately 20 hours every three days; during the winter, the valve is open for approximately 20 hours every five days.

If the WTP was operating at the current design capacity of 3.0 MGD, the amount of wastewater produced would be about 0.26 MGD. However, currently, the discharge from the backwash pond is done on a "batch basis", at an average rate of 800 gpm which is approximately 1.78 cfs. To minimize the potential for an excessive amount of chlorine reaching the SFLWR, the effluent limitation on TRC for Outfall 001 is 0.10 mg/L (i.e. 100 ug/L). That is the lower detection limit in the analysis for TRC when using the DPD spectrophotometric method of analysis.

Effluent Limitations

Outfalls 001 and 002 have the same numerical effluent limitations, which are given below in the table. Currently there are no effluent limitations guidelines for discharges from water treatment plants. In addition, there are no other promulgated effluent limitations that apply to the discharge. In the absence of promulgated effluent limitations, the permit issuing authority may determine applicable effluent limitations based on "best professional judgment" (BPJ). This is in accordance with Section 402 (a)(1) of the Clean Water Act. The effluent limitations on total suspended solids (TSS) are based on BPJ. The detention time in the backwash pond should be adequate for the settling of suspended material in the wastewater going into the backwash pond. While no discharge is anticipated from Outfall 002, in the case of discharge, the detention time should be adequate to provide the necessary settling to meet the TSS limits.

As discussed in the above section on water quality considerations, the effluent limitations on TRC and pH are based on protecting the quality of the receiving waters.

Effluent Characteristic	Effluent Limitation		
	30-Day Average a/	7-Day Average a/	Daily Maximum a/
Total Suspended Solids, mg/L	30	N/A	60
Total Residual Chlorine, mg/L b/	N/A	N/A	0.10 b/
The pH of the discharge shall not be less than 6.5 nor greater than 9.0 at any time.			

a/ See Definitions, Part I.A. for definition of terms.

b/ For the purposes of the permit, the minimum limit of analytical reliability in the analysis for total residual chlorine is considered to be 0.10 mg/L. For purposes of this permit and calculating averages and reporting on the Discharge Monitoring Report form, analytical values less than 0.10 mg/L shall be considered zero.

Self-Monitoring Requirements:

The self-monitoring requirements are given in Part 1.3.2 of the permit. The requirements for Outfall 001, given in Part 1.3.2.1, are somewhat different from the requirements for Outfall 002, given in Part 1.3.2.2, because of differences in the two discharges.

The discharge from Outfall 001 can be controlled and there is the capability to measure the rate of discharge and the total volume of water discharged. A sample of the effluent being discharged can be pumped continuous to the laboratory in the WTP, making it easy to collect samples. Daily monitoring is required for TRC and pH as a means of providing protection water quality in the receiving waters. Monitoring for TSS will be every two weeks, which should be adequate for the type and size of discharge involved.

Although no discharge is anticipated from Outfall 002, the permit requires that the outfall be visually inspected at least every two weeks to see if a discharge is occurring. If work is being done in either Vault No. 1 and/or Vault No. 2 that may result in a discharge, Outfall 002 is to be visually inspected daily to see if a discharge is occurring. Whenever a discharge is observed, daily sampling is to be done for TSS, pH, and TRC. Flow monitoring is not required because there is no flow measuring equipment at this outfall. The permittee is required to provide an estimate of the total volume of water discharged and the number of days the discharge occurred.

Reporting of self-monitoring results is to be quarterly. More frequent reporting is not considered necessary for this facility.

Additional Monitoring Requirements:

Included in the permit is additional effluent monitoring to screen for constituents that may be present in source water and concentrated in the discharge (Permit Part 1.3.2.3.). The requirement to monitor for these constituents is to develop a dataset to evaluate the reasonable potential for pollutants in the

source water to affect the quality of the discharge and impact the receiving stream into which the facility discharges. Source water quality may very over time or in seasonal cycles. This permit requires the permittee to monitor for the constituents listed below four times during the life of the permit. One sampling period shall take place representing each of the quarters during which DMR data is submitted; specifically, one sampling period will take place once over the next permit cycle representing each of the following quarters for a total of four sampling periods:

- January 1 – March 31;
- April 1 – June 30;
- July 1 – September 30;
- October 1 – December 31.

Reporting of each of the four monitoring datasets shall be submitted to the permit issuing authority, at the time of the DMR submittal for that reporting period in which the sample was taken. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136. Additional monitoring requirements are provided in the table below.

Additional Monitoring Requirements and Required Detection Limits:

Parameter	Required Detection Limit
Biochemical Oxygen Demand (BOD5)	2.0 mg/L
Nitrate plus Nitrite Nitrogen	0.5 mg/L
Arsenic, Total	1.0 µg/L
Cadmium, Total Recoverable	5.0 µg/L
Chromium, Total Recoverable	5.0 µg/L
Lead, Total Recoverable	1.0 µg/L
Selenium, Total Recoverable	2.0 µg/L
Thallium, Total Recoverable	50 µg/L

<u>Inspection Requirements</u>:

Part 1.3.3 of the permit requires that at least monthly the backwash pond(s) be checked for leakage through the dikes, animal burrows in the dikes, excessive erosion of the dikes, and the distance from the water surface in the backwash pond(s) and the invert of the overflow pipe. For both the backwash pond(s) and the pit for Outfall 002 the permittee is to check to see if there are any rooted plants, including weeds, growing in the backwash pond(s) and pit for Outfall 002. (Note: grass and low weeds growing on the banks of the dikes and in the pit for Outfall 002 is acceptable.) At least annually the backwash ponds are to be checked for the accumulation of sediment, with measurements being taken. Based on the

measurements, the permittee is to make a determination as to whether or not sediment should be removed from the pond(s) before the next measurement is taken. A record is to be kept of all information obtained during inspections.

Endangered Species Act (ESA) Requirements

Section 7(a) of the Endangered Species Act requires federal agencies to ensure that any actions authorized, funded or carried out by an agency are not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or adversely modify or destroy critical habitat of such species. Federally listed threatened, endangered and candidate species found in Fremont County, Wyoming include:

Species	Status
Bald Eagle (Haliaeetus leucocephalus)	R
Yellow-billed Cuckoo (*Coccyzus americanus*)	C
Greater Sage Grouse (*Centrocercus urophasianus*)	C
Blowout Penstemon (*Penstemon haydenii*)	E
Fremont County Rockcress (*Boechera pusilla*)	C
Ute Ladies Tresses (*Spiranthes diluvialis*)	T
Desert Yellowhead (*Yermo xanthocephalus*)	T
Grizzly Bear (*Ursus arctos horribillis*)	T
Black-footed Ferret (*Mustela nigripes*)	E
Gray Wolf (*Canis lupus*)	R
Canada Lynx (*Lynx canadensis*)	T
North American Wolverine (*Gulo gulo luscus*)	C

T Threatened R Recovery
E Endangered C Candidate

It does not appear that discharges from the Shoshone Water Treatment Facility will result in significant impact to any endangered species or critical habitats. This permit renewal is not likely to adversely affect any of the species listed by the U. S. Fish and Wildlife Service under the Endangered Species or critical habitats of the irrigation ditch leading to South Fork of the Little Wind River.

National Historic Preservation Act (NHPA) Requirements

Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470(f) requires that federal agencies consider the effects of federal undertakings on historic properties. The EPA has evaluated the reissuance of the NPDES permit for Shoshone Water Treatment Facility to assess this action's potential effects on any listed or eligible historic properties or cultural resources. This correspondence is typically conducted with the Tribal Historic Preservation Office (THPO).

EPA does not anticipate any impacts on listed/eligible historic or cultural properties because this permit is a renewal and will not be associated with any new ground disturbances or changes to the volume or point of discharge. During the public comment period, the EPA will notify the Tribal Historic Preservation Offices (THPOs) of the Northern Arapaho and Eastern Shoshone Tribes of the planned issuance of this NPDES permit and request their input on potential effects on historic properties and the EPA's preliminary determination in this regard.

Technical References Used in Establishing Permit Requirements

United States Environmental Protection Agency (December 2011): Drinking Water Treatment Plan Residuals Management Technical Report, Summary of Residuals Generation, Treatment, and Disposal at Large Community Water Systems, http://water.epa.gov/scitech/wastetech/guide/treatment/upload/residuals_management_report.pdf

Miscellaneous:

The permit will be issued for a period of approximately five years, but not exceeding five years. The effective date and expiration dates of the permit will be determined at the time of issuance. The expiration date will be at the end of the calendar quarter closest to five years from the effective date without exceeding five years.

Permit drafted by Elaine Lai, Wastewater Unit, 8P-W-WW – August 29, 2013

Permit reviewed by Bob Shankland, SEE, Wastewater Unit, 8P-W-WW – August 29, 2013