APS
The Power To Make It Happen
FOUR CORNERS POWER PLANT
P.O. Box 355 • FRUITLAND, NEW MEXICO 87416

November 29, 2006

CERTIFIED MAIL

Ms. Nancy Yoshikawa
USEPA, Region 9. STR-5
75 Hawthorne St.
San Francisco, California 94105

Re: Reconsideration of Classification of the APS Four Corners Power Plant under CWA 316(b) Rules

Dear Ms. Yoshikawa:

As you are aware, Arizona Public Service (APS) has submitted a Proposal for Information Collection (PIC), consistent with EPA's Phase II 316(b) Rule, for its Four Corners Power Plant (FCPP). Upon further review of the Phase II Rule and the facts concerning the FCPP, however, we have concluded that the FCPP is not subject to the Phase II Rule. Instead, it properly falls within the Phase III Rule, which covers power plants with withdrawal rates of less than 50 MGD.

We reached this conclusion in this case because: (1) the facility has a closed-cycle recirculating cooling system, the intake for which is on the San Juan River, and (2) the design withdrawal rate at the San Juan River is only 48.96 MGD. In support of this conclusion, we undertook an engineering analysis of the plant's cooling system, intake structure, and source waterbody. The results of that analysis are attached. In light of this new information, we ask that Region 9 treat APS's PIC for the FCPP as withdrawn.

Although we believe that the attached report clearly demonstrates that the FCPP has a closed-cycle recirculating system, as a result of which its intake flow is below 50 MGD, if EPA, after reviewing the report, has any remaining questions about whether or not this facility falls under Phase III, we would like to discuss them with you as soon as possible. As you are aware, the Phase II Rule, if it were to apply, sets ambitious deadlines for completion of a "Comprehensive Demonstration Study" (CDS) that is not required for Phase III facilities. Preparation of a CDS is a complex, time-consuming, and expensive task, which we estimate would require at least a year to complete. Thus, if we have not resolved any issues regarding applicability of the rules by mid-January, 2007, APS will ask the Region to use its authority under 40 CFR § 122.21(d)(2)(ii) to extend the CDS deadline that otherwise would be applied in the renewal permit.

We look forward to your response to this submittal. If you have any questions, please contact Richard Grimes, EHS Manager at (505) 598-8210 or Carl Woolfolk, Environmental Supervisor at (505) 598-8799.

Sincerely,

David L Saliba

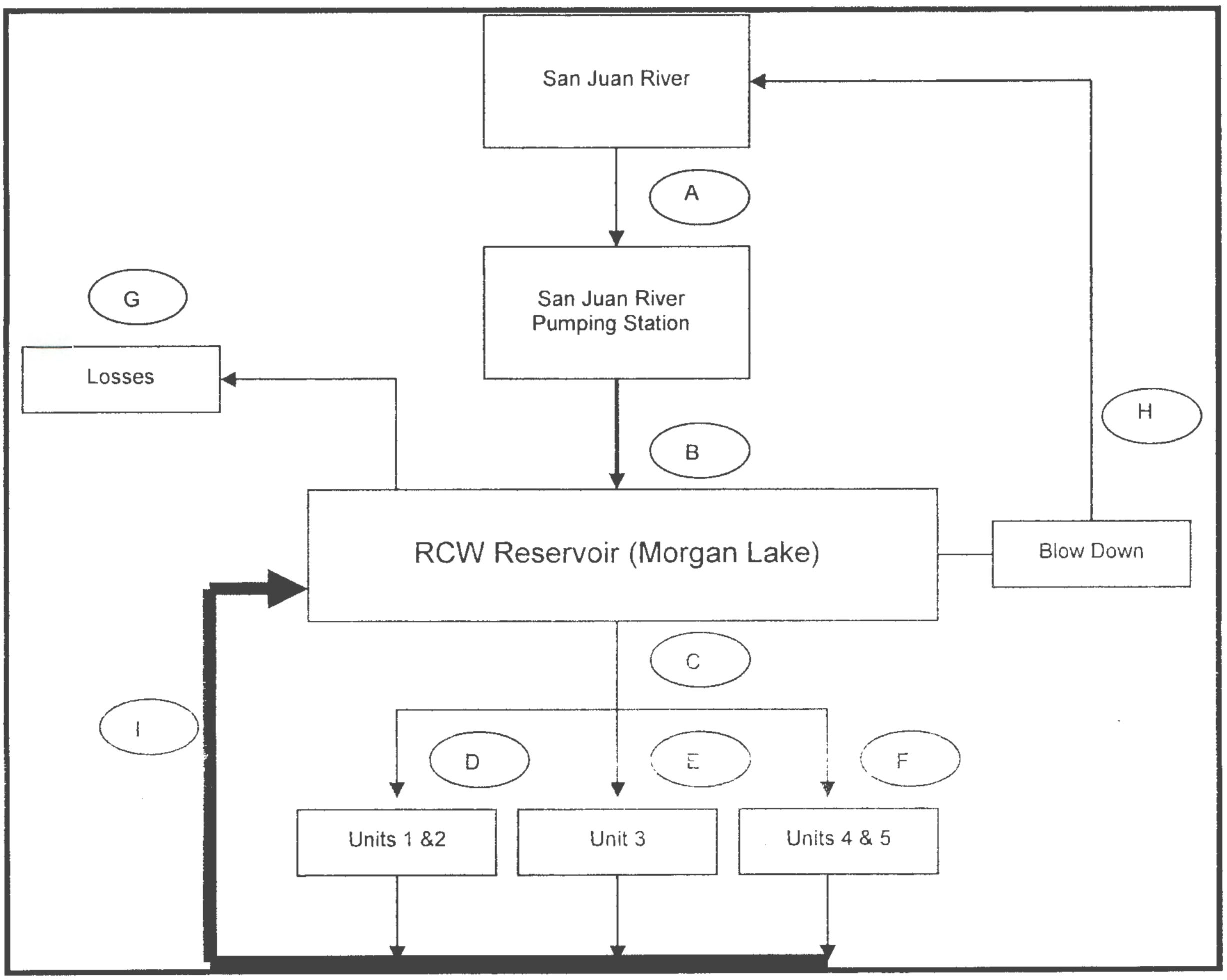
David L. Saliba
Fossil Plant Manager

CDW/jmd

Attachment

Description of Arizona Public Service's Four Corners Power Plant Closed-cycle Recirculating Cooling Water System

- Source Water Physical Data
- Cooling Water Intake Structure
- Cooling Water System Data
- Appendices



Submitted by: Four Corners Plant Engineering
To: USEPA Region 9
On: November 21, 2006

Contents

Introduction

The general purposes of this report are:

- To provide information about the design of the recirculating cooling water (RCW) system at Arizona Public Service's Four Corners Power Plant and about the San Juan River (its source waterbody) that will aid EPA in determining whether APS is subject to Phase II of 316(b) of the Clean Water Act.
- To document the proportions of intake water that the Four Corners Power Plant uses for cooling, make up water, and process water.

Specifically, this report:

- Describes the cooling water intake structure and the recirculating cooling water system used by the Four Corners Power Plant, using aerial photos, maps, drawings, depths, salinity and temperature regimes, and provides supporting documents.
- Provides a narrative description and scaled drawings showing the physical configuration of the source waterbody used by the Four Corners Power Plant, including areal dimensions, depths, salinity and temperature regimes, and identifies and characterizes the hydrologic and geomorphologic features of the source water body.
- Provides relevant information on the recirculating cooling water (RCW) reservoir, Morgan Lake.
- Documents the configuration of the source water intake and RCW intakes, including locations, depth in the water column, design intake flows, seasonal variations, daily hours of operation, and number of days of the year in operation.
- Describes the subsystems that make up the overall cooling water system, including (for each subsystem) the proportional relationships to the source water intake, the number of days the subsystem is in operation, and provides supporting documentation.

General System Description

This section is a simple explanation of the entire recirculating cooling water system used by the Four Corners Power Plant.

As noted above, the system begins at the San Juan River, which interfaces with the plant's River Pumping Station, from which water is pumped 2 ½ miles into the Morgan Lake, a man-made cooling water reservoir constructed in 1960. Morgan Lake was designed and constructed to serve as part of the plant's recirculating cooling water system, providing both a reliable supply of cooling water and waste heat treatment. That remains its primary purpose. Without make-up water from the San Juan River, Morgan Lake would dry up, eventually becoming incapable of supporting plant operations. The terms "Morgan Lake" and "RCW reservoir" will be used interchangeably throughout this report.

From the RCW reservoir, the water passes under a 43' deep skimmer wall and into the intake bay. Water from the intake bay is channeled to the different units and made available to the plant once it is passed through circulating cooling water (CCW) intake traveling screens.

The plant RCW is then pumped through various process operations and is released back into the RCW reservoir through a single common discharge canal. To blow down, water from the RCW reservoir is released into the No-Name Wash, which drains into the Chaco River and eventually back into the San Juan River (see Drawing #1).

Source Water Body Description:

The source waterbody for the Four Corners Power Plant is the San Juan River. The interface between the plant and the source water is the **River Station**. Its location is approximately 3 miles north east of the plant. The specific location of the station is 36° 44' 35.88" N latitude 108° 27' 39.276" W longitude.[1]

At this location, the width of the river can be approximated by the length of the weir, a low head dam that regulates water level and permits monitoring of water flow (see drawings #2 and #4 for details). The weir is approximately 149 feet 4 inches in length. Regulated releases from Navajo Lake (a large reservoir about 50 miles upstream of the River Station), unregulated flows from the Animas and La Plata Rivers (which join the San Juan about 20 miles upstream of the River Station) and precipitation upstream, influence flow volumes in this section of the San Juan River. Releases from Navajo Lake generally range from 250 cubic feet per second (cfs) to 5000 cfs and average around 600 cfs annually.[2] Depending on river flow volume, the actual width and depth of the water at the weir will vary. However, the minimum depth required for pumping is 6 feet above the bottom of the sump (see drawing # 3).

The river is constrained by a valley, limiting lateral movement. Cobble is the predominant substrate type, and some sections are essentially sediment free. Maximum flows are during the spring months, when snowmelt and rainfall increase runoff into the river.

[1] (http://terraserver-usa.com/image.aspx?T=1andS=10andZ=12andX=3639andY=20324andW=1 was used to determine this location).
[2] (SJRIP Biology Committee Report May 1999, Chapter 2: Geomorphology, Hydrology, and Habitat Flow Report).

Recirculating Cooling Water Reservoir Description ("Morgan Lake"):

The RCW reservoir, Morgan Lake, is an integral part of the Four Corners Power Plant design. It was constructed on the Navajo Reservation in 1960, when the plant itself was constructed, expressly for plant cooling water. The RCW reservoir, covers approximately 1230 surface acres between 36° 42' 39.528" N at the northern most point, 36° 41' 23.388" N at the southern most point latitude, 108° 26' 55.608" W at the eastern most point, and 108° 29' 22.272" W at the western most point longitude (also the southern point on the dam).[3] The surface elevation is generally maintained at a maximum pool of 5327' above sea level, but fluctuates from around 2 feet below (5325'). The maximum depth is about 100 feet. Temperature regimes at the deepest point (near dam) fluctuate between 48°F to 96°F, depending on the season and depth. Although surface temperatures are not monitored in the cooling reservoir, they are known (grab samples, inference from condenser inlet and outlet temps) to cycle from around 60 to 110°F, depending on the season, plant operation (heat load) and location. The salinity of the reservoir is controlled by the source water pumped from the river and by the blowdown rate. Salinity or TDS will greatly influence the temperature, by trapping the radiant energies from the atmosphere below the surface. These constituents also will increase scaling potential on plant equipment. The maximum suggested limit for the RCW reservoir is 1000 ppm of total dissolved solids.

General geomorphologic features of the RCW reservoir change very little within a given year. Changes that do take place are mostly due to sediment pumped into the RCW reservoir from the San Juan River. This sediment forms a delta around the inlet to the RCW reservoir. This accumulation of sediment poses a potential problem in controlling the quality of the water that the plant uses for cooling.

Hydrological characteristics of the RCW reservoir are important to both our NPDES permit and plant performance, and a few select parameters are monitored (lake level, pH, TDS, blowdown temperature and discharge flow). Temperature regimes are one of the most significant concerns because the lake water is very warm, directly impacting performance and efficiency. Data are collected periodically as ongoing research to improve plant operations (see Figure 3).

[3] http://terraserver-usa.com/image.aspx?T=1andS=10andZ=12andX=3639andY=20324andW=1 was used to determine these locations).

Source Water Intake Structure (River Station)

This section documents the configuration of the source water intake structure.

The cooling water intake structure for the Four Corner Power Plant is known as the "River Station," which begins at the weir on the San Juan River. At this point, very little control is involved. Attached to the weir is a river diversion gate and sluiceway that maintains the pump suction water level. There are two different sump cells, one for each train of pumps with stationary screens as the first barriers to ingress. Within a train, the first stage vertical pump will discharge to the suction for the second stage horizontal pump, which discharges via a piping system to the RCW reservoir. Seasonal changes in flow volume, lake level, maintenance and suspended solids in the San Juan River will influence operations.

The location of the River Station intake within the water column varies due to the varying height of the river. The River Station Intake structure is designed for a minimum water column elevation height of **5046** feet above sea level. The minimum water column height for the intake structure is 6 feet above the sump floor (see drawing # 3). The intake is designed to provide enough flow to the pumps. Each pump train has two centrifugal pumps (vertical & horizontal) and is **designed** to deliver 17000 gallons per minute (gpm) maximum. There are two pump trains for a maximum total **design** maximum pumping capacity of 34000 gpm. This is equivalent to **48.96 MGD (actual pumping rate is 38.8 MGD)**. The hours of daily operation on average are 18.47 hours for 2005. On a yearly basis, the hours of operation will deviate slightly depending on the weather. The 2005 average days per month operation time is 23.3 days/month. The River Station was in operation for 282.94 days during 2005.

The maximum percentage of water pumped out of the river compared to the total flow in the river is 6.59% by design, while the 2005 year actual average percentage is approximately 3.87%[4] (see Figure 4 and Figure 5).

[4] This value is based on the mean flow value specified on http://waterdata.usgs.gov/nm/nwis/uv?09368000, which can be view as Figure 4.

RCW Reservoir Structures and Operation

Once in the RCW reservoir, water is drawn into the Four Corners Power Plant via two sets of internal structures. These are located inside the skimmer wall on the RCW reservoir. These internal intake structures will be known as the "Units 1-3 Internal Intakes" and the "Units 4-5 Internal Intakes.

The Units 1-3 Internal Intake is located to the northwest of the units, at 36° 41' 25.3201" N latitude and 108° 29' 6.35176" W longitude and feeds from the intake bay.[5] The Units 4-5 Internal Intake is located west of Units 4 and 5 at 36° 41' 16.61878" N latitude and 108° 28' 55.58602" W longitude and feeds from a canal that serves the Units 1-3 Internal Intake.

The Units 1-3 Internal Intakes have a design flow of 547.2 MGD[6] but generally operate at around 439.71 MGD. The Units 4-5 Internal Intakes have a design flow of 2456.01 MGD, but actually operate at a rate closer to 559.90 MGD [due to pump design].][7] Tables 3, 4, and 5 contain information regarding the Units 1 through 5 internal intakes' design flows and the actual operating flows for 2005. The intake structures for Units 1 through 5 are located between 5327.5 feet and 5316.0 feet in water elevation above sea level, or 11.5 feet in the reservoir water column as specified in drawings 6 and 7. The daily hours of operation for each unit, along with the yearly operation time, can be found in table 3.

Both sets of intakes use traveling screens that continuously monitor the flow and filter debris. When a decrease in flow is detected by a height differential, the screens rotate and are sprayed/backwashed automatically. Debris is then conveyed to a dumpster and properly disposed. Units 1, 2, and 3 account for about 9:1 of the plant's recirculating water proportioned to the design make up water. Units 4 and 5 account for about 11:1, usage proportioned to design makeup.

There are two in plant discharge points (Units 1, 2 & 3 and Units 4 & 5 CCW) for the RCW system, which combine into one common internal CCW (hot) discharge canal to the RCW reservoir. The hot CCW discharge moves the hot water to our RCW pond to reject waste heat so that it can be re-circulated. Another internal discharge point is the Combined Waste Treatment Pond discharge to common CCW (hot) discharge canal prior to reaching the lake.

The discharge out of Morgan Lake, an external discharge, starts at the blow down tower located near the north end of the dam, and is operated manually. Blow down, helps to control TDS, as well as level and temperature, in Morgan Lake. (View drawing #5, 6, and 7 for internal and external discharges and intake structures on the RCW reservoir). However, in the warmer months, blow down is limited or impossible due to several compounding factors: high lake water temperatures near our NPDES permitted limit, high lake evaporative losses, high TSS levels in the river from "monsoon" precipitation or maintenance preventing River Station operation, low river levels, and "base load" operations putting maximum heat load on the lake. Annually averaged, blow down discharges amount to approximately 1839.7 million gallons (Table # 7).

For the 2005 yearly operation, view table #3 for information regarding operation times of each unit. Seasonal changes in the operation of the CCW intake structures are irrelevant since plant operations are year round and are absolutely dependent on the RCW system.

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[5] The location data for the intakes discussed in this paragraph were obtained using a Trimble GPS System.
[6] System Description – Units 1, 2 & 3 Circulating Water System - CWS
[7] System Description – Units 4 and 5 Circulating Water System - CWS

To conclude, the Four Corners Power Plant withdraws approximately 28.8 MGD of source water from the San Juan River for make up purposes. Once the water enters Morgan Lake it becomes part of the cooling system and is referred to as recirculating cooling water. The plant circulates nearly 1000 MGD of cooling water through Units 1, 2 and 3 Intakes and Units 4 and 5 Intakes. When comparing actual to actual, the plant circulates approximately 34.72 gallons for every 1 gallon of make up water (999.1/28.8 = 34.72). The proportion of actual plant water usage to the *design* source water intake flow is 20.42:1 (actual plant usage / River Station design capability). This proportion is accomplished by the use of Morgan Lake and recirculating the stored water through the plant, creating a closed-cycle recirculating system. (View table #6 for proportional calculations.) Note this simplified example disregards minimal losses from other Morgan Lake water uses (potable, air & ash management, etc.).

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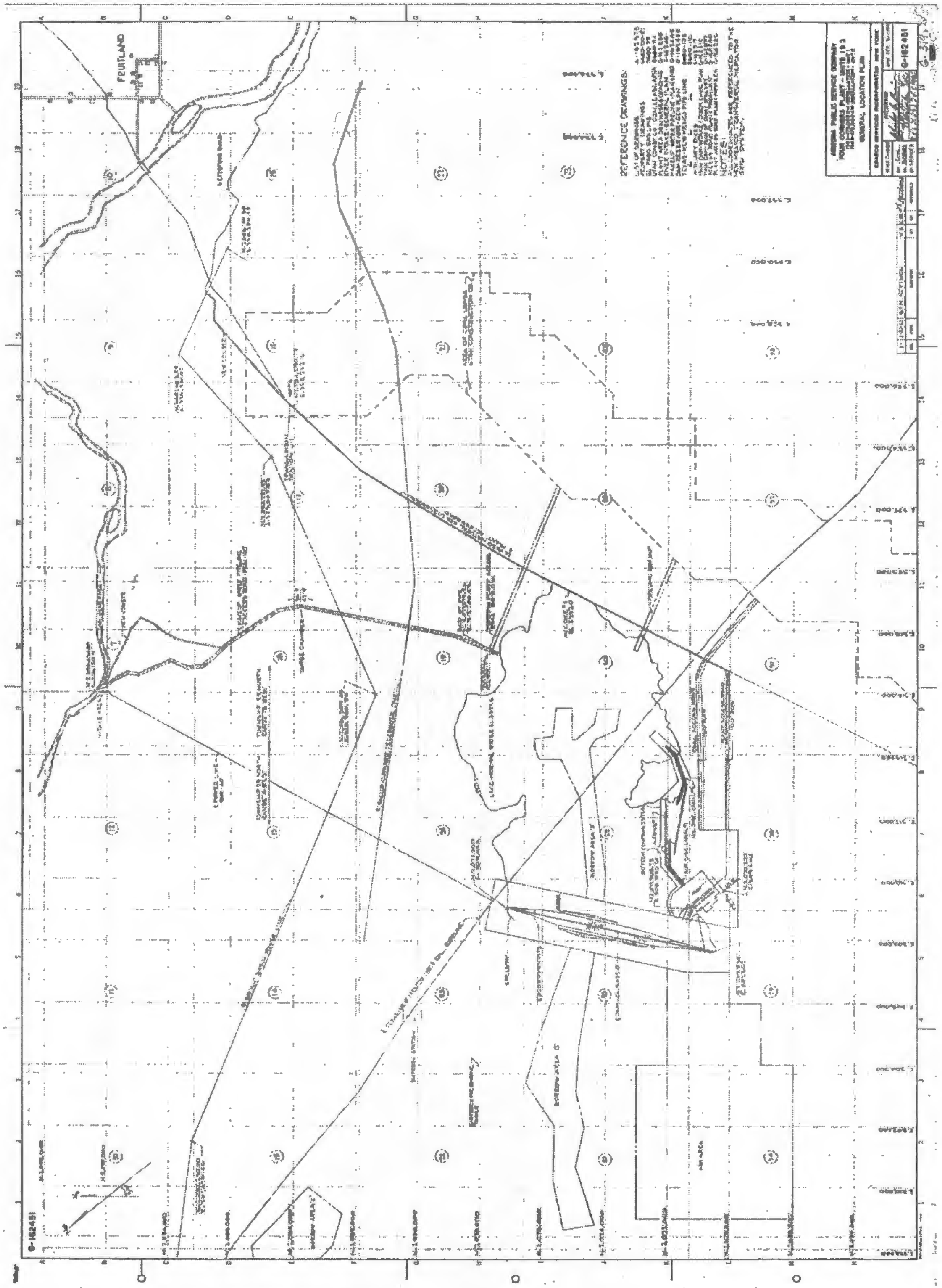
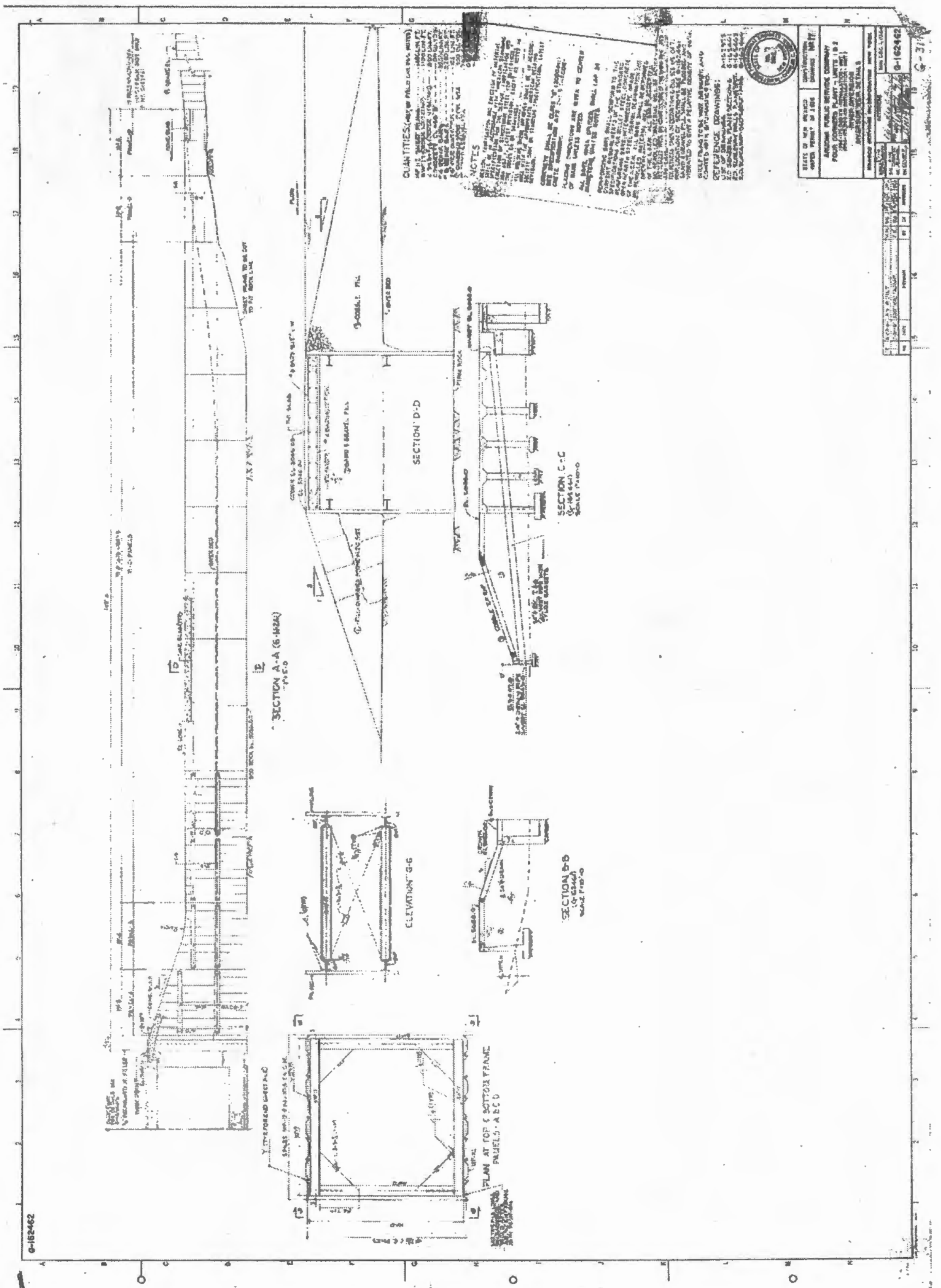
Appendices

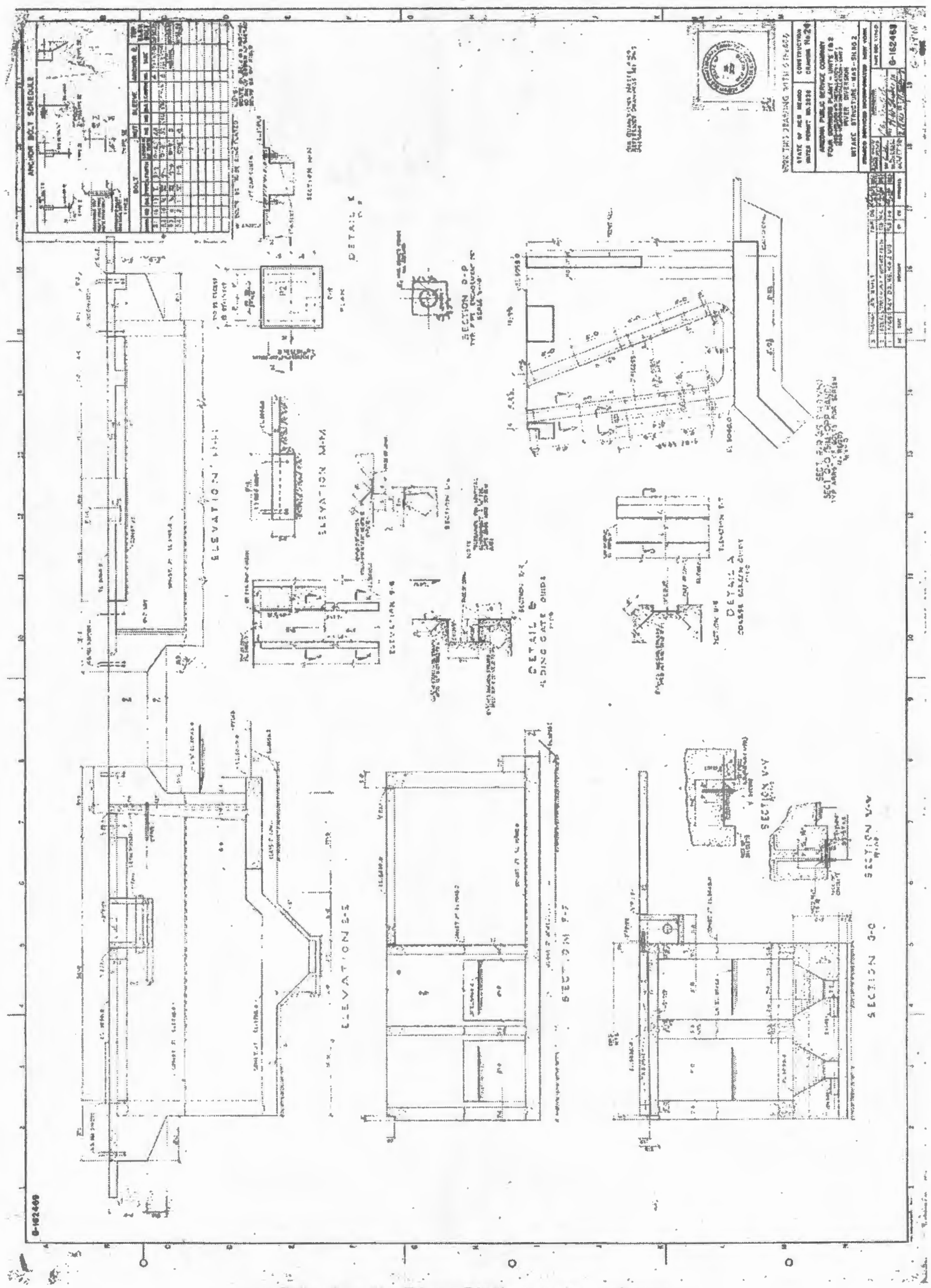
Appendix A: Drawings



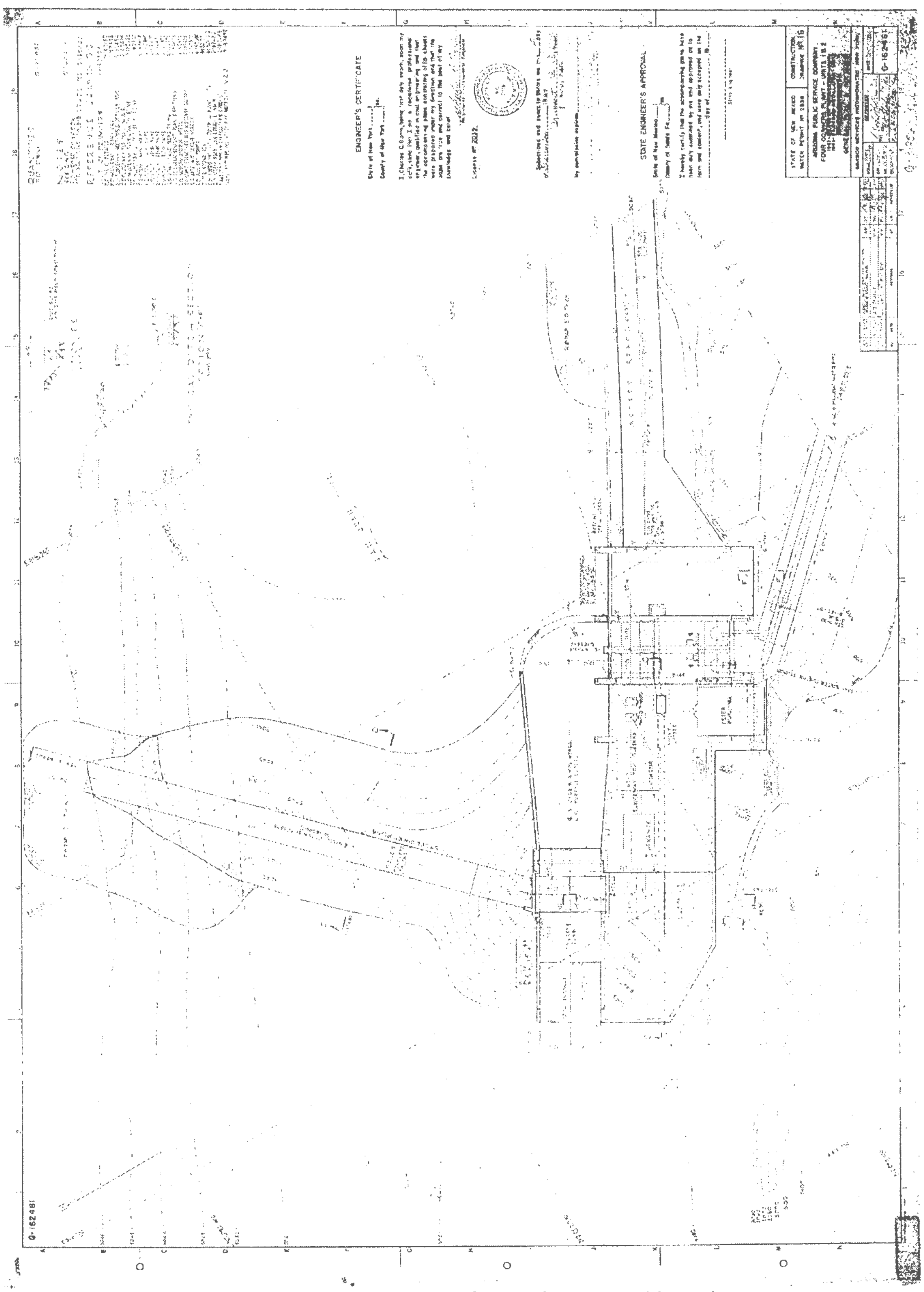
Drawing 1: APS Four Corners Power Plant area map



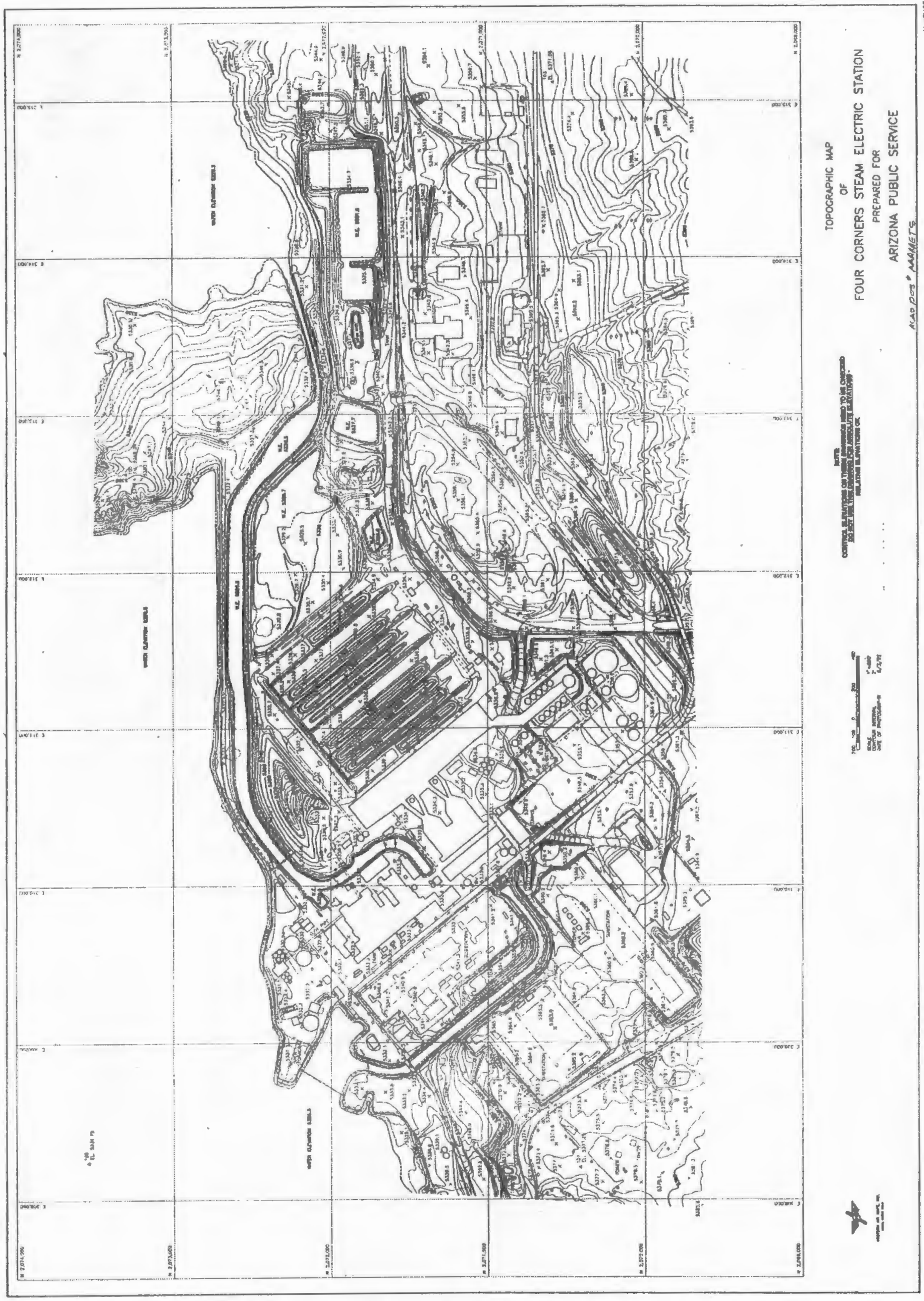
Drawing 2: San Juan River at the Pumping Station Weir



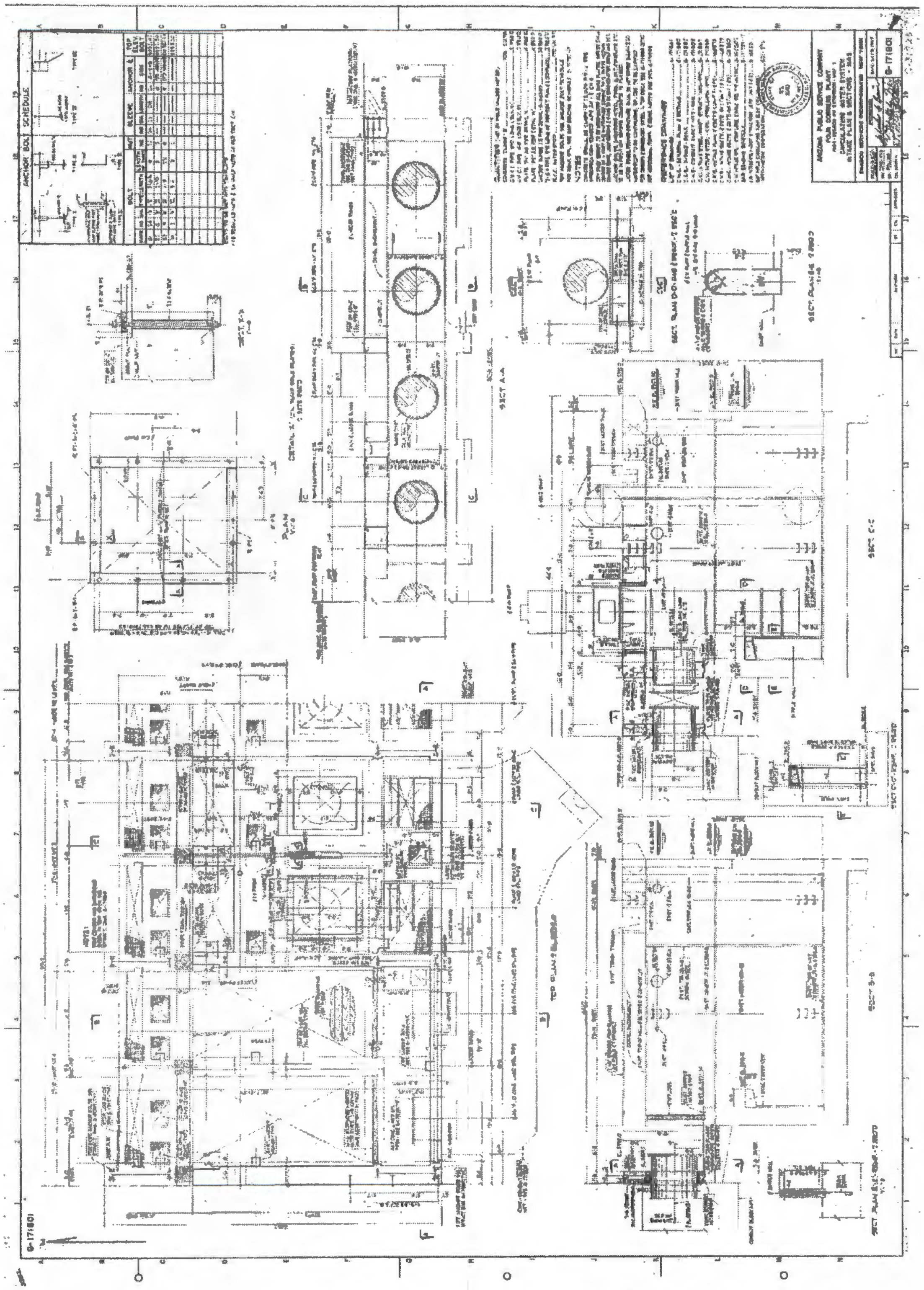
Drawing 3: River Station water column



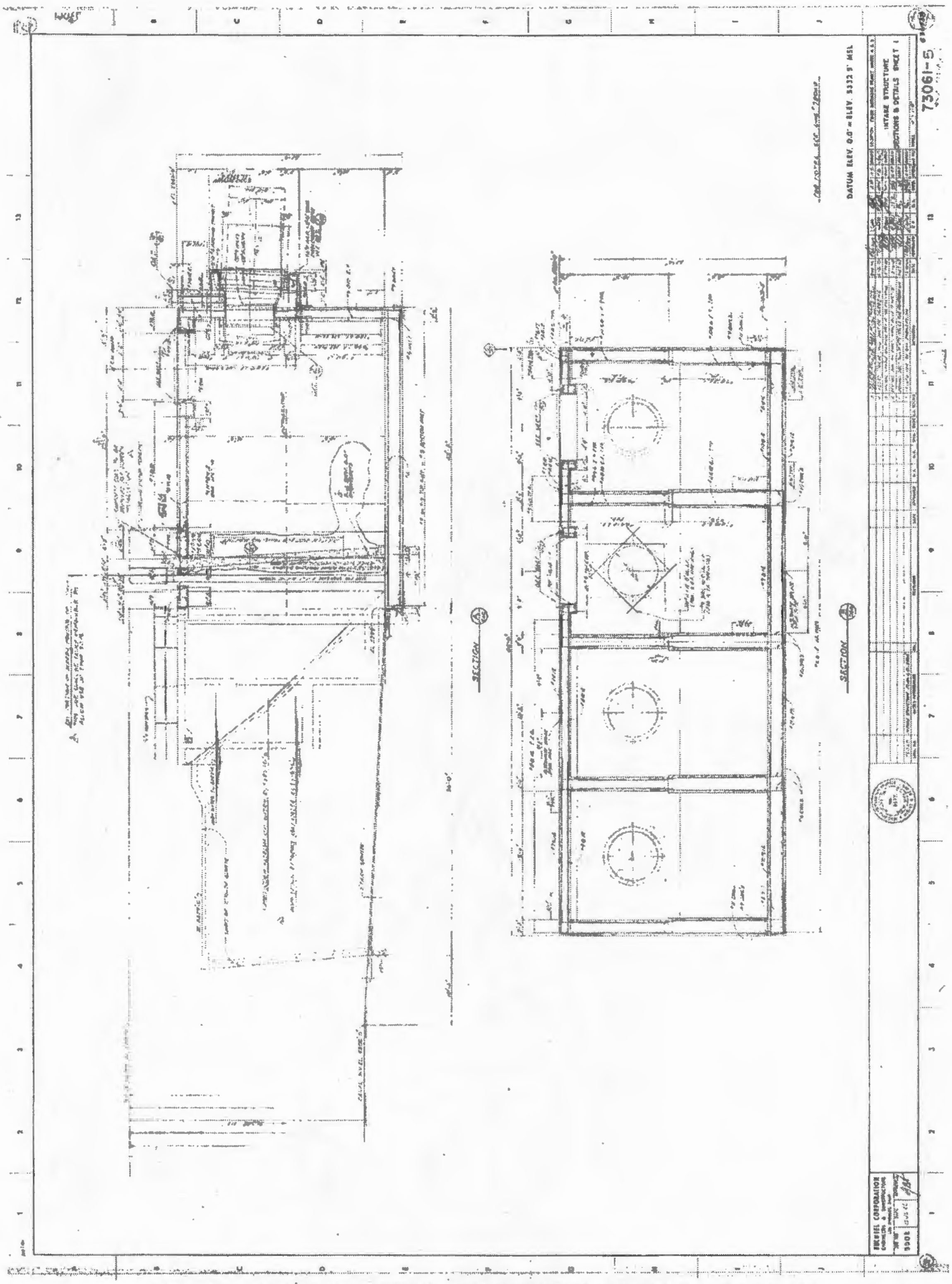
Drawing 4: River Pumping Station Layout and Location



Drawing 5: Plant intake bay and canal, located in the bottom left area of land mass



Drawing 6: Unit 1, 2, and 3 Intake Structure and water column depth



Drawing 7: Unit 4 and 5 Intake Structure and water column depth

Appendix B: Figures

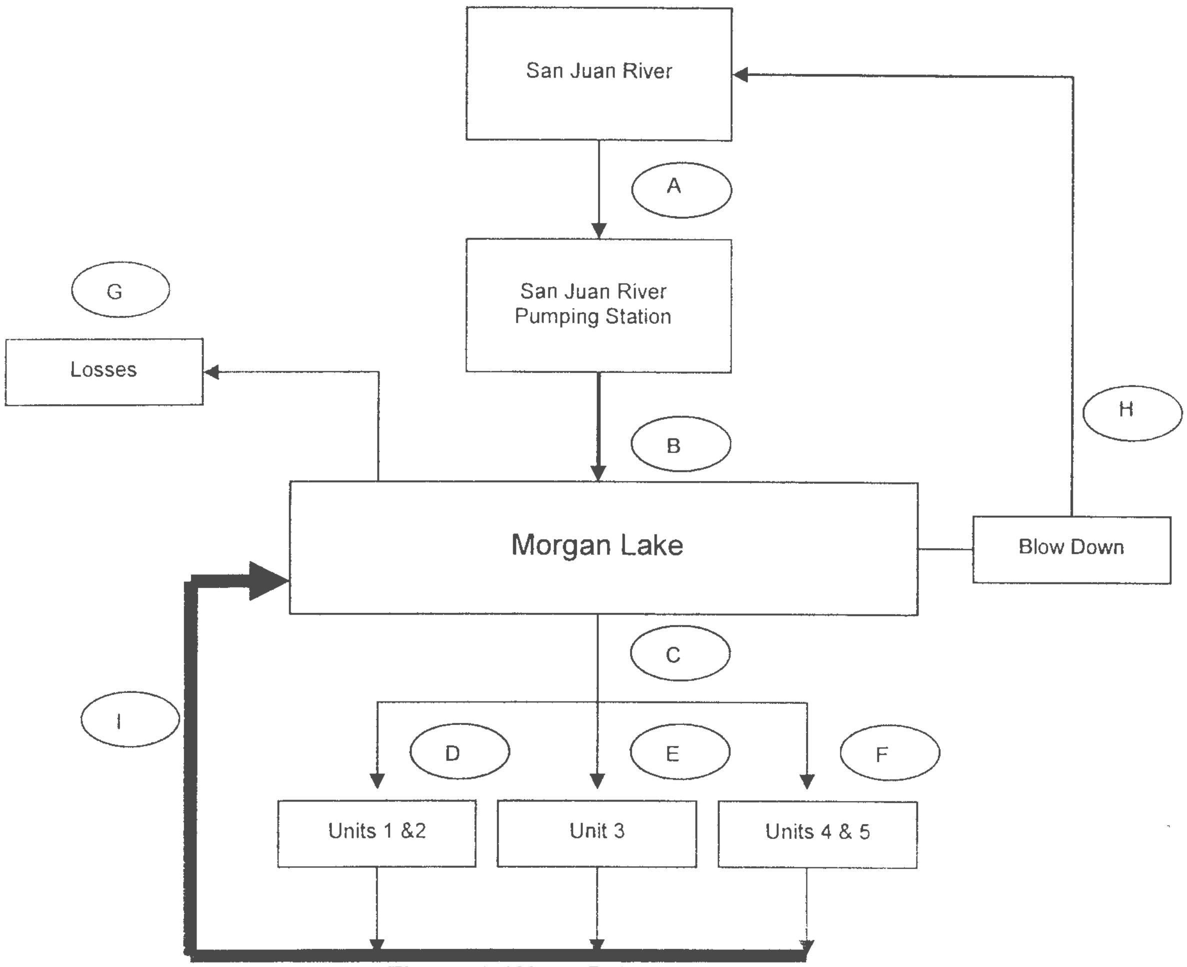


Figure 1: Water Balance Diagram

Water Balance Diagram Information

- A: **Water from San Juan River.**
  - Usage depends on cleanliness.
- B: **River water pumped into Morgan Lake.**
  - approximately 28.8 MGD.
- C: **Water usage from Morgan Lake to various plant processes.**
  - Approximately 999.60 MGD.
- D: **Cooling water for units 1 & 2.**
  - Approximately 265.61 MGD.
- E: **Cooling water for unit 3.**
  - Approximately 174.09 MGD.
- F: **Cooling water for units 4 & 5.**
  - Approximately 559.90 MGD.
- G: **Losses from evaporation, potable water,....etc, non-recoverable**
  - Approximately 28.8 MGD.
- H: **Blow Down losses, non-recoverable.**
  - Approximately 1839.7 Million Gallons per Year.
- I: **Discharge water from all units back into Morgan Lake.**

*** All values are averages for the 2005 year.**

Figure 2: Information to Diagram 1

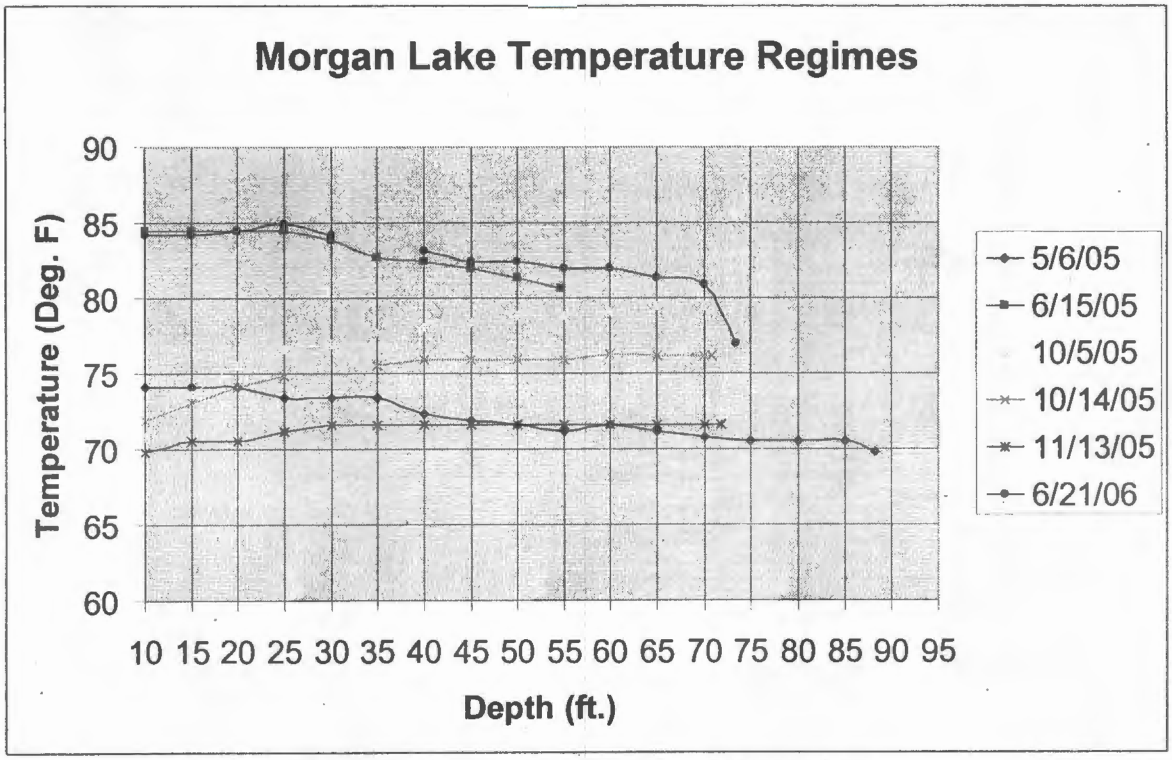


Figure 3: Temperature Regimes of Morgan Lake
Deepest point near dam

Water Resources National Water Information System: Web Interface

Data Category: Real-time Geographic Area: New Mexico GO

USGS 09368000 SAN JUAN RIVER AT SHIPROCK, NM

PROVISIONAL DATA SUBJECT TO REVISION

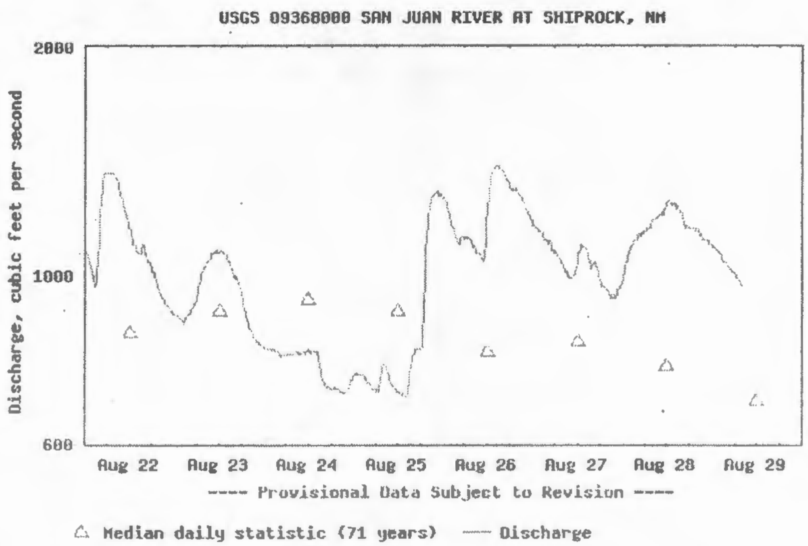
Available data for this site Time-series: Real-time data GO

This station is operated in cooperation with the New Mexico Office of the State Engineer.

	Available Parameters	Output format	Days	
☐	All 2 Available Parameters for this site	Graph	7 (1-31)	GO
☑	00060 Discharge			
☑	00065 Gage height			

Discharge, cubic feet per second

Most recent value: 969 08-29-2006 08:00



Create presentation-quality graph Parameter 00060: DD 08

Daily discharge statistics, in cfs, for Aug 29 based on 71 years of record

Min (1962)	20 %	Median	Current	Mean	80 %	Max (1999)
74	343	685	969	1150	1790	7350

Figure 4: San Juan River Flow Information, below the River Station.

$$1150\frac{ft^3}{\sec}\cdot 86400\frac{\sec}{day}\cdot 7.48055\frac{gal}{ft^3}\cdot 10^{-6}=743.268MGD$$

$$\frac{28.8MGD}{743.268MGD}\cdot 100\%=3.87\%Avg.$$

$$\frac{48.96MGD}{743.268MGD}\cdot 100\%=6.59\%\max$$

Figure 5: Average and Maximum Percentage limits of Source Water used.

Appendix C: Tables

Water usage from the San Juan River	
Design Pumping Capacity (GPM/T)	17000
Number of Pumping Trains (T)	2
Total Pumping Capacity (GPM)	34000
Total Pumping Capacity (MGD)	48.96

*Total Pumping Capacity is a Maximum Value

Table 1: Maximum Water Flow from San Juan River

River Station Operation Information					
Month	Dual Train Actual Operation Hours	Single Train Actual Operation Hours	Hours per Day/Mo.	Days per Month	Avg. Flow (MGD)
Jan-05	704.67	0.00	23.49	29.36	47.92
Feb-05	194.81	131.50	11.25	13.60	18.33
Mar-05	66.66	458.83	17.52	21.90	20.13
Apr-05	175.42	470.78	20.85	26.93	27.03
May-05	0.00	694.57	23.15	28.94	23.62
Jun-05	434.92	263.62	22.53	29.11	37.29
Jul-05	259.68	475.42	24.50	30.63	33.82
Aug-05	282.58	238.77	16.82	21.72	26.45
Sep-05	604.37	0.00	20.15	25.18	41.10
Oct-05	225.03	110.75	10.83	13.99	18.45
Nov-05	401.75	234.52	21.21	26.51	35.29
Dec-05	201.50	88.83	9.37	12.10	16.18
			Total = 221.67	Total = 279.96	
			Avg Hours per Day	Avg. Days per Month	Avg. MGD
			18.47	23.3	28.80

Table 2: 2005 River Pumping Station Operating Information

2005 Generating Operation Time					
	Unit1	Unit2	Unit3	Unit4	Unit5
Yearly Hours	7666.60	8502.58	8247.45	7926.58	7410.35
Avg. Daily Operating Hours	20.99	23.28	22.58	21.70	20.29
Avg. Operating Days	319.44	354.27	343.64	330.27	308.76

Table 3: Unit Operation Time during 2005

2005 Water Intake Pump Information					
	Unit1	Unit2	Unit3	Unit4	Unit5
Pumping Capacity (GPM)*	100000.00	100000.00	128500.00	229000.00	215000.00
Capacity per Hour (GPH)	6000000.00	6000000.00	7710000.00	13740000.00	12900000.00
Avg. Yearly Run Time (H)	7666.60	8502.58	8247.45	7926.58	7410.35
Avg. Monthly Pumping (G/Y)	45999600000.00	51015500000.00	63587839500.00	108911255000.00	95593515000.00
Avg. Daily Pumping (MGD)	125.94	139.67	174.09	298.18	261.72

*Indicates design capacity

Table 4: Unit Intake from Morgan Lake during 2005

Intake Design Information					
	Unit 1*	Unit 2	Unit 3	Unit 4	Unit 5
Design Capacity (MGD)	216.00	144.00	187.20	1228.01	1228.01

*Includes General Service Water

Table 5: Unit Intake Structure design flows

Proportional Information	
Intake for Units 1, 2, 3 (MGD)	439.71
Intake for Units 4 and 5 (MGD)	559.90
Total Plant Intake (MGD)	999.61
Maximum River Make Up (MGD)	48.96
Proportion Intake to Make Up	20.42
Unit 1, 2, and 3 to Make Up	8.98
Unit 4 and 5 to Make Up	11.44

Table 6: Proportion of Plant Water Intake to Maximum River Water Make Up

Blow Down Information in Millions of Gallons														
	January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**	**Total**	
2000	86.5	411.2	439.5	139.3	80.0	293.9	34.3	*	*	*	220.8	246.9	1952.5	MG
2001	322.2	284.9	*	280.5	299.9	137.5	*	*	*	*	432.1	94.0	1851.2	MG
2002	434.0	283.6	426.4	412.7	279.7	80.8	*	*	*	125.1	438.2	452.8	2933.4	MG
2003	452.8	269.6	*	*	124.8	392.8	11.3	*	*	205.9	326.9	125.2	1909.3	MG
2004	*	*	193.9	375.5	255.9	*	*	*	*	1.8	302.0	327.1	1456.2	MG
2005	327.1	16.3	35.7	129.1	133.4	61.9	13.6	*	*	72.0	146.7	*	935.7	MG
Average	270.4	210.9	182.6	222.9	195.6	161.2	9.9	0.0	0.0	67.5	311.1	207.7	1839.7	

Table 7: Actual Morgan Lake Blow Down Data, * indicates blowdown did not occur

Appendix D: Formulas

To find the maximum flow rate in Millions of Gallons per Day, given a flow rate in Gallons per Minute from a pump:

$$\frac{\left(Q \cdot 60\frac{\min}{hr} \cdot 24\frac{hr}{day}\right)}{10^6} = X(MGD)$$

$$Q = FlowRate(GPM)$$
$$X(MGD) = FlowRate(MillionGallonsperDay)$$

To find the Average Hours of Operation per Day at the River Station:

$$\frac{(D_t + S_t)}{dayspermonth} = Avg.HoursperDay$$

$$D_t = DualTrainoperation(Hr)$$
$$S_t = SingleTrainoperation(Hr)$$

To find the Average Flow Rate, given the pump capacity (GPM) and the time of operation (Hr) at the River Station using two trains:

$$\frac{\left(Q_2 \cdot 60\frac{\min}{Hr} \cdot T_2\right) + \left(Q_1 \cdot 60\frac{\min}{Hr} \cdot T_1\right)}{10^6} \cdot \left(\frac{1month}{Ddays}\right) = X(MGD)$$

$$Q_1 = SingleTrain$$
$$Q_2 = DualTrain$$
$$T = ActualTrainOperationTime\left(\frac{Hr}{Month}\right)$$
$$D = NumberofDaysinthatMonth$$
$$X = FlowRateinMillionGallonsperDay$$

To find the Average Daily Operating Hours of the Electrical Generating Units (Hr):

$$T\left(\frac{Hr}{Year}\right)\cdot\frac{1}{365.25}\left(\frac{Year}{Days}\right)=DailyTime\left(\frac{Hr}{Day}\right)$$

$$T = ActualOperationTime\left(\frac{Hr}{Year}\right)$$

To find the Average Operating Days of the Electrical Generating Units (Day):

$$T\left(\frac{Hr}{Year}\right)\cdot\frac{1}{24}\left(\frac{Day}{Hr}\right)=AnnualOperatingDays\left(\frac{Day}{Year}\right)$$

$$T = ActualOperationTime\left(\frac{Hr}{Year}\right)$$

To find the amount of water per year through an Intake (GPY):

$$Q(GPM)\cdot 60\left(\frac{Min}{Hr}\right)\cdot T\left(\frac{Hr}{Year}\right)=Y(GPY)$$

$$Q = PumpingCapacityperUnit$$

$$T = ActualOperationTime\left(\frac{Hr}{Year}\right)$$

$$Y = FlowRateperYear(GPY)$$

To find the Daily amount of water through an Intake (MGD):

$$\frac{Y(GPY)}{365.25}\cdot\frac{1}{10^6}=X(MGD)$$

$$Y = FlowRateperYear(GPY)$$

$$X = FlowRateperDay(MGD)$$