SECTION 7

Water Supply

This chapter describes the quantity and quality of water required, the proposed primary and back-up water supply sources, water quality, and wastewater discharges for the AES Highgrove Project.

7.1 Water Supply and Use

The Highgrove Project will be constructed on the site of Southern California Edison's former Highgrove Generating Station, which was constructed in the 1950s. Four onsite wells, which together were capable of providing over 3,500 gallons per minute (gpm), were used to provide water for four large cooling towers, process makeup, fire protection and domestic uses. The proposed source of water to serve the limited process water needs of Highgrove Project are two of the onsite wells until an acceptable alternative water source (reclaimed or impaired water) is available. Section 9, Alternatives, contains a description of the alternative sources of supply evaluated.

The gas turbine technology chosen for the Highgrove Project is unique compared to many peaking technologies currently in operation. The high efficiency of the GE LMS100 gas turbine requires an external source of cooling. Use of cooling water will allow the gas turbine to achieve peak efficiency when high temperatures are experienced and electricity demand may be at its highest. Cooling and process demands for the plant include water that will replace water losses in the cooling tower from evaporation, drift, and blowdown. Water will also be used for evaporative cooling of the combustion turbine-generator (CTG) inlet air to improve efficiency; CTG wash water to remove deposits from the turbine blades to improve performance; and CTG water injection to reduce nitrogen oxide (NOx) emissions. Process water would be provided by two of the existing onsite wells and stored in a 350,000-gallon tank.

Water for potable uses (sinks, toilets, showers, drinking fountains, eye wash/safety showers, plant hose stations, etc.) will be provided by the local water purveyor, Riverside Highland Water Company. In addition to these uses, potable water would be used for backup supply when the onsite wells require maintenance or when both wells experience a forced outage. Potable water would be provided through an approximately 4-inch-diameter tap connecting to an existing water main in Main Street, which is approximately 1,300 feet south of the site (see Figure 7.1-1). A separate 10- to 12-inch connection will be used for fire protection and emergency process back-up when the onsite wells need to be maintained.

The following water balances show the projected use of water:

- Annual Average Water Flow (Figure 7.1-2a)
- Peak Water Flow (Figure 7.1-2b)

Based on a maximum expected capacity factor of 30 percent, the Highgrove Project is expected to use an average of 358 acre-feet per year to serve, potable, process, and landscape irrigation water needs (based on an annual average temperature during peaking operation of 80ºF). The instantaneous or steady-state flow corresponding to this condition is approximately 737 gpm. Of the 358 acre-feet per year of water use, approximately 60 percent (or 209 acre-feet per year) is used for power plant cooling. On a peak summer day (at an ambient condition of 97ºF), the instantaneous water consumption for process water needs is expected to be 854 gpm. Water consumption figures are based on all CTGs operating at 100 percent load.

Potable water demands are estimated to average 4.0 gpm, or approximately 2 acre-feet per year. Additional information about water resources is provided in Subsection 8.14, Water Resources.

7.2 Water Quality

Table 7.2-1 summarizes the quality of groundwater based on an analysis from an existing well located at the Highgrove Generating Station site. The quality of the circulating water is discussed in Section 8.14, Water Resources.

TABLE 7.2-1
Estimated Water Quality from Onsite Well

Parameter	Estimated Concentration (mg/L)
Alkalinity (total)	150
Aluminum	0.05
Arsenic (total)	0.0006
Cadmium	< 0.0002
Total Organic Carbon	0.98
Chromium (total)	< 0.001
Iron (total)	< 0.1
Lead (total)	< 0.001
Phosphorus	< 0.1
Calcium	51.7
Magnesium	9.7
Silica	22.2
Chloride	28.0
Total Hardness (as $CaCo_3$)	180
Total Dissolved Solids	280
pH	7.05

mg/L = milligrams per liter.
Source: Calscience Environmental Laboratories, Inc. 2004.

7.3 Water Treatment

The highly efficient gas turbine technology being used by the project requires a high purity source of water for NOx injection water. Therefore, additional water treatment systems will be provided onsite to provide demineralized water for NOx injection. The demineralized water will be produced by a reverse osmosis (RO) and Electro Deionization (EDI) system. Water supply to the demineralizer will be provided from the raw water storage tank and stored in a 150,000-gallon demineralized water storage tank.

The raw water storage tank will provide water for the demineralized water system, cooling tower makeup, gas turbine evaporative cooling, and other minor plant uses. Based on the current raw water analysis, no pretreatment is planned for the raw water supply to the storage tank.

Makeup water for the cooling tower will be pumped from the raw water storage tank to replace water lost from evaporation, drift and blowdown. The cooling tower water will be operated at high cycles of concentration to minimize blowdown and makeup. A chemical feed system will supply water conditioning chemicals to the circulating water to minimize corrosion and control the formation of mineral scale and biofouling. Sulfuric acid will be fed into the circulating water system in proportion to makeup water flow for alkalinity reduction to control the scaling tendency of the circulating water. The acid feed equipment will consist of a bulk sulfuric acid storage tank and two full-capacity sulfuric acid metering pumps.

To further inhibit scale formation, a polyacrylate solution will be fed into the circulating water system as a sequestering agent in an amount proportional to the circulating water blowdown flow. The scale inhibitor feed equipment will consist of a chemical solution bulk storage tank and two full-capacity scale inhibitor metering pumps. In addition, silica scale inhibitor will be used for treatment of the circulating water system in an amount proportional to the circulating water blowdown flow. Depending on raw material compatibility, this product may be blended in with the polyacrylate solution described above, or be fed with its own separate chemical solution bulk storage tank and two full-capacity scale inhibitor metering pumps.

To prevent biofouling in the circulating water system, sodium hypochlorite will be fed into the system. The hypochlorite feed equipment will consist of a bulk storage tank and two full-capacity hypochlorite metering pumps. A bulk storage tank, 100- to 400-gallon totes, and 2 full-capacity metering pumps will be provided for the feeding of either stabilized bromine or sodium bromide as alternate biocides.

7.4 Wastewater Collection and Disposal

To minimize groundwater use and discharge, the project will be designed to recover wastewater sources from other uses within the plant and use these sources as water supply to the cooling tower. In addition, the cooling tower water, concentrated through evaporative cooling losses, would be operated at high cycles of concentration to minimize blowdown and makeup. When operating at 6.5 cycles of concentration, the volume of blowdown is expected to be about 42 acre-feet per year under annual average climatic conditions and about 98 gpm under maximum daily climatic conditions. A portion of this concentrated water will then be removed from the cooling tower via blowdown to prevent mineral scale formation on heat transfer surfaces. The blowdown will be combined with discharges from the plant drain system and trucked offsite to the Santa Ana Regional Interceptor (SARI) brine pipeline system. There will be an onsite area to temporarily store the wastewater in Baker tanks until it is trucked offsite. The SARI pipeline system is described in detail in Section 8.14, Water Resources.

7.4.1 Cooling Tower Drift

Since high efficiency drift eliminators would be used in the cooling towers, the amount of total dissolved solids (TDS) emitted to the atmosphere will be very low. The drift quality is equivalent to the blowdown quality. Assumptions used to evaluate the cooling tower from an Air Quality perspective are further addressed in Section 8.1.

7.4.2 Sanitary Wastewater

Sanitary wastewater from sinks, toilets, showers and other sanitary facilities would be discharged to the existing sewer on Taylor Street. The sanitary wastewater flow will average about 2.0 gpm (equivalent to 2,880 gallons per day [gpd] on a 24-hour basis) (see Subsection 8.14, Water Resources).

7.4.3 Plant Drainage

Miscellaneous general plant drainage would consist of cleanup, sample drainage, equipment leakage, and drainage from facility containment areas. Water from these areas will be collected in a system of floor drains, sumps, and pipes within the facility and discharged to an oil/water separator. The oil-free discharge water would be combined with the cooling tower blowdown and trucked offsite to the SARI pipeline. An average flow of 2 gpm and a peak flow of 5 gpm are projected for these plant service water uses. Potable water from the Riverside Highland Water Company would be used for these purposes. Plant drainage and storm water discharge permitting is addressed further in Section 8.14, Water Resources.

7.5 Water Use Authorization

The Project Site is not currently within the service territory of a water purveyor. The Riverside Highland Water Company serves the City of Grand Terrace and has wells adjacent to the Project Site. The Project Site was most likely never annexed into the service territory because the existing wells were used to serve both process and domestic needs of the plant. However, Riverside Highland Water Company has indicated that it will annex the site in order to provide potable water to serve the proposed facility. Since the Project Site is not currently within any other water company's annexed service territory, Riverside Highland does not anticipate any delays in the annexation process. Prior to water service, AES will purchase shares of the mutual water company and pay applicable connection fee for service. For purposes of this Application for Certification, we have assumed the annexation will occur well before the time the project will require water service.

A summary of the permits required and the permitting agencies related to water resources is provided in Table 8.14-1, Water Resources. Table 7.5-1 provides the contact information for the annexation process.

TABLE 7.5-1
AES Highgrove Water Annexation

Process	Schedule	Agency
Annexation Process	Prior to Commercial Operation	Riverside Highland Water Company 1450 E. Washington Street Colton, CA 92324 Contact: Don Hough, General Manager (909) 825-4128

7.6 References

Calsciences Environmental Laboratories, Inc. 2004. Analytical Report for Well No. 2. Calsciences Work Order 04-11-1181. December 22.

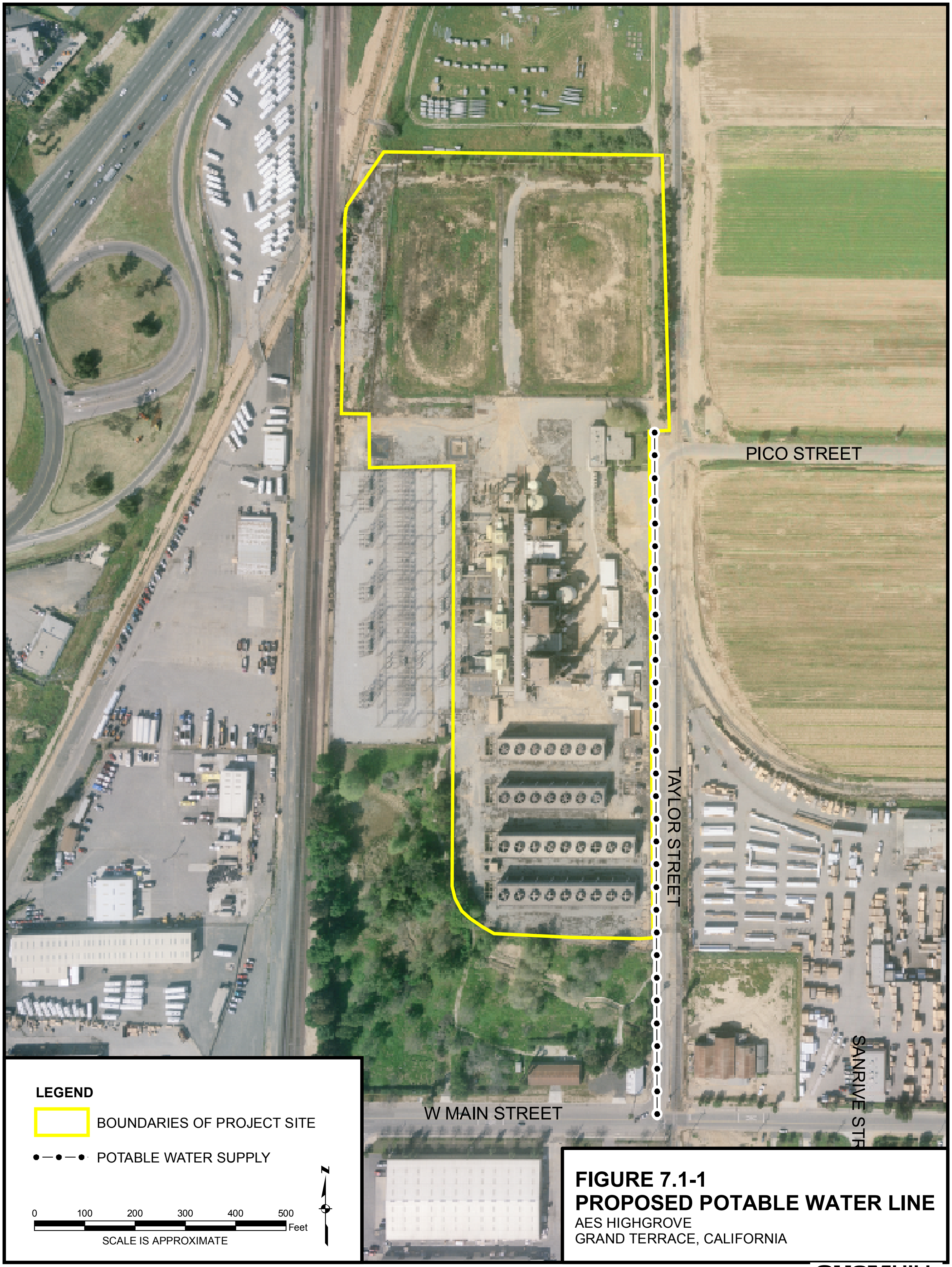
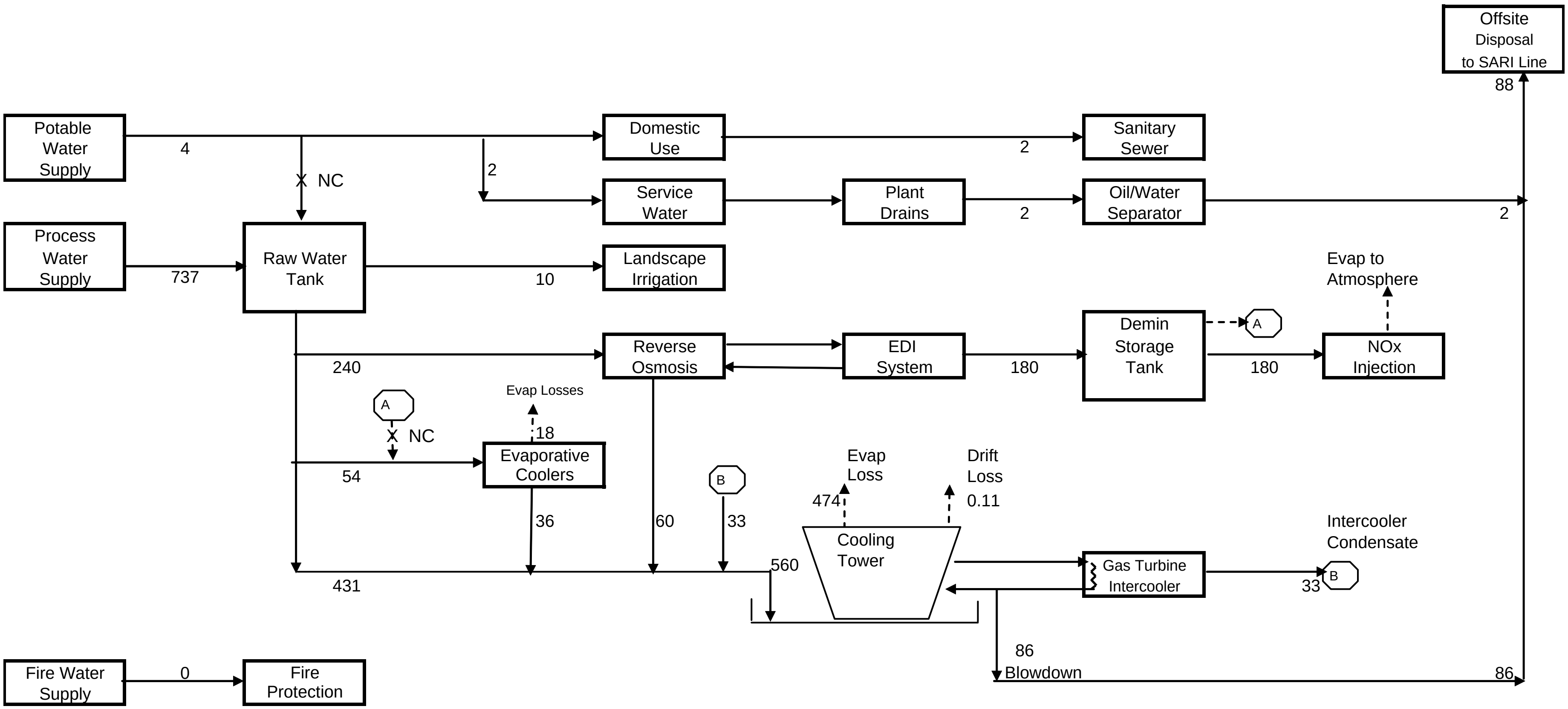


FIGURE 7.1-1
PROPOSED POTABLE WATER LINE
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA



Notes

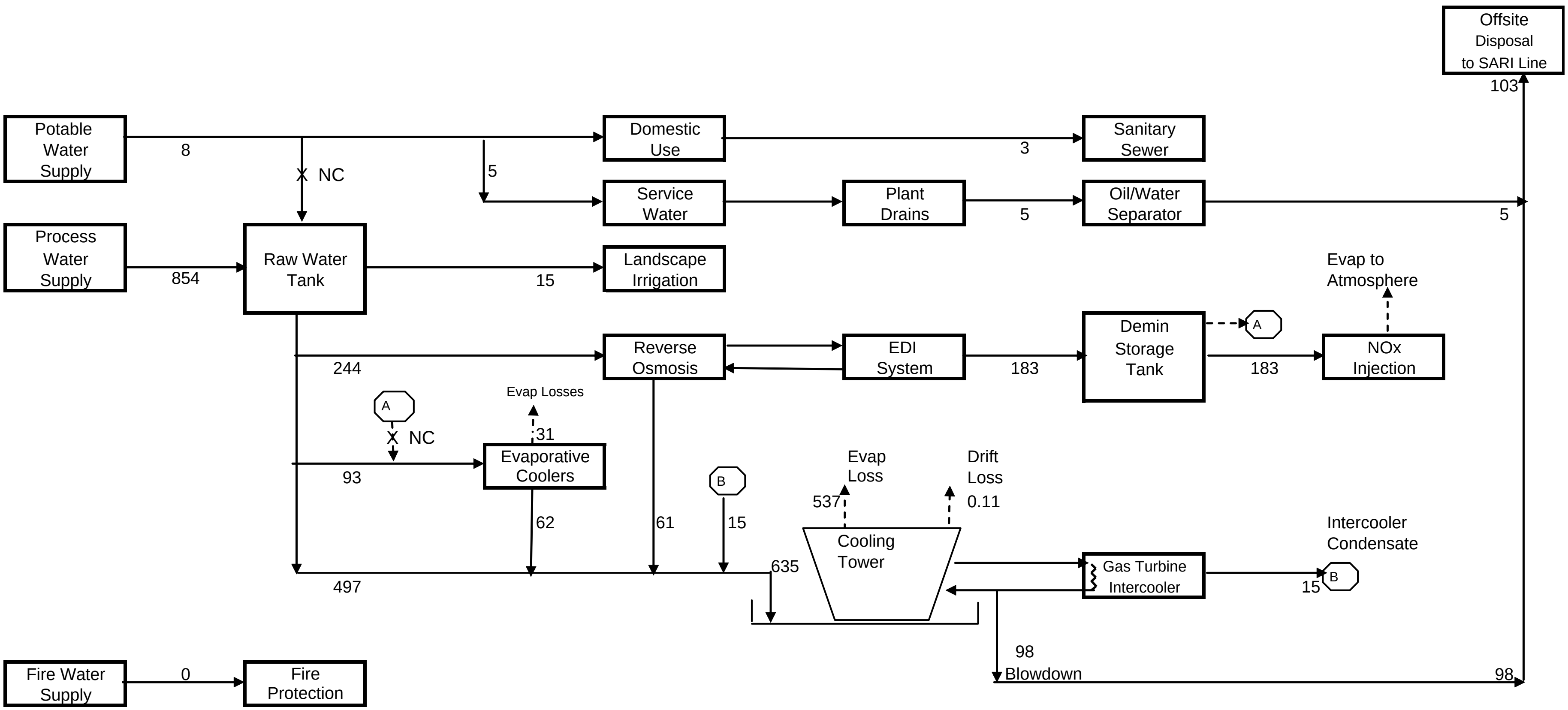
1. Numerical values represent steady state flows in gpm
2. Cooling tower blowdown is estimated at expected maximum cycles of concentration (6.5 x)
3. Ambient temperature assumed for this water balance is 80 F DBT/60% RH

NC = Normally Closed

FIGURE 7.1-2a
ANNUAL AVERAGE WATER BALANCE DIAGRAM
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA

IS032006003RDD_06 (5/3/06)

CH2MHILL



Notes
1. Numerical values represent steady state flows in gpm
2. Cooling tower blowdown is estimated at expected maximum cycles of concentration (6.5 x)
3. Ambient temperature assumed for this water balance is 97 F DBT/20% RH

NC = Normally Closed

IS032006003RDD_08 (5/3/06)

FIGURE 7.1-2b
PEAK WATER BALANCE DIAGRAM
AES HIGHGROVE
GRAND TERRACE, CALIFORNIA
CH2MHILL