NRC
AUDIT TEAM TOUR

GRAND GULF NUCLEAR STATION

JUNE 16, 2008

Grand Gulf Nuclear Station, Unit 3 COLA
NRC Audit Team Tour
June 16, 2008

DRAFT TOUR ROUTE (ROUTING, SUBJECT TO AREA AVAILABILITY ON DATE OF TOUR)				
Tour Stop #	**Time**	**Activity, Area or Point of Interest**	**Approx. Duration (min)**	**Exit Bus**
		0800: Tour Begins at Echelon One		
		Bus to Site - begin Site Tour	**1 hr, 15 min**	
1	0915	Unit 1 Energy Services Center (ESC) – Short briefing for tour participants Discussion of TLD monitoring locations – copy of AREOR, 2006, or latest	30	Y – All
2	0945	Unit 3 Cooling Tower and Clarifier Area	15	Y – All
3	1000	Unit 3 Power Block Area	15	N
4	1015	Stream B, Culvert 1, Upper end of Sedimentation Basin B	15	Y – Hydro.
5	1030	Other Surface Waters - Gin and Hamilton Lakes	15	N
6	1045	River Intake and Discharge Area and Borrow Pit	30	Y – All
7	1115	Sedimentation Basin B	15	N
	11:30	Archeological Sites Review (Separate vehicle, small group)	30 - 45	Y
	1130	**LUNCH AT ESC**	**60**	
		Bus exits site via north gate		
8	1230	Stream A, Culvert 9, Sanitary Waste Facility, Sedimentation Basin A	15	Y – Hydro.
9	1245	Meteorological Tower	15	Y – Met.
10	1300	Baxter Wilson 500 kV ROW, Switchyard Area, Franklin 500 kV ROW	10	N
11	1310	Bald Hill Rd south of Unit 1 Cooling Towers	10	N
	1330	**BUS RETURNS TO ECHELON ONE**		

Grand Gulf Nuclear Station, Unit 3 COLA
NRC Environmental/Safety Audit Team Tour
June 16, 2008

ON-SITE TOUR, STOPS KEY FEATURES AND ITEMS OF INTEREST

(TOUR STOPS NUMBERED ON FIGURE #1)

STOP No. 1 - ESC Building

Grand Gulf Nuclear Station (GGNS) Overview, Site Area – Figure #2 (ER Figure 2.1-201)

- SERI owns the site property, Entergy operates Unit 1, transmission is owned and operated by Entergy Mississippi, Inc.
- Approximately 2100 acre site
- Site divided by "bluffs" approximately mid-way to River, elevation drops from about 160' msl at edge of bluffs, to about 85' to 90' msl at toe of bluffs – gradual slope
- Floodplain elevation varies from about 60' to 75' msl
- Significant grading/filling done to level upland areas for Units 1 and 2 during construction, including most areas planned to be used for Unit 3
- Unit 1 & 2 power block area is at approx. elevation of 132.5' msl
- Unit 3 power block area is at approx. 133.5' msl
- Site access road runs north to south, between Unit 1 and planned Unit 3 site location
- Unit 1 and switchyard to the east of access road; Unit 1 natural draft cooling tower with mechanical draft helper tower south of Unit 1 powerblock
- Unit 2 structures (Reactor, Turbine, Diesel buildings) north of Unit 1 – not operating
- Dry fuel storage pad installation north of Unit 2 structures, inside PA, partially loaded
- Unit 3 powerblock site to the west of access road, in existing parking and construction laydown areas
- Heavy haul road runs from MS River at the existing barge slip to the Unit 1, 2, 3 power block area
- Radial wells along and south of the barge slip and U3 intake on the MS River shore provide makeup water for Unit 1
- Intake on MS River planned for Unit 3 for direct river water uptake

The GGNS site is located in Claiborne County in southwestern Mississippi. The plant site is on the east side of the Mississippi River about 25 miles south of Vicksburg,

Mississippi, 6 miles northwest of Port Gibson, Mississippi, and 37 miles north-northeast of Natchez, Mississippi. The Grand Gulf Military Park borders a portion of the north side of the property, and the community of Grand Gulf is approximately 1-1/2 miles to the north. (NUREG-1817, Figure 1-1)

An estimated 234 acres (ac.) of the 2100-ac. GGNS site would be affected by construction of a new facility (COL ER Table 4.3-201). Including the intake structure and laydown areas, about 134 ac. are to be overlain by permanent structures. Acreage not containing permanent structures amounts to about 100 ac. and is expected to be reclaimed to the maximum extent possible. ER Table 4.3-201 describes the Unit 3 plant structures and acreages to be affected during the Unit 3 construction. Unit 3 structures and construction laydown areas, as well as the construction disturbance areas proposed in the ESP, are illustrated in Figure 2.

Radiological Health Discussions – Figure 1 (FSAR Figure 2.1-201) and Figure #9 (U1 REMP Near Field Sample Collection Sites)

- "Nearest" residence
- "Nearest" garden (on-site leafy vegetable garden and off-site garden)
- Prevailing winds generally from the southerly direction
- Radiological sources for construction worker dose: ISFSI pad, U1 Turbine building, and CST, all inside Unit 1 PA fence

STOP No. 2

Unit 3 Cooling Tower and Clarifier Area – Figure #3 (FSAR Figure 2.4.1-201)

- Located west of powerblock area, on plateau above retaining wall
- Existing Engineering and Training Building (ESC) would be removed
- Natural draft cooling tower with mechanical draft tower operate in parallel during peak temperature conditions
- System chemistry control provided by injection of biocide, algaecide, pH adjuster, corrosion inhibitor, and scale inhibitor.
- Chemical injection occurs in the return to the cooling towers spray headers, and chemicals are injected directly into the cooling tower basin ahead of the main circulating pumps suction point (FSAR Figures 10.4-201, 10.4-203, and 10.4-204).
- Quantities and identification of the various chemicals are shown in ER Table 3.3-201.
- Four (4) clarifiers located to the south of the cooling towers (1/3rd capacity ea.); provide clarified river water for makeup to cooling towers, fire protection and demineralized water treatment systems
- Additional water treatment provided by granular filters for supply to makeup water and firewater storage tanks.
- SWS Water treatment for removal of suspended solids is via use of a coagulant and flocculant

The circulating water system provides cooling water during startup, normal plant operations, and shutdown for removal of power cycle heat from the main condensers and ejects this heat to the normal plant heat sink (NPHS). The main plant condensers contribute the majority of the heat to the NPHS, with additional heat load (less than 3 percent of the total) introduced by the plant service water system (PSWS) during normal operation. The NPHS is comprised of both a hyperbolic natural draft cooling tower (NDCT), and mechanical draft cooling tower (MDCT). The NDCT would be similar in design and construction as the existing Unit 1 NDCT, utilizing low clog high performance fill and drift eliminators to maximize efficiency and minimize drift. The MDCT will be similar in design and construction to the existing Unit 1 MDCT, with the slightly larger individual cells arranged in an octagonal pattern (rather than linear) for Unit 3 because of space limitations. The total heat removal requirements for the cooling towers is approximately 10.7 x 109 Btu/hr during normal full-power operation. Operation of the two towers will vary seasonally, with the MDCT operating during periods of high ambient temperature to ensure the design cooling water temperature and unit electrical output can be maintained. The MDCT is designed to accommodate approximately 30 percent of the heat load during design ambient conditions and normal full power operation. During cooler periods, MDCT flows will vary by reducing and/or stopping flow

to the MDCT. Full circulating water system flow can be accommodated by the NDCT if the MDCT is not operating.

Makeup to the NPHS and the plant service water system (PSWS) cooling systems is provided by the station water system. The station water system (SWS) draws water from the Mississippi River, the only surface water source of makeup to the plant. The water is pumped to clarifiers for removal of suspended solids by use of a coagulant and/or flocculant. Clarified water is provided for makeup to the normal power heat sink cooling tower, and to the PSWS for makeup to the PSWS cooling tower.

STOP No. 3

Unit 3 Power Block Area – Figure #1 & Figure #6

- Located in existing parking area and construction laydown area
- Majority of structures located just east of existing cut-slope
- Existing cut-slope removed; new vertical retaining wall installed to the west and north of the powerblock (**Figure 6**)
- Site grade is 133.5' msl at powerblock structures walls, grade slopes away from structures, finished floor elevation is 134' msl
- Grading design provides drainage from powerblock area to the north, to Stream A, and to the south, to Stream B (**Figure #4 [FSAR Figure 2.4.2-204]**)
- Approximately 30 acres of land required for powerblock structures and transformer area

GGNS Unit 3 will be a General Electric (GE)–Hitachi Nuclear Energy designed ESBWR. The reactor has a thermal power level of 4500 megawatts thermal (MWt) and a gross electrical output of approximately 1600 ± 50 megawatts electric (MWe). The powerblock will be located slightly to the west and north of the adjoining Unit 1, and will consist of a single reactor plant. The GGNS Unit 3 powerblock is located wholly within the powerblock location described in the GGNS ESP application (**Figure 1**).

STOP No. 4

Stream B, Culvert #1 – Figure #5 (ESP SSAR Figure 2.4-13, Sh. 1) and Figure #6 (FSAR Figure 2.4.2-201)

- Stream B drains Basin B (about 0.5 to 0.6 sq mi area) south and east of the Unit 3 and Unit 1 sites
- Stream B was rerouted around and to the south of the Unit 1 cooling tower, with paved and/or rip-rap lined channel designed to handle PMP flow
- Stream B flows via Culvert #1 into Sedimentation Basin B, and on to Hamilton Lake and the MS River
- Generally a dry stream; storm drains from the Unit 1 plant area drain into Stream B

STOP No. 5

Surface Water - Gin and Hamilton Lakes – Figure #2

- Two oxbow lakes, Hamilton Lake and Gin Lake, located in the western portion of the site, in the floodplain
- Both are subject to being inundated annually during the spring flood season
- Shallow lakes (8 to 10 ft. deep) connected by culverts under heavy haul road
- Stream A flows into Gin Lake; Stream B flows into Hamilton Lake
- Sanitary waste effluent discharged into Sedimentation Basin A, and Stream A, flows to Gin Lake
- Lakes serve no other function in support of Unit 1 or proposed Unit 3 operation
- No drinking water or other water use of lakes on site.

The western half of the site is in the Mississippi Alluvial Valley, consisting of materials deposited by the Mississippi River and extending eastward from the river about 0.8 mile. This area is generally at elevations of 55 to 75 feet above mean sea level (msl). Gin Lake and Hamilton Lake are natural oxbow lakes formed when the Mississippi River abandoned a former channel. These two lakes have been classified as lacustrine, littoral, unconsolidated bottom wetlands. The lakes are probably not deep enough to be classified as limnetic (greater than 2 meters in depth) – Unit 1 FER reported that the lakes had an average depth of approximately 8 to 10 feet. Palustrine, emergent, seasonally flooded wetlands are located near the periphery of both Gin Lake and Hamilton Lakes. The size of Gin and Hamilton lakes is estimated to be approximately 55 acres and 64 acres, respectively, based on an aerial photograph of the site taken in December 2001.

The lakes retain water when floods recede from the bottomlands to the Mississippi River. Hamilton Lake also receives water from Streams "A" and "B" which carry storm drains water from the existing plant area. Hamilton and Gin Lake are connected through culverts beneath the Heavy Haul Road.

STOP No. 6

River Intake and Discharge Area, and Borrow Pit – Figure #2 and Figure #7 (ER Figure 3.4-201)

- Intake embayment located at the end of Heavy Haul Road on east bank of MS River
- Uses existing Unit 1 barge slip, expanding the area by dredging as shown on **Figure 7** for the Unit 3 embayment
- Pump house located to the north of the embayment, with pipelines running adjacent to and north of Heavy Haul Rd, to the clarifier location
- Intake piping (pump suction) in the embayment incorporates screens, sized to ensure CWA 316(b) requirements for approach velocity are met at maximum flow
- Unit 3 discharge will be combined with Unit 1 discharge into single outfall diffuser on the east river shore; Unit 1 discharge relocated from barge slip to the combined discharge/outfall
- Combined discharge includes both units' cooling tower blowdown, liquid radwaste discharges, and diluted clarifier bottoms from Unit 3
- Borrow pit near the river created from excavations made to collect sand backfill for Unit 1 construction; it also is likely to be flooded annually

The station water system (SWS) draws water from the Mississippi River, the only surface water source of makeup to the plant. The water is pumped to clarifiers for removal of suspended solids by use of a coagulant and flocculant. Clarified water is provided to the circulating water system (CIRC) for makeup to the normal power heat sink (NPHS) cooling tower basin, and to the plant service water system (PSWS) for makeup to the PSWS cooling tower basin.

The SWS draws river water from an embayment (Figure 7) on the eastern shore of the Mississippi River through fixed strainers (screens) located below the extreme low water level to ensure proper system operation under all expected river level conditions. Two dry-pit type vertical pumps are located in an intake structure on the north shoreline of the embayment. Single pump operation provides 100 percent makeup flow to the plant, and the second pump is kept in standby, not operating. The suction lines are provided with automatic valves and are interconnected to allow the operating pump to draw water from either strainer.

The intake screens are sized to allow a maximum flow of approximately 35,300 gpm with a corresponding maximum screen slot velocity of 0.50 ft/s. This intake screen maximum design flow exceeds the expected total Unit 3 SWS makeup flow (slightly over 29,200 gpm) required from the Mississippi River. Thus, the screen slot velocity at the maximum SWS makeup flow requirement will be approximately 0.4 ft/s, which meets the United States Environmental Protection Agency requirements (0.50 ft/s) found in regulations implementing Clean Water Act Section 316(b). Variations in final design for screen flow and approach velocity may occur; however, requirements for an approach velocity less than 0.50 ft/s would be adhered to.

Blowdown from the circulating water and service water cooling systems of Unit 3 would be discharged to a blowdown outfall structure located on the shoreline of the Mississippi River, at a temperature no greater than 100°F, and a flow rate of approximately 7000 gpm, based on 4 cycles of concentration operation.

A flooded man-made borrow pit now exists north of the barge slip at GGNS. This pit was formed by excavating fill material during the construction of Unit 1, thus it was not present in the 1970s. The borrow pit includes an area of about 16 acres, classified as lacustrine, littoral, unconsolidated bottom wetlands.

STOP No. 7

Sedimentation Basin B – Figure #3

- Stream B drains to Sedimentation Basin B, which then drains on to Hamilton Lake and the MS River

As we exit the site - Figure #8 (FSAR Figure 2.1-202):

- To the east of the access road is the Unit 1 "100-yr flood" drainage ditch, designed to accommodate the Unit 1 license basis 100-yr rainfall event runoff
- Unit 1 Turbine Building and Condensate Storage Tank locations
- Location of ISFSI pad for Unit 1, and casks installed thereon, north of Unit 2 buildings

STOP No. 8

Stream A, Culvert #9 – Hydrology – Figure #5 and Figure #6

- Stream A is drainage path for surface runoff from Basin A flowing from east to west, via Culvert #9 (about 2.8 sq mi area)
- Culvert #9 below the road continues Stream A from east to west into Sedimentation Basin A
- Sedimentation Basin A flows to Gin/Hamilton Lakes and the MS River

Sanitary Waste Water Treatment Facility – to the West of the north access road – Figure #1, Figure #8 (Item 7 location)

- Unit 1 treatment system - prefabricated, aerobic, digestion-type sewage treatment plant
- Located adjacent to Sedimentation Basin A
- Current capacity for approx. 100,000 gpd
- Capacity would be increased to approx. 160,000 gpd to accommodate Unit 3 operations
- Wastewater discharge is to Sedimentation Basin A which flows to Stream A and Gin Lake and on to the MS River
- Chemical treatment of waste water effluent consists of chlorination for bacteria control and addition of sodium bisulfite to neutralize residual chlorine

STOP No. 9

Meteorological Tower – Figure #1

- Located west and north of both Units 1 and 3; approximately 5300 ft. from Unit 1, 2600 ft. from Unit 3 NDCT to the south and 3200 ft. from Unit 3 power block
- 50 m and 10 m towers installed, with base elevation approximately 156 ft. msl; new equipment installed in late 2000
- Instrumentation and data collection meets RG 1.23, as described in the ESP ER (Section 2.7.5) and SSAR (Section 2.3.3)
- Parameters measured include wind speed, wind direction, temperature, and rainfall rate (rain gauge); delta-temperature calculated from difference between 10 m and 50 m instrument readings

STOP No. 10

Transmission Lines, Switchyard Area – Figure #2

- Two existing 500 kV lines with separate ROWs from U1 switchyard – Baxter Wilson to the north, and Franklin line to the south
- Existing yard and equipment designed for two units; Unit 2 not completed, but swyd. equipment was installed
- One 115 kV line from/to Port Gibson
- Some additional land area required for Unit 3 switchyard, to the north of the Unit 1 yard (about 19 acres)
- Approximately 11 acres of land disturbed for switchyard addition
- On-Site – two new transmission lines to/from Unit 3 transformer yard near Unit 3 Turbine Bldg. and the switchyard addition
- New 500 kV transmission line off site from new switchyard addition, parallels Baxter Wilson line from Unit 1 for a short distance, then runs east of the BW line and north (ER Figure 2.2-201)

STOP No. 11

Bald Hill Rd, South of Unit 1 Cooling Towers @ South Access Point – Figure #1

- Unit 1 NDCT and linear MDCT helper tower
- Stream B to the south of the NDCT
- Areas to the south of Bald Hill Rd are not slated for use for Unit 3, except possible overflow construction parking area

Archeological Site – Figures (Sensitive information)

- Small group tour during lunch break

TOUR STOPS FIGURES
CROSS REFERENCE TO SOURCE

Figure No.	Title	Source
	GGNS Site Region (50 mi)	NUREG-1817, Figure 1-1
1	Tour Stops and Points of Interest	FSAR Figure 2.1-201
2	Overall Site View with Major Features	ER Figure 2.1-201
3	Unit 3 Layout and Drainage Plans	FSAR Figure 2.4.1-201
4	Unit 3 Drainage Areas for PMP Analysis	Figure 2.4.2-204
5	Plant Drainage Areas, Streams A & B, Culverts 1 & 9	ESP SSAR Figure 2.4-13
6	Drainage Basins A & B	FSAR Figure 2.4.2-201
7	Embayment, Intake and Discharge	ER Figure 3.4-201
8	Site Plan – Existing and New Major Structures	ER Figure 2.1-202
9	REMP Sample Collection Sites – Near Field	Unit 1 ODCM Figure 3.0-1
10	Well Locations	FSAR Figure 2.4.12-201

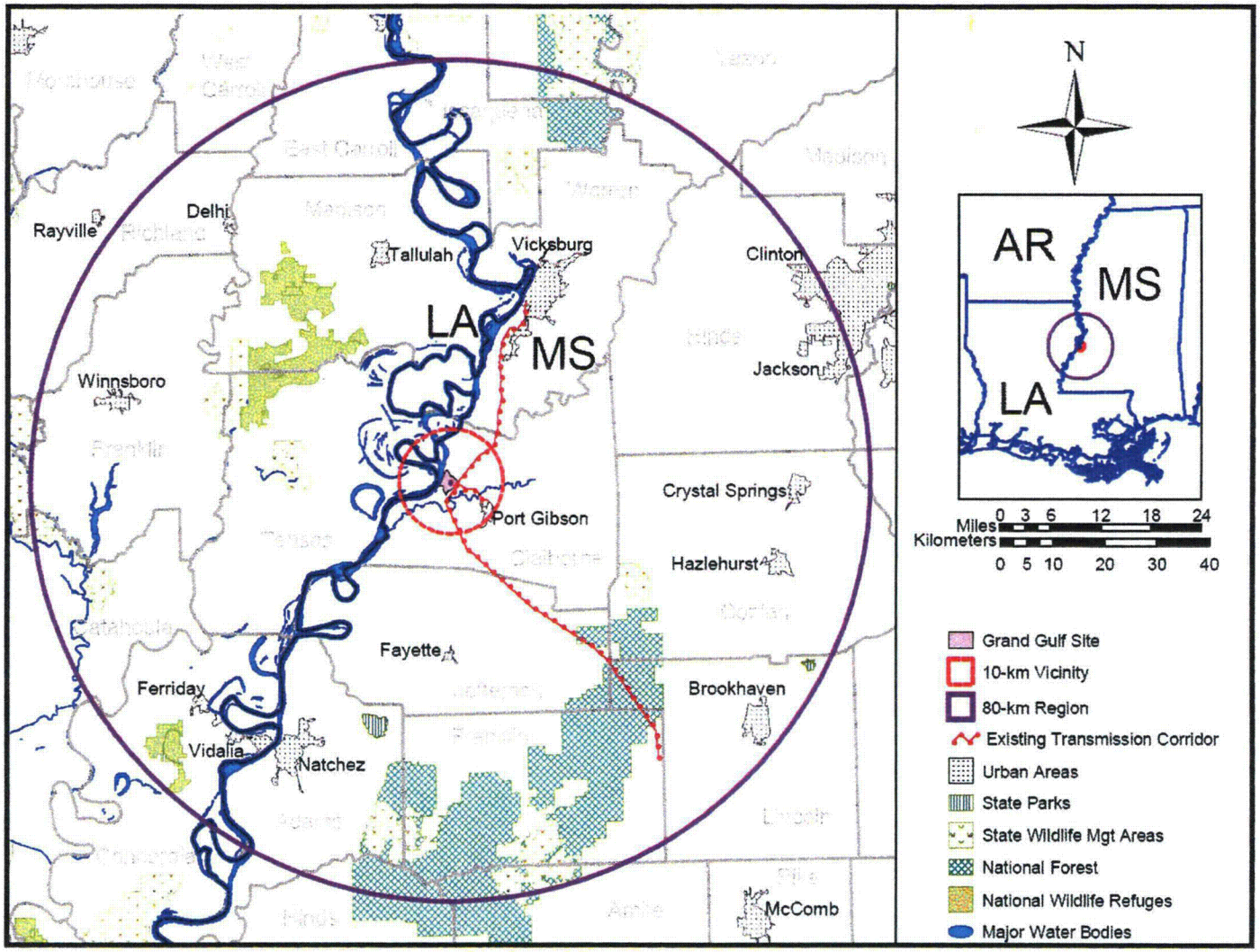
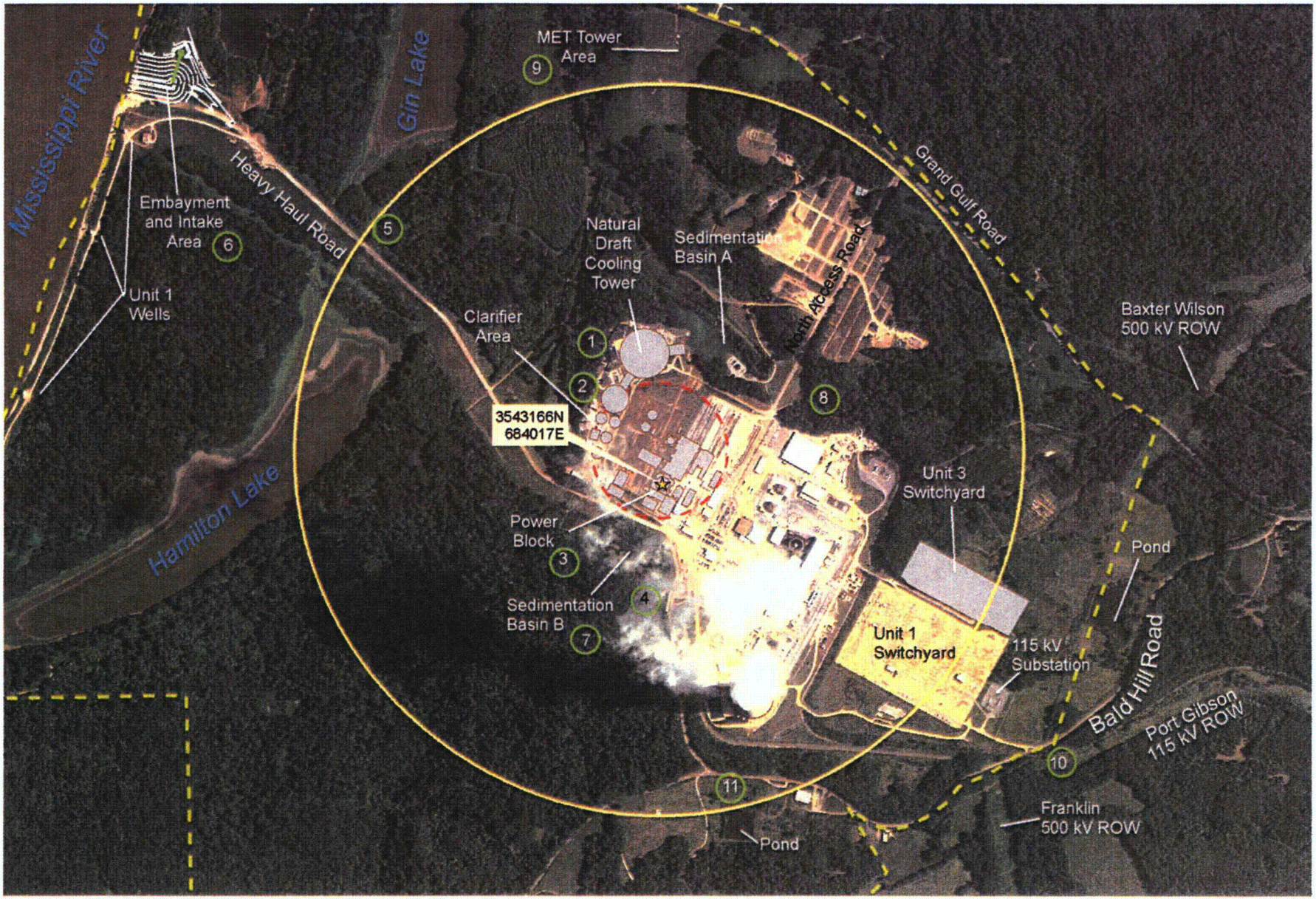


Figure 1-1. Region within 80 Kilometers (50 Miles) of the Proposed Grand Gulf Early Site Permit Site



Legend

- GGNS Unit 3 RB Center Point
- Unit 3 Significant Facility Footprints
- Property Boundary
- Exclusion Area Boundary (2760 ft.) from the Power Block Radius
- ESP Power Block Radius (630 ft.)

0 0.15 0.3 0.6

Miles

Source: National Agricultural Imagery Program, 2005.

The center point coordinates are in meters with a projection of NAD 83, UTM Zone 15N

True North

Figure 1. Tour Stops and Points of Interest

Figure 2. Overall Site View with Major Features

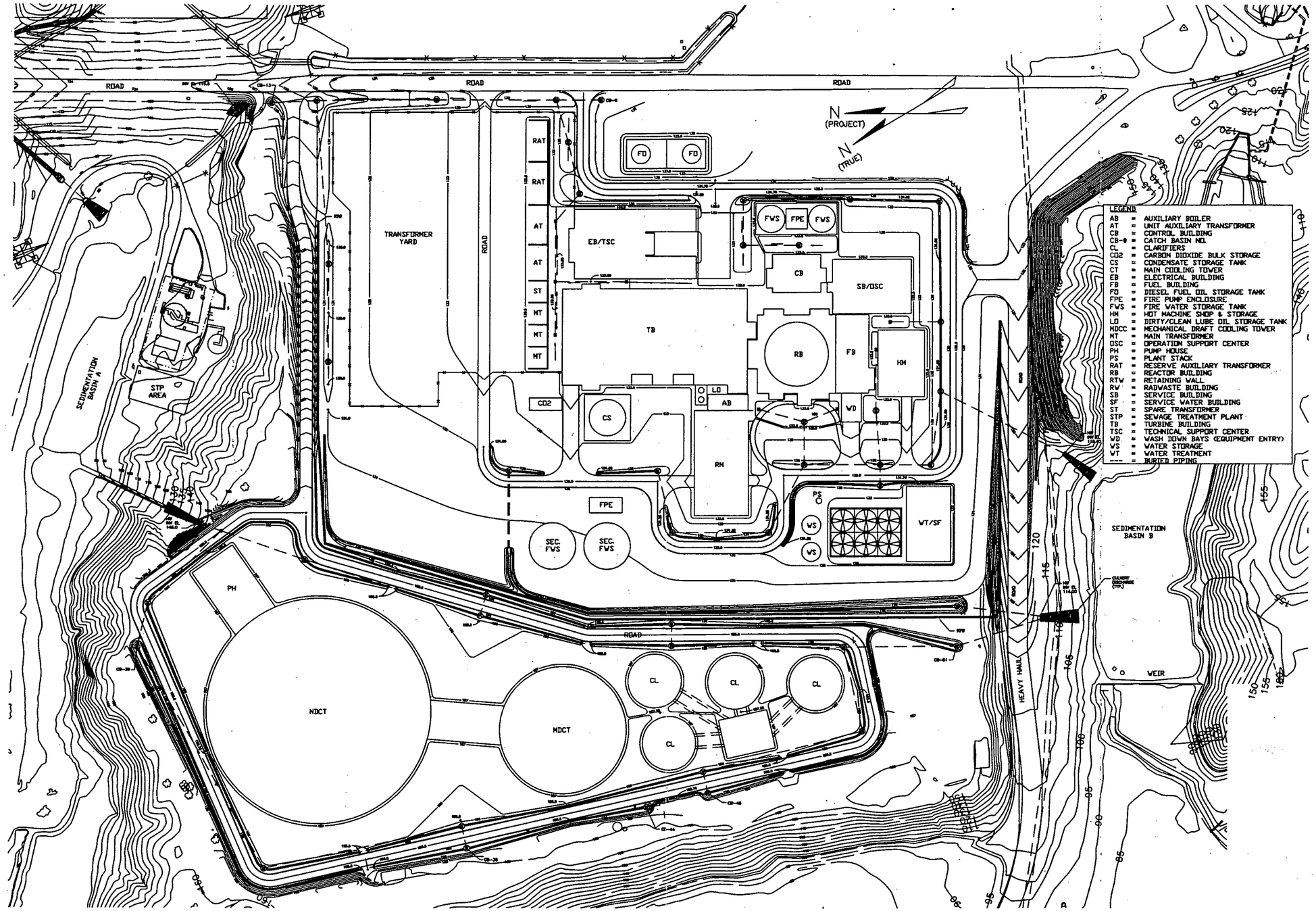


FIGURE 3 UNIT 3 LAYOUT AND DRAINAGE PLANS

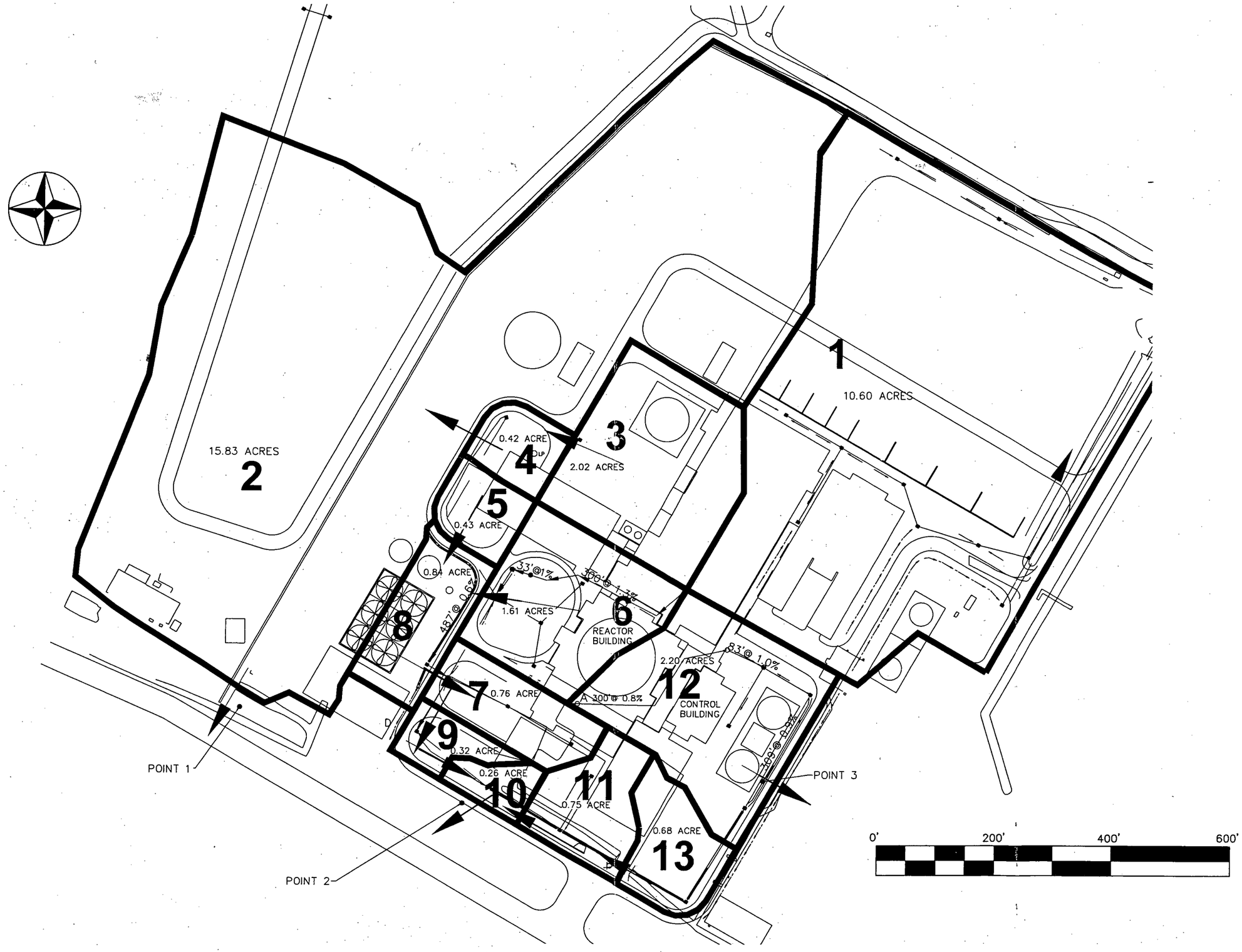


FIGURE 4 UNIT 3 DRAINAGE AREAS FOR PMP ANALYSIS

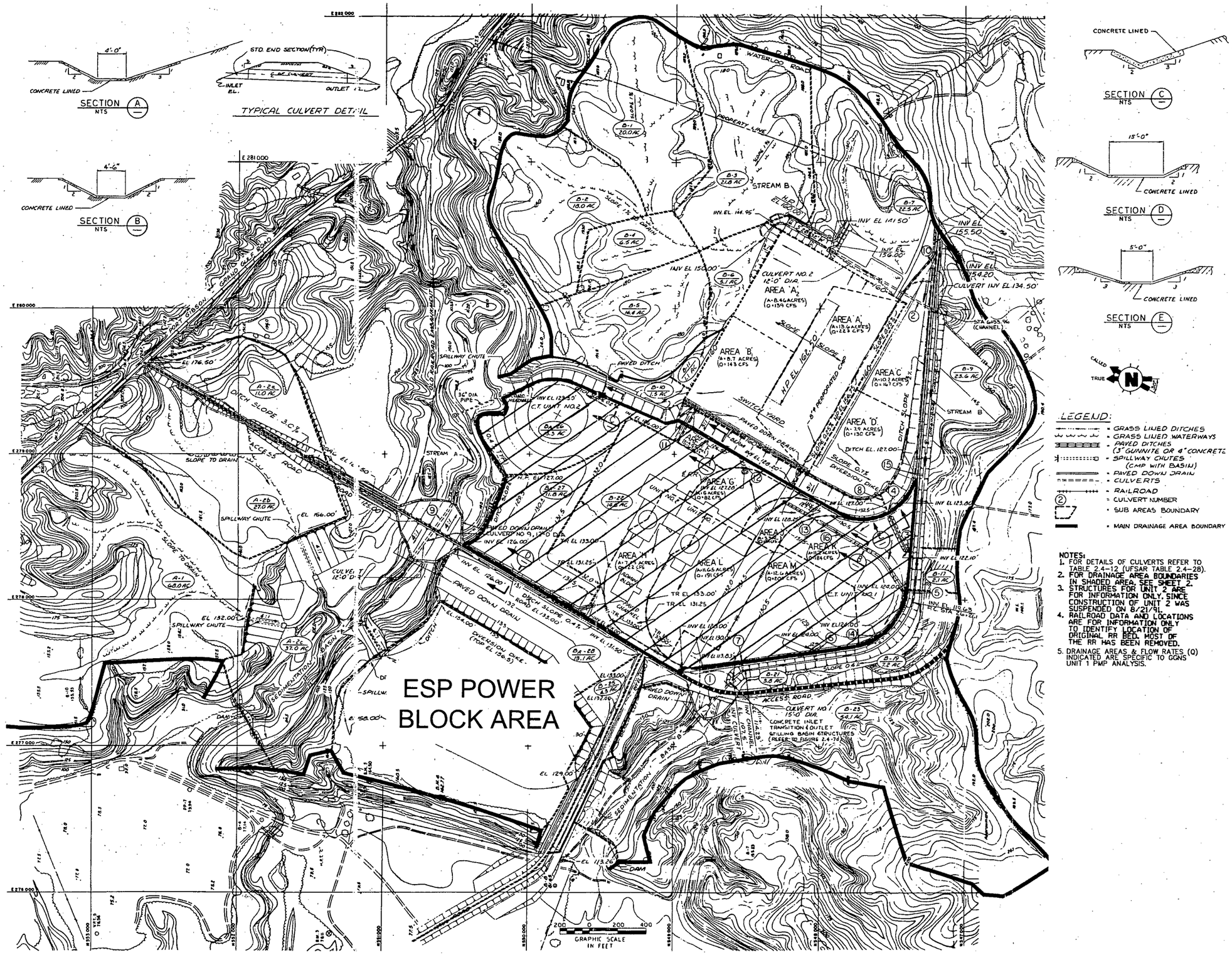


FIGURE 5 PLANT DRAINAGE AREAS,
STREAMS A & B, CULVERTS 1 &9

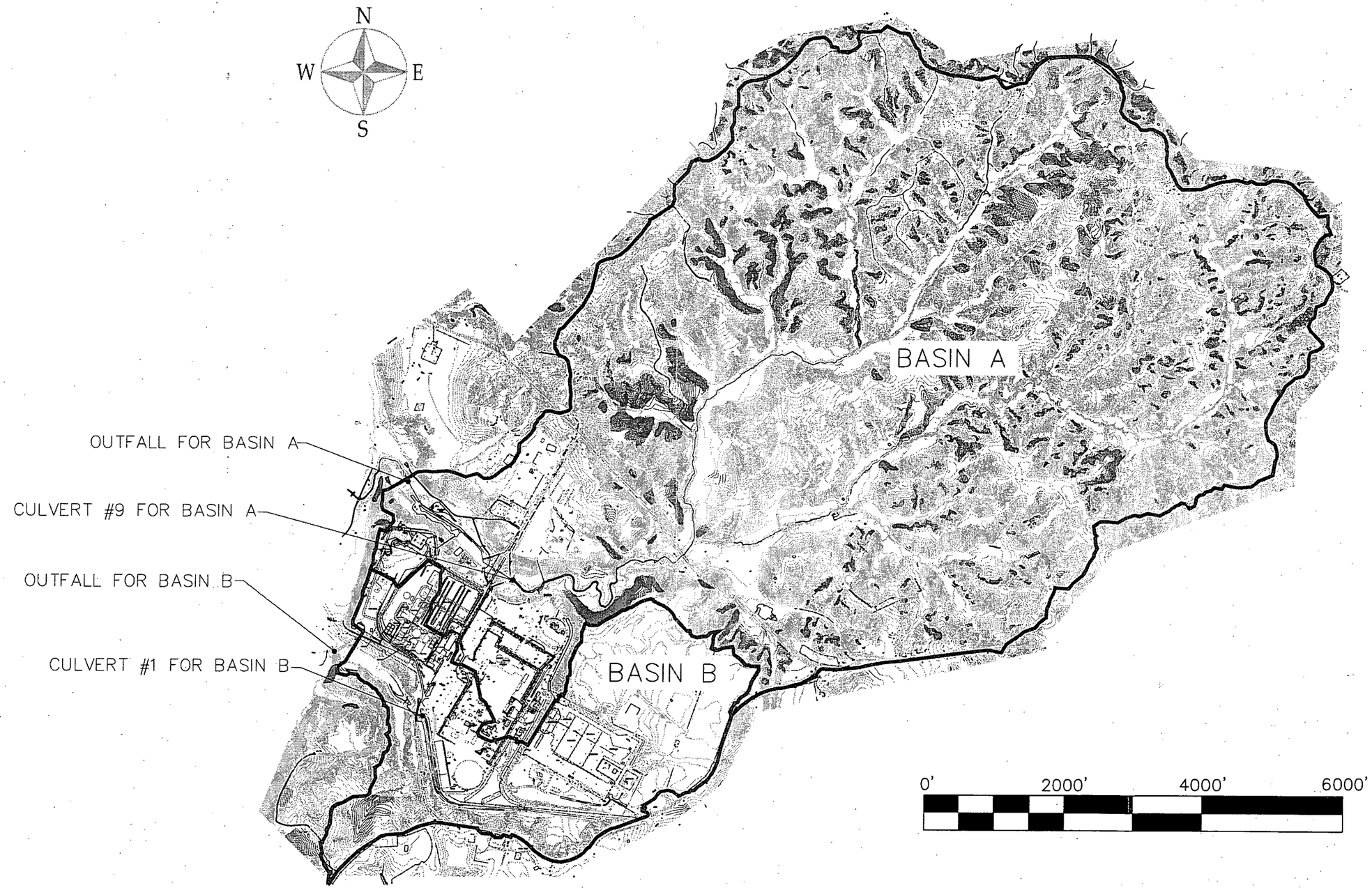


FIGURE 6 DRAINAGE BASINS A & B

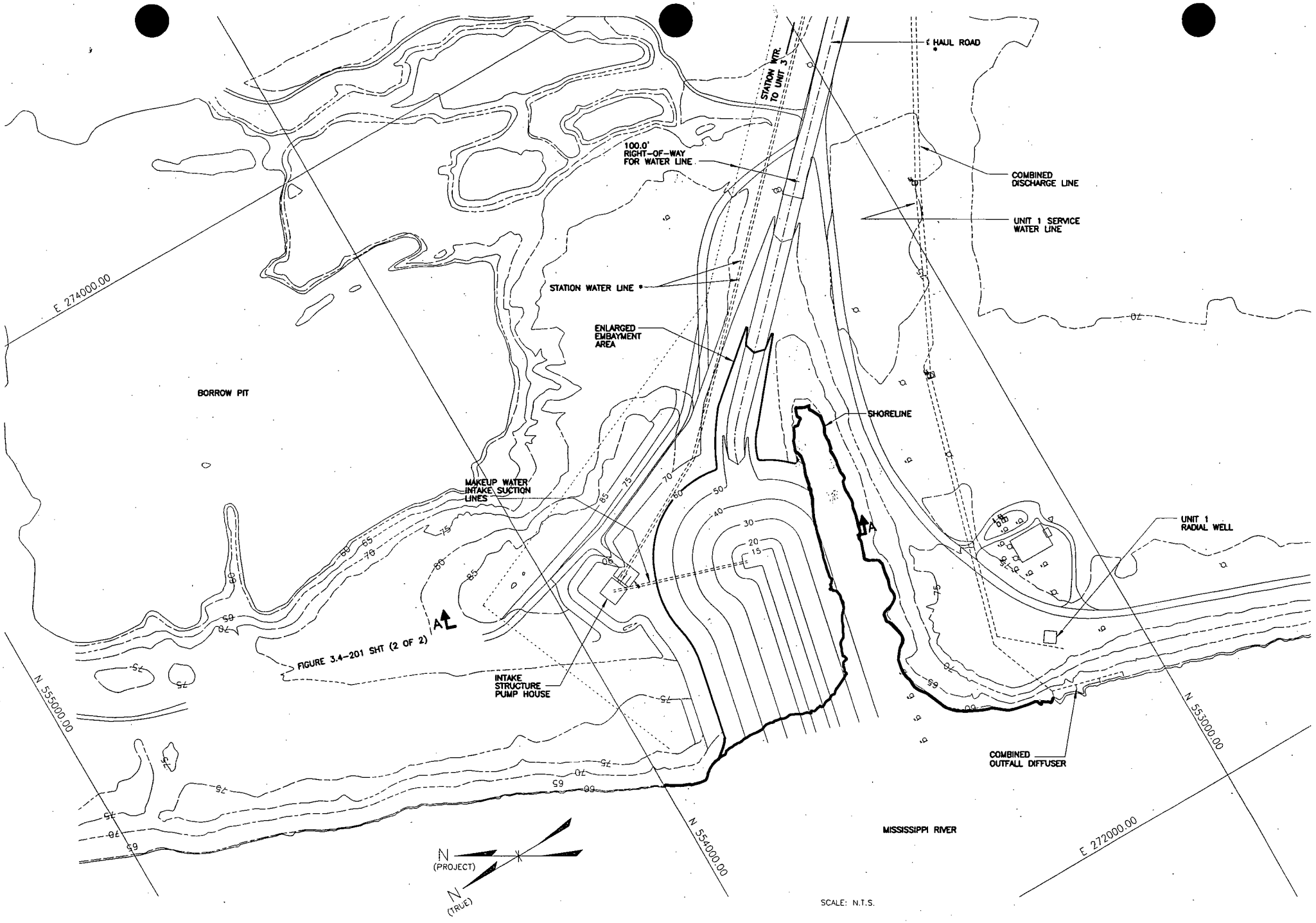


FIGURE 7 EMBAYMENT, INTAKE AND DISCHARGE

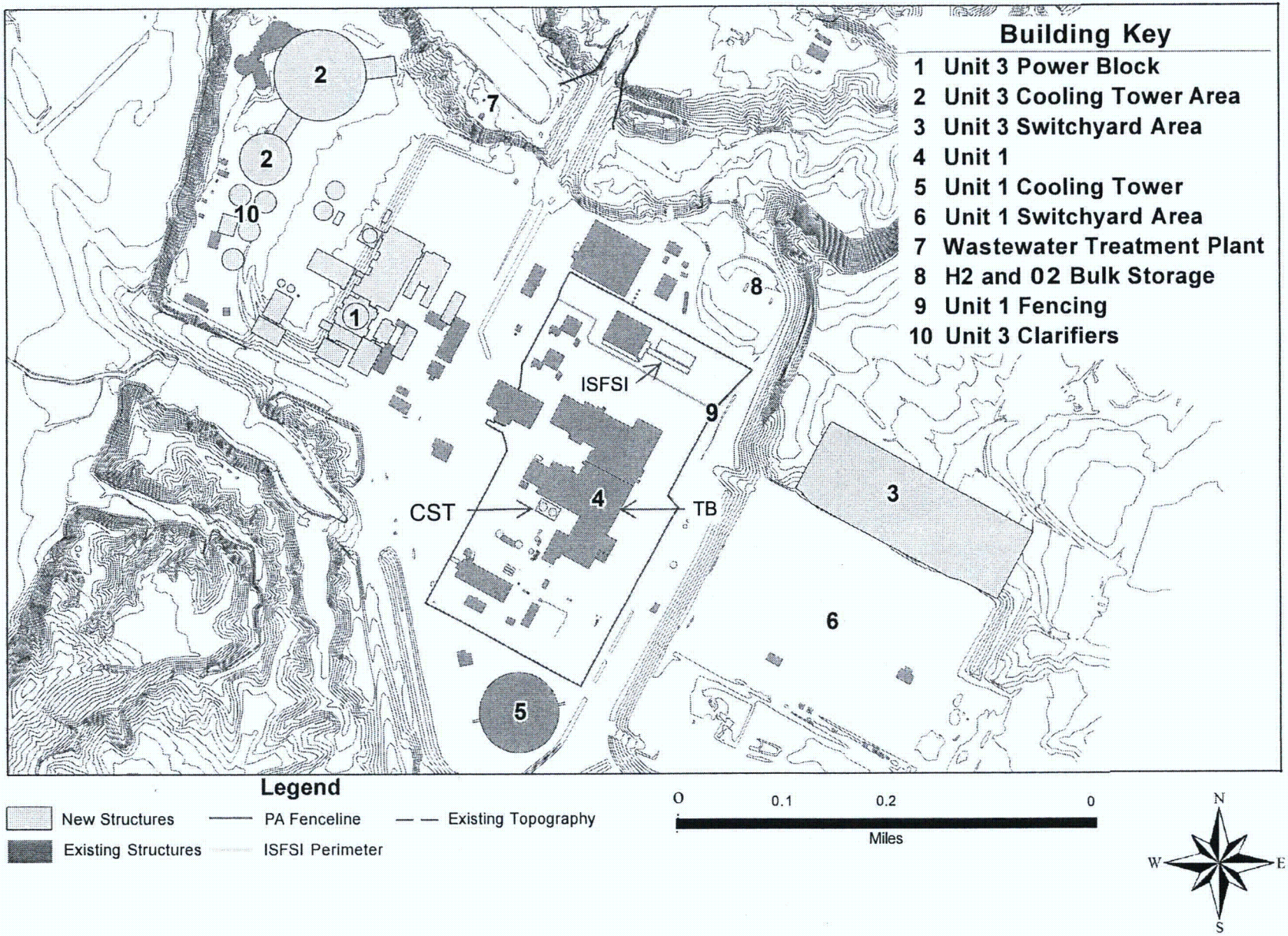


FIGURE 8 SITE PLAN-EXISTING AND NEW MAJOR STRUCTURES

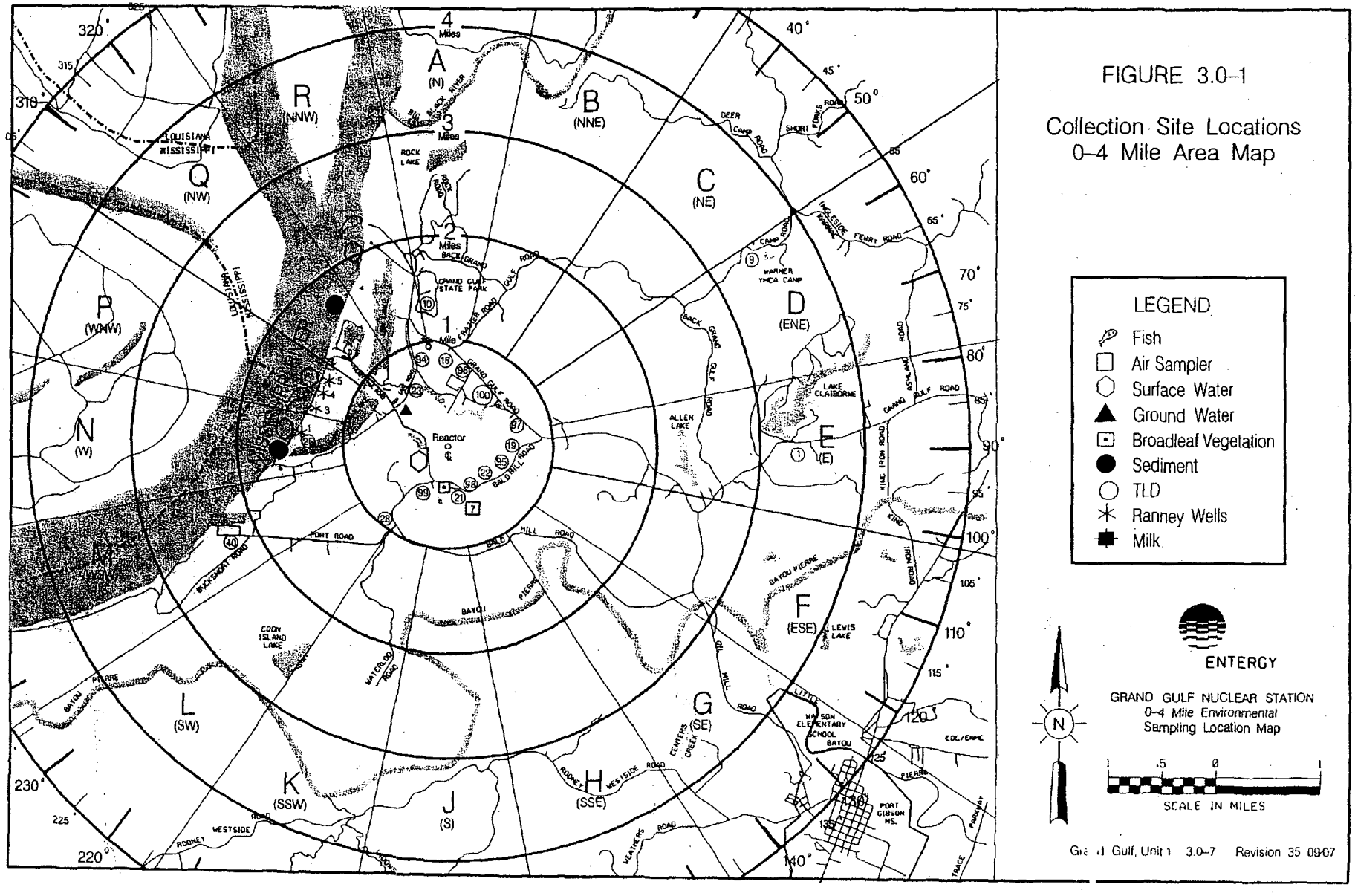
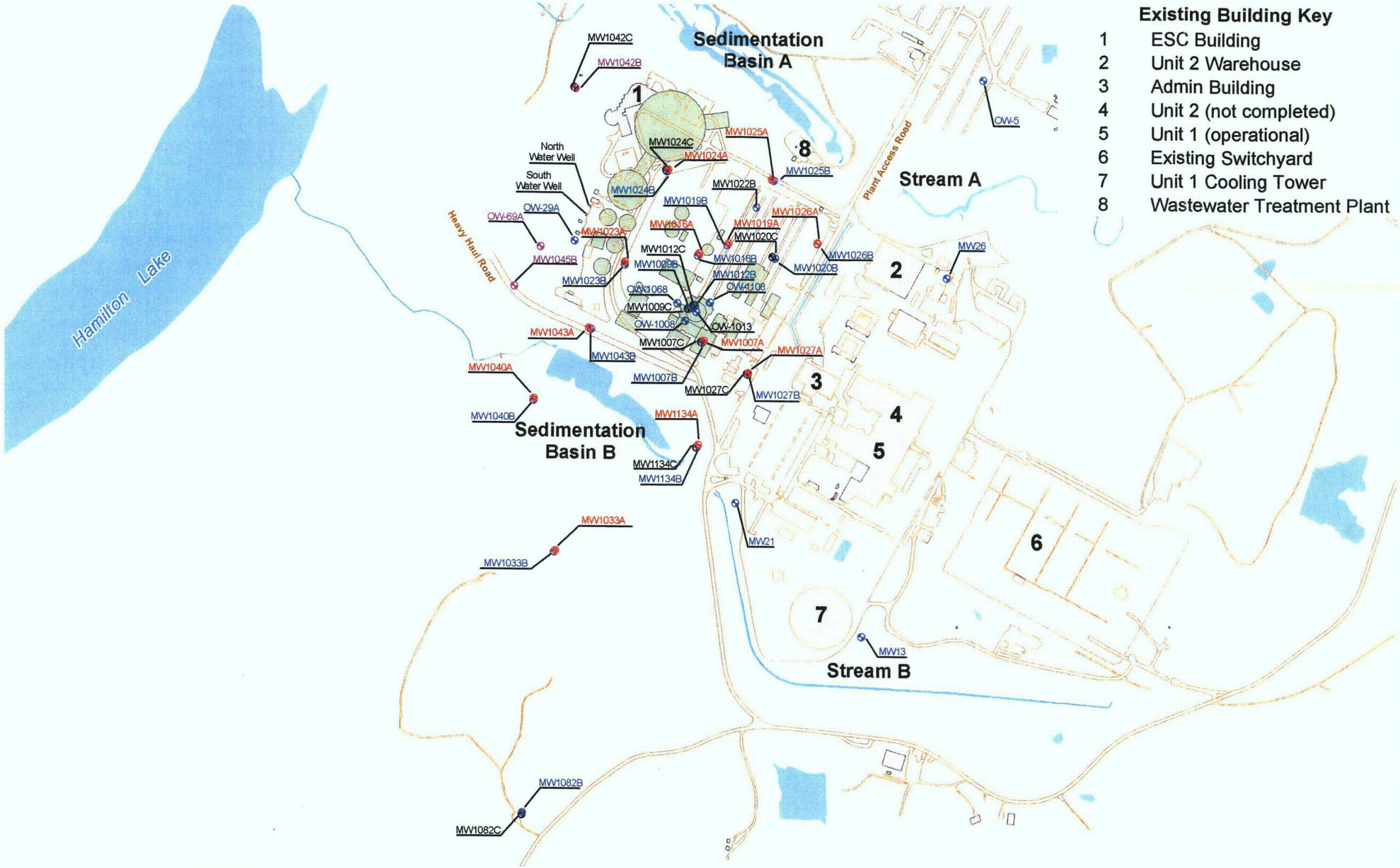


FIGURE 9 NEAR FIELD COLLECTION SITE LOCATIONS (0-4 MI)



Existing Building Key

1 ESC Building
2 Unit 2 Warehouse
3 Admin Building
4 Unit 2 (not completed)
5 Unit 1 (operational)
6 Existing Switchyard
7 Unit 1 Cooling Tower
8 Wastewater Treatment Plant

Legend

- Monitoring Wells screened in Alluvium
- Monitoring Wells screened in Catahoula Formation
- Monitoring Wells Screened In Loess
- Monitoring Wells Screened in Upland Complex
- New Buildings
- Surface Water
- Existing Buildings

Wells designated as "MW" were installed as monitoring wells for water levels. Wells designated as "OW" were installed primarily as observation wells for pump tests. Construction and installation methods for "MW" wells and "OW" wells were the same.

0 850 1,700 3,400
Feet

N W E S

Figure 10. Well Locations