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Dominion®

February 10, 2011

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Serial No. NA3-11-002
Docket No. 52-017
COL/MWH

DOMINION VIRGINIA POWER
NORTH ANNA UNIT 3
COMBINED LICENSE APPLICATION – REVISED RESPONSES TO RAI QUESTIONS 02.03.02-2, 02.04.02-1, AND ER SECTION 3.4-1

In a letter dated November 26, 2007 (Letter Serial No. NA3-07-001), Dominion Virginia Power (Dominion) submitted the North Anna Unit 3 Combined License Application (COLA) that incorporated the ESBWR DCD by reference. North Anna Unit 3 was designated by the ESBWR DCWG as the R-COLA. In a letter dated June 28, 2010 (Letter Serial No. NA3-10-011), Dominion revised the North Anna COLA to incorporate the US-APWR DCD by reference instead. That action resulted in the North Anna Unit 3 COLA being designated as an S-COLA for the US-APWR technology. In a letter dated December 16, 2010 (Letter Serial No. NA3-10-023), Dominion provided the results of the review of its responses to NRC requests for additional information (RAI) on the North Anna Unit 3 ESBWR R-COLA to determine whether the change in technology impacted the applicability of the RAIs or responses to the June 28 COLA revision. That letter committed to provide revised responses to RAI Questions 02.03.02-2, 02.04.02-1, and ER Section 3.4-1.

The revised responses to RAI Questions 02.03.02-2, 02.04.02-1, and ER Section 3.4-1 are provided in Enclosures 1, 2, and 3 to this letter, respectively.

Please contact Regina Borsh at (804) 273-2247 (regina.borsh@dom.com) if you have questions.

Very truly yours,

Eugene S. Grecheck

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NRO

COMMONWEALTH OF VIRGINIA

COUNTY OF HENRICO

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Eugene S. Grecheck, who is Vice President-Nuclear Development of Virginia Electric and Power Company (Dominion Virginia Power). He has affirmed before me that he is duly authorized to execute and file the foregoing document on behalf of the Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 10th day of February, 2011
My registration number is 7173057 and my
Commission expires: August 31, 2012

Wanda K. Marshall
Notary Public

WANDA K. MARSHALL
Notary Public
Commonwealth of Virginia
7173057
My Commission Expires Aug 31, 2012

Enclosure:

1. Revised Response to RAI Question 02.03.02-2
2. Revised Response to RAI Question 02.04.02-1
3. Revised Response to RAI Question ER Section 3.4-1

Commitments made by this letter:

None.

cc: U. S. Nuclear Regulatory Commission, Region II
C. P. Patel, NRC
T. S. Dozier, NRC
J. T. Reece, NRC

Enclosure 1

Revised Response to RAI Question 02.03.02-2

NRC RAI 02.03.02-2

FSAR Section 2.3.2.3, Potential Influence of the Plant and the Facilities on Local Meteorology, includes discussion of salt deposition. Please explain why the service water cooling tower produces higher salt deposition rates than the CIRC hybrid cooling tower even though the CIRC hybrid cooling tower is modeled with a higher drift rate.

Dominion Response (Revised)

[The following response supersedes the response to RAI Question 02.03.02-2 provided in Dominion letter NA3-08-086R, dated August 28, 2008 {ADAMS ML082460847}, in its entirety.]

The North Anna Unit 3 (NA3) design, which is based on the US-APWR and described in the FSAR, includes four Ultimate Heat Sink (UHS) cooling towers that provide cooling for the Essential Service Water System (ESWS) during normal plant operations. During normal plant operation, two of the four UHS cooling towers operate and the Seasonal/Annual Cooling Tower Impact (SACTI) analyses indicate that these two UHS cooling towers produce a higher salt deposition rate in the proximity of the electrical equipment (within the switchyard and transformers area) than does the hybrid cooling tower for the Circulating Water System (CWS).

The difference in salt deposition rates is evident in the SACTI outputs. Both types of cooling towers use of the same drift spectrum and drift rate. However, the difference can be attributed to a combination of the following factors:

1) The UHS cooling towers have a lower exit elevation than the hybrid cooling tower.
2) The UHS cooling towers have a lower exit temperature than the hybrid cooling tower.
3) The UHS cooling towers operate at a lower air flow rate and exit air velocity than the hybrid cooling tower.

As a result of these factors, a smaller, more localized plume is projected to be generated by the UHS cooling towers resulting in increased local salt deposition. In contrast, the hybrid cooling tower, because of its larger size and higher heat load, produces a larger, more diffuse plume (greater plume rise) resulting in salt deposition over a wider area.

The procedure used to analyze the SACTI results focused on the combined impacts of all three sources (the hybrid tower and two of the UHS towers) rather than considering the contribution from any one individual cooling tower.

To overcome the inherent limitations in the SACTI model which, in its current form, does not allow the modeling of multiple towers having different design characteristics within the same run, a raster algebra technique was used to combine the output data sets of independent model runs into a final 'net effect' grid.

The SACTI model was run using three sets of input parameters to encompass two cooling tower designs (hybrid tower for the CWS and linear mechanical draft towers for the UHS) and three heat ejection rates during normal operation (the two operating UHS cooling towers have different heat ejection rates based on which ESWS train is serviced). The output of each model run was converted to a raster data set using the process shown in Figure 1. In this process, the coordinates of the tower centers were used to register the centers of Cartesian grids developed from the SACTI output to the appropriate tower center for the hybrid cooling tower and UHS cooling towers A and C (the two physically closest to the switchyard and transformers which would be in service during normal operations).

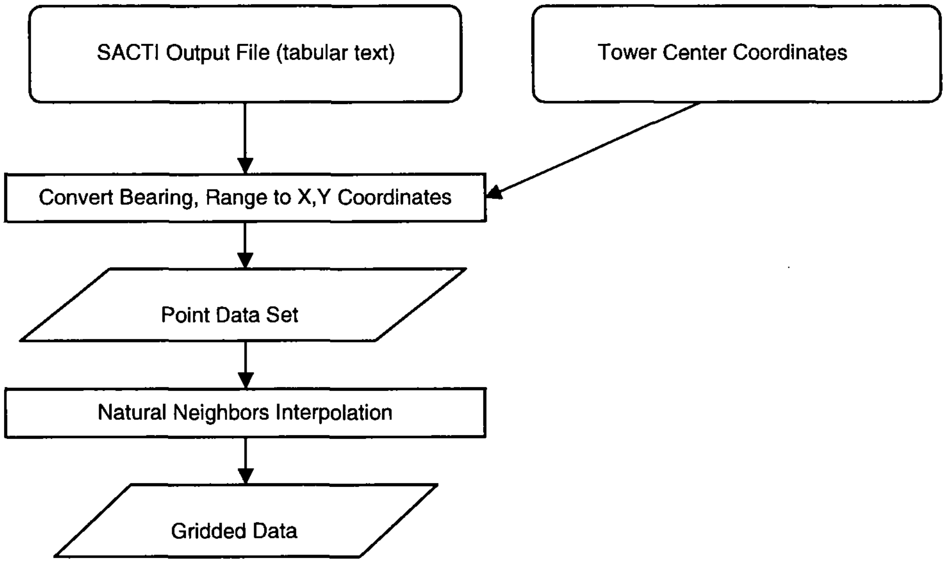


Figure 1: Schematic of Data Gridding Procedure

Once the grids were generated, they were composited using raster algebra to create a combined grid showing the net output from all three towers. The process for compositing the individual grids is shown in Figure 2. First, a composite of the UHS towers was generated to facilitate analysis of the UHS effects separate from the impacts of the hybrid tower. Subsequently, the UHS composite and the hybrid grid were added together to generate the final composite.

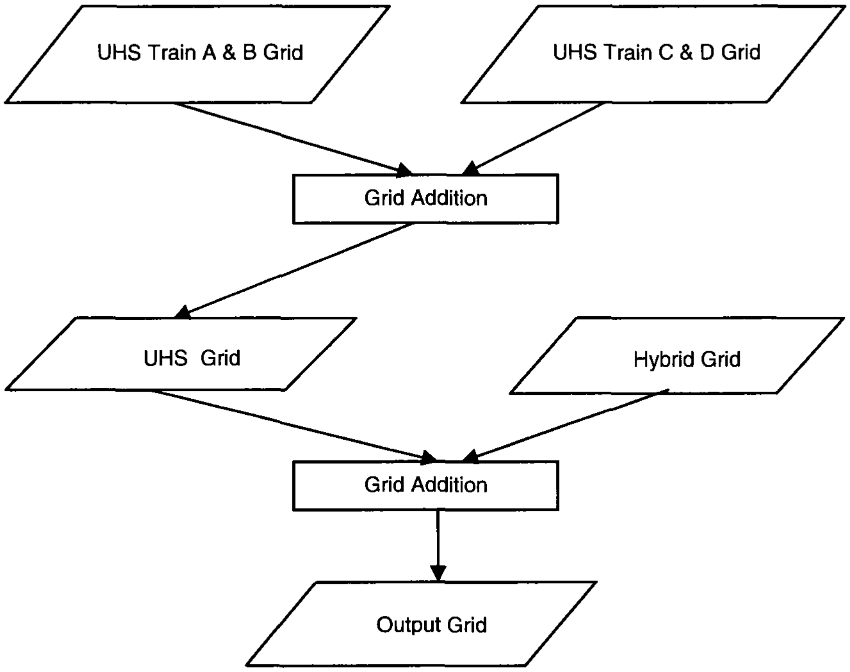


Figure 2: Schematic of Grid Addition Procedure

By overlaying the resultant composited grid on the site layout, the net impacts upon the NA3 electrical equipment were determined as described in FSAR Section 2.3.2.3.

Proposed COLA Revision

None

Enclosure 2

Revised Response to RAI Question 02.04.02-1

NRC RAI 02.04.02-1

Based on the requirements associated with GDC 2, 10 CFR 52.79, and 10 CFR 100.20(c), the applicant computed the effects of locally-intense precipitation falling on and near the site. Results from these computations are described in FSAR Section 2.4.2. On June 10, 2008, Dominion submitted the HEC-RAS input files that were used to compute the reported water surface elevation values. Based on the staff's review of the FSAR and the HEC-RAS files, staff requests that Dominion explain why a 3-inch safety margin is sufficient to provide reasonable assurance that runoff from the Unit 3 site will not impact the Units 1 and 2 site (FSAR page 2-127). Specifically, the staff requests that Dominion provide:

a. Assurance that the 'as-built' site topography will match values provided in the HEC-RAS cross-sections (locations shown in FSAR Figure 2.4-203) and that this topography will remain static (or is a conservative assumption) considering the length of the Unit 3 licensing period;

b. A description of provisions to prevent placement of obstructions or other channel blockages in key drainage canals throughout the Unit 3 licensing period, and hence justify the selected HEC-RAS model parameters (e.g, contraction/expansion coefficients, channel roughness, and channel geometry values;

c. A description of how runoff from each building and parking lot shown in FSAR Figure 2.4-201 have been captured in the HEC-RAS model and hence are correctly represented in the sub-basin drainage boundaries shown in FSAR Figure 2.4-201.

Dominion Response (Revised)

[The following response supersedes the response to RAI Question 02.04.02-1 provided in Dominion letter NA3-08-106R, dated September 16, 2008 {ADAMS ML082680033}, in its entirety.]

Note that all directions presented in the following discussion are referenced to plant north and are consistent with directions presented in FSAR Section 2.4.2. As indicated in FSAR Revision 3, Section 2.4.2, plant north is oriented 217.54 degrees clockwise from true north.

In addition, as indicated in FSAR Section 2.4.2.3, the maximum probable maximum precipitation (PMP) water level is 0.16 ft (1.9 in.) below the elevation of the drainage divide between Unit 3 and the Unit 1 and 2 sites. Therefore, the 3 inch safety margin noted in NRC RAI 02.04.02-1 above was revised to 1.9 inches in FSAR Revision 3.

The local PMP analysis performed for FSAR Section 2.4.2 incorporated conservative assumptions so that the resulting water levels presented in FSAR Section 2.4.2 are conservatively high. The conservative assumptions in the analysis included the following:

- A high runoff coefficient (0.9) for all pervious areas compared with values between 0.6 and 0.8 typically used for such areas.

- A 25% reduction in calculated time of concentration values for each sub-basin, which increases calculated peak discharges.

- The runoff from sub-basins E1 through E3 and N1 (FSAR Figure 2.4-201) will be contained in the east drainage ditch and not overflow the plant access road on the east side of the power block and thus will discharge to the storm water management basin. During a local PMP event, some of this flow will overflow the road and flow off site through the water treatment area bypassing the storm water management basin. By including this flow in the storm water management basin, water levels in the basin are higher than what they would otherwise be, resulting in more conservative upstream water levels.

- Any attenuation of peak discharges resulting from channel or basin storage is ignored by not utilizing channel or basin storage routing in the runoff analysis.

- Culverts, storm drain pipes, and enclosed outlet structures are assumed clogged and non-operational to convey any of the PMP runoff and thus, computed water levels are conservative.

- The estimated peak discharges for each sub-basin are applied to the upstream-most cross-section in each sub-basin rather than distributing the discharges throughout the sub-basin based on contributing area. This approach results in more conservative computed water levels.

Overall, the conservative assumptions described above provide reasonable assurance that the 1.9-inch (0.16 ft) safety margin indicated in FSAR Section 2.4.2.3 is sufficient to ensure that runoff from the Unit 3 site will not impact the existing units.

The responses to the specific NRC requests are addressed below:

a. The HEC-RAS cross-sections were developed from the finished grade as shown on FSAR Figure 2.4-203. Drawings issued for construction are checked against the finished grade drawings and the local PMP analysis prior to issue. Changes to finished grade topography shown on Figure 2.4-203 are assessed by a re-evaluation of the PMP flooding in accordance with 10 CFR 50.59 requirements. Likewise, once the Unit 3 combined license is issued, changes to site topography that would result in a change to the cross sections or parameters used in the HEC-RAS model will be assessed in accordance with 10 CFR 50.59 requirements.

b. A Stormwater Pollution Prevention Plan (SWPPP) and Erosion & Sediment Control Plan are prepared to obtain land disturbance permits associated with stormwater for construction-related activities. The permits/plans require stormwater control structures/conveyances to be maintained during construction. Similarly, the existing Virginia Pollutant Discharge Elimination System (VPDES) SWPPP for North Anna Units 1 and 2 will be modified to include Unit 3 when Unit 3 begins operation. The SWPPPs include provisions to prevent placement of obstructions or blockages in drainage canals.

   In addition, the drainage channels shown on FSAR Figures 2.4-201 and 2.4-203 include 3-to-1 side slopes and narrow bottom widths which restrict the placement of objects that could obstruct flow paths. Note also that the hydraulic analysis includes the conservative assumptions of blocked culverts, storm drain pipes and enclosed outlets.

c. Runoff from roofs is divided amongst the sub-basins as shown on FSAR Figure 2.4-201. During the PMP event, roof drainage structures, such as drains and pipes, are assumed to be clogged and non-operational. The roof drainage will flow over the edges of the roof and fall directly to the ground where it will follow the finished grading towards the drainage ditches. Finished grade contours were used to delineate sub-basin boundaries, so the flow from roof tops is accounted for on the basis of these boundaries.

   No detention or lag is included in the analysis for runoff from the roofs. Roofs are included as impervious areas in the sub-basin. If final roof configurations indicate different runoff patterns than what is shown on Figure 2.4-201, a reanalysis of the PMP flooding will be performed in accordance with 10 CFR 50.59 requirements.

   As shown on Figure 2.4-201, there are no parking lots within the power block area for North Anna Unit 3. Runoff from the parking lot near the administration building discharges to the storm water basins located northwest of the parking lot. The basins then discharge to existing drainage to the north which eventually discharges to the Waste Heat Treatment Facility. Thus, runoff from the parking lot near the administration building is not included in the local PMP analysis as it does not contribute to the power block runoff and drainage near the safety-related facilities. However, surfaces, including gravel surfaces, in the power block area, other than grassed slopes in sub-basins B, W1, N1, and E1 through E3, are considered impervious with a runoff coefficient of 1.0.

Proposed COLA Revision

None

Enclosure 3

Revised Response to RAI Question ER Section 3.4-1

RAI Question ER Section 3.4-1

ER Section 3.4-1: To the extent information is available describe the Unit 3 Intake design, including the lagoon and any culverts through the coffer dam, and the new intake structure dimensions, the design flow velocity, the fish screens, and other features. Provide updated figures of the intake area (plan view), the planned intake structure, and flow path.

Dominion Response (Revised)

[The following response supersedes the response to RAI Question ER Section 3.4-1 provided in Dominion letter NA3-08-079R, dated July 17, 2008 {ADAMS ML082530148}, in its entirety.]

The North Anna Unit 3 intake structure withdraws water from Lake Anna to supply the plant's water needs. It has three pump/screen bays and is designed to accommodate the following combination of pumps:

(1) Three 50% capacity make-up pumps to supply make-up water for the normal plant circulating water and service water cooling systems at a design flow rate of 22,300 gpm (49.6 cfs).
(2) Two 100% capacity station water pumps to deliver station water at a design flow rate of 675 gpm (1.5 cfs).
(3) Two 100% capacity fire water pumps to deliver fire protection water at a maximum design flow rate of 2500 gpm (5.6 cfs).
(4) Two 100% capacity screen wash pumps, installed in the screen well to clean the traveling water screens during operation of the intake pumps, at a design flow rate of 500 gpm (about 1.1 cfs). The screen wash flow will be recirculated back to intake flow upstream of the traveling water screens.
(5) One fire water jockey pump for maintaining system pressure at a design flow rate of 25 gpm (0.06 cfs).

To protect the pumps from debris, the entrance opening of the intake structure is equipped with trash racks and raking mechanism. Downstream of the trash racks, there are three sets of dual flow traveling water screens, each with an 8-ft basket width and a 2 mm screen mesh size. The maximum flow-through velocity at the openings of the trash racks and the traveling water screens is designed to be less than 0.5 ft/sec. Figures 1a and 1b (below) are schematic sketches that illustrate the principal hydraulic dimensions of the intake structure. Minor adjustments of the intake dimensions are expected to be necessary during detailed design stage to accommodate the size of equipment (pumps and screens) specified by the suppliers.

The intake structure is located at the end of a cove on the south shore of Lake Anna near Harris Creek and immediately west of the cove that houses the existing intake structure. The cove was originally planned for the intake of the previously abandoned North Anna Units 3 and 4.

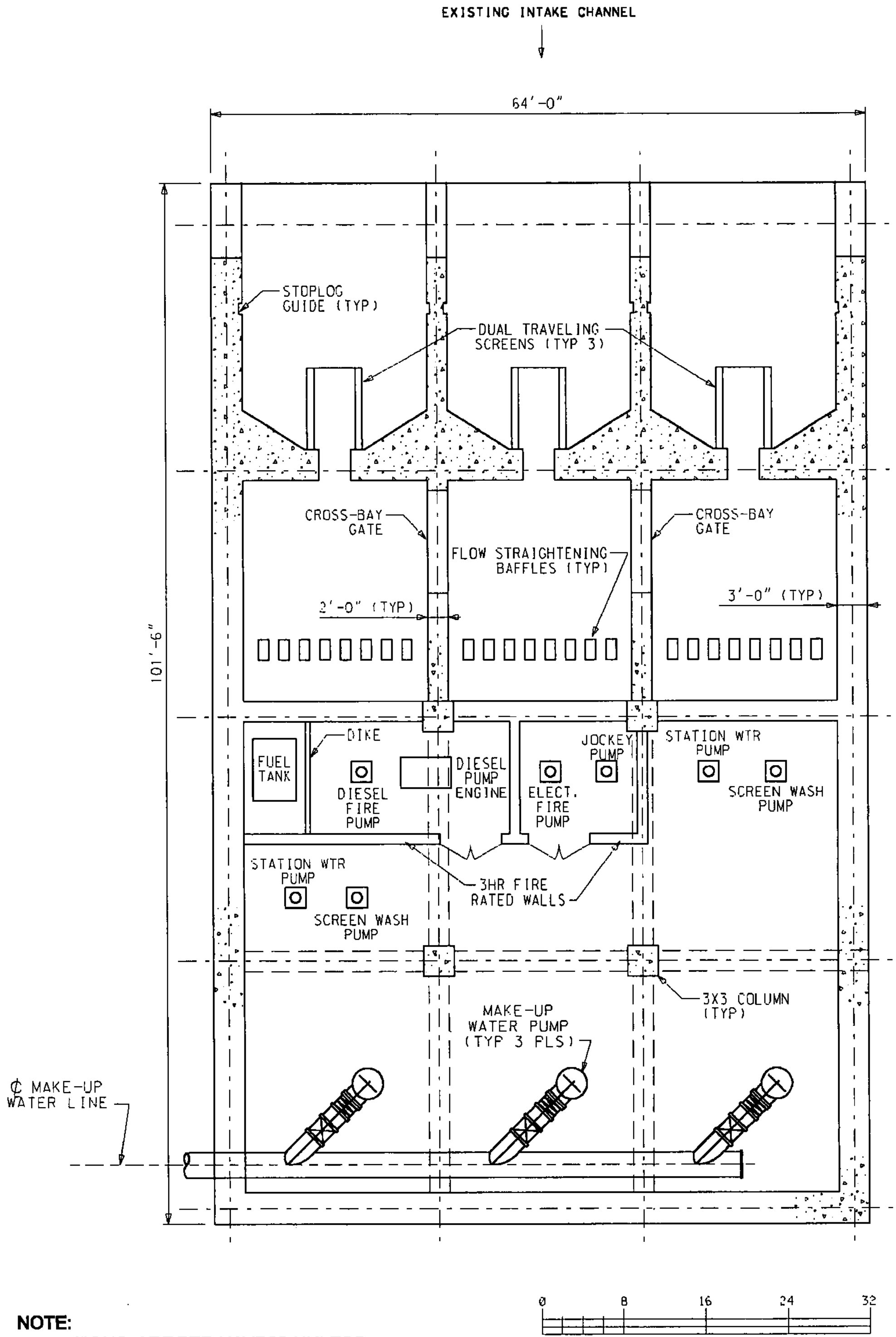
In the early 1980s, a cofferdam was installed across the cove to facilitate the construction of the now-abandoned intake tunnel. For the new North Anna Unit 3 intake, five box culverts of dimensions 10 ft x 12 ft, or equivalent, will be installed in the cofferdam to allow water from Lake Anna to flow through toward the North Anna Unit 3 intake via the approach channel. Figure 2 (below) shows the location of the cofferdam and the culverts in relation to the intake structure. The general flow path of the intake flow is also shown in Figure 2.

Because of the limited quantity of water to be supplied from Lake Anna, no major modification to the existing shoreline or dredging in the approach channel is necessary.

The approach channel has a typical side slope of 3:1 (horizontal to vertical) on both sides and a bottom width varying from about 500 feet at the lake end to 150 feet at the entrance to the screen well and pump bays. The invert elevation, i.e., bottom elevation, of the channel is approximately 220 ft msl (NGVD29). The flow velocity in the approach channel is designed to be about 0.01 ft/sec, based on the design flow rate of the North Anna Unit 3 intake structure. The flow-through velocity at the culverts connecting Lake Anna and the intake channel is designed to be about 0.1 ft/sec, similar to the current velocity in Lake Anna, to minimize entrainment of debris, aquatic life, and sediment.

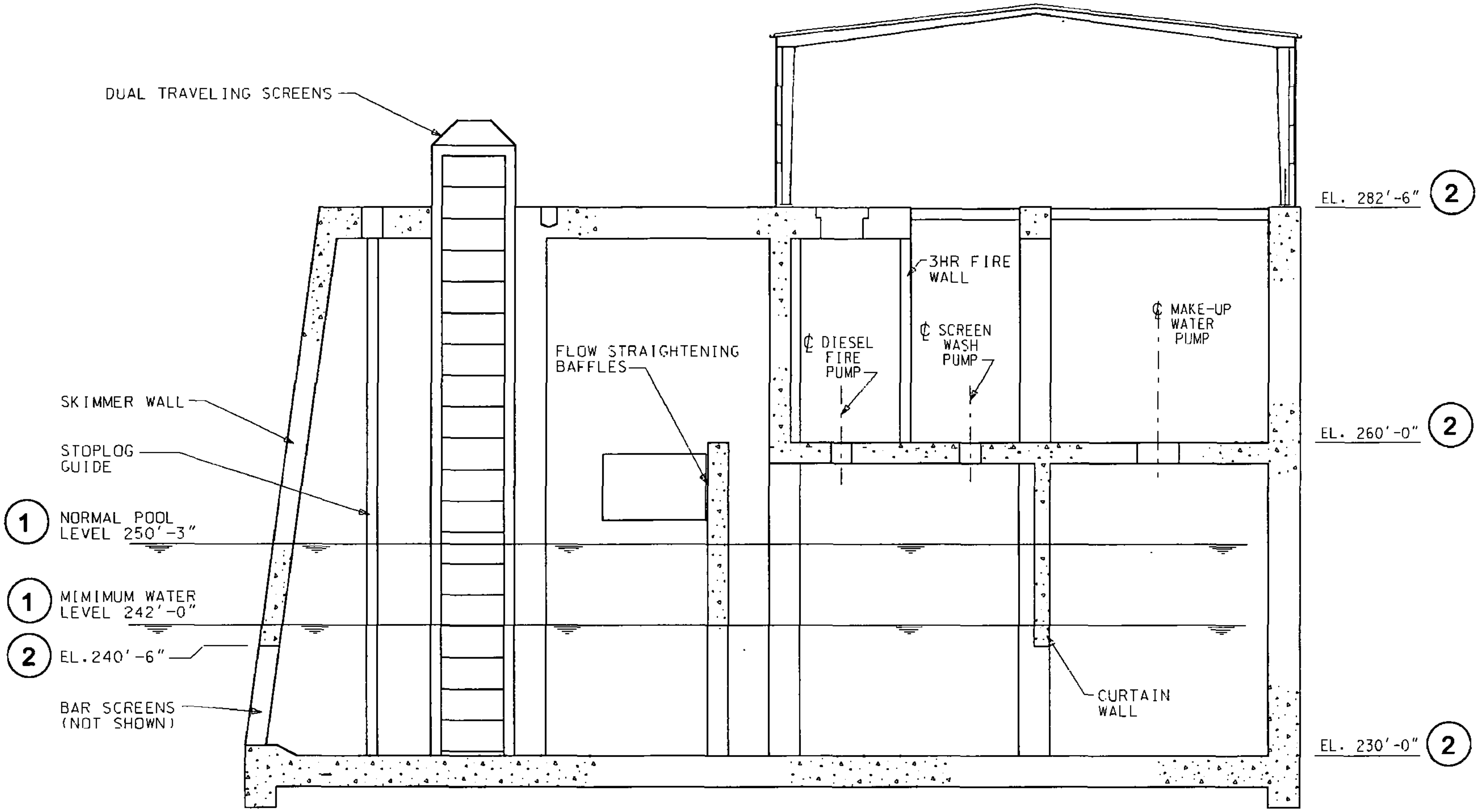
<u>Proposed COLA Revision</u>

None



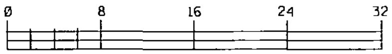
NOTE:
ELEVATIONS ARE PER NAVD88 UNLESS SPECIFICALLY NOTED OTHERWISE

SCHEMATIC ARRANGEMENT OF NAPS UNIT 3
MAKE-UP WATER PUMP INTAKE
RAI ER SECTION 3.4-1 FIGURE 1a

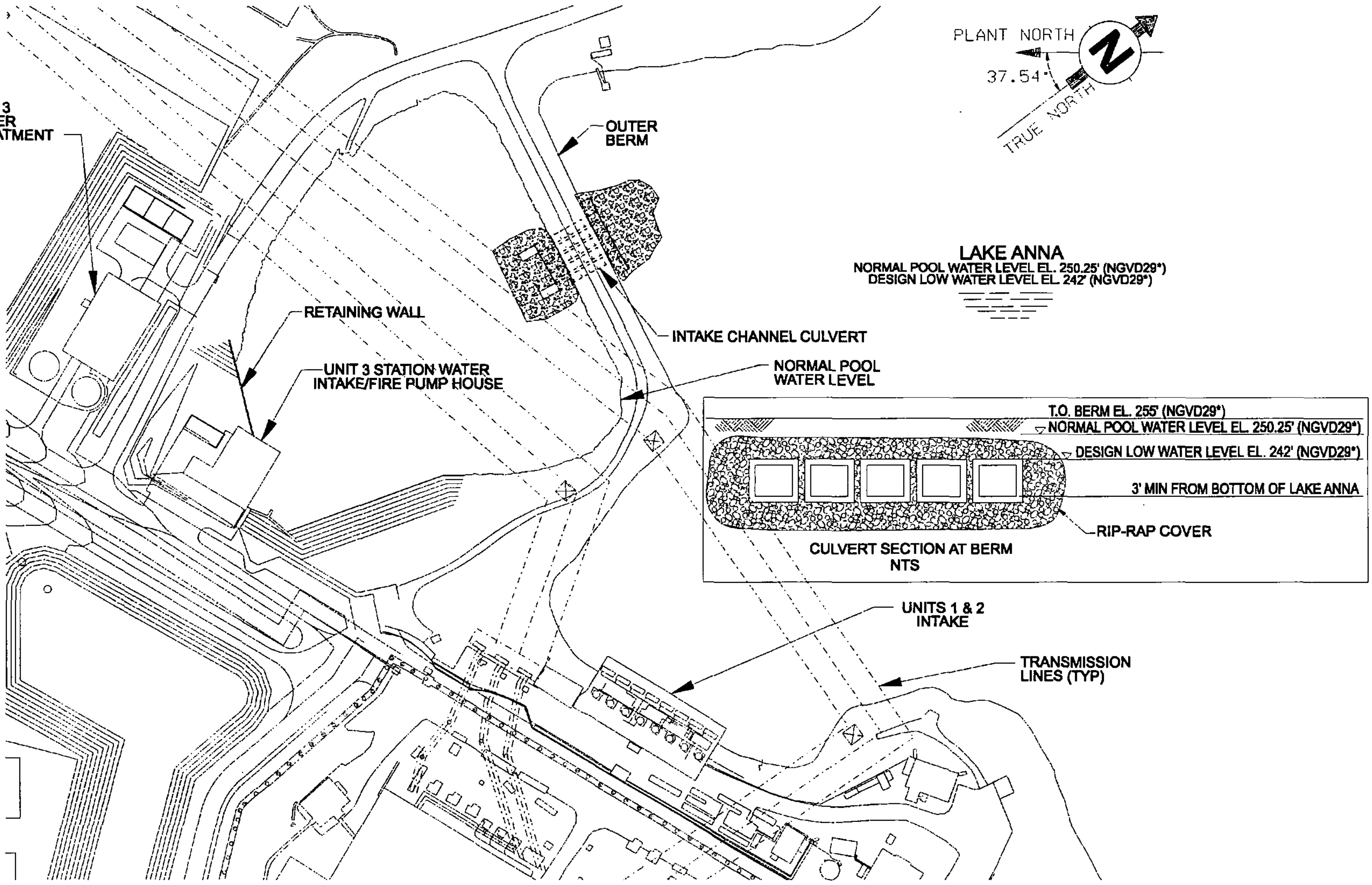


NOTE:
① ALL WATER ELEVATIONS ARE PER NGVD29

② ALL ELEVATIONS ARE PER NAVD88
UNLESS SPECIFICALLY NOTED OTHERWISE



SCHEMATIC ARRANGEMENT OF NAPS UNIT 3
MAKE-UP WATER PUMP INTAKE
RAI ER SECTION 3.4-1 FIGURE 1b



* THE CONVERSION FROM NGVD29 DATUM ELEVATIONS TO NAVD88 DATUM ELEVATIONS IS -0.86 FT

AREA PLAN

RAI ER SECTION 3.4-1
FIGURE 2