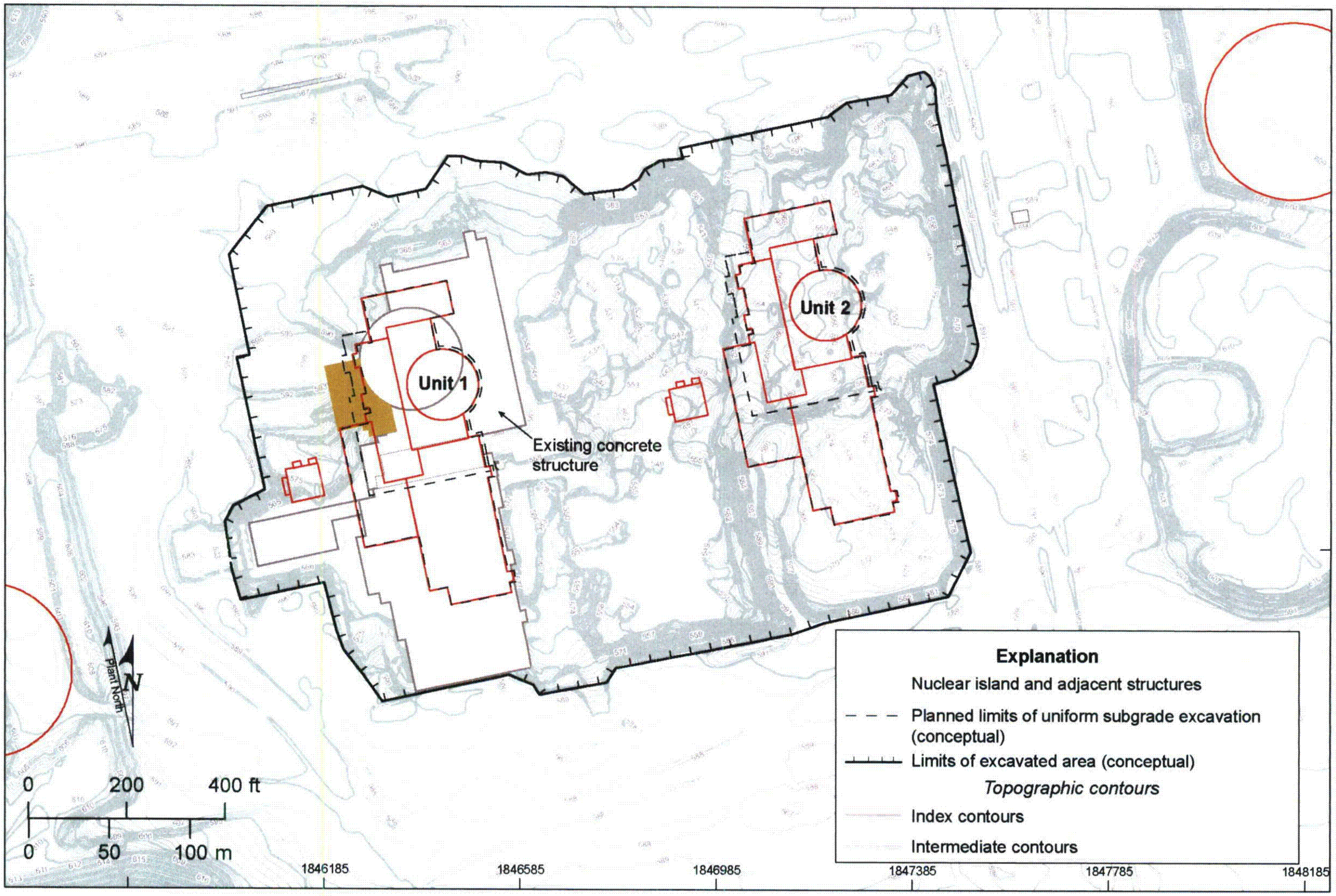
115. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-243 is revised as follows:



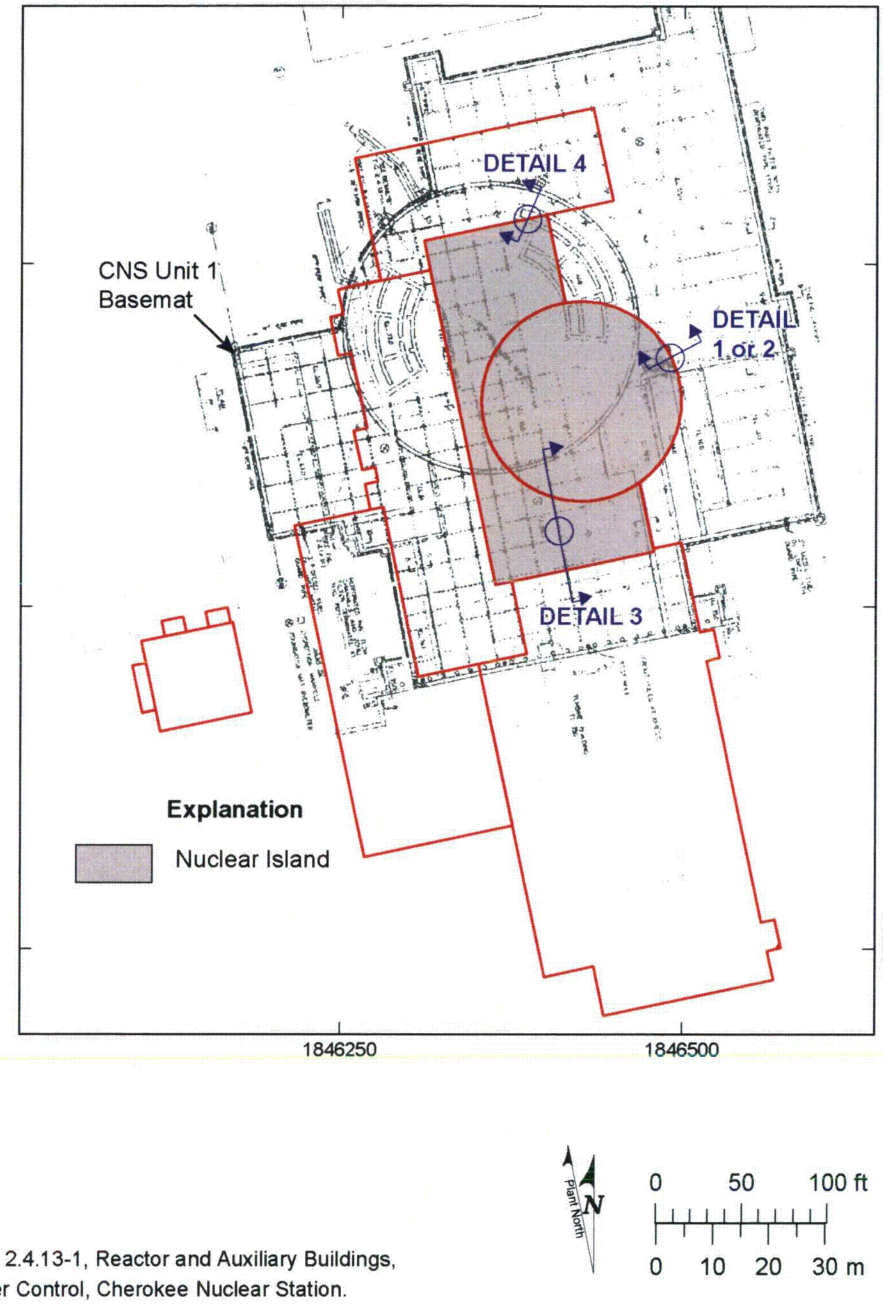
WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Limits

FIGURE 2.5.4-243

116. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-244a is revised as follows:



Sources:

1. PSAR Figure 2.4.13-1, Reactor and Auxiliary Buildings, Ground Water Control, Cherokee Nuclear Station.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
   Title: Lee Nuclear Station Units 1 & 2 Site Plan.

References:

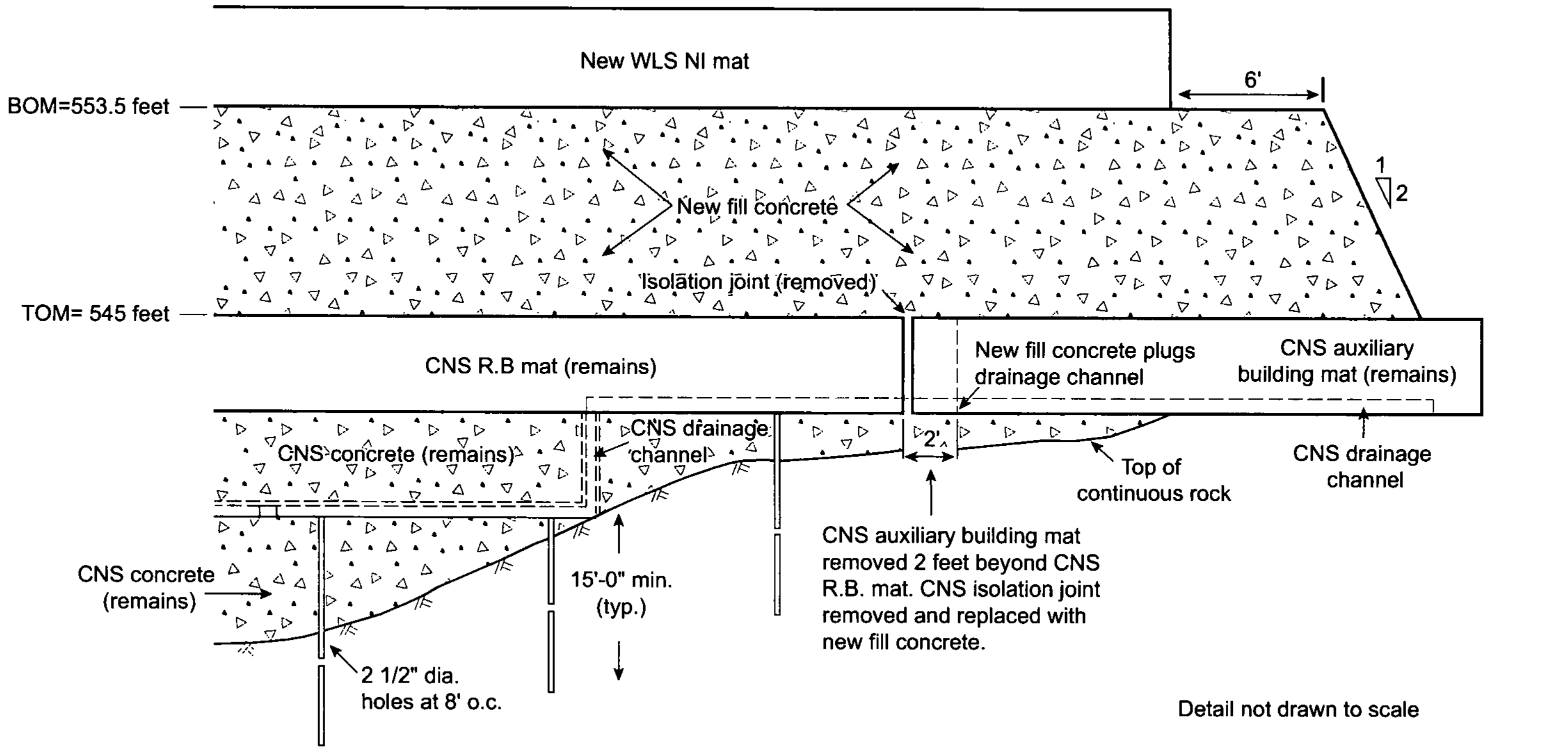
1. PSAR Figure 2.4.13-1 "Typical detail for drain holes" and plan.
2. Relocated NI per Duke letter dated 10/17/2012, ML12293A238.

WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Cherokee Nuclear Station
Foundation Drainage and Lee Nuclear
Station Nuclear Island
FIGURE 2.5.4-244a

117. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-244b is revised as follows:



Note: TOM = Top of Mat Elevation
BOM = Bottom of Mat Elevation
CNS = Cherokee Nuclear Station

DETAIL 1

Reference: CNS PSAR Figure 2.4.13-1, "Reactor and Auxiliary Building Ground Water Control"

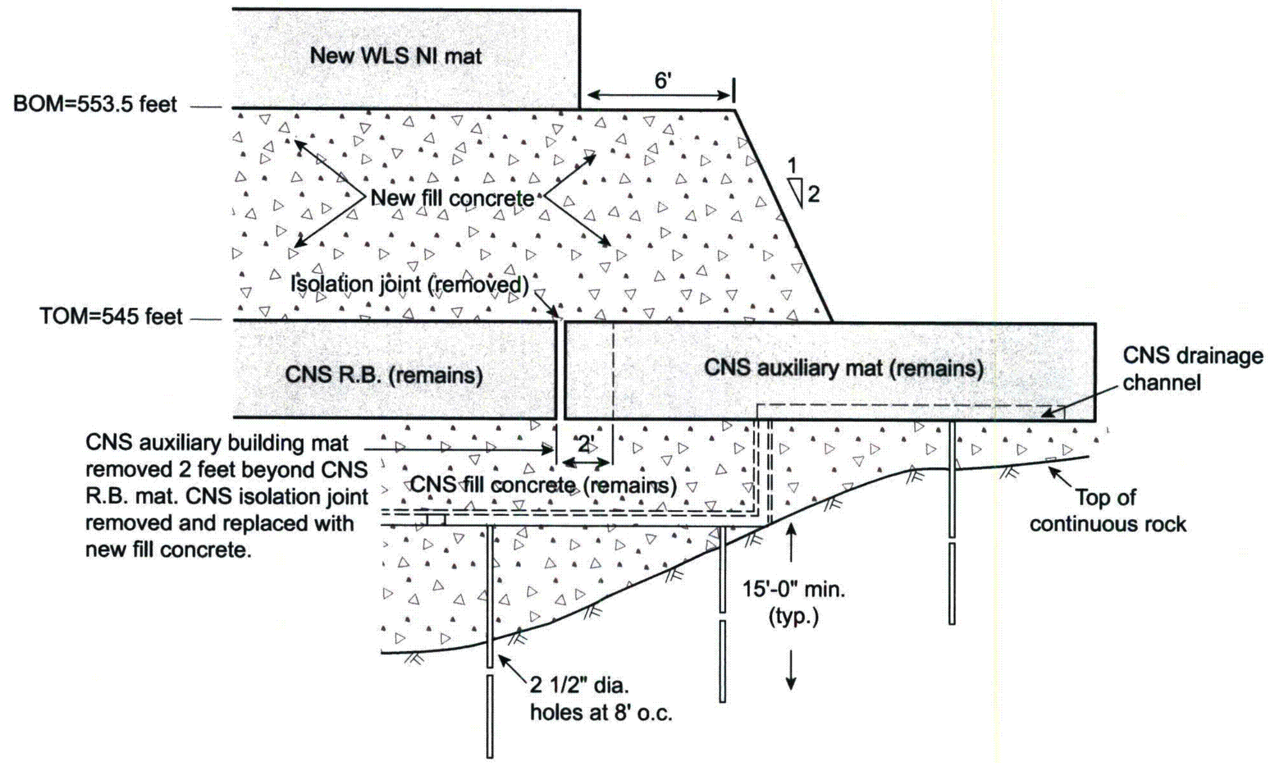
Note: The elevations for TOM shown for the CNS R.B. Mat and the CNS PSAR Auxiliary Builging Mat are from the CNS PSAR figure and may not precisely represent the As-Built elevations.

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

CNS Foundation with Drainage Channels at Bottom of Mat

FIGURE 2.5.4-244b

118. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-244c is revised as follows:



DETAIL 2

Detail not drawn to scale

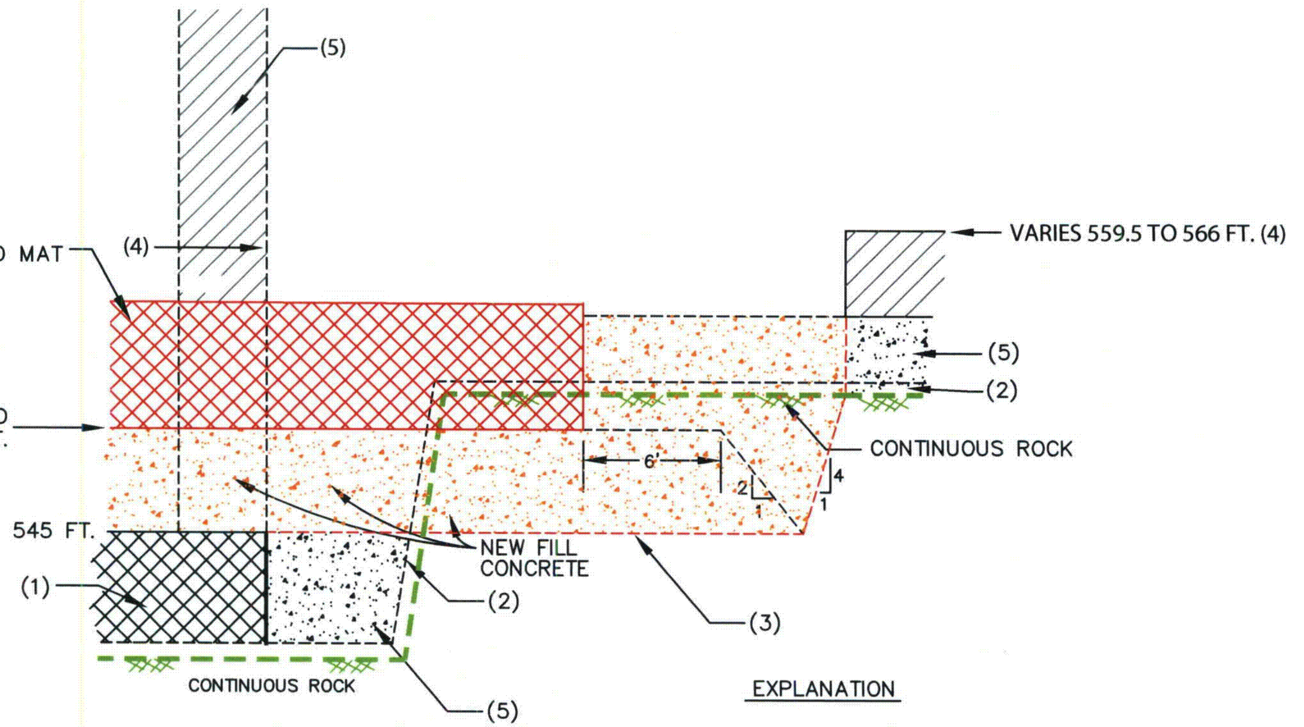
Note: TOM = Top of Mat Elevation
BOM = Bottom of Mat Elevation
CNS = Cherokee Nuclear Station

Reference: CNS PSAR Figure 2.4.13-1, "Reactor and Auxiliary Building Ground Water Control"

Note: The elevations for TOM shown for the CNS R.B. Mat and the CNS PSAR Auxiliary Builging Mat are from the CNS PSAR figure and may not precisely represent the As-Built elevations.

WILLIAM STATES LEE III NUCLEAR STATION UNITS 1 & 2
CNS Foundation with Drainage Channels within Fill Concrete
FIGURE 2.5.4-244c

119. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-244d is revised as follows:



DETAIL NOT DRAWN TO SCALE

NOTES:
TOM = TOP OF MAT ELEVATION
BOM = BOTTOM OF MAT ELEVATION
CNS = CHEROKEE NUCLEAR STATION

EXPLANATION

(1) CNS REACTOR BUILDING MAT.
(2) CNS FOUNDATION MAT DRAIN CHANNELS.
(3) CUT OUT THE CNS AUXILIARY BUILDING MAT, FILL CONCRETE, AND SOUND ROCK AND REPLACE WITH NEW FILL CONCRETE.
(4) CNS AUXILIARY BUILDING MAT REMOVED FOR NEW NUCLEAR ISLAND SUPPORT ZONE.
(5) CNS FILL CONCRETE.

DETAIL 3

REFERENCE: CNS PSAR FIGURE 2.4.13-1
"TYPICAL DETAIL FOR DRAIN HOLES" AND PLAN.

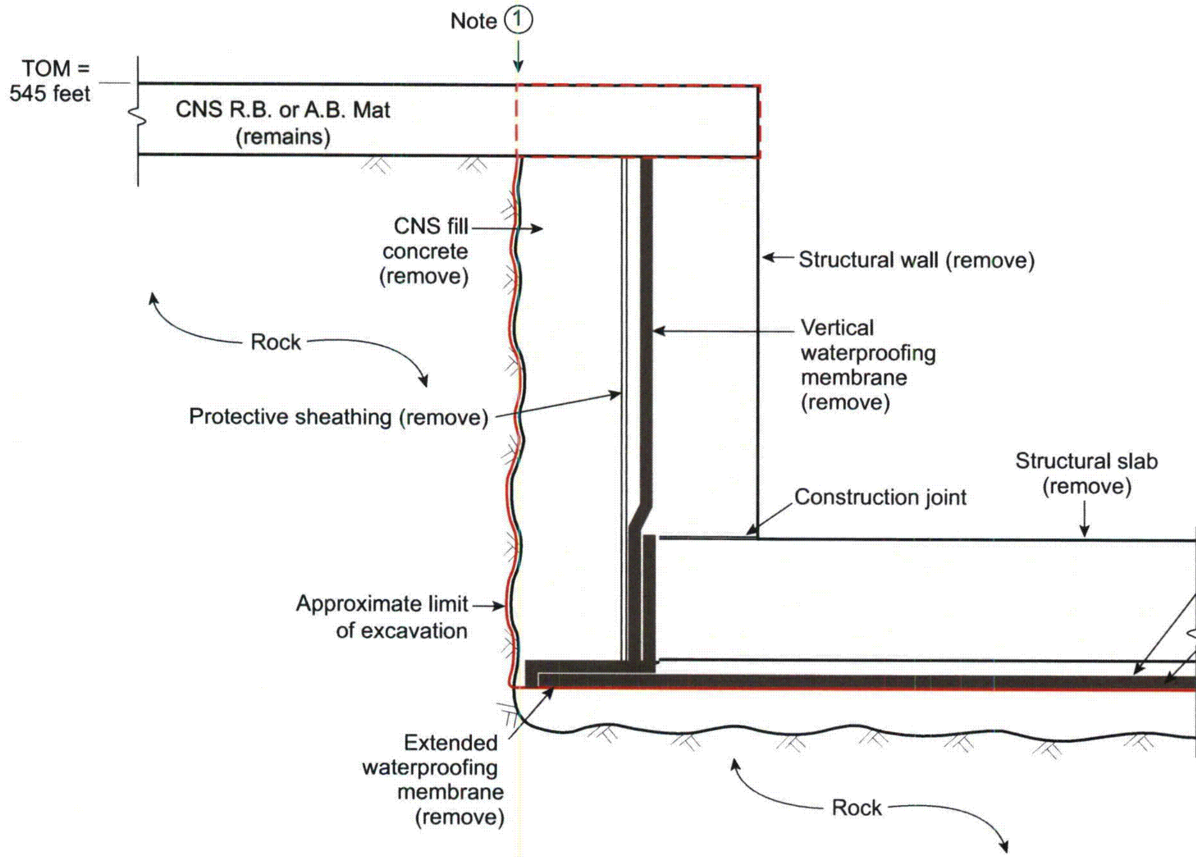
Note: The elevations for TOM shown for the CNS R.B. Mat and the CNS PSAR Auxiliary Builging Mat are from the CNS PSAR figure and may not precisely represent the As-Built elevations.

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Cherokee Nuclear Station
Foundation Drainage and Lee Nuclear
Station Nuclear Island-Detail 3

FIGURE 2.5.4-244d

120. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-244e is revised as follows:



Notes:
1. Remove CNS R.B. or A.B. basemat at elev. 545 following saw cut parallel to pit wall to expose fill concrete (having an estimated typical width 3 feet from back of structural wall) between wall and rock.
2. Remove structural wall, sheathing, vertical waterproofing membrane (including horizontal extension at base of fill concrete) and fill concrete between wall and rock.
3. Remove structural slab, 3½-inch-thick fill concrete mudmat, and horizontal waterproofing membrane.
4. Backfill pit with fill concrete to elev. 545. Thereafter, place fill concrete to support new WLS NI basemat foundation.
5. Opposite wall of pit not shown.

Typical Waterproofing Detail

Explanation

 Limit of excavation, dashed where approximate

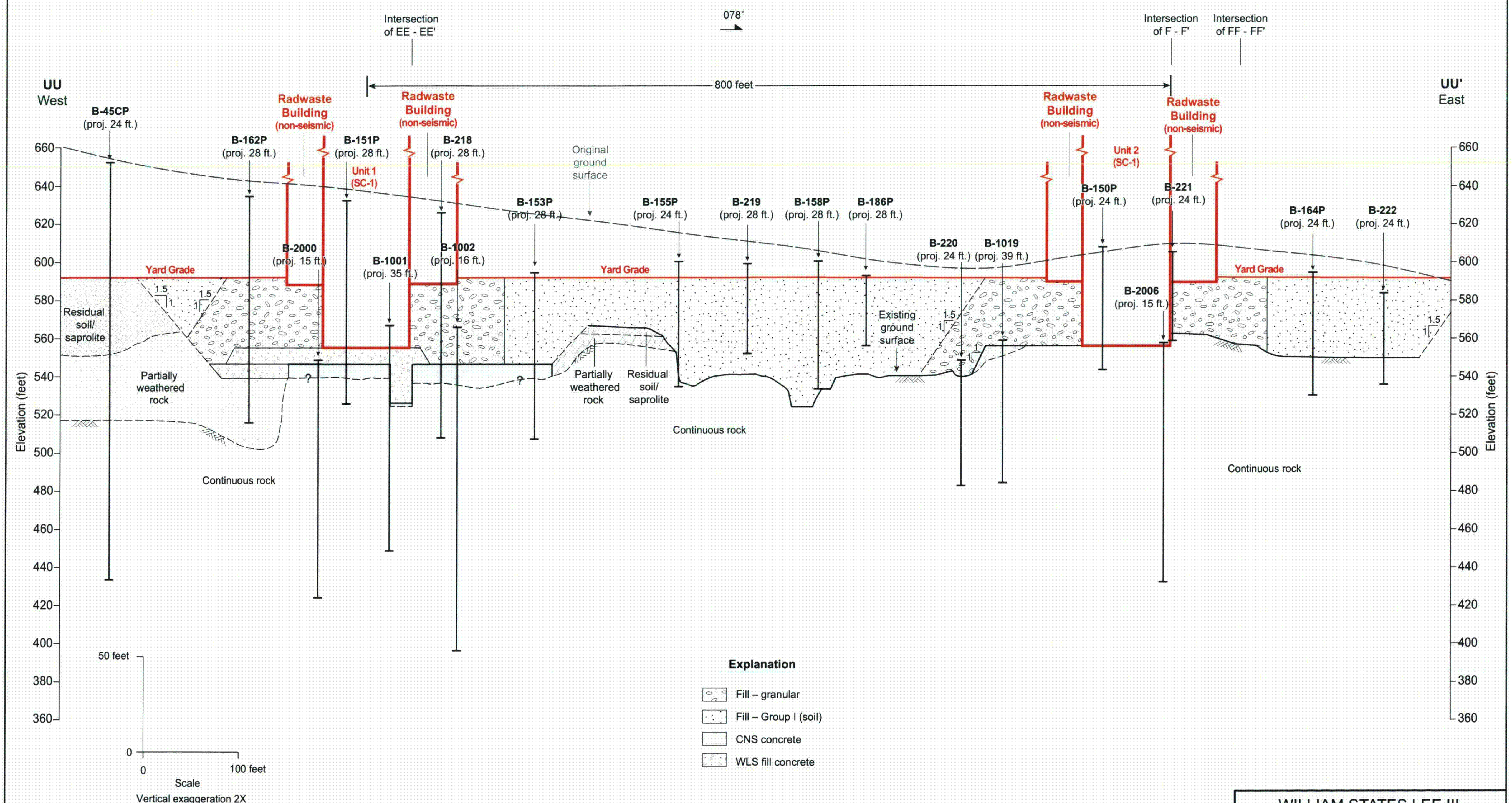
WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

CNS Foundation with Waterproofing Membrane in Local Pit – Detail 4

FIGURE 2.5.4-244e

121. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-245 is revised as follows:



WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

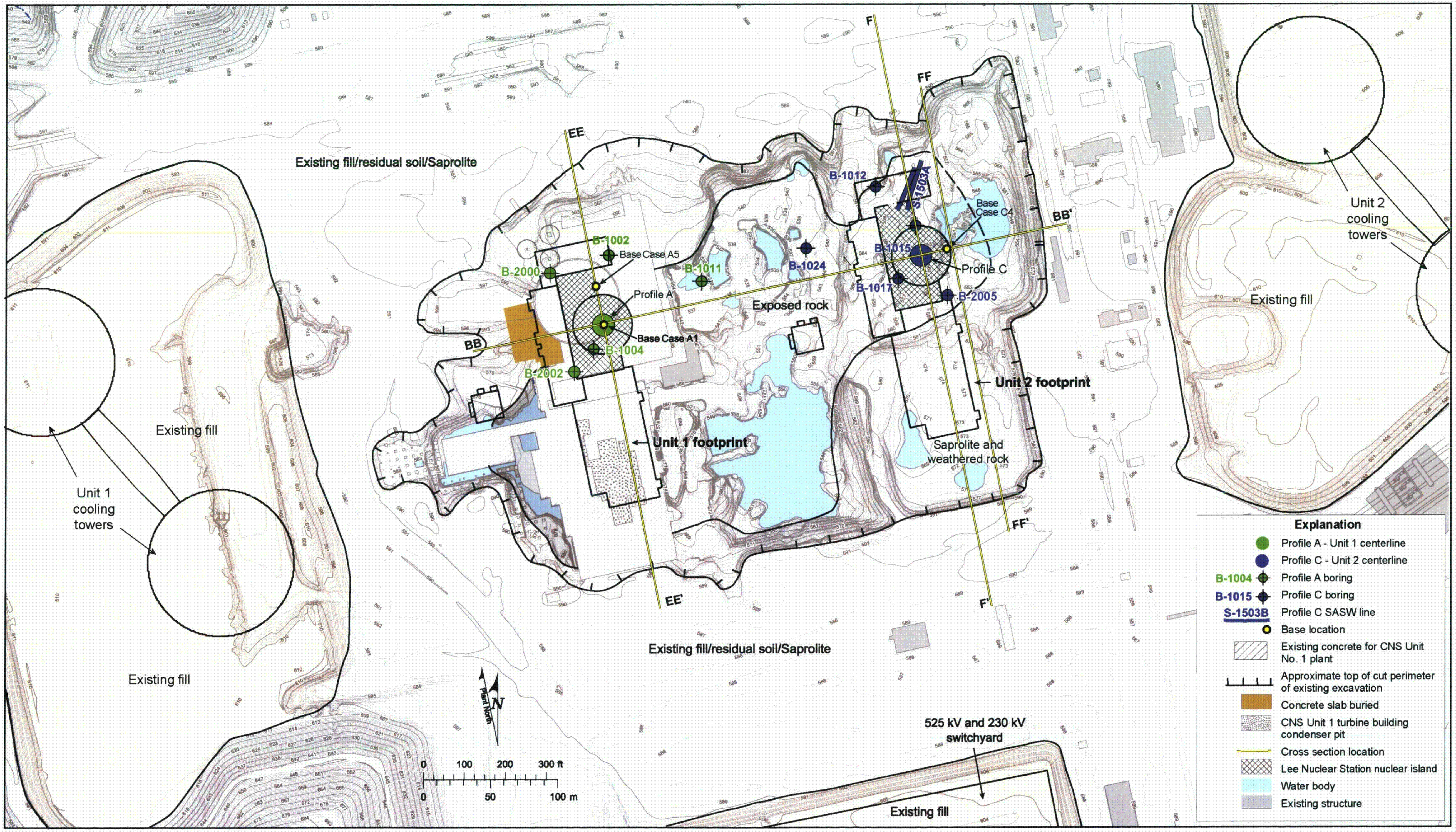
Planned Excavation Profile, Geologic Cross Section UU-UU'
FIGURE 2.5.4-245

122. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-246 is removed as follows:

Figure 2.5.4-246

Deleted

123. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-247 is revised as follows:



Sources: 1. Site topography and structure - Sanborn 2006
Shaw, Stone & Webster, September, 2007
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13.
Title: Lee Nuclear Station Units 1 & 2 Site Plan.

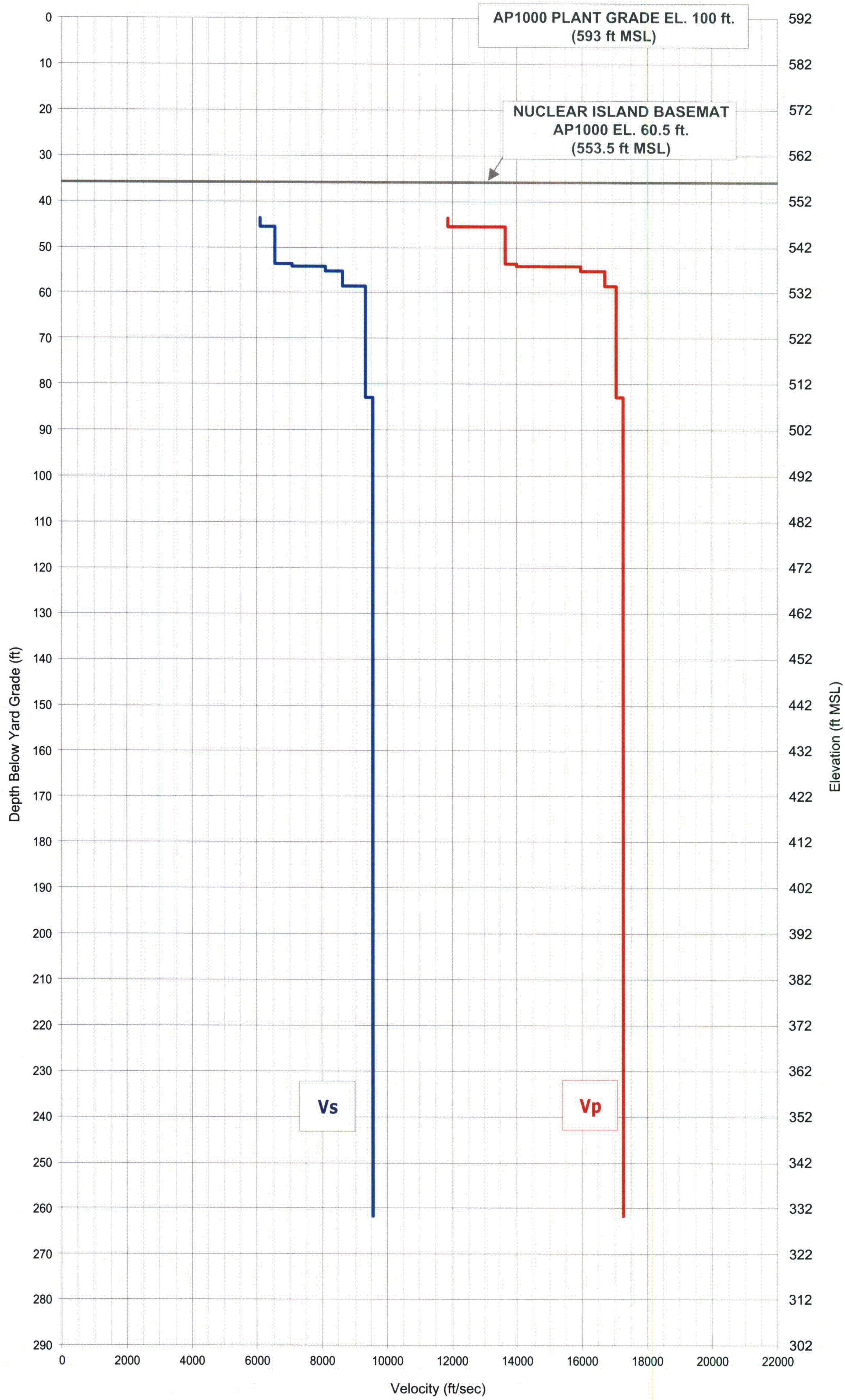
WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Locations of Dynamic Velocity Profiles, Associated Data Sources, and Cross Section Locations

FIGURE 2.5.4-247

124. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-248 is revised as follows:



Note: Plot truncated at elevation 330 feet MSL.

WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Smoothed Velocity Profile A

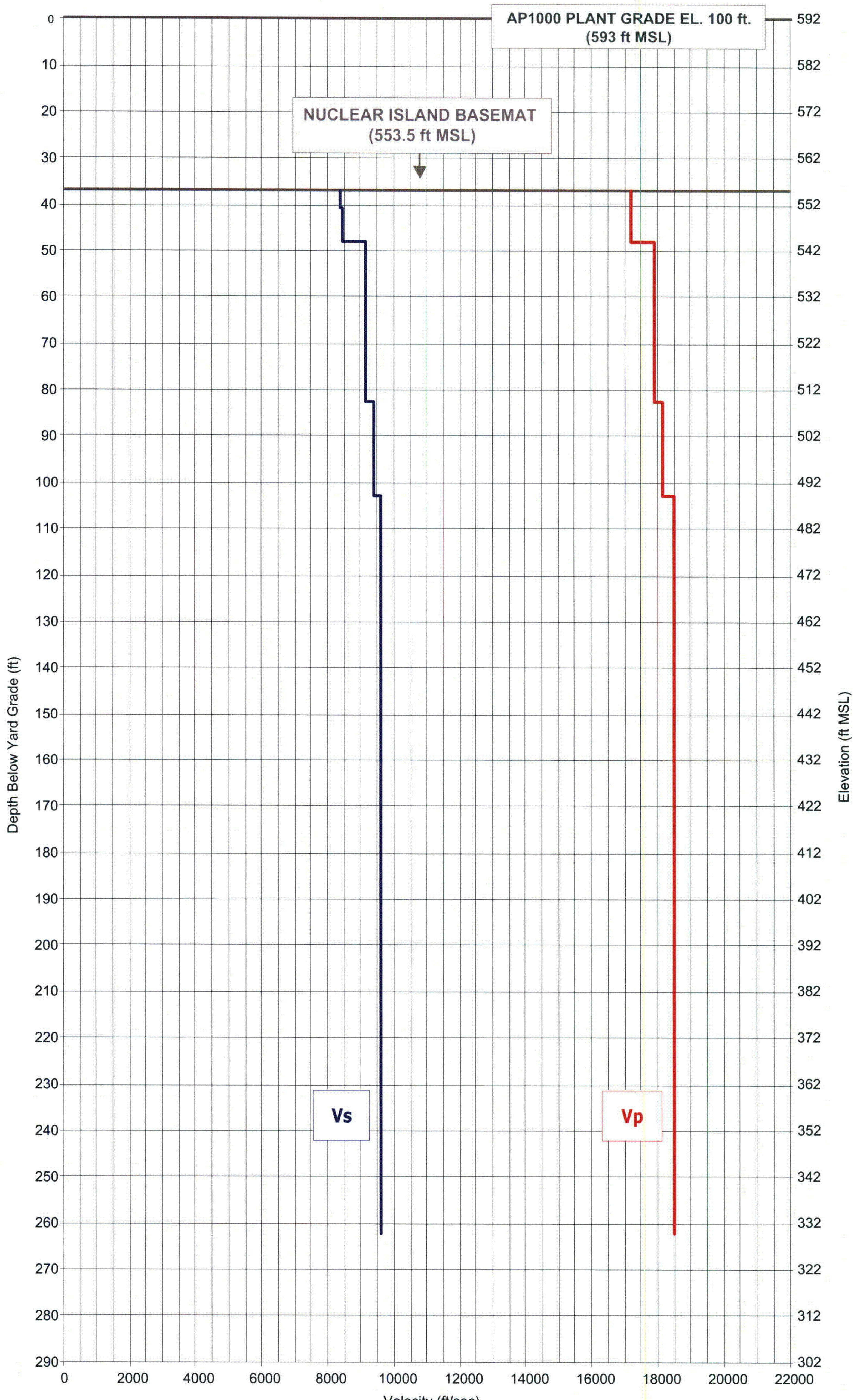
FIGURE 2.5.4-248

125. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-249 is removed as follows:

Figure 2.5.4-249

Deleted

126. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-250 is revised as follows:



Note: Plot truncated at elevation 330 feet MSL.

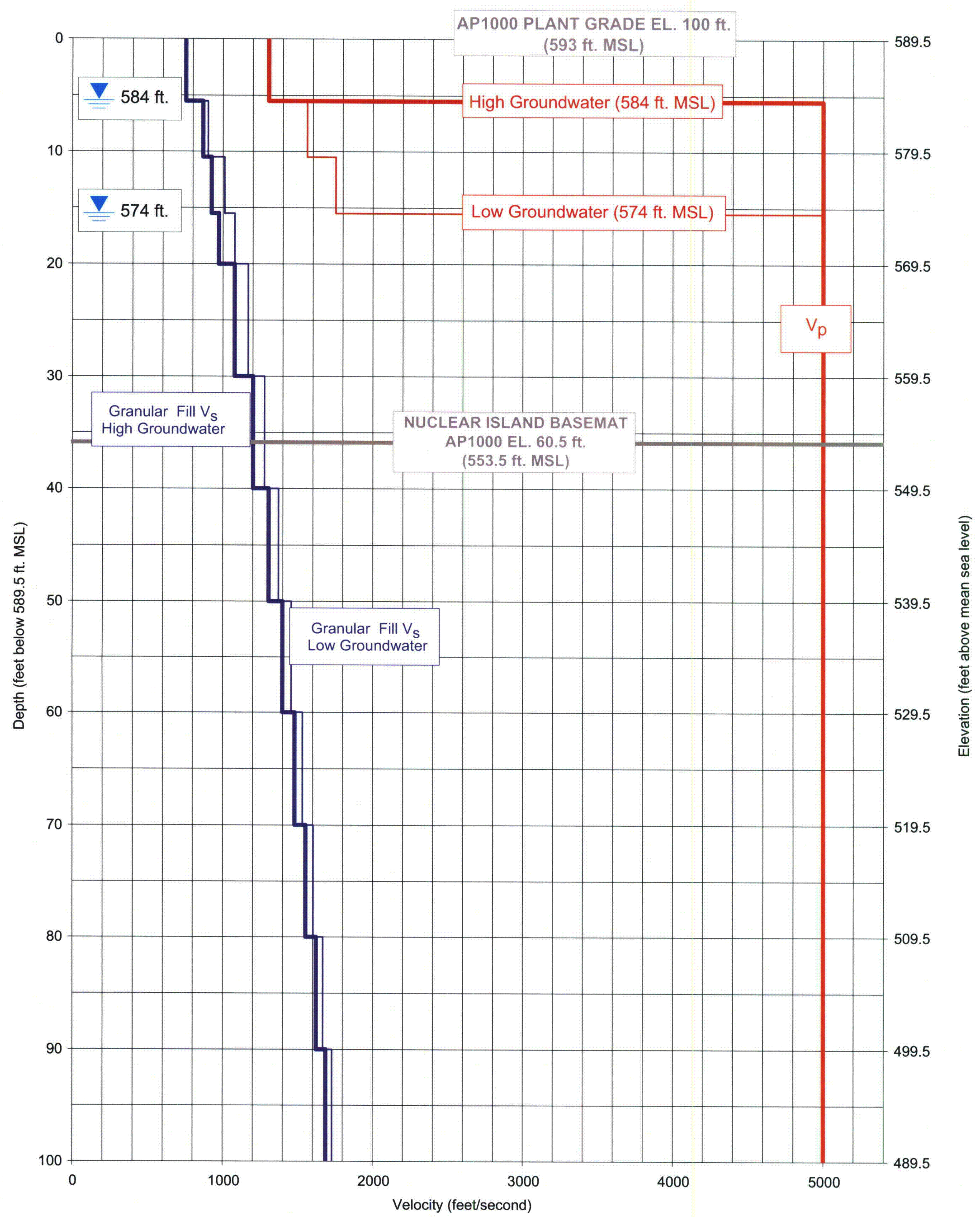
WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Smoothed Velocity Profile C

FIGURE 2.5.4-250

127. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-251a is revised as follows:

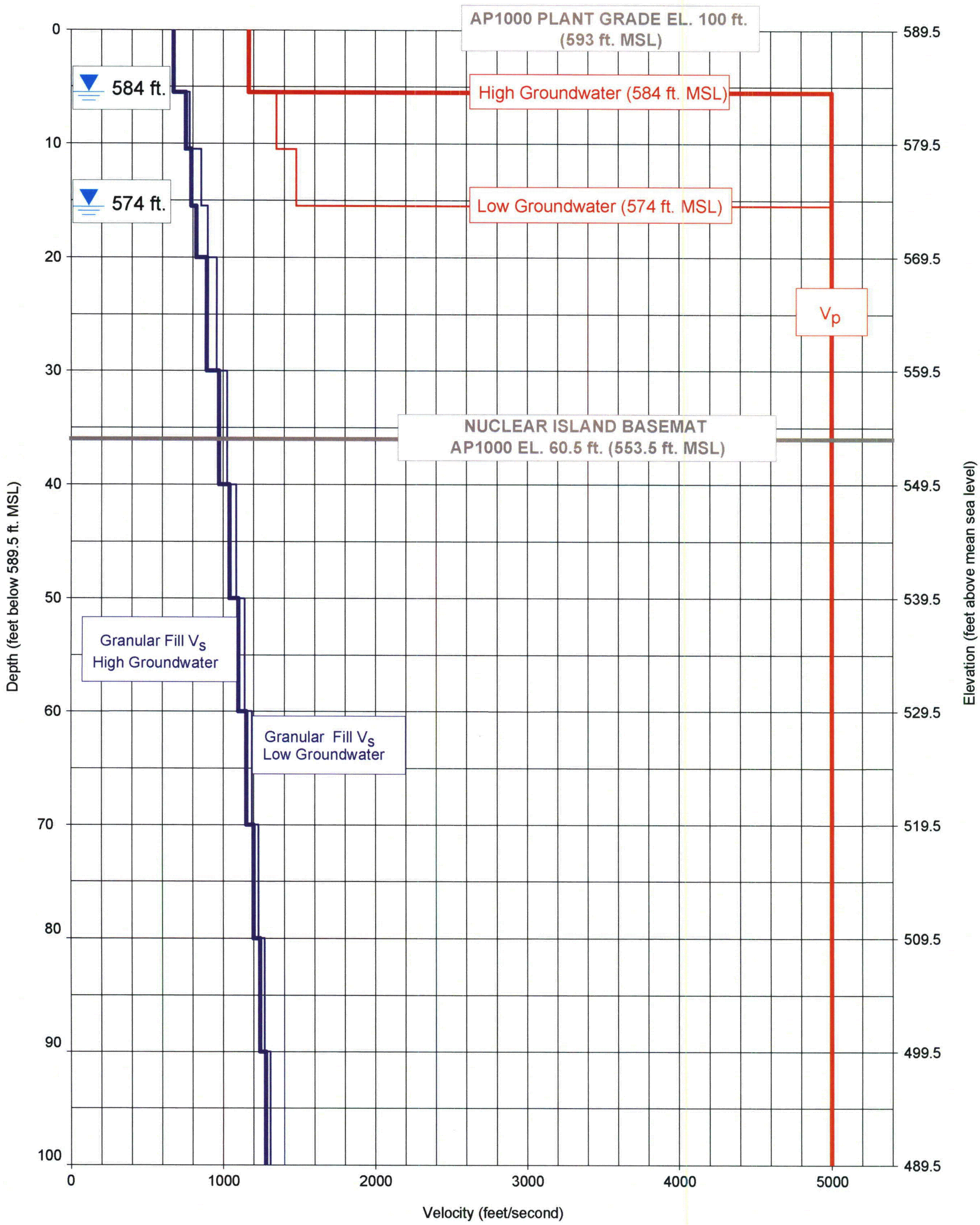


WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Best Estimate Layer Velocity
Profile G, Generic Engineered
Granular Fill Profile – GW
FIGURE 2.5.4-251a

128. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-251b is revised as follows:



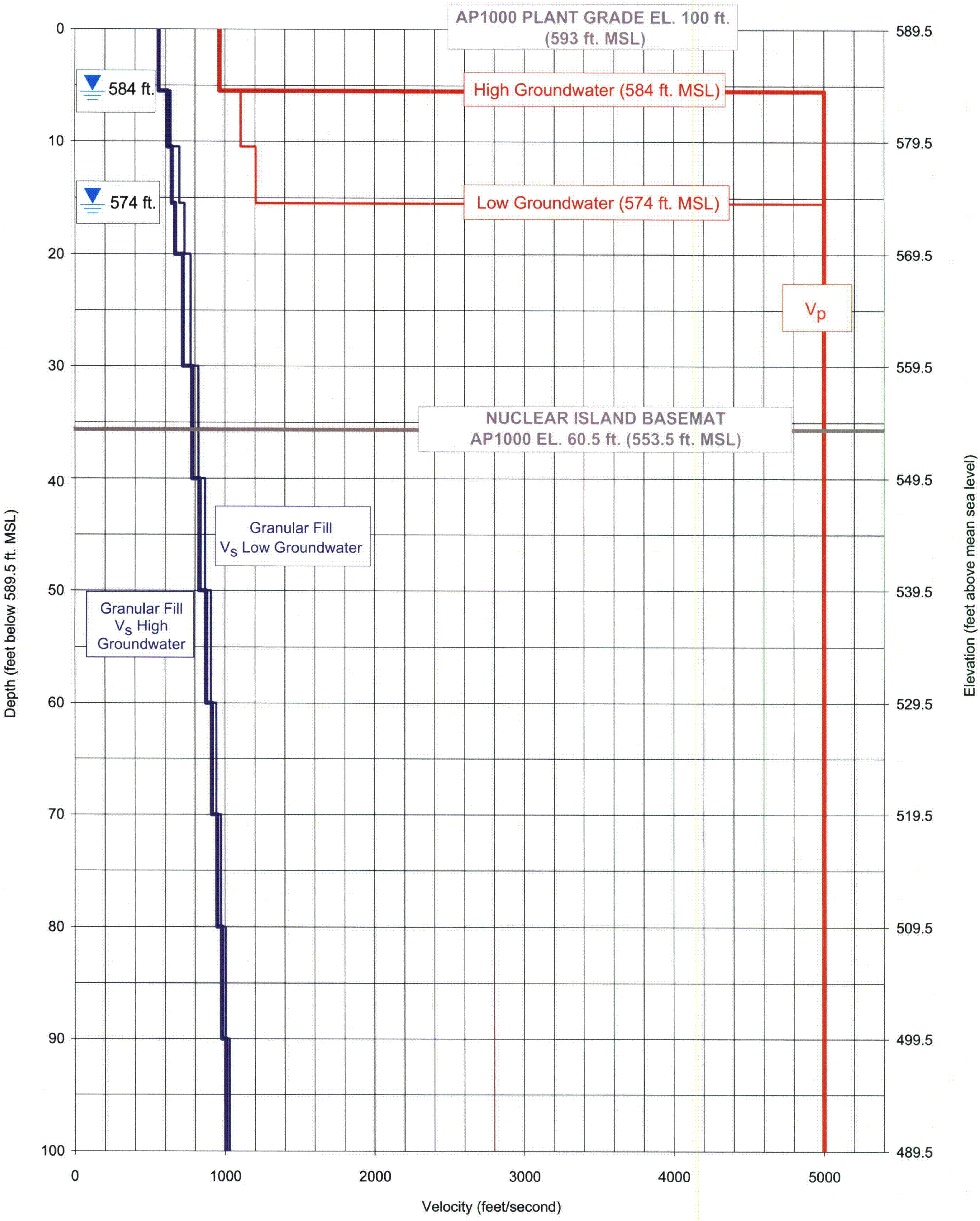
WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Best Estimate Layer Velocity Profile G, Generic Engineered Granular Fill Profile – GP

FIGURE 2.5.4-251b

129. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-251c is revised as follows:



WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

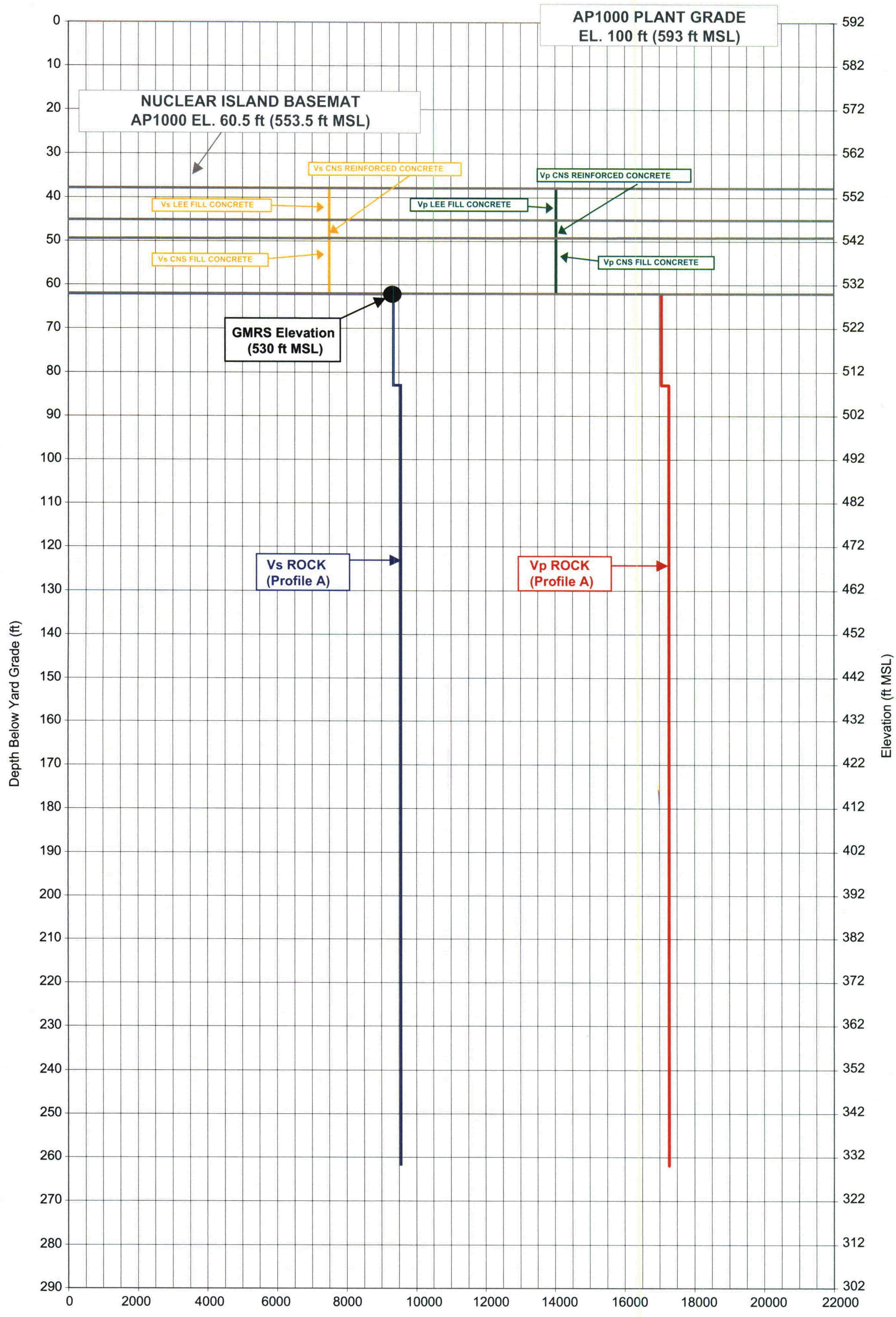
Best Estimate Layer Velocity
Profile G, Generic Engineered
Granular Fill Profile – SW
FIGURE 2.5.4-251c

130. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-252 is deleted and presented as Figure 2.5.2-252a as follows:

Figure 2.5.4-252

Deleted

131. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-252a is revised as follows:



Note: Plot truncated at elevation 330 feet MSL.

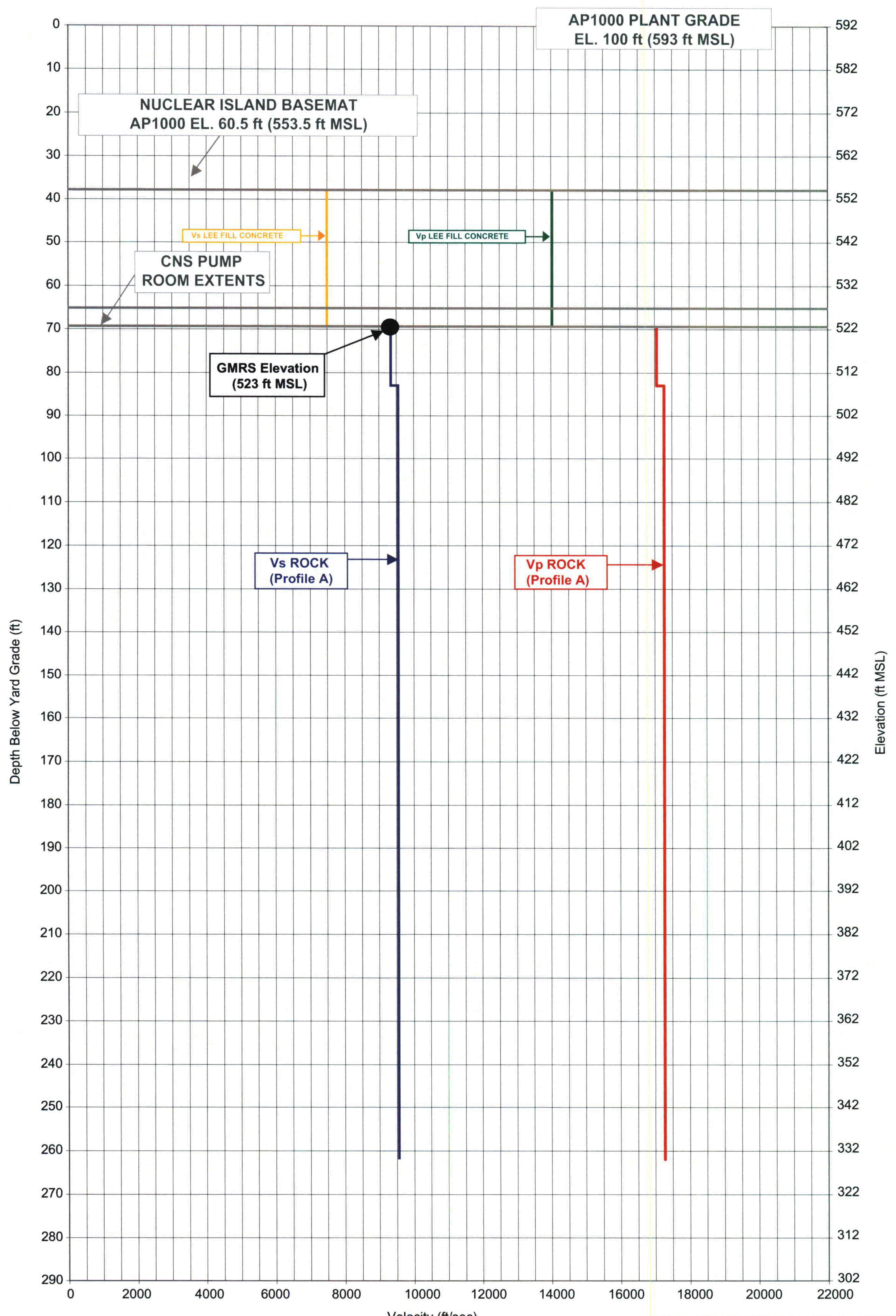
WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Dynamic Profile - Base Case A1

FIGURE 2.5.4-252a

132. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-252b is revised as follows:



Note: Plot truncated at elevation 330 feet MSL.

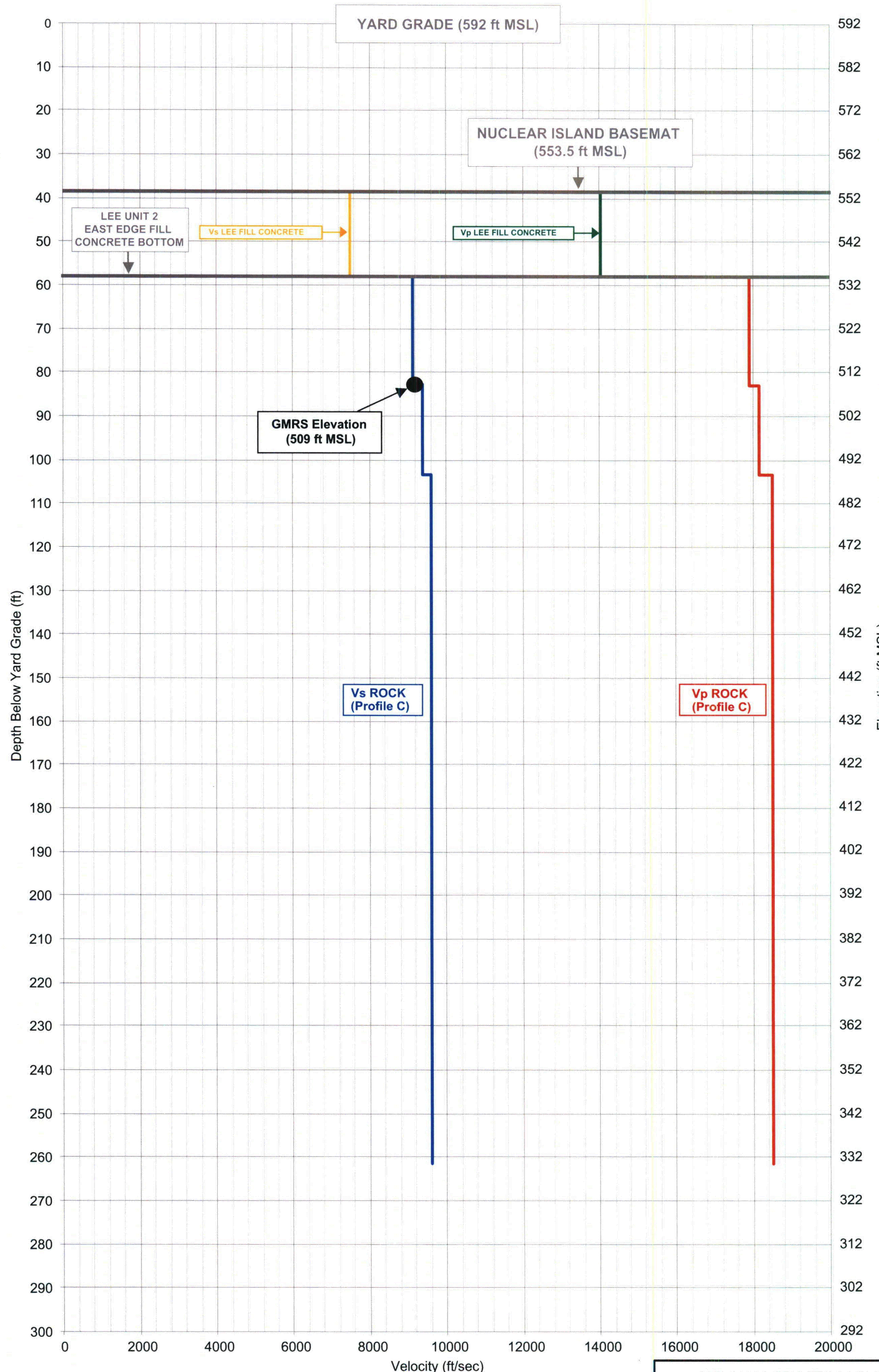
WLS COL 2.5-6

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Dynamic Profile - Base Case A5

FIGURE 2.5.4-252b

133. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-252c is revised as follows:



Note: Plot truncated at elevation 330 feet MSL.

WLS COL 2.5-6

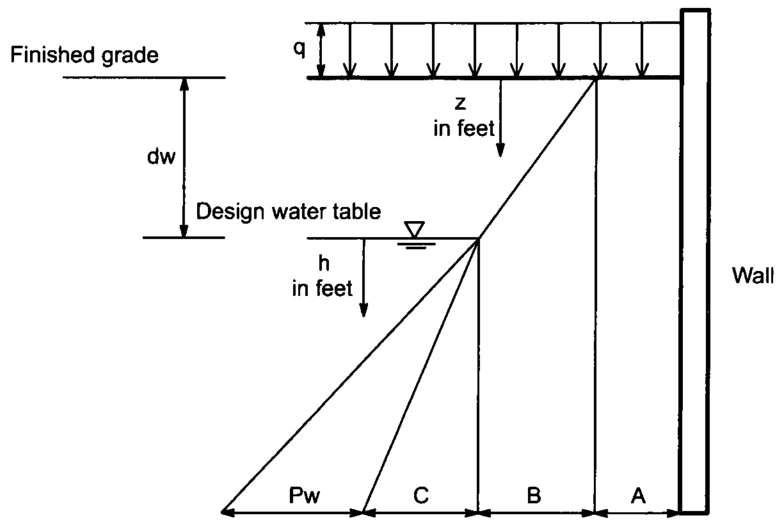
WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Dynamic Profile - Base Case C4

FIGURE 2.5.4-252c

134. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-255a is revised as follows:

Active Earth Pressure on 1-ft Wide Vertical Strip



$A = K_a$ (q) = Effect of uniform full coverage surface surcharge
$B = K_a \gamma_s$ (z) = Active earth pressure above water table
$C = K_a \gamma'$ (h) = Active earth pressure increment below water table
Pw = 62.4 (h) = Hydrostatic pressure increment
H = A + B = Static lateral earth pressure above water table (z < dw)
$H = A + K_a \gamma_s (dw) + K_a \gamma' (z - dw)$ = Static lateral earth pressure below water table (z > dw) (Pw not included)

Conditions on information:

- Units of pressure, psf
- Backfill of granular material compacted to 96% maximum dry density by ASTM D1557
- γ_s = saturated unit weight of granular backfill above water table, pcf
- γ' = submerged unit weight of granular backfill, pcf
- φ = 35 degrees = angle of internal friction of soil
- $K_a = \tan^2(45 - \varphi/2)$ = Active earth pressure coefficient of soil
- Plane strain conditions (corner adjustment factors not included)
- Dynamic soil pressure not included
- Compaction-induced residual pressure not included

USCS Type	γ_s	γ'	K_a
GW	150	87.6	0.271
GP	142	79.6	0.271
SW	136	73.6	0.271

WLS COL 2.5-13

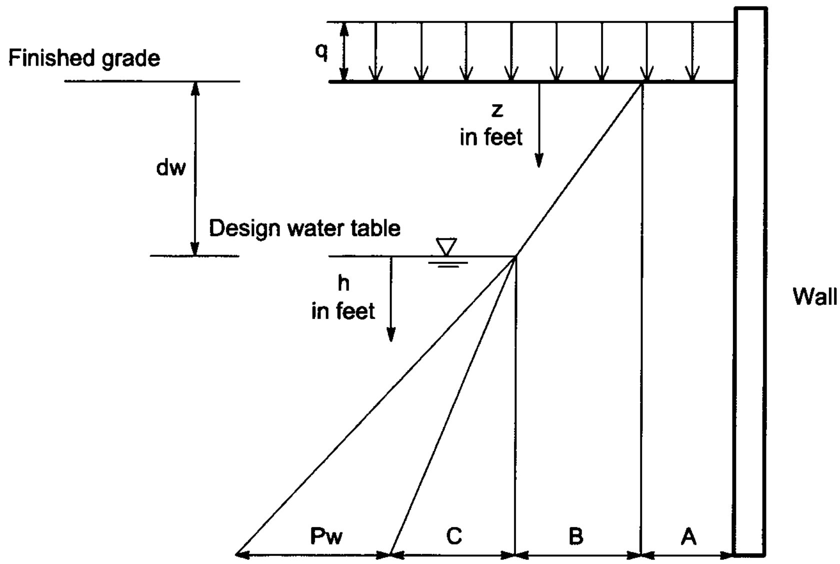
WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Static Lateral Active
Pressures on Nuclear Island

FIGURE 2.5.4-255a

135. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-255b is revised as follows:

At-Rest Earth Pressure on 1-ft Wide Vertical Strip



$A = K_o(q)$ = Effect of uniform full coverage surface surcharge
$B = K_o\gamma_s(z)$ = Earth pressure at-rest above water table
$C = K_o\gamma'(h)$ = Earth pressure at-rest increment below water table
$Pw = 62.4(h)$ = Hydrostatic pressure increment
$H = A + B$ = Static lateral earth pressure above water table ($z < dw$)
$H = A + K_o\gamma_s(dw) + K_o\gamma'(z - dw)$ = Static lateral earth pressure below water table ($z > dw$) (Pw not included)

Conditions on information:

- Units of pressure, psf
- Backfill of granular material compacted to 96% maximum dry density by ASTM D1557
- γ_s = saturated unit weight of granular backfill above water table, pcf
- γ' = submerged unit weight of granular backfill, pcf
- ϕ = 35 degrees = angle of internal friction of soil
- $K_o = 1 - \sin(\phi)$ = at-rest earth pressure coefficient of soil
- Plane strain conditions (corner adjustment factors not included)
- Dynamic soil pressure not included
- Compaction-induced residual pressure not included

USCS Type	γ_s	γ'	K_o
GW	150	87.6	0.426
GP	142	79.6	0.426
SW	136	73.6	0.426

WLS COL 2.5-13

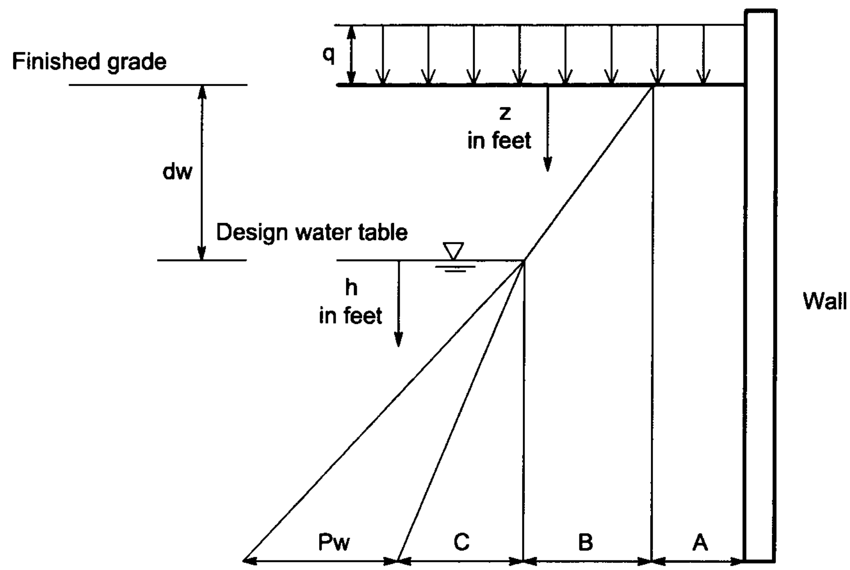
WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Static Lateral At-Rest
Pressures on Nuclear Island

FIGURE 2.5.4-255b

136. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-255c is revised as follows:

Passive Earth Pressure on 1-ft Wide Vertical Strip



$A = K_p (q)$ = Effect of uniform full coverage surface surcharge
$B = K_p\gamma_s (z)$ = Passive earth pressure above water table
$C = K_p\gamma' (h)$ = Passive earth pressure increment below water table
$Pw = 62.4 (h)$ = Hydrostatic pressure increment
$H = A + B$ = Static lateral earth pressure above water table ($z < dw$)
$H = A + K_p\gamma_s (dw) + K_p\gamma' (z - dw)$ = Static lateral earth pressure below water table ($z > dw$) (Pw not included)

Conditions on information:

- Units of pressure, psf
- Backfill of granular material compacted to 96% maximum dry density by ASTM D1557
- γ_s = saturated unit weight of granular backfill above water table, pcf
- γ' = submerged unit weight of granular backfill, pcf
- ϕ = 35 degrees = angle of internal friction of soil
- $K_p = \tan^2 (45 + \phi/2)$ = passive earth pressure coefficient of soil
- Plane strain conditions (corner adjustment factors not included)
- Dynamic soil pressure not included
- Compaction-induced residual pressure not included

USCS Type	γ_s	γ'	K_p
GW	150	87.6	3.690
GP	142	79.6	3.690
SW	136	73.6	3.690

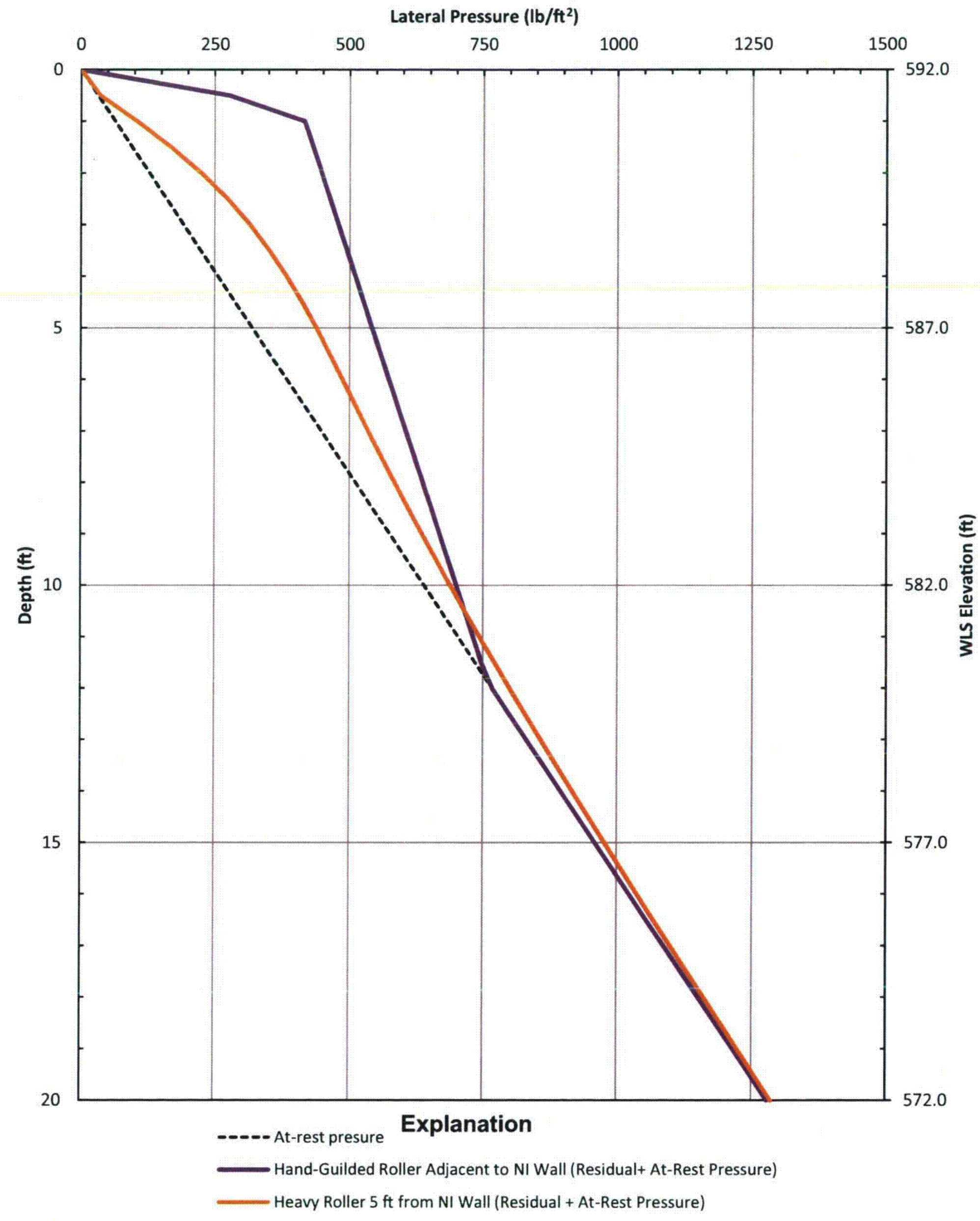
WLS COL 2.5-13

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Passive Lateral Pressure on Nuclear Island

FIGURE 2.5.4-255c

137. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-256a is revised as follows:



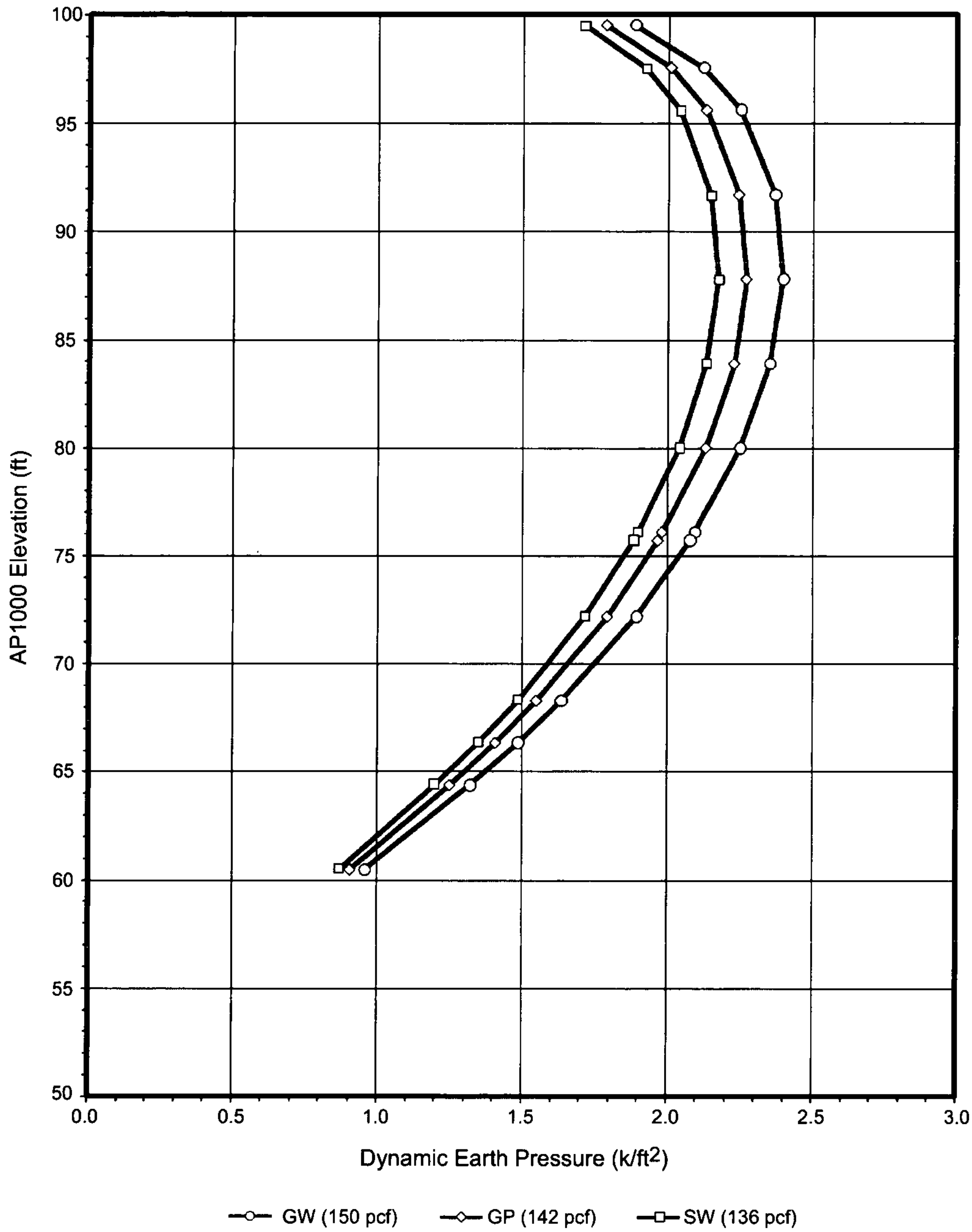
WLS COL 2.5-13

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Compaction-Induced Earth Pressures on Nuclear Island

FIGURE 2.5.4-256a

138. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-256b is revised as follows:



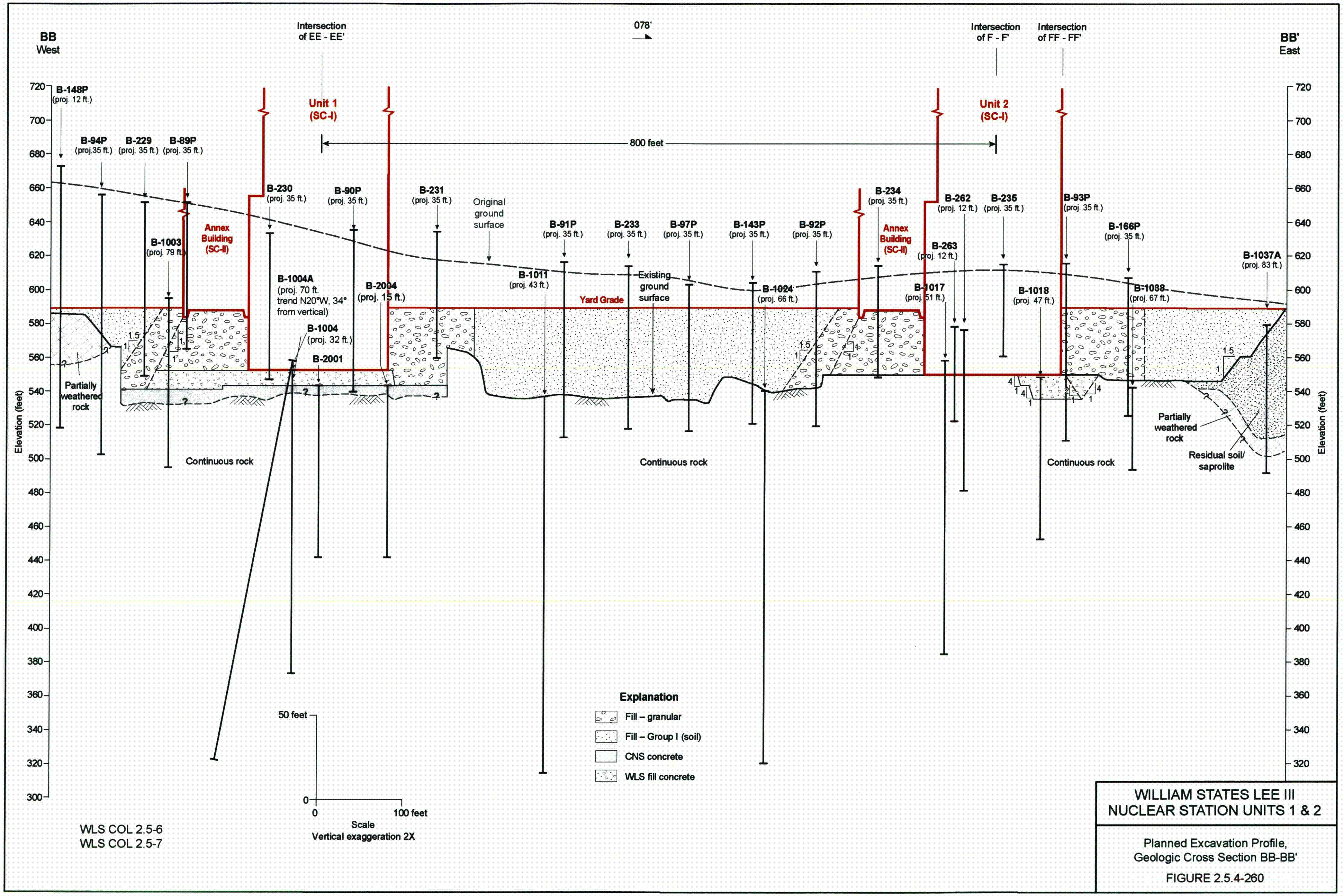
WLS COL 2.5-13

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Dynamic Earth Pressures
on Nuclear Island

FIGURE 2.5.4-256b

139. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-260 is revised as follows:

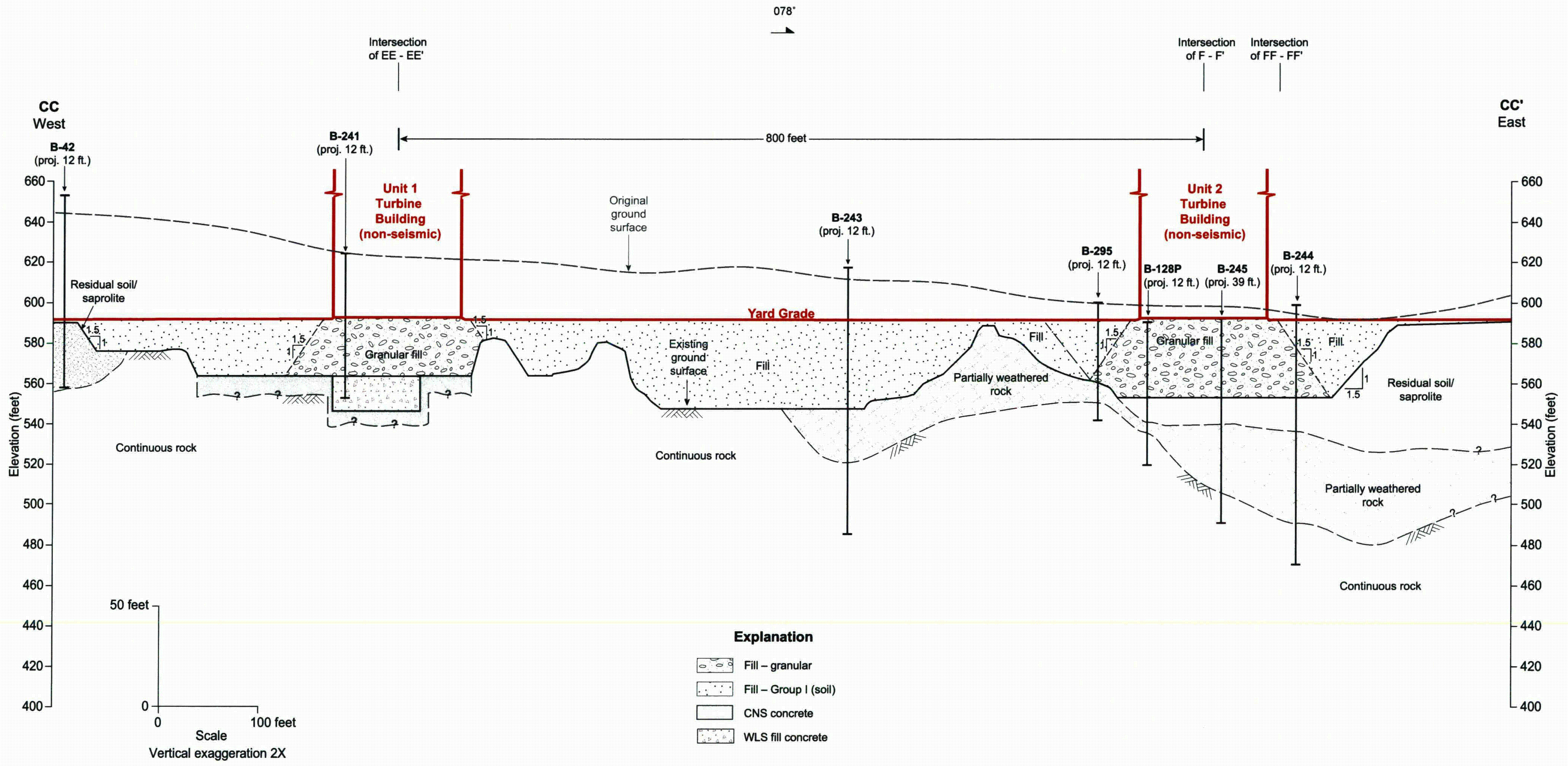


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile,
Geologic Cross Section BB-BB'

FIGURE 2.5.4-260

140. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-261 is revised as follows:



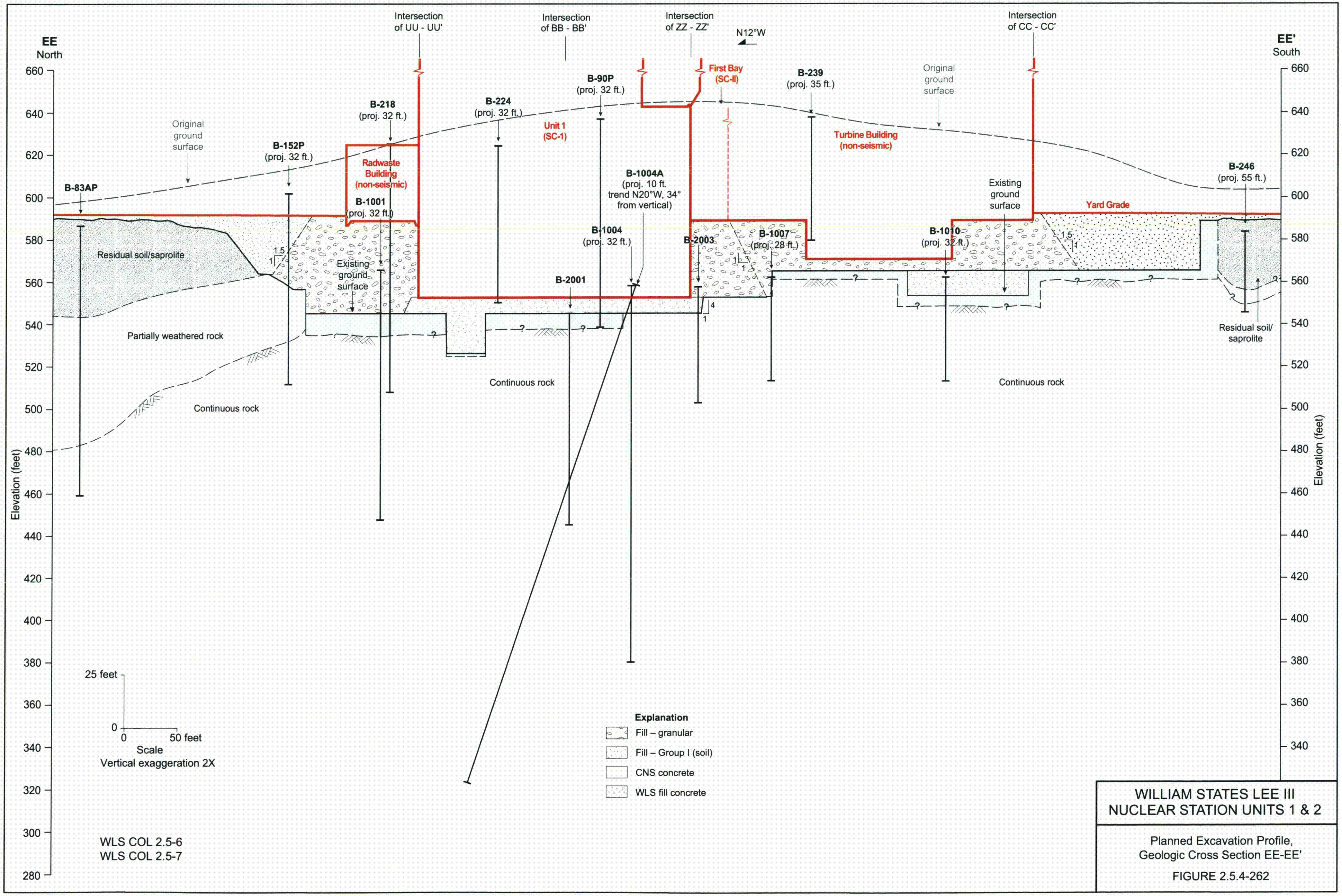
WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile
Geologic Cross Section CC-CC'

FIGURE 2.5.4-261

141. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-262 is revised as follows:

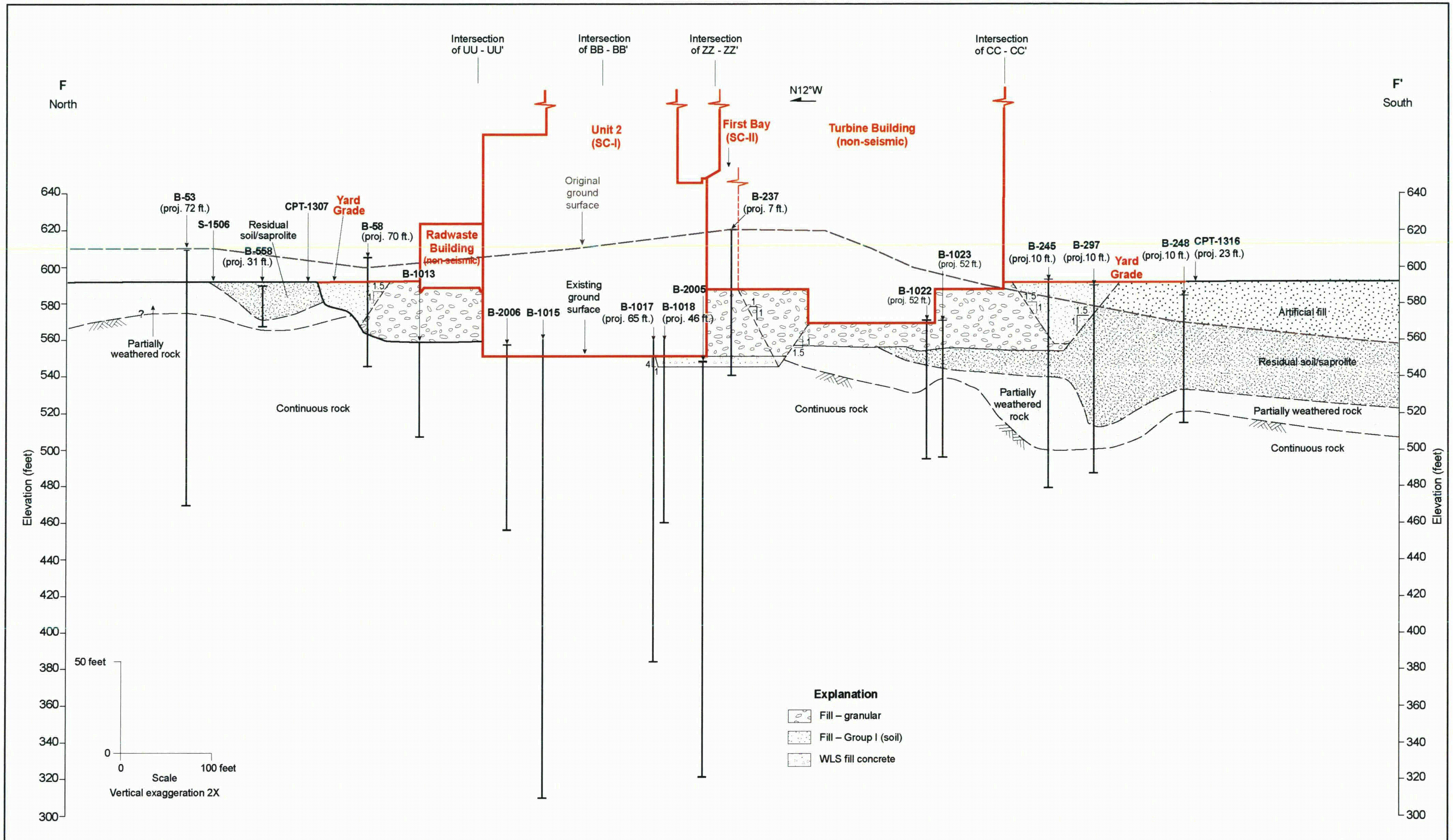


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile,
Geologic Cross Section EE-EE'

FIGURE 2.5.4-262

142. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-263 is revised as follows:

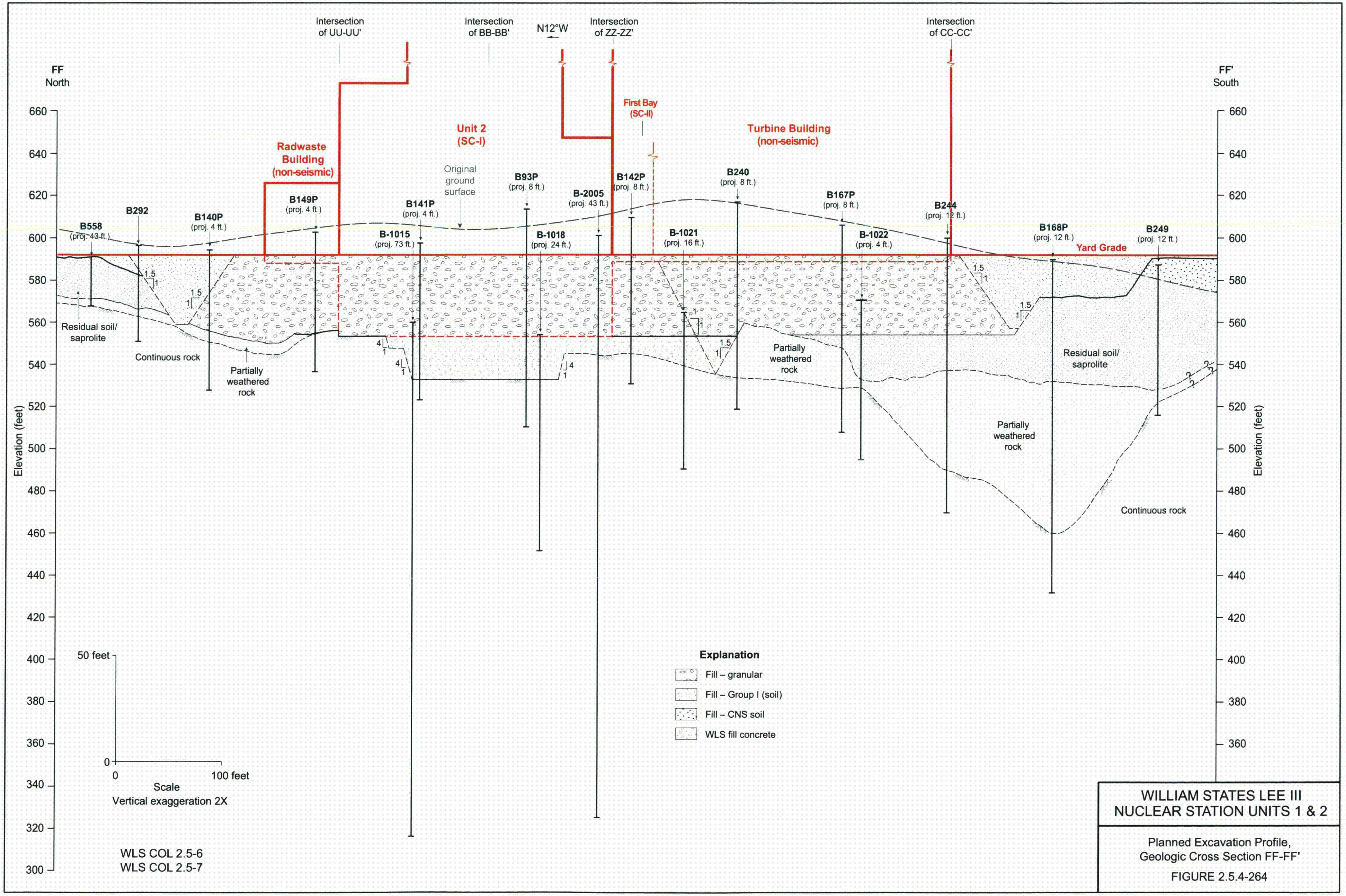


WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile
Geologic Cross Section F-F'
FIGURE 2.5.4-263

143. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-264 is revised as follows:

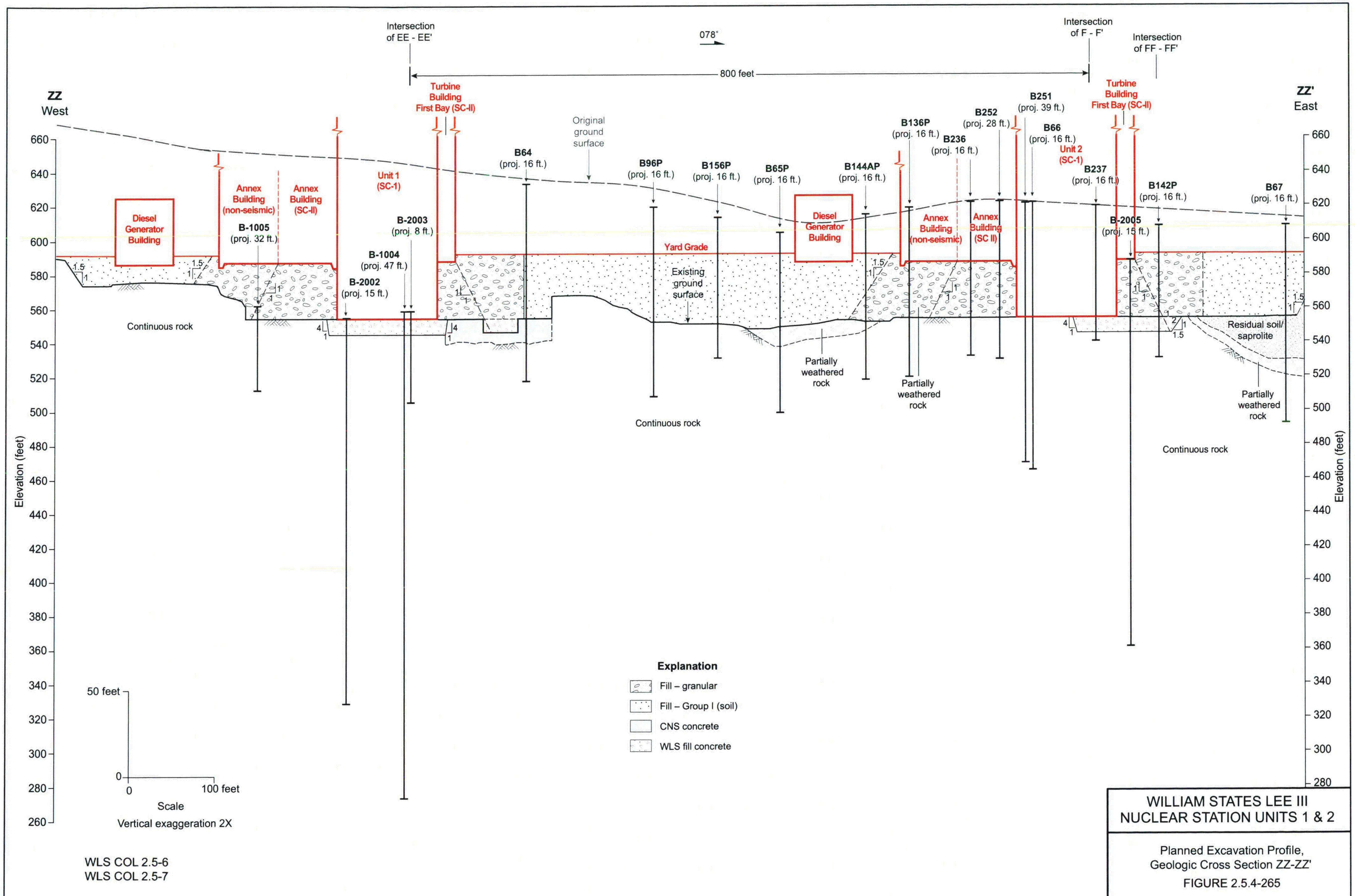


WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile,
Geologic Cross Section FF-FF'

FIGURE 2.5.4-264

144. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-265 is revised as follows:

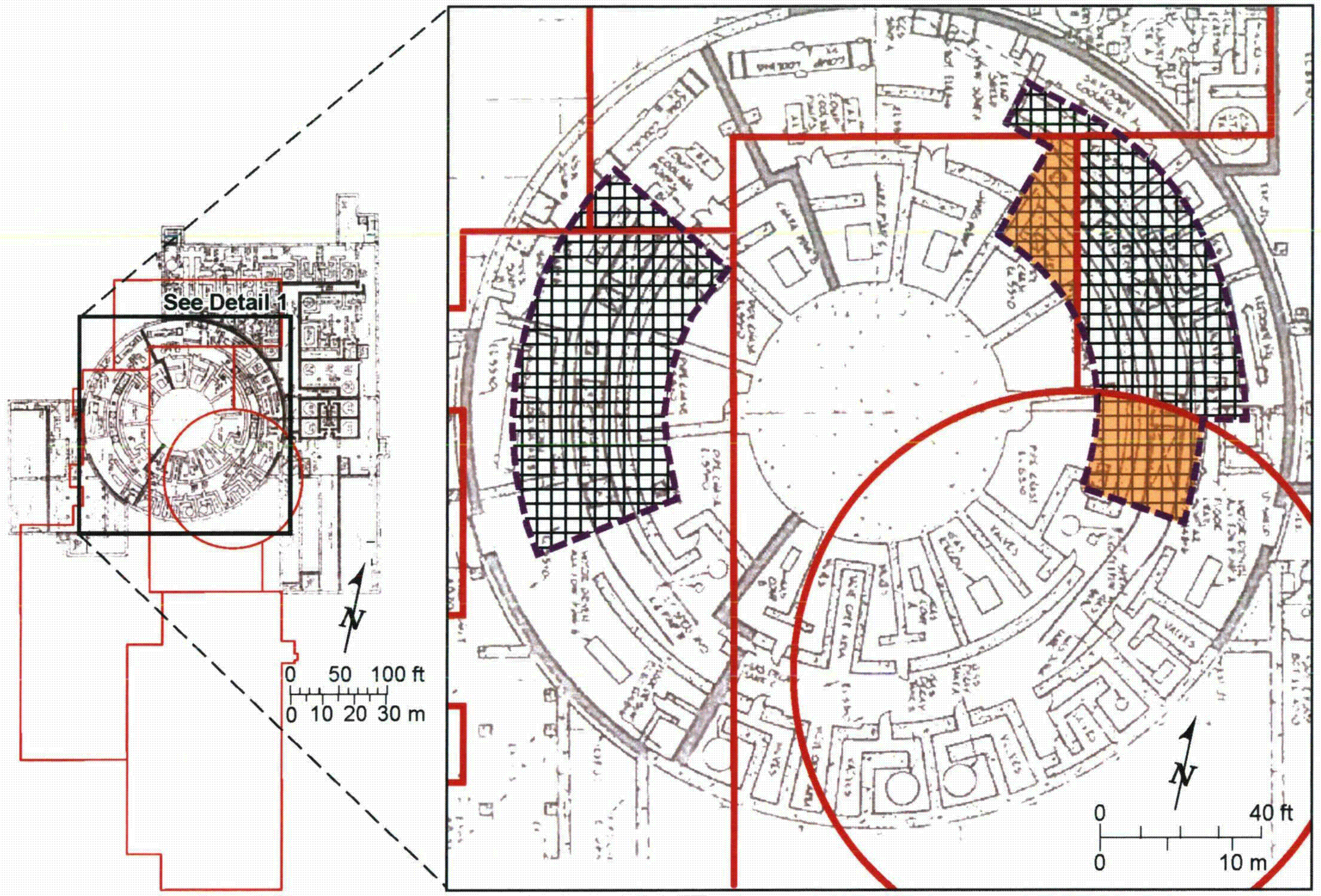


WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Planned Excavation Profile,
Geologic Cross Section ZZ-ZZ'
FIGURE 2.5.4-265

145. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-266 is added as follows:



Detail 1

Explanation

- CNS pump room floor
- WLS Unit 1 AP1000 power block footprint
- Area of WLS Unit 1 Nuclear Island underlain by CNS pump room
- Area of CNS pump room (elevation 37 + 0, 527 ft MSL)

Sources: 1. PSAR Figure 2.4.13-1, Reactor and Auxiliary Buildings, Ground Water Control, Cherokee Nuclear Station, Duke Power Company, 1974.
2. Shaw, Stone & Webster, Inc. Drawing WLG-0000-X2-800005, Revision H, 2/11/13. Title: Lee Nuclear Station Units 1 & 2 Site Plan.

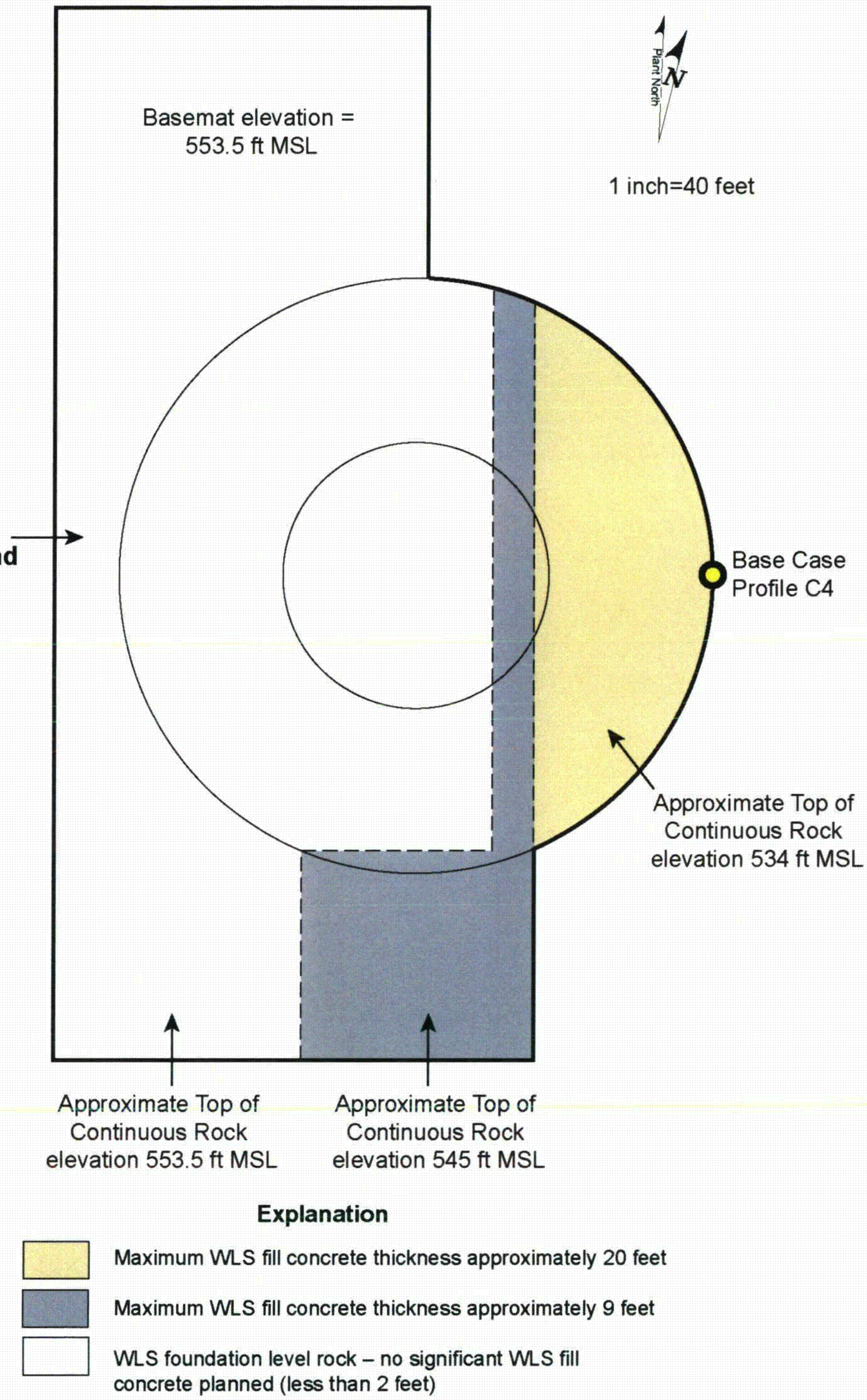
WLS COL 2.5-6
WLS COL 2.5-7

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Cherokee Basemat
and Lower Room Details

FIGURE 2.5.4-266

146. COLA Part 2, FSAR Chapter 2, Figure 2.5.4-267 is added as follows:



Note: See Figures 2.5.4-260, 2.5.4-263, 2.5.4-264, and 2.5.4-265 for WLS fill concrete slope and bench plans.

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Fill Concrete Configuration along East Side of WLS Unit 2

FIGURE 2.5.4-267

Attachment 4

Revisions to FSAR Chapter 2, Subsection 2.5.5

Subsection 2.5.5

Table 2.5.5-201

Figure 2.5.5-201

1. COLA Part 2, FSAR Chapter 2, Subsection 2.5.5, third paragraph is revised as follows:

WLS COL 2.5-14 The plants are centrally sited within a backfilled excavation forming a broad, relatively level yard grade at approximate elevation ~~589~~ 592 feet for a distance of approximately ~~300~~ 1000 feet from the ~~perimeter of the excavation~~nuclear island. No natural or manmade slopes exist in proximity to the safety related nuclear island structures that pose a potential slope stability hazard to the safe operation of the plant. Additionally, no natural descending slopes, such as river banks or ridge slopes, exist around the perimeter of the Lee Nuclear Station plant yard area that pose a potential encroachment or undermining hazard. Site investigations, subsurface geotechnical characterizations, and excavation and backfill profiles used for the slope stability evaluation are presented in Subsections 2.5.4.1, 2.5.4.2, 2.5.4.3, and 2.5.4.5.

2. COLA Part 2, FSAR Chapter 2, Subsection 2.5.5.1.1, first paragraph, last sentence is revised as follows:

Additional descriptions for ~~several~~ two of these slopes nearest to the nuclear island structures are provided below.

3. COLA Part 2, FSAR Chapter 2, Subsection 2.5.5.1.1, fourth paragraph forward is revised as follows:

The nearest permanent slope that ascends above the Lee Nuclear Station nuclear island area is a natural hill slope located southwest of the Unit 1 (Slope 5). This slope is also the highest slope within the one-quarter mile search area. This hill slope may be trimmed during plant grading.

This hill rises approximately ~~100~~ 80 feet above the yard elevation. The hill has a slope of approximately 2.5 horizontal to 1 vertical and is located ~~greater than~~about ~~900~~ 1000 feet from the Unit 1 nuclear island. The closest distance to the toe of the slope is ~~approximately~~ more than 9 times the height of the slope. No credible mechanism of slope failure would predict movement of the slope failure material over such a large distance. Based on the past stable history, slope height and inclination, and the distance from the nuclear island, this hill does not pose a hazard to safety related structures. Excavation of this hill for borrow source material may reduce the slope height, and the toe of slope may be relocated in a southerly direction away from the plant area, further reducing the already negligible potential hazard.

~~The next permanent slope that ascends above the Lee Nuclear Station nuclear island area is an engineered slope at the switchyard located south of Units 1 and 2 (Slope 6). The switchyard pad was constructed using engineered earthen (Group I) fill during site preparation for Cherokee Nuclear Station. The pad is constructed to an elevation of approximately 605 feet, which is approximately 15 feet above the yard elevation. The toe of this slope is at least 1100 feet away from the nearest safety related structure. The switchyard pad is constructed at a slope of approximately 2 horizontal to 1 vertical or shallower. No credible mechanism of slope failure would predict movement of the slope failure material over such a large distance. On the basis of engineering judgment and past performance, slope height, inclination, and distance from the nuclear island, this switchyard slope (Slope 6) does not pose a hazard to the Lee Nuclear Station safety related structures due to the limited height, significant distance to the nuclear island, and the existing slope angle.~~

The nearest permanent slope that descends below the plant yard grade and the nuclear island area is an engineered slope located north of Unit 2 (Slope 7). The top of this slope is ~~greater than 1100~~about 1200 feet from the nuclear island. This slope descends 55 feet below the yard elevation to the surface of a pond adjacent to the Broad River. The slope is inclined approximately 2 horizontal to 1 vertical. There is no credible mechanism whereby failure of a descending slope

55 feet high and ~~800~~ 1200 feet away could affect the nuclear island. Based on the distance, height, and inclination of this slope from the nuclear island, it does not pose a hazard to the safety related structures.

4. COLA Part 2, FSAR Chapter 2, Subsection 2.5.5.2 is revised as follows:

Analyses of permanent slope conditions were limited to a review of permanent slopes within a one-quarter mile distance from the Units 1 and 2 nuclear island structures. This conservative evaluation is based on past performance, height, slope angle, and distance from the safety related structures. The nearest permanent slopes are ~~900~~ 1000 feet or more away from the Units 1 and 2 nuclear island structures. These permanent slopes do not require further analysis, including quantitative pseudostatic analysis, to calculate a safety factor because there is no failure mechanism that would create a hazard to the safety related structures.

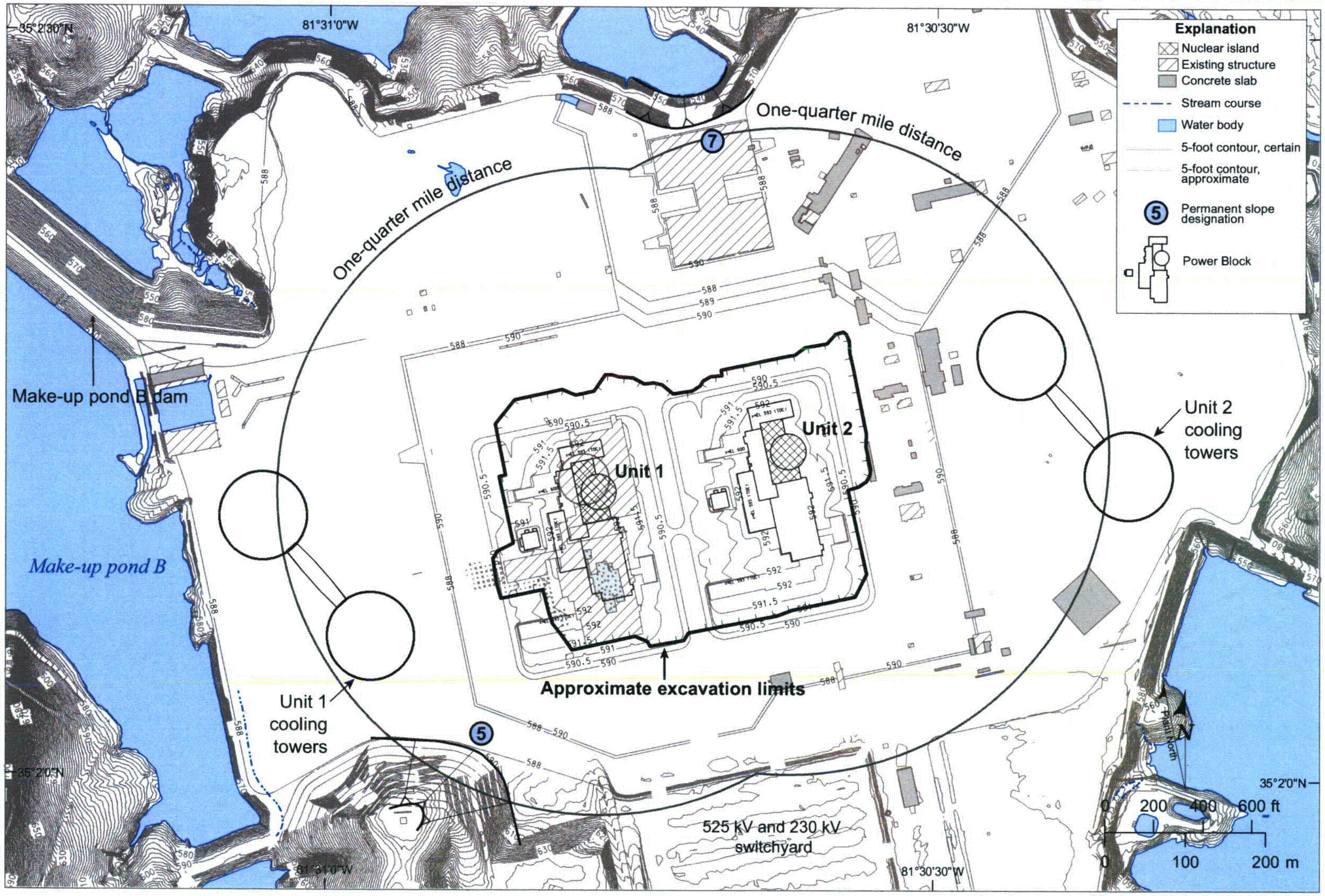
5. COLA Part 2, FSAR Chapter 2, Table 2.5.5-201 is revised as follows:

/LS COL 2.5-14

TABLE 2.5.5-201
PERMANENT SLOPES WITHIN ONE-QUARTER MILE OF UNIT 1 AND 2 NUCLEAR ISLAND STRUCTURES

Slope (Number)	Constructed Condition	Approximate Distance to Toe (feet)	Approximate Distance to Crest (feet)	Approximate Slope Height (feet)	Approximate Slope Inclination (Horizontal to Vertical)
Hill Southwest of Unit 1 (~~1~~5)	Natural Slope – cut	~~900~~1000	~~1350~~-	~~100~~80	2.5:1.0
~~Switchyard (2)~~	~~Engineered Fill~~	~~1100~~	~~1150~~	~~15~~	~~2.0:1.0~~
Pond North of Units (~~3~~7)	Engineered Fill	~~1250~~-	~~1100~~1200	55	2.0:1.0

6. COLA Part 2, FSAR Chapter 2, Figure 2.5.5-201 is revised as follows:



WLS COL 2.5-14

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Permanent Slopes within One-Quarter Mile of Units 1 and 2 Nuclear Island Structures

FIGURE 2.5.5-201

Attachment 5

Revisions to FSAR Chapter 3

Subsection 3.7

Table 3.7-201

Figure 3.7-201

Figure 3.7-202

Figure 3.7-203

Figure 3.7-204a – Deleted

Figure 3.7-204b – Deleted

Figure 3.7-204c – Deleted

Figure 3.7-205a – Deleted

Figure 3.7-205b – Deleted

Figure 3.7-205c – Deleted

Figure 3.7-206a – Deleted

Figure 3.7-206b – Deleted

Figure 3.7-206c – Deleted

Figure 3.7-207a – Deleted

Figure 3.7-207b – Deleted

Figure 3.7-207c – Deleted

Figure 3.7-208a – Deleted

Figure 3.7-208b – Deleted

Figure 3.7-208c – Deleted

1. COLA Part 2, FSAR Chapter 3, Subsection 3.7.1.11 is revised as follows:

3.7.1.1.1 Design Ground Motion Response Spectra

Design ground motion response spectra for Lee Nuclear Station Unit 1 and Unit 2 nuclear islands are presented in this subsection. The foundation conditions at Lee Nuclear Station are unique in that the Unit 1 nuclear island foundation is supported on new and previously placed concrete materials placed directly over continuous rock. In contrast, the Unit 2 nuclear island foundation is configured more conventionally with the nuclear island founded directly over continuous rock, except for the eastern edge of the Unit 2 nuclear island, which will require approximately 20 ft. of fill concrete to build up the support zone to the base of the nuclear island. Based on these foundation conditions, individual design ground motion response spectra are provided for the certified design portion of the plant at Units 1 and 2.

Measured shear wave velocities for continuous rock underlying the Units 1 and 2 nuclear islands range from between 9000 to 10,000 fps, as described in Subsection 2.5.4.7. The stability of subsurface materials including foundation conditions are described in Subsection 2.5.4.

Figures 3.7-201 and 3.7-202 compare the Units 1 and 2 horizontal and vertical site-specific design ground motion response spectra to the certified seismic design response spectrum (CSDRS) and the AP1000 generic hard rock spectrum (WEC). For Unit 1, the Foundation Input Response Spectrum (FIRS) defines the site response foundation input motion for the nuclear island foundation placed on concrete over continuous rock. Unit 1 FIRS, associated with Unit 1 FIRS A1 (Figure 2.5.4-252a), represents the nuclear island centerline foundation input motion and is based on the GMRS developed at the top of a hypothetical outcrop (e.g. continuous rock) fixed at 530 feet (NAVD) transferred up through previously placed and new concrete materials to the basemat foundation level at 553~~0~~.5 feet (NAVD). For Unit 2, the GMRS defines the site response foundation input motion developed at the top of a hypothetical outcrop of competent material (e.g. continuous rock) fixed at the basemat foundation level at 553~~0~~.5 feet (NAVD).

Detailed discussions of the methods used to calculate the horizontal and vertical GMRS and FIRS are described in Subsections 2.5.2.6, Ground Motion Response Spectra, and 2.5.2.7, Development of ~~Foundation Response Spectra (~~FIRS~~)~~ for Units 1 and 2. Variations in the Unit 1 FIRS and GMRS horizontal and vertical spectrum shown on Figures 3.7-201 and 3.7-202 are attributed to the independent calculation methodologies used to estimate the site-specific design ground motion response spectra.

As shown on Figure 3.7-201, the horizontal GMRS and Unit 1 FIRS exceed the horizontal CSDRS at frequencies of about 20 to 75 hertz and 20 to 85 hertz, respectively. PGA at 100 hertz of the GMRS and Unit 1 FIRS is 0.21 g and 0.23~~2~~ g, respectively. As shown on Figure 3.7-202, the vertical GMRS and Unit 1 FIRS exceed the vertical CSDRS at frequencies between about 25 to 70 hertz.

Similar high-frequency exceedances were evaluated by Westinghouse in DCD Appendix 3I using a standard hard rock spectrum (shown as WEC generic hard rock spectrum in Figures 3.7-201 and 3.7-202). In Figures 3.7-201 and 3.7-202, it can be seen that the horizontal and vertical GMRS and Unit 1 FIRS are below the corresponding horizontal and vertical WEC generic hard rock spectrum for all frequencies. As described in DCD Appendix 3I, generic hard rock spectrum high frequency exceedances are within the seismic design margin of the AP1000 and will not adversely affect the systems, structures, or components of the plant.

~~Subsection 2.5.4.7.4.1, including Figures 2.5.4-245, 2.5.4-246, and 2.5.4-264, describe and illustrate a localized area of non-uniform foundation conditions associated with the Unit 1~~

~~Northwest Corner, and the area adjacent to and outside the nuclear island foundation footprint. Westinghouse has evaluated (Reference 201) the potential effect of this condition on the dynamic response of the nuclear island, and has concluded that its effect on in-structure response spectra is small. At the six key nuclear island locations described in AP1000 DCD Appendix 3G, significant margin exists between the site-specific in-structure response spectra and that resulting from the AP1000 CSDRS.~~
The Lee Nuclear Station site provides uniform hard-rock support for the nuclear island, and the site characteristic GMRS and Unit 1 FIRS are less than the horizontal and vertical WEC generic hard rock spectrum at all frequencies. Therefore the site complies explicitly with the AP1000 DCD and no site-specific analysis is required. Subsection 3.7.2.15 describes ~~the~~ confirmatory site-specific analyses of the nuclear island ~~to~~ that demonstrate compliance with the AP1000 DCD.

2. COLA Part 2, FSAR Chapter 3, Subsection 3.7.2.1.2, first paragraph is revised as follows:

~~FSAR Subsection 3.7.1.1.1 describes site-specific analyses of Lee Nuclear Station Unit 1 to confirm that the effects of localized areas of non-uniform foundation conditions do not result in unacceptable in-structure responses.~~ For ~~use in these~~cases when site-specific analyses of the nuclear island structures may be required, artificial time histories (two horizontal and one vertical) were developed to be compatible with the Lee Nuclear Station Unit 1 FIRS spectrum (FSAR Figures 3.7-201 and 3.7-202), and to satisfy the requirements of Standard Review Plan (SRP) 3.7.1. The methodology used in the development of these time histories is summarized in the following four steps:

3. COLA Part 2, FSAR Chapter 3, Subsection 3.7.2.1.2, last paragraph is revised as follows:

Attributes of the resulting time histories representing the Unit 1 FIRS are shown in FSAR Table 3.7-201. FSAR Figure 3.7-203 illustrates a representative horizontal component time history.

4. COLA Part 2, FSAR Chapter 3, Subsection 3.7.2.8.4, is revised as follows:

Add the following information to the end of DCD Subsection 3.7.2.8.4:

WLS SUP 3.7-4 ~~The foundation conditions beneath most of the Unit 1 Annex Building are very uniform, and are in fact similar to those described in the AP1000 DCD, except that the fill material supporting the Annex Building is a few feet thicker. In the northernmost end of the Unit 1 Annex Building, the top-of-continuous-rock slopes away, but the overall character of the building support remains quite uniform. This is illustrated in FSAR Figures 2.5.4-246, 2.5.4-260, and 2.5.4-264. Since the entire Seismic Category II portion of the Annex Building is on a common base mat and will behave as a unit, these localized differences in the support conditions will not significantly affect overall response of the Unit 1 Annex Building, or the potential for interaction with the nuclear island.~~

~~FSAR Figure 2.5.4-260 also illustrates the support conditions beneath the Unit 2 Annex Building. Though final excavation profiles to support construction of Unit 2 have not been established, the foundation support provided by the existing rock excavation provides uniform support at a depth about ten feet less than the configuration described in the AP1000 DCD.~~

~~The foundation conditions beneath the Seismic Category II portion of the Unit 1 and Unit 2 Turbine Buildings are also very uniform and are in fact similar to those described in the AP1000 DCD, except that the supporting rock or fill concrete will be a few feet above the level considered for the standard design.~~

FSAR Subsection 2.5.4.5.2 describes how areas in the foundation support zones of Seismic Category II buildings (the Annex Building and Turbine Building first bay) will be excavated to expose concrete or rock, and fill concrete will be used to build up to the base level of the nuclear island. If rock within the foundation support zone of these Seismic Category II structures is higher than the base of the nuclear island, the rock will be removed to the elevation of the base of the nuclear island. In areas where the pre-existing concrete and/or rock within the foundation support zone of these Seismic Category II structures are at a lower elevation than the base of the nuclear island, fill concrete will be used to build up to the base level of the nuclear island. This configuration is illustrated in FSAR Figures 2.5.4-245 and 2.5.4-260 through 2.5.4-265. These measures ensure that the Lee Nuclear Station site provides uniform support for the Seismic Category II structures in a configuration identical to that considered in the AP1000 DCD designs.

From the candidate granular fill materials described in FSAR Subsection 2.5.4, Duke Energy has determined that Macadam Base Course material provides properties appropriate for precluding interaction of Seismic Category II buildings with the nuclear island. Duke Energy has selected the static and dynamic properties described in FSAR Subsection 2.5.4 as well-graded gravel (GW) to represent that Macadam Base Course material.

As shown in FSAR Subsection 3.7.1.1.1, the Lee GMRS and Unit 1 FIRS are enveloped by the AP1000 HRHF response spectrum. The properties of the granular fill material that will be placed above continuous rock, presented in FSAR Table 2.5.4-211 and FSAR Tables 2.5.4-224A through 2.5.4-224F, are consistent with those used by Westinghouse in developing design criteria for adjacent Seismic Category II structures and include having a shear wave velocity greater than 500 fps.

~~Lee site-specific performance-based surface response spectra at the ground surface of the granular fill supporting the adjacent Seismic Category II buildings have been developed, considering the effects of the different thicknesses of granular fill material beneath the adjacent buildings. For frequencies above 5 Hz, these site-specific spectra are generally lower than the AP1000 generic plant-grade spectra for a Hard Rock High Frequency site that were considered in developing design criteria for the Seismic Category II buildings and any isolated exceedances of the AP1000 generic plant-grade spectra would not result in any change to the standard design criteria for the AP1000 Seismic Category II buildings. For frequencies below 5 Hz, the design of Seismic Category II structures is governed by the CSDRS.~~

~~From the candidate granular fill materials described in FSAR Subsection 2.5.4, Duke Energy has determined that Macadam Base Course material provides properties appropriate for precluding interaction of Seismic Category II buildings with the nuclear island. Duke Energy has selected the static and dynamic properties described in FSAR Subsection 2.5.4 as well-graded gravel (GW) to represent that Macadam Base Course material.~~

The Lee site-specific bearing capacity for the granular fill material supporting the Seismic Category II structures (shown in FSAR Table 2.5.4-228) is greater than the generic AP1000 bearing demand for these structures.

As described in FSAR Subsection 2.5.4.5.1, the source for the granular fill material (Macadam Base Course) supporting the Seismic Category II buildings has not yet been identified. Once a source for the granular fill material has been selected, the static and dynamic properties of the material supporting Seismic Category II buildings will be verified as compatible with Lee Nuclear Station site response analyses.

The information above demonstrates that the Lee site provides uniform support for the Seismic Category II buildings; site-specific fill material is consistent with that considered in establishing generic AP1000 design criteria for these buildings; the site-specific seismic demands on the Seismic Category II buildings are less than those considered in the AP1000 standard design; the configuration of the granular fill supporting the Seismic Category II buildings is consistent with that described in the DCD; and the bearing capacity of the supporting granular fill is greater than the bearing demand. Therefore, the Lee Nuclear Station site complies explicitly with the requirements of DCD Subsection 3.7.2.8.4 for a hard rock site, and no site-specific analysis is required.

Westinghouse has nevertheless performed a confirmatory site-specific analysis of Seismic Category II structures supported by granular fill material with the static and dynamic properties associated with well-graded gravel (GW), and has concluded that all DCD criteria have been met. This analysis is presented in Reference 205. The conditions considered in Reference 205 included a variety of potential thicknesses of granular fill material (depth to supporting rock). The analysis cases considering thicker granular fill bound the Lee Nuclear Station site configuration actually selected. The lower levels of granular fill considered in Reference 205 have actually been replaced by fill concrete, resulting in a configuration virtually identical to the DCD~~calculated site-specific relative displacements of adjacent buildings are less than the building separation, so there is no contact between the nuclear island and adjacent buildings. The calculated foundation input response spectra at the base of the Annex Building and at the base of the first bay of the Turbine Building are less than those considered in the AP1000 standard design of those structures. The maximum site-specific bearing demand (approximately 13.06 ksf for the Annex Building and 7.75 ksf for the Turbine Building) is significantly less than the site-specific allowable bearing pressure shown in FSAR Table 2.5.4-228 (approximately 32.05 ksf for the Annex Building and 43.74 ksf for the Turbine Building). The base shears and moments for those two structures are also significantly less than those considered in the AP1000 standard design of the Seismic Category II structures for the CSDRS.~~

~~As described in FSAR Subsection 2.5.4.5.1, the source for the granular fill material (Macadam Base Course) supporting the Seismic Category II buildings has not yet been identified. Once a source for the granular fill material has been selected, the static and dynamic properties of the material supporting Seismic Category II buildings will be verified as compatible with Lee Nuclear Station site response analyses.~~

~~The site-specific analysis presentend in Reference 205 demonstrates that the Lee site provides uniform support for the Seismic Category II buildings; site-specific fill material is consistent with that considered in establishing generic AP1000 design criteria for these buildings; and the site-specific seismic demands on the Seismic Category II buildings are less than those considered in the AP1000 standard design.~~

5. COLA Part 2, FSAR Chapter 3, Subsection 3.7.2.15, is revised as follows:

Add the following information to the end of DCD Subsection 3.7.2:

As described in FSAR Subsection 3.7.1.1.1, the Lee Nuclear Station site provides uniform hard-rock support and the site characteristic GMRS and Unit 1 FIRS are bounded by the Westinghouse generic hard rock spectrum. Therefore, no site-specific analysis of the nuclear island is required. ~~To fully document the acceptability of the WLS site,~~ Westinghouse has nevertheless performed confirmatory site-specific analyses of the nuclear island Seismic Category I structures. These analyses were initially documented in Revision 1 of Reference 201, and were subsequently updated in Revision 2 of Reference 201 to address AP1000 modeling updates during the Design Certification Amendment, revisions to the WLS Unit 1 Foundation Input Response Spectrum (FIRS) and the associated time-histories, and the decision to use granular fill material adjacent to the WLS nuclear island structures.

These site-specific analyses included ~~a combination of~~ two-dimensional ~~(2D) and~~SSI analysis, as well as three-dimensional ~~(3D)~~ incoherent SSI ~~analyses~~analysis, and investigated the effect of having layers of fill concrete over hard rock supporting the nuclear island (Lee Unit 1), compared to the nuclear island supported on hard rock (Lee Unit 2). The measure of the effects was a comparison of in-structure response spectra at six key locations shown below.

- CIS at Reactor Vessel Support Elevation
- ASB SW Corner at Control Room Floor
- CIS at Operating Deck
- ASB Corner of Fuel Building Roof at Shield Building
- SCV Near Polar Crane
- ASB Shield Building Roof Area

The results of these site-specific analyses confirmed that the presence of approximately 20' of fill concrete instead of rock has very small effect on in-structure response spectra. The three-dimensional incoherent SSI analyses confirm that at these key locations, in-structure response spectra are enveloped by those resulting from the AP1000 CSDRS and HRHF SSI envelopes. ~~The 2D analyses were conducted to:~~

- ~~Address the revised Unit 1 FIRS and associated time-history;~~
- ~~Evaluate the extent of subsurface characterization, site response and surface motions;~~
- ~~Analyze the site-specific dynamic profile and foundation medium underlying the Units 1 and 2 NI footprints;~~
- ~~Assess the effect of the Unit 1 Northwest corner site-specific conditions on the seismic response; and~~
- ~~Compare the 2D SSI results of the various site subsurface and foundation conditions, and determine the controlling conditions to be used in subsequent three-dimensional (3D) SSI analyses.~~

~~The 3D analyses updated the WLS 3D SSI model and analysis to include the AP1000 NI20r 3D Model, incorporated the results and parameters established in the 2D parametric studies and performed twenty-five (25) 3D SASSI incoherent simulation analyses.~~

~~The WLS 3D horizontal and vertical in-structure floor response spectra (FRS) were compared to the AP1000 3D Certified Seismic Design Response Spectra (CSDRS) and Hard Rock High Frequency (HRHF) FRS envelopes at six (6) key AP1000 NI locations.~~

~~The 2D SSI analyses were performed using the computer code SASSI2000 and post-processed using ACS SASSI. 3D Incoherent SSI analyses were performed using ACS SASSI. All SASSI SSI analyses performed used the SASSI Direct method for computing in-structure FRS.~~

~~Site-specific SSI analyses were performed using the AP1000 NI20r finite element model and the site-specific Foundation Input Response Spectra (FIRS) A1 time history inputs described in Subsection 3.7.2.1.2.~~

~~As described below, the 3D SSI analyses results show that the in-structure FRS of an AP1000 plant at the WLS Unit 1 & 2 sites are enveloped by the FRS from AP1000 CSDRS and HRHF analyses at the six key AP1000 NI locations described in DCD Subsection 3.7.2 and DCD Table 3G.4-1.~~

~~3.7.2.15.1 Site Characteristics~~

~~Foundation conditions for the two (2) WLS units are described in Subsection 2.5.4.7.4. The Unit 1 NI basemat is founded at El. 550.5 ft. msl (AP1000 El. 60.5 ft.), predominately on fill concrete over hard rock, and the Unit 2 NI basemat is founded at El. 550.5 ft. msl. on hard rock. The final grade level for both units is at El 590.0 ft. msl (AP1000 El. 100.0 ft.).~~

~~Unit 1 will overlie portions of the former Cherokee Nuclear Station fill concrete and legacy structural slabs and native rock. Similarly, Lee Unit 2 will occupy portions of the former Cherokee Unit 3 area, and will overlie native rock. Both nuclear island (NI) structures will require some additional minor excavation and replacement with fill concrete. In the Northwest corner of Unit 1, engineered fill will be placed adjacent to the fill concrete which will extend below the elevation of the AP1000 basemat.~~

~~The foundation conditions and geologic profiles vary between Units 1 and 2, and locally at the Northwest corner of Unit 1. A total of three (3) site-specific SSI models were developed with corresponding site dynamic profiles to represent the varied conditions and backfill beneath the Units 1 and Unit 2 NIs. Three cross-sections were modeled:~~

- ~~Unit 1 Centerline Cross-Section B-B' (Figure 2.5.4-260);~~
- ~~Unit 2 Centerline Cross-Section B-B' (Figure 2.5.4-260); and~~
- ~~Unit 1 Northwest Corner Cross-Sections Y-Y' and U-U' (Figures 2.5.4-264 and 2.5.4-245).~~

~~Three dynamic profiles were developed to represent the conditions at each plant basemat, corresponding to:~~

- ~~Unit 1 Centerline – Base Case A1 (Figure 2.5.4-252);~~
- ~~Unit 2 Centerline – Profile C (Figure 2.5.4-250); and~~
- ~~Unit 1 Northwest Corner – Profile B (Figure 2.5.4-249).~~

~~As shown in the Unit 1 Northwest Corner Cross-Sections U-U' (Figure 2.5.4-245) and Y-Y' (Figure 2.5.4-260), up to approximately 30 feet of engineered fill is required adjacent to the fill concrete beneath the NI (below El. 550.5), which replaces excavated lower shear wave velocity weathered rock down to continuous rock at the Northwest corner. Strain compatible dynamic soil properties were calculated for granular fill materials in three (3) representative profiles located within the Unit 1 Northwest corner. Calculation of these properties considered the three candidate engineered fill material types (GP, GW, and SW) described in Subsection 2.5.4, and a range of ground water conditions. The calculation results included 16th, median, and 84th percentile values for the dynamic soil properties. A range of average dynamic properties was determined, parametrically evaluated in the 2D SSI analysis of the Unit 1 Northwest corner, and the results (in-structure FRS) were enveloped.~~

~~Cross-Section B-B' (Figure 2.5.4-260) shows bedrock conditions on an East-West centerline of Unit 1 and Unit 2. The new Unit 1 NI basemat will be constructed over approximately five (5) feet of new fill concrete overlying an average of about 15 feet of existing fill concrete, structural basemat concrete and native rock from the former Cherokee foundation. The Unit~~

~~2 NI basemat is founded on native hard rock. The Unit 1 NI centerline rock shear wave velocity (Vs) ranges from about 7,500 feet per second (fps) (fill concrete) to about 9,600 fps (continuous rock) as shown in the Unit 1 Base Case A1 (Figure 2.5.4-252). The Unit 2 Centerline continuous rock Vs ranges from about 8,400 fps to about 9,600 fps as shown in the Unit 2 Profile C (Figure 2.5.4-250).~~

~~Cross-Sections Y-Y' and U-U' (Figures 2.5.4-264 and 2.5.4-245) represents bedrock conditions at the Northwest corner of the Unit 1 NI. In this area, the NI overlies a localized zone of weathered and fractured rock, extending approximately 15 to 25 feet deep below the Unit 1 basemat elevation (El. 550.5 ft.). This localized zone of weathered rock exhibits lower Vs velocities, ranging from approximately 4500 to 6000 fps, than the underlying and adjacent sound rock with Vs of approximately 9200 fps. Excavation of this isolated lower velocity material to continuous rock at the Northwest corner of Unit 1 NI will be replaced with fill concrete beneath the basemat. Engineered backfill will be placed and compacted adjacent to the fill concrete beneath the NI (and beneath the northern end of the Annex Building) approximately 20 to 30 feet below the NI basemat elevation. The Unit 1 rock shear wave velocity at the Northwest corner ranges from about 5,300 fps to about 9,200.~~

~~Because the rock and fill concrete materials were found to behave linearly in the development of site response spectra, a material damping value of 0.005 was used for rock and for fill concrete in all profiles. For the granular fill materials adjacent to the Northwest corner, damping values were determined as one of the strain-compatible material properties, and varied between approximately 0.05 and 0.10, depending on material type and depth.~~

~~3.7.2.15.2 Seismic Inputs~~

~~The horizontal and vertical site GMRS and Unit 1 Foundation Input Response Spectra (FIRS) are described in Subsection 3.7.1.1.1. Subsection 3.7.2.1.2 describes the development of artificial time histories to represent the Unit 1 FIRS, consistent with the guidance in Standard Review Plan 3.7.1. Since the Unit 1 FIRS bounds the site GMRS, which is the Unit 2 base motion, the Unit 1 FIRS time histories are conservatively used for the analysis of both Unit 1 and Unit 2.~~

~~Analysis of the AP1000 for the Certified Seismic Design Response Spectra (CSDRS) envelope is provided in Reference 202, and for the hard rock high frequency (HRHF) FRS envelope in Reference 203. The WLS 3D SSI in-structure FRS are compared to the AP1000 CSDRS and HRHF envelopes at the six key locations identified in DCD Subsection 3.7.2 and DCD Table 3G.4-1.~~

~~3.7.2.15.3 Two-Dimensional SASSI Parametric Studies~~

~~Two-dimensional (2D) parametric SSI analyses were performed using SASSI to compare the 2D SSI results of the various site subsurface and foundation conditions, and determine the controlling conditions to be evaluated in greater detail in subsequent 3D SSI analyses. The 2D East-West (EW) model typically yields a higher response than the north-south model as described in Section 6.2 of Westinghouse Technical Report TR03 (APP-GW-S2R-010, "Extension of Nuclear Island Seismic Analysis to Soil Site", Reference 202). Therefore, the 2D EW model is used for these parametric studies.~~

~~The models consist of a 2D SASSI stick model of the AP1000 nuclear island that is used with three site-specific 2D SASSI finite element models representing three (3) cross-sections of interest for Units 1 and 2. The AP1000 Nuclear Island model includes three stick models representing the the Auxiliary Shield Building (ASB), the Steel Containment Vessel (SCV), and the Containment Internal Structure (CIS). The three (3) east-west cross-sections~~

~~modeled are the Unit 1 NI centerline, the Unit 2 NI centerline, and the Unit 1 nuclear island Northwest corner. The SASSI Direct method is used to compute in-structure FRS. From the analyses using the 2D models, the important modes of the structure and seismic interaction between the NI structures and supporting media are obtained to evaluate the response of the three cross-sections.~~

~~The Unit 1 centerline east-west 2D SASSI finite element model includes the supporting medium up to the bottom of the basemat of the nuclear island. Consistent with DCD analyses of hard-rock conditions, the model does not include backfill material adjacent to the nuclear island above that level. The 2D model of the supporting medium has properties assigned to represent areas of continuous rock, legacy fill concrete and structural concrete remaining from the Cherokee construction, and new fill concrete to be used to bring the site to the level of the bottom of the nuclear island basemat. The Unit 2 centerline east-west 2D SASSI finite element model is constructed similarly, but the finite element properties are selected to represent the continuous hard rock supporting the Unit 2 nuclear island.~~

~~The Unit 1 Northwest corner east-west 2D SASSI model is constructed similarly, but is extended laterally so that the SASSI finite elements can represent not only the material types in the Unit 1 centerline model, but also materials and configurations that are unique to the Northwest corner. These include areas of continuous rock with lower shear wave velocity, thicker fill concrete layers, the irregular surface of the continuous rock, and the presence of weathered rock and granular fill outside the support zone of the nuclear island, but adjacent to the nuclear island and below the level of the bottom of the basemat.~~

~~The configuration of each of the site-specific models is selected with the objective that each material layer should have a passing frequency of approximately 50 Hz based on the material properties. The 2D SASSI analysis uses a 50 Hz cut-off frequency. Time-history seismic analyses of the three (3) east-west 2D SASSI models were performed considering simultaneous occurrences of one horizontal and one vertical component. The Unit 1 FIRS time history was input at the basemat bottom elevation. The 2D in-structure FRS results were combined algebraically using each directional analysis FRS to produce site-specific in-structure 5% damped horizontal and vertical spectra at each of the six (6) key locations identified in DCD Subsection 3.7.2 and DCD Table 3G.4-1. These six (6) locations are shown below. (Note that Lee North corresponds to AP1000 South.)~~

- ~~2D Node 4041, CIS at Reactor Vessel Support Elevation~~
- ~~2D Node 4061, ASB SW Corner at Control Room Floor~~
- ~~2D Node 4535, CIS at Operating Deck~~
- ~~2D Node 4120, ASB Corner of Fuel Building Roof at Shield Building~~
- ~~2D Node 4412, SCV Near Polar Crane~~
- ~~2D Node 4310, ASB Shield Building Roof Area~~

~~For the Northwest corner 2D SASSI analyses, individual analyses were conducted for the three (3) candidate granular fill materials (GP, GW, and SW), for a range of groundwater levels, and for the 16th, median and 84th percentile values of the strain-compatible dynamic properties, and the results enveloped for each granular fill type. The resulting site-specific in-structure FRS are shown in Figures 3.7-204a through 3.7-205c for these six (6) key locations.~~

~~It is important to note that the HRHF broad curve (envelope) is based on SASSI 3D analyses and includes seismic motion incoherency effects. The WLS 2D FRS does not include in the SSI analyses coherency functions. The purpose of the 2D SSI analyses was to evaluate the various cases for subsequent 3D SSI analyses and to assess potential FRS impacts from the NW corner subsurface conditions. Subsequent 3D analyses compare the~~

~~WLS 3D FRS results with incoherency to the AP1000 HRHF envelope, also including incoherency. The following observations can be made from the 2D SASSI parametric analyses results:~~

- ~~Consideration of the Unit 1 Northwest Corner configuration and materials results in a relatively small change in the calculated in-structure FRS compared to the Unit 1 Centerline model. Likewise, the selection of engineered fill (GP, GW or SW) to be used adjacent to the nuclear island also has a relatively small effect on the calculated in-structure FRS for the nuclear island.~~
- ~~Only minor spectral acceleration differences are observed between the Unit 1 NI Centerline 2D FRS and the Unit 2 NI Centerline 2D FRS across the entire frequency spectrum in both the horizontal and vertical directions. The slight variation of the dynamic properties of Unit 1 situated on fill concrete versus Unit 2 founded on sound rock do not result in a appreciable difference in each respective model FRS; and~~
- ~~Comparing the Unit 1 and Unit 2 NI Centerline 2D FRS to the AP1000 2D CSDRS and HRHF FRS envelopes suggests that above 20 Hz, the Unit 1 and 2 in-structure FRS exceed the AP1000 envelope FRS. As previously discussed, coherency functions were not applied to the WLS 2D parametric analyses. As demonstrated in the 3D analyses below, consideration of incoherency effects reduces the calculated in-structure FRS above 20 Hz.~~

~~Based on the results of the 2D parametric SSI analyses, subsequent 3D incoherent SSI analyses were performed using both the Unit 1 and Unit 2 NI Centerline cross-section models and the corresponding Base Case A1 and Profile C site dynamic profiles, respectively. In-structure FRSfrom 3D incoherent SSI analyses are compared to the AP1000 and HRHF 3D envelope spectra.~~

~~3.7.2.15.4 Three-Dimensional SASSI SSI Analyses~~

~~3D SASSI analyses were performed to demonstrate that the in-structure FRS of an AP1000 plant at the WLS site is enveloped by the AP1000 CSDRS and HRHF 3D envelopes at the six (6) NI key locations shown below. (Note that Lee North corresponds to AP1000 South.)~~

- ~~3D Node 1761, CIS at Reactor Vessel Support Elevation~~
- ~~3D Node 2078, ASB SW Corner at Control Room Floor~~
- ~~3D Node 2199, CIS at Operating Deck~~
- ~~3D Node 2675, ASB Corner of Fuel Building Roof at Shield Building~~
- ~~3D Node 2788, SCV Near Polar Crane~~
- ~~3D Node 3329, ASB Shield Building Roof Area~~

~~Since WLS is a hard-rock site, the Unit 1 FIRS spectra shown in Figures 3.7-201 and 3.7-202 exhibit a shape similar to the HRHF response spectra documented in Westinghouse Technical Report TR115 (Reference 204). Therefore, the same incoherent analysis methodology was used in the WLS site-specific 3D SASSI SSI analyses.~~

~~The 3D SASSI incoherent analyses were performed with the Unit 1 and Unit 2 NI Centerline soil profiles and the corresponding Unit 1 FIRS time history. The 3D SASSI model used is the AP1000 NI20r surface model that is described in Westinghouse Technical Report TR03 (APP-GW-S2R-010, Rev. 5,~~
~~Reference 202). Consistent with AP1000 DCD analyses, reinforced concrete elements are assigned 7% damping, structural steel elements are assigned 4% damping, and concrete-filled steel plate (SC) structures are assigned 5% damping. The benchmarking of AP1000 NI10 and NI20r was documented in Westinghouse Technical Report TR03 Appendix C – Comparison of NI10 and NI20r Responses. Structural damping of 7% is used in the development of HRHF in-structure response spectra (ISRS).~~

~~The 3D incoherent analyses include performing 25 simulations of the Unit 1 and Unit 2 NI20r surface models with outcrop input time history. The coherency functions employed and the methods of analysis are consistent with COL/ DC-ISG-1 (Reference 204) and are also consistent with those used in DCD-supporting analyses. The 3D incoherent analyses includes 25 simulations using the NI20r surface model, and were performed using the Unit 1 and Unit 2 NI Centerline Base Case A1 and C site dynamic profiles, respectively, Unit 1 FIRS time history input at AP1000 El. 60.5 ft., and SASSI Direct method.~~

~~Similar to the 2D SASSI analyses, the configuration of each 3D SASSI layer was selected considering the SASSI wavelength criteria for 50 Hz. Since the Unit 1 and Unit 2 centerline profiles are comprised of fill concrete and hard rock, with Vs>7500 fps, this criteria is easily met. The 3D SASSI analyses use a 50 Hz cut-off frequency, and are consistent with the guidance in COL/DC-ISG-1.~~

~~The site-specific NI 3D SASSI results are shown in Figures 3.7-206a through 3.7-208c. The WLS Units 1 and 2 NI20r surface models were run through 25 simulations of incoherent 3D analysis using the three predefined direction-based Unit 1 FIRS time histories. The calculated 5% damping in-structure FRS at the six (6) key locations are enveloped by the AP1000 3D CSDRS and HRHF SSI envelopes with significant margin.~~

~~3.7.2.15.5 Site-Specific Analyses Conclusions~~

~~The site-specific analyses of the WLS nuclear islands led to the following conclusions:~~

- ~~Consideration of the Unit 1 Northwest Corner configuration and materials results in a relatively small change in the calculated in-structure FRS compared to the Unit 1 Centerline model. Likewise, the selection of engineered fill (GP, GW or SW) to be used adjacent to the nuclear island also has a relatively small effect on the calculated in-structure FRS for the nuclear island.~~
- ~~Only minor differences exist between the Unit 1 NI Centerline 2D FRS and the Unit 2 NI Centerline 2D FRS across the frequency spectrum in both the horizontal and vertical directions;~~
- ~~The site-specific WLS 3D incoherent SSI analyses results for Unit 1 and Unit 2, which incorporate the AP1000 NI20r 3D model and revised Unit 1 FIRS time history, indicate that the 5% damping in-structure FRS at six (6) key NI locations are enveloped by the AP1000 CSDRS and HRHF SSI envelopes.~~

6. COLA Part 2, FSAR Chapter 3, Subsection 3.7.6, is revised to remove References 202, 203, and 204 as follows:

3.7.6 REFERENCES

201. Westinghouse Electric Company Report WLG-1000-S2R-802, Revision 2, William S. Lee Site Specific Seismic Evaluation Report, March 15, 2012.

202. Deleted~~Westinghouse Electric Company Report APP-GW-S2R-010, TR03 "Extension of Nuclear Island Seismic Analyses to Soil Sites," Rev. 5, February 2011~~.

203. Deleted~~Westinghouse Electric Company Report APP-GW-GLR-115, TR115 "Effect of High Frequency Seismic Content on SSCs," Rev.3, January 2011~~.

204. Deleted~~COL/DC-ISG-1, "Interim Staff Guidance on Seismic Issues Associated with High Frequency Ground Motion in Design Certification and Combined License Applications," May 2008~~.

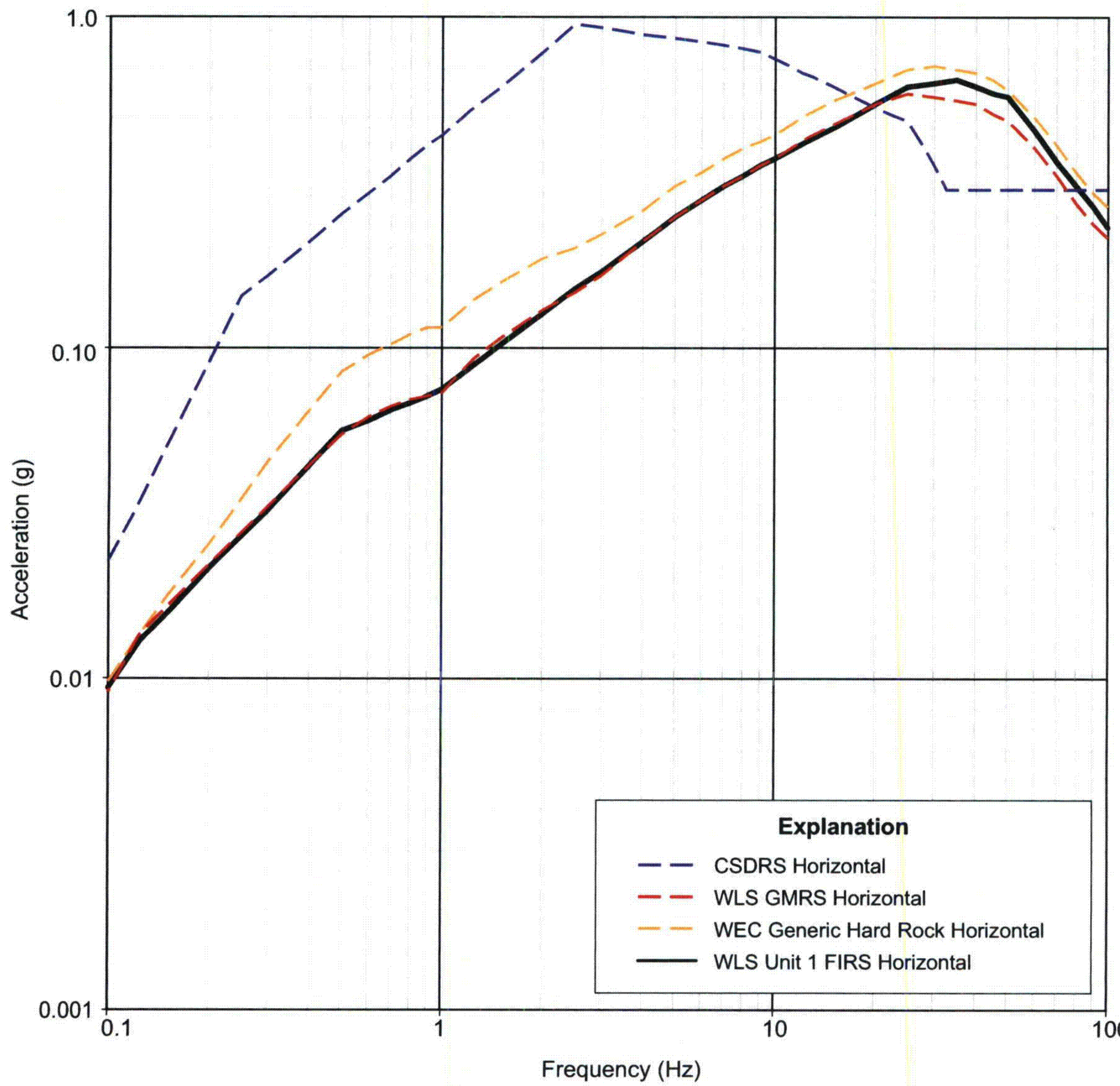
205. Westinghouse Electric Company Report WLG-1000-S2R-804, Revision 2, William S. Lee Site Specific Adjacent Building Seismic Evaluation Report, July 2012.

7. COLA Part 2, FSAR Chapter 3, Subsection 3.7.6, is revised to remove References 202, 203, and 204 as follows:

TABLE 3.7-201
SUMMARY OF CHARACTERISTICS OF ARTIFICIAL TIME HISTORIES REPRESENTING UNIT 1 FIRS

Parameter	Horizontal 1	Horizontal 2	Vertical
Duration (5-75%; sec)	13~~2~~.2~~9~~	11~~2~~.9~~4~~	13~~5~~.8~~5~~
PGA (g)	0.23	0.23	0.18~~7~~
PGV (cm/sec)	12~~8~~.7~~8~~	12~~8~~.6~~7~~	9~~7~~.5~~4~~
PGD (cm)	10~~7~~.4~~6~~	10~~7~~.0	6~~4~~.3~~9~~
PGD/PGA (cm/g)	45~~33~~	43~~0~~	35~~29~~
PGV/PGA (cm/sec/g)	55~~38~~	55~~38~~	53~~44~~
PGA*PGD/PGV^2	15~~22~~	14~~21~~	12~~5~~
Correlation with Horizontal 1	--	0.079~~4~~	-0.039~~17~~
Correlation with Horizontal 2	--	--	-0.072~~91~~

8. COLA Part 2, FSAR Chapter 3, Figure 3.7-201 is revised as follows:



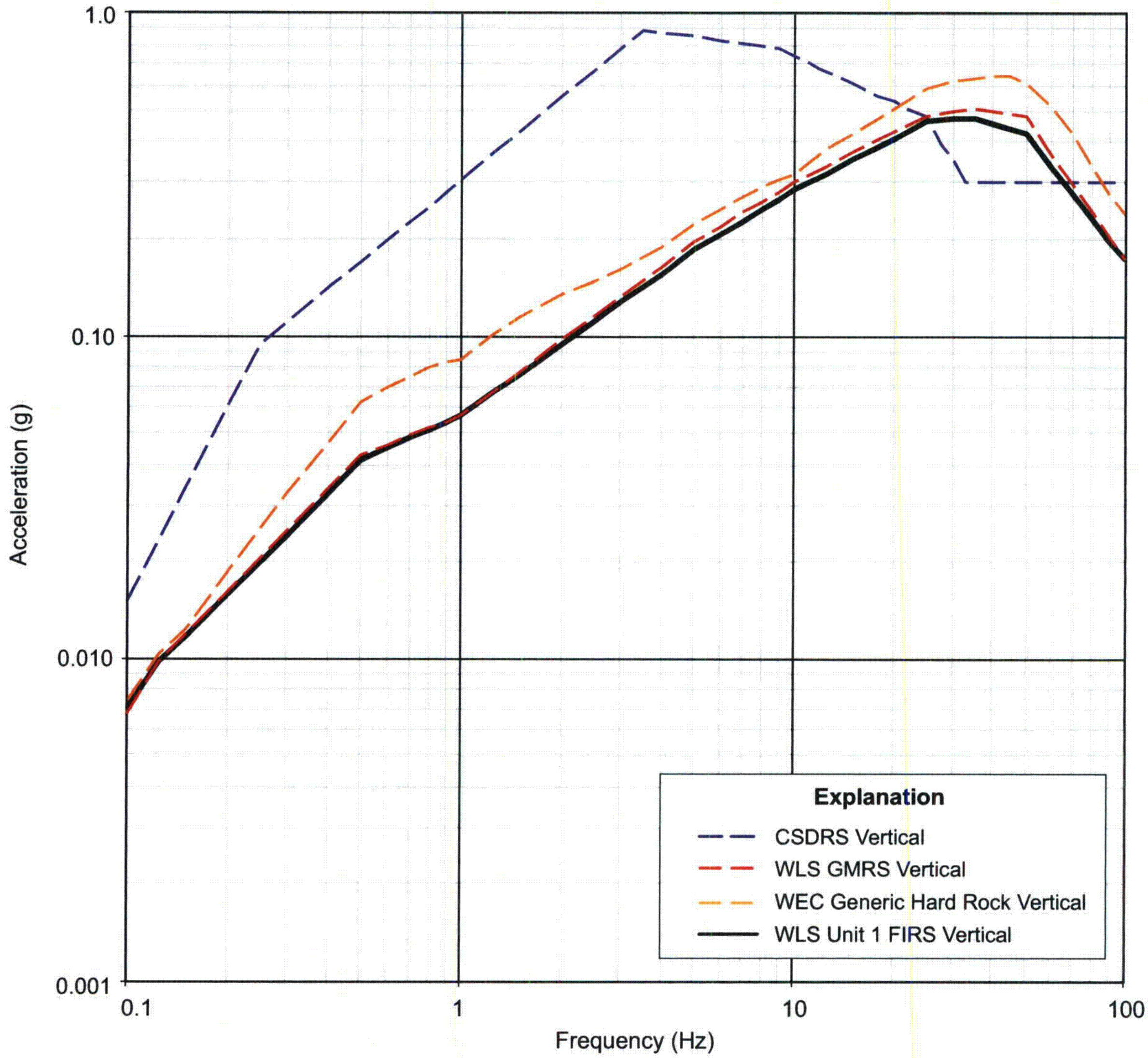
WLS SUP 3.7-3

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Design Ground Motion
Response Spectra - Horizontal

FIGURE 3.7-201

9. COLA Part 2, FSAR Chapter 3, Figure 3.7-202 is revised as follows:



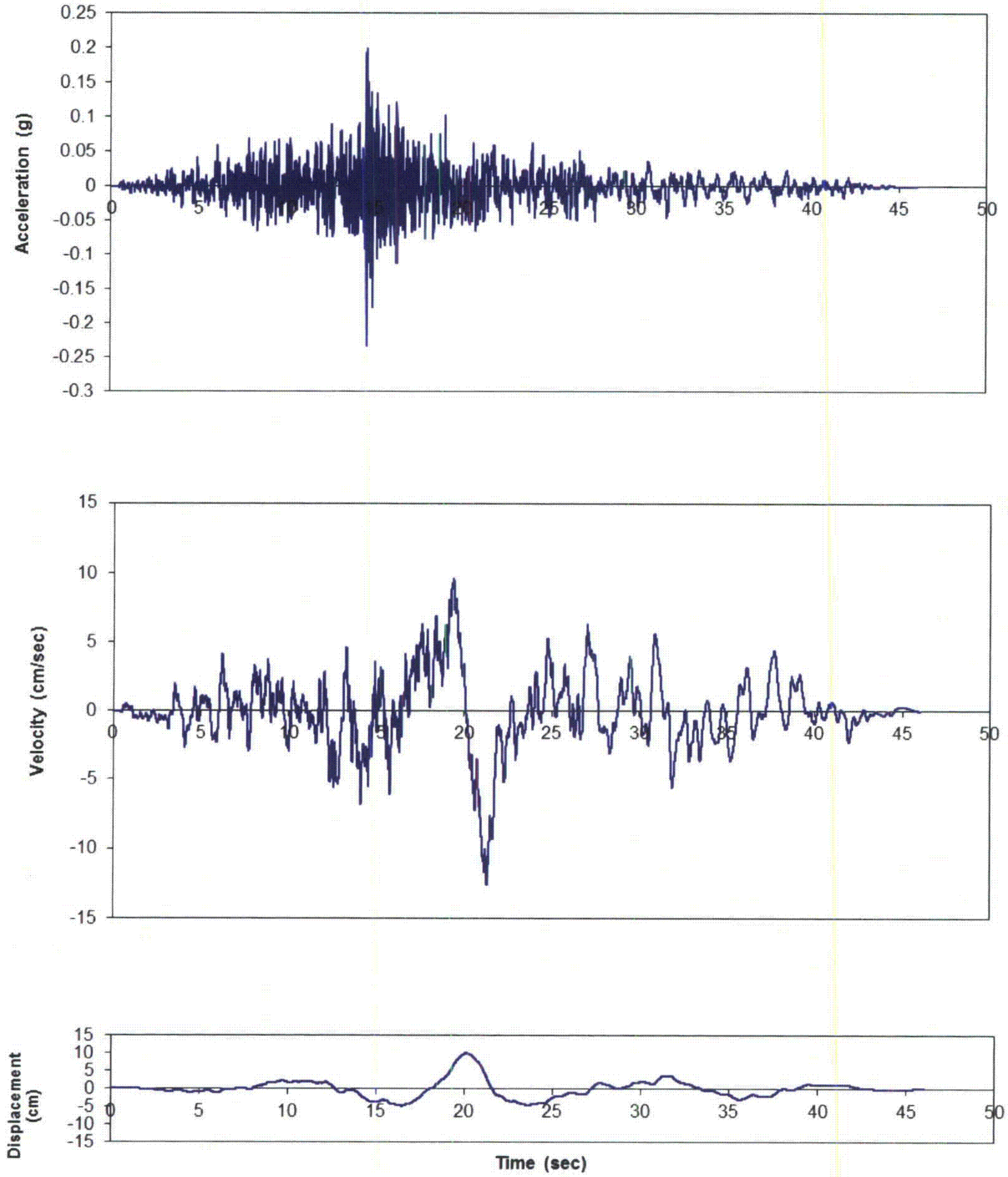
WLS SUP 3.7-3

WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Design Ground Motion
Response Spectra - Vertical

FIGURE 3.7-202

10. COLA Part 2, FSAR Chapter 3, Figure 3.7-203 is revised as follows:



WILLIAM STATES LEE III
NUCLEAR STATION UNITS 1 & 2

Representative Horizontal Time
History Representing Unit 1 FIRS

FIGURE 3.7-203

11. COLA Part 2, FSAR Chapter 3, Figure 3.7-204a is removed as follows:

Figure 3.7-204a

Deleted

12. COLA Part 2, FSAR Chapter 3, Figure 3.7-204b is removed as follows:

Figure 3.7-204b

Deleted

13. COLA Part 2, FSAR Chapter 3, Figure 3.7-204c is removed as follows:

Figure 3.7-204c

Deleted

14. COLA Part 2, FSAR Chapter 3, Figure 3.7-205a is removed as follows:

Figure 3.7-205a

Deleted

15. COLA Part 2, FSAR Chapter 3, Figure 3.7-205b is removed as follows:

Figure 3.7-205b

Deleted

16. COLA Part 2, FSAR Chapter 3, Figure 3.7-205c is removed as follows:

Figure 3.7-205c

Deleted

17. COLA Part 2, FSAR Chapter 3, Figure 3.7-206a is removed as follows:

Figure 3.7-206a

Deleted

18. COLA Part 2, FSAR Chapter 3, Figure 3.7-206b is removed as follows:

Figure 3.7-206b

Deleted

19. COLA Part 2, FSAR Chapter 3, Figure 3.7-206c is removed as follows:

Figure 3.7-206c

Deleted

20. COLA Part 2, FSAR Chapter 3, Figure 3.7-207a is removed as follows:

Figure 3.7-207a

Deleted

21. COLA Part 2, FSAR Chapter 3, Figure 3.7-207b is removed as follows:

Figure 3.7-207b

Deleted

22. COLA Part 2, FSAR Chapter 3, Figure 3.7-207c is removed as follows:

Figure 3.7-207c

Deleted

23. COLA Part 2, FSAR Chapter 3, Figure 3.7-208a is removed as follows:

Figure 3.7-208a

Deleted

24. COLA Part 2, FSAR Chapter 3, Figure 3.7-208b is removed as follows:

Figure 3.7-208b

Deleted

25. COLA Part 2, FSAR Chapter 3, Figure 3.7-208c is removed as follows:

Figure 3.7-208c

Deleted

Lee Nuclear Station Units 1 and 2
FSAR Content Not Impacted due to Plant Relocation and
Additional Design Enhancements

FSAR Chapter 2

Section 2.2

This subsection evaluates off-site hazards due to an explosion and a toxic gas release.

For the explosive hazard, the computer program ALOHA was used to determine the overpressure. The ALOHA analysis was based on a "nominal" center of the site from which lines are drawn to the nearest point of various accidents. This analysis shows that the resulting maximum overpressure is insensitive to the distance from the Lee site to the accident site. Therefore, the slight relocation of Units 1 and 2 does not invalidate the analysis' conclusions.

For the toxic gas release, the analysis uses the site property boundary as the point of reference used to analyze the distance from the potential hazard location to the site. Therefore, the slight relocation of Units 1 and 2 does not invalidate the analysis' conclusions.

The conclusions of the off-site hazard analyses for explosions and toxic gas releases are not impacted by the relocation of Lee Units 1 and 2. Therefore, plant relocation has no impact to the content of Subsection 2.2.

FSAR Chapter 4

The information provided in FSAR Chapter 4 is limited to the incorporation by reference to the AP1000 DCD and a future commitment to calculate departure from nuclear boiling ratio (DNBR) limits following the selection of actual plant operating instrumentation. The instrumentation selection is not dependent on the plant location and therefore the plant relocation has no impact on the content Chapter 4.

FSAR Chapter 5

The information provided in FSAR Chapter 5 is limited to the incorporation by reference to the AP1000 DCD and programmatic information that is independent of the Lee Units 1 and 2 locations. Therefore plant relocation has no impact to the content Chapter 5.

FSAR Chapter 6

The information provided in FSAR Chapter 6 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and the assessment of control room habitability from the release of toxic chemicals either on-site or off-site. The programmatic information provided is not dependent on the plant location.

For the off-site toxic hazards, the analysis (see Reference 1) was evaluated for impacts resulting from plant relocation. Unit 1 is moved 50 feet east of the previous location analyzed. Units 1 and 2 are moved 66 feet south and raised 3 feet in elevation. The intake height used in the analysis was 17 m (56 ft.) since the release point was assumed to be at the same elevation as plant grade. Raising the plant elevation by three feet increases the control room intake elevation relative to the spill elevation, which reduces concentrations at the intake. The analysis was also based on the site being 5100 m (16732 ft) from Highway 329, which is located slightly north of due west of the site. The relocation of both units described above increases the distance from the nearest approach of Highway 329 to the Unit 1 and Unit 2 nuclear islands, which increases the dispersion of the gas and reduces its concentration prior to reaching the control room intake. The plant relocation allows the results of the previously presented analysis to remain bounding. Therefore, the plant relocation has no impact to the content of this Chapter 6 due to off-site toxic hazards.

For the on-site toxic hazards analysis, the maximum distance from the chemical release point, (located in the turbine building), to the control room air intake is 203 ft. (see Reference 2). The relocation of Unit 1 50 ft. closer to Unit 2 does not make the distance between a turbine building and the other unit's control room intake more limiting. The distance from the turbine building to the control room for the same unit's control room intake remains unchanged from the previously submitted analysis since the principal buildings in the standard plant layout (nuclear island, turbine building, annex building, diesel generator, and radwaste building) for each unit remain in the same relative position. The distances from the Unit 1 Circulating Water System (CWS) cooling towers to the Unit 1 and Unit 2 control room intakes are increasing. The distances between the Unit 2 CWS cooling towers and the Unit 1 and Unit 2 control room intakes are decreasing slightly, but remain bounded by the certified design distances listed in the AP1000 DCD. The plant relocation does not impact the results of Duke Energy's on-site toxic hazards analysis. Therefore, the plant relocation has no impact to the content of Chapter 6 due to on-site toxic hazards.

FSAR Chapter 7

The information provided in FSAR Chapter 7 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and identification of site-specific information related to environmental monitoring. The location of these instruments is not specified in FSAR Chapter 7, but is addressed in FSAR Chapter 2. The programmatic information provided in FSAR Chapter 7 is not dependent on the plant location. Therefore the plant relocation has no impact to the content of Chapter 7.

FSAR Chapter 9

The information provided in FSAR Chapter 9 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and conceptual design information related to site-specific design. The programmatic information provided in FSAR Chapter 9 is not dependent on the plant location.

The plant relocation changes the physical relationship between the Service Water System (SWS) cooling towers and the Circulating Water System (CWS) cooling towers. FSAR Subsection 9.2.1.2.2 (SUP 9.2-2) was assessed for impact and determined to be valid for the revised configuration. The response to RAI 09.02.01-008 (see Reference 3) was reviewed and determined to remain valid for the relocated configuration. This review noted the number of CWS cooling towers per unit has been changed from three to two by a conceptual design change (see Reference 4). This conceptual design change does not affect the conclusions discussed in the response to RAI 09.02.01-008.

No other subsections in FSAR Chapter 9 are impacted by the plant relocation. Therefore, the plant relocation has no impact to the content of Chapter 9.

FSAR Chapter 10

The information provided in FSAR Chapter 10 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and conceptual design information related to site-specific design. The programmatic information provided in FSAR Chapter 10 is not dependent on the plant location. The locations of the Circulating Water System cooling towers are unchanged. Therefore, the information contained in FSAR Chapter 10 remains valid and the plant relocation has no impact to Chapter 10.

FSAR Chapter 13

The information provided in FSAR Chapter 13 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and site-specific organizational information. The programmatic and organizational information is not dependent on the plant location. Therefore, the plant relocation has no impact to the content of Chapter 13.

FSAR Chapter 14

The information provided in FSAR Chapter 14 is limited to the incorporation by reference to the AP1000 DCD and programmatic information that is not dependent on the plant location. Therefore, plant relocation has no impact to the content of Chapter 14.

FSAR Chapter 15

The information provided in FSAR Chapter 15 is limited to the incorporation by reference to the AP1000 DCD and a future commitment to calibration and testing requirements of feedwater flow instrumentation. Additional pointers to other sections of the FSAR for additional information are also presented. This information is not dependent on the plant location. Therefore, plant relocation has no impact to the content of Chapter 15.

FSAR Chapter 16

The information provided in FSAR Chapter 16 is limited to the incorporation by reference to the AP1000 DCD and programmatic information that is not dependent on the plant location. Therefore, plant relocation has no impact to the content of Chapter 16.

FSAR Chapter 17

The information provided in FSAR Chapter 17 is limited to the incorporation by reference to the AP1000 DCD and programmatic information that is not dependent on the plant location. Therefore, plant relocation has no impact to the content of Chapter 17.

FSAR Chapter 18

The information provided in FSAR Chapter 18 is limited to the incorporation by reference to the AP1000 DCD, programmatic information, and departures for the locations of the Technical Support Center (TSC) and Operations Support Center (OSC). The programmatic information provided in FSAR Chapter 18 is not dependent on the plant location. Although the buildings within which the TSC and OSC are located will be moved, the locations of the TSC and OSC remain the same within the buildings following plant relocation. Therefore, plant relocation has no impact on the content of Chapter 18.

References:

1. Letter from Christopher M. Fallon (Duke Energy) to NRC Document Control Desk, Response to Request for Additional Information, Ltr# WLG2012.05-03, dated May 31, 2012 (ML12156A212)
2. Letter from Christopher M. Fallon (Duke Energy) to NRC Document Control Desk, Response to Request for Additional Information (RAI No. 6339), Ltr# WLG2012.03-07, dated March 28, 2012 (ML12090A052)
3. Letter from Bryan J. Dolan (Duke Energy) to NRC Document Control Desk, Response to Request for Additional Information (RAI No, 5464), Ltr# WLG2011.03-05, dated March 14, 2011 (ML110750044)
4. Letter from Ronald A. Jones (Duke Energy) to NRC Document Control Desk, Supplemental Information Related to Design Changes to the Circulating Water System, Ltr# WLG2011.11-04, dated November 22, 2011 (ML11327A153)