Luminant

Rafael Flores
Senior Vice President &
Chief Nuclear Officer
rafael.flores@luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.5590
F 254.897.6652
C 817.559.0403

CP-201000763
Log # TXNB-10039

Ref. # 10 CFR 52

June 1, 2010

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
HYDROLOGY PUBLIC MEETING DRAFT PRESENTATION MATERIAL

Dear Sir:

As requested by the NRC, Luminant Generation Company LLC (Luminant) submits herein the draft presentation material that will form the basis for discussion of the remaining hydrology issues at a public meeting in the near future. Luminant has tentatively scheduled the week of June 21, 2010 for the public meeting and requests that the NRC also consider that week.

Should you have any questions regarding this draft presentation material, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

I state under penalty of perjury that the foregoing is true and correct.

Executed on June 1, 2010.

Sincerely,

Luminant Generation Company LLC

RD Graf for

Rafael Flores

Attachments: 1. Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #144
2. Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #145
3. Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #147.

D090
NRO

cc: Stephen Monarque w/attachments

Electronic distribution w/o attachments

Rafael.Flores@luminant.com
mlucas3@luminant.com
jeff.simmons@energyfutureholdings.com
Bill.Moore@luminant.com
Brock.Degeyter@energyfutureholdings.com
rbird1@luminant.com
Matthew.Weeks@luminant.com
Allan.Koenig@luminant.com
Timothy.Clouser@luminant.com
Ronald.Carver@luminant.com
David.Volkening@luminant.com
Bruce.Turner@luminant.com
Eric.Evans@luminant.com
Robert.Reible@luminant.com
donald.woodlan@luminant.com
John.Conly@luminant.com
JCaldwell@luminant.com
David.Beshear@txu.com
Ashley.Monts@luminant.com
Fred.Madden@luminant.com
Dennis.Buschbaum@luminant.com
Carolyn.Cosentino@luminant.com
NuBuild Licensing files

Luminant Records Management (.pdf files only)

shinji_kawanago@mnes-us.com
masanori_onozuka@mnes-us.com
ck_paulson@mnes-us.com
joseph_tapia@mnes-us.com
russell_bywater@mnes-us.com
diane_yeager@mnes-us.com
mutsumi_ishida@mnes-us.com
nan_sirirat@mnes-us.com
nicolas_kellenberger@mnes-us.com
rjb@nei.org
kak@nei.org
michael.takacs@nrc.gov
cp34update@certrec.com
michael.johnson@nrc.gov
David.Matthews@nrc.gov
Balwant.Singal@nrc.gov
Hossein.Hamzehee@nrc.gov
Stephen.Monarque@nrc.gov
jeff.ciocco@nrc.gov
michael.willingham@nrc.gov
john.kramer@nrc.gov
Brian.Tindell@nrc.gov
Donald.Palmrose@nrc.gov
Elmo.Collins@nrc.gov
Loren.Plisco@nrc.com
Laura.Goldin@nrc.gov
James.Biggins@nrc.gov
Susan.Vrahoretis@nrc.gov
sfrantz@morganlewis.com
jrund@morganlewis.com
tmatthews@morganlewis.com

Attachment 1

Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #144

Luminant

CP RAI No. 144

Questions 02.04.05-6 & 02.04.05-7

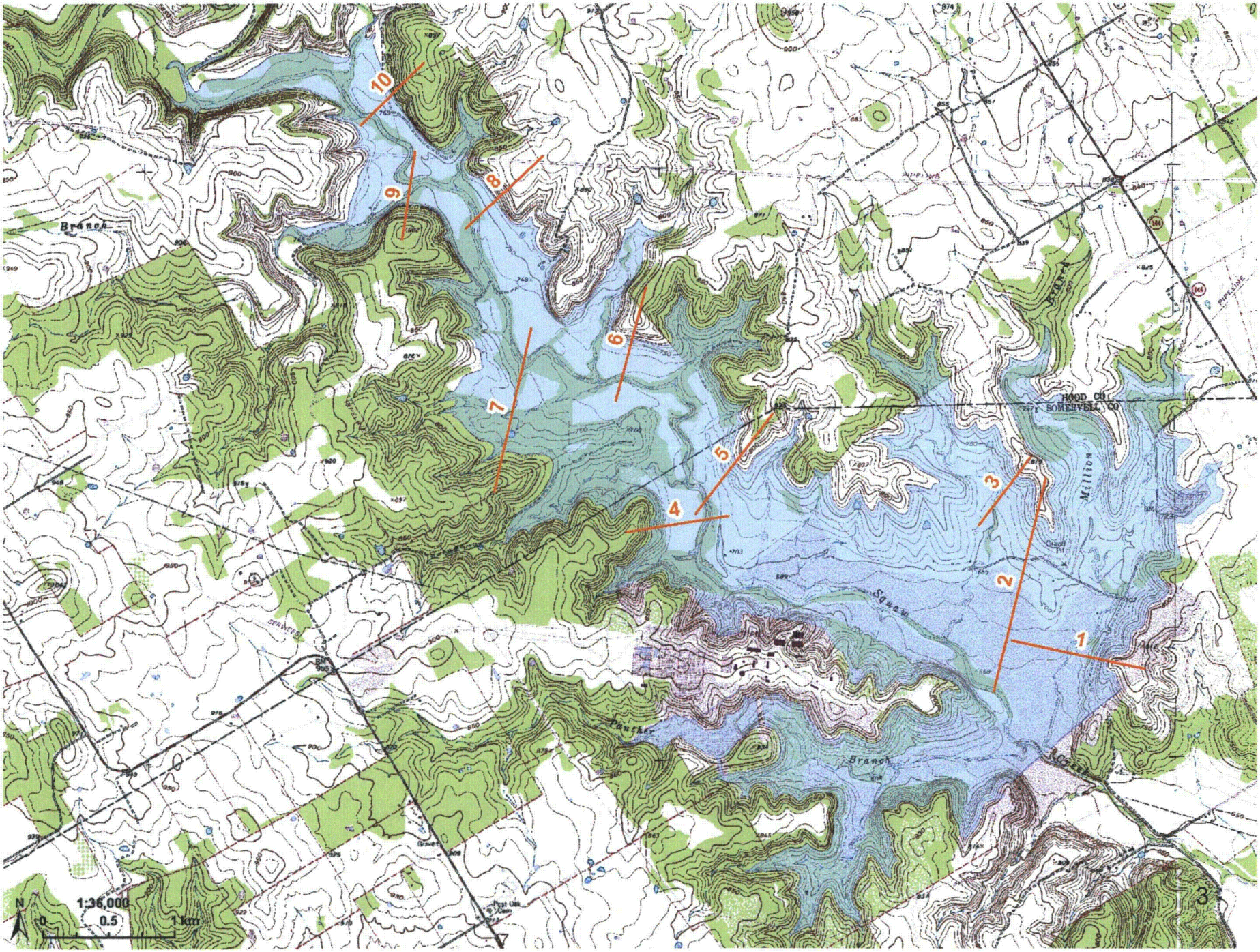
- SCR Landslide-Induced Seiche
- SCR Seismic Seiche

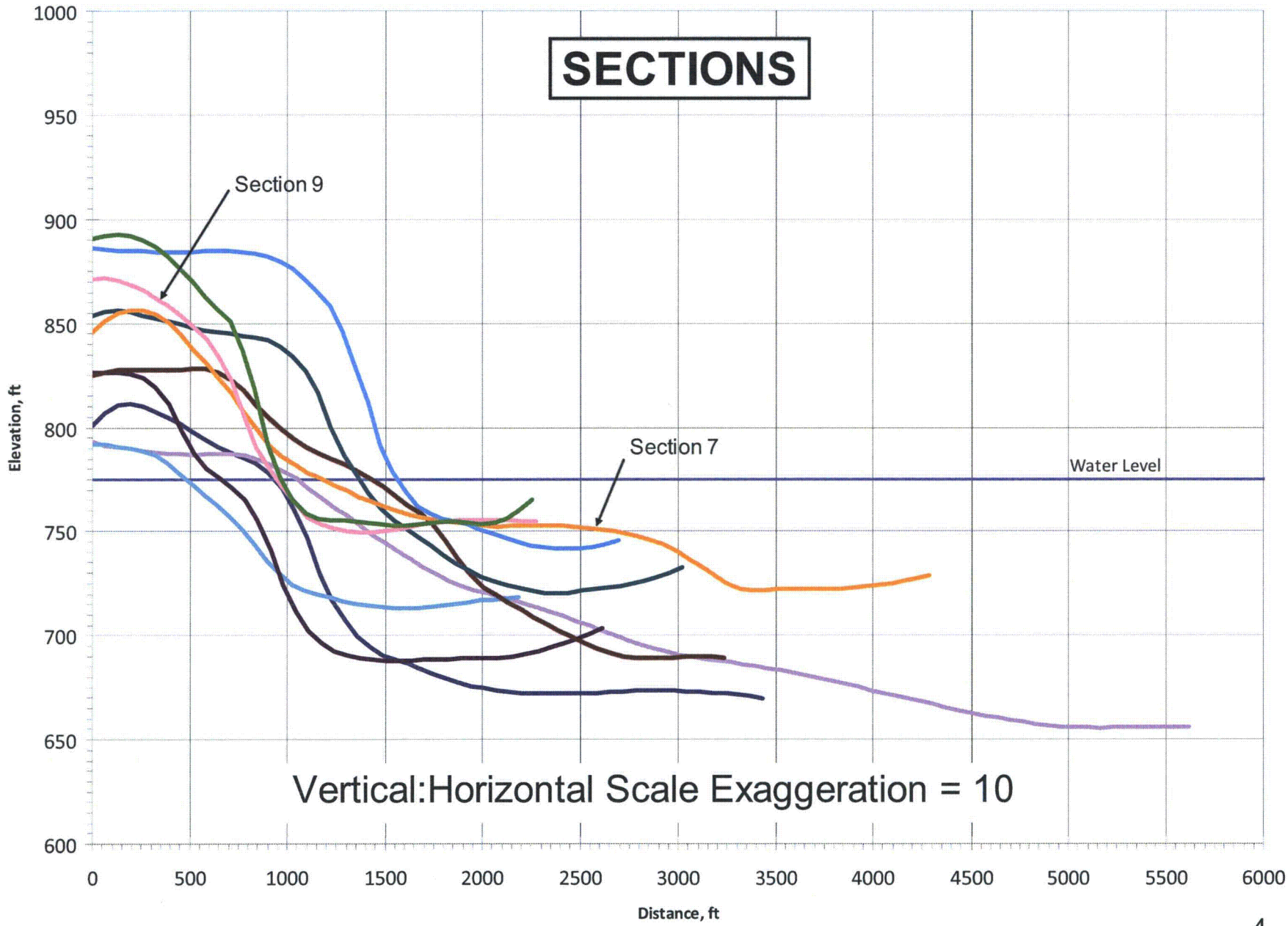
MNES
Mitsubishi Nuclear Energy Systems

ENERCON
Excellence—Every project. Every day.

Landslide-Induced Seiche

- **Geology**
  - Flat-lying stratigraphy
  - Glen Rose Formation
  - No past landslides or slope failures
- **Engineering**
  - Studied pre- and post-construction USGS topographic data
  - Selected 10 representative sections along SCR based on slope height, gradient, and location


10
9
8
7
6
5
4
3
2
1
Branch
Squaw
Branch
Milliron
HOOD CO
SOMERVELL CO
PIPELINE
N
1:36,000
0
0.5
1 km


SECTIONS
Section 9
Section 7
Water Level
Vertical:Horizontal Scale Exaggeration = 10
Elevation, ft
Distance, ft
1000
950
900
850
800
750
700
650
600
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6000

Landslide-Induced Seiche

Sections Geometries

SCR shoreline slopes are generally very flat.

Section	Slope Height (ft)	Slope Gradient (H:V)
1	137	28:1 to 4.8:1
2	139	33:1 to 15:1
3	77	13:1 to 8.5:1
4	137	14:1 to 4.5:1
5	138	19:1 to 7.6:1
6	142	15:1 to 5.2:1
7	135	24:1 to 8.4:1
8	145	30:1 to 3.7:1
9	120	13:1 to 5:1
10	135	10:1 to 3.2:1

Landslide-Induced Seiche

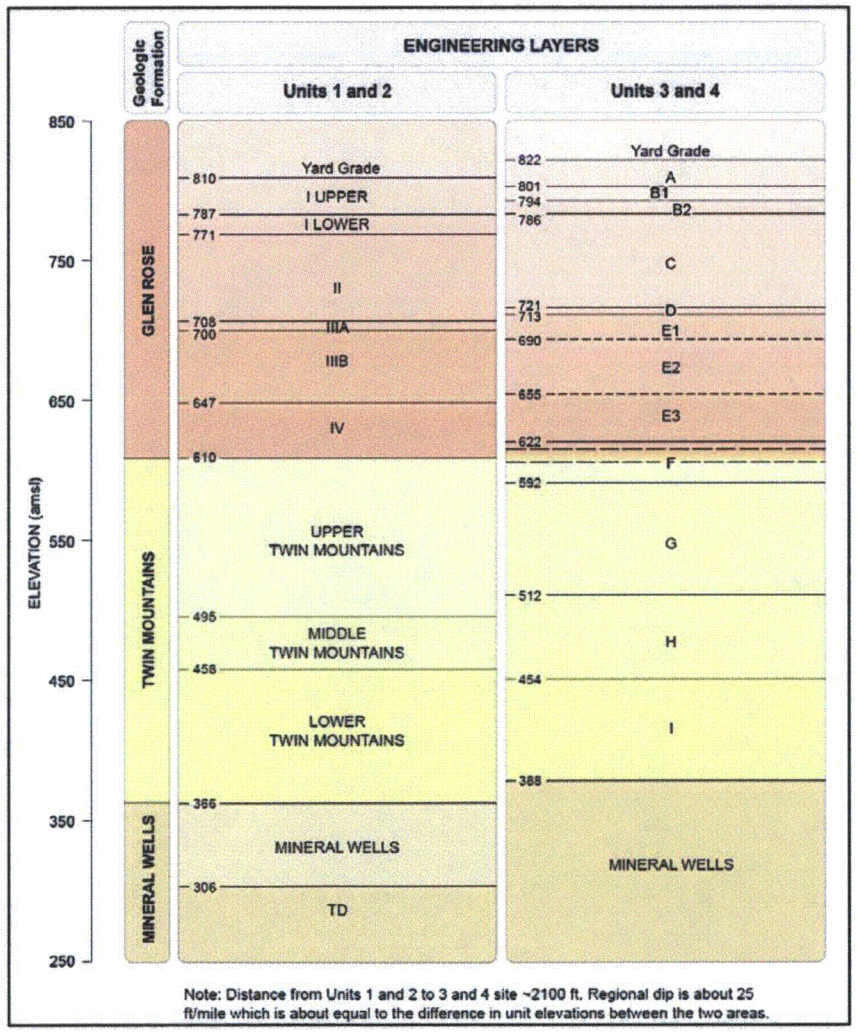
Section Subsurface Properties

Model 1

- Subsurface properties assumed similar to CPNPP site because of
  - Uniform geology
  - Flat-lying stratigraphy
- Top of Engineering Layer A
  - Average El. 833 ft
- Material properties assumed at lower bound strength values

Model 2

- Very conservative worst case scenario
- Subsurface assumed to consist of soil material (C=200 psf, Φ=25°)



Landslide-Induced Seiche

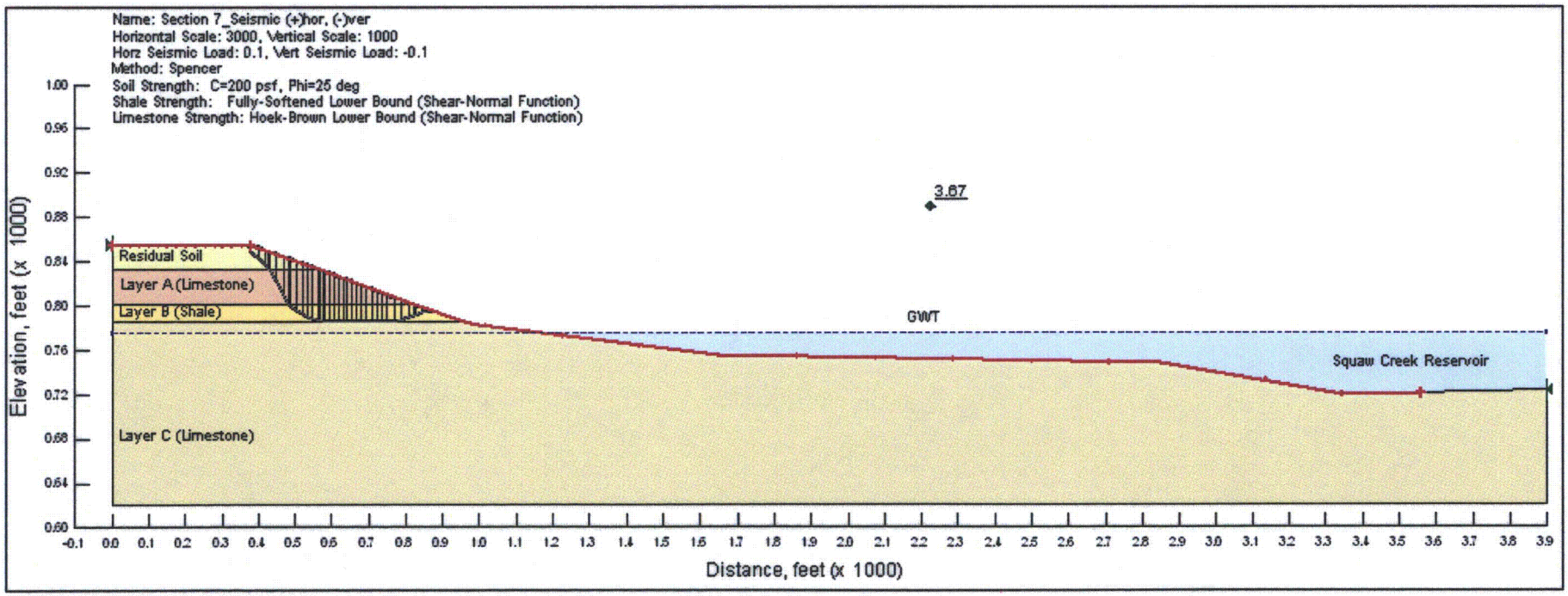
Slope Stability Analysis

- Slope stability analyses were performed for both static and seismic (pseudo-static) loading conditions
- CPNPP site ground motion analyses
  - Horizontal PGA: 0.045g - 0.07g
- Horizontal & Vertical PGA selected design value: PGA 0.1g
- Both positive (downward) and negative (upward) direction of the vertical coefficients were considered. The orientation resulting in the lower factor of safety (FS) was considered the critical condition
- Acceptable Minimum FS based on USACE Slope Stability Manual
  - Static Long-Term FS: 1.5
  - Pseudo-static FS: 1.1

Landslide-Induced Seiche

Sample Results

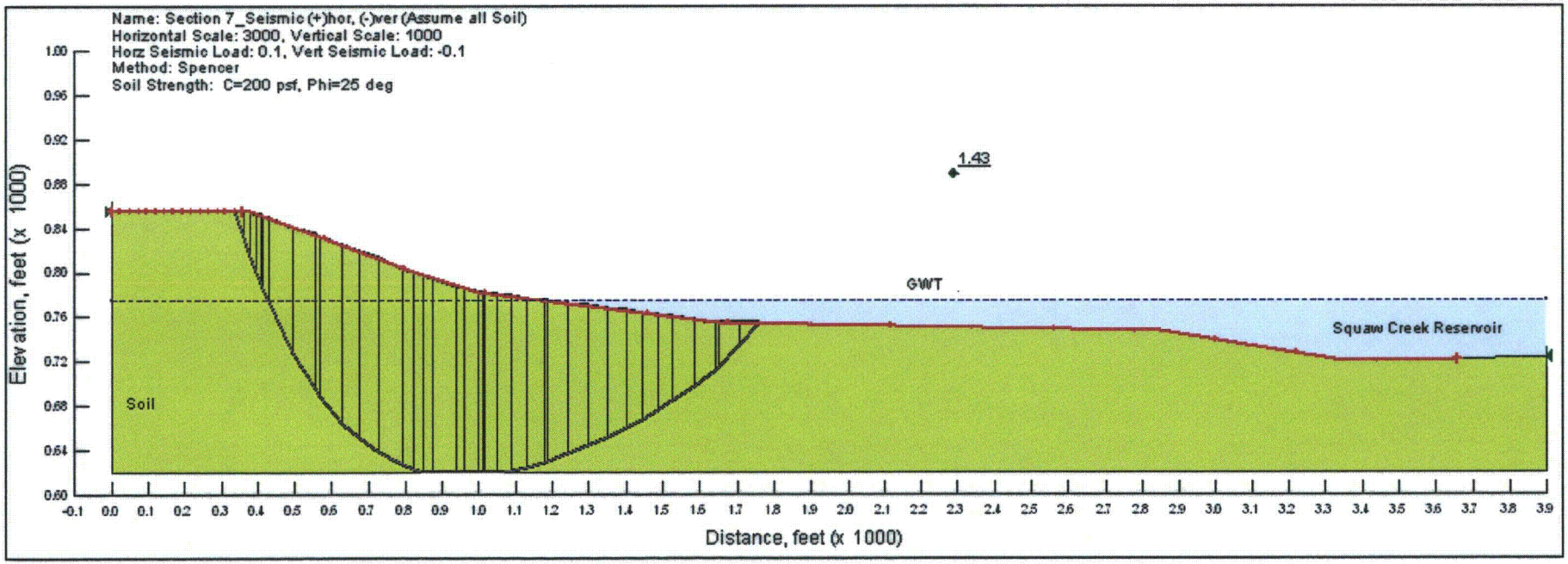
- Section 7: Model 1, Seismic Stability
- Vertical:Horizontal Scale Exaggeration = 3
- FS = 3.67



Landslide-Induced Seiche

Sample Results

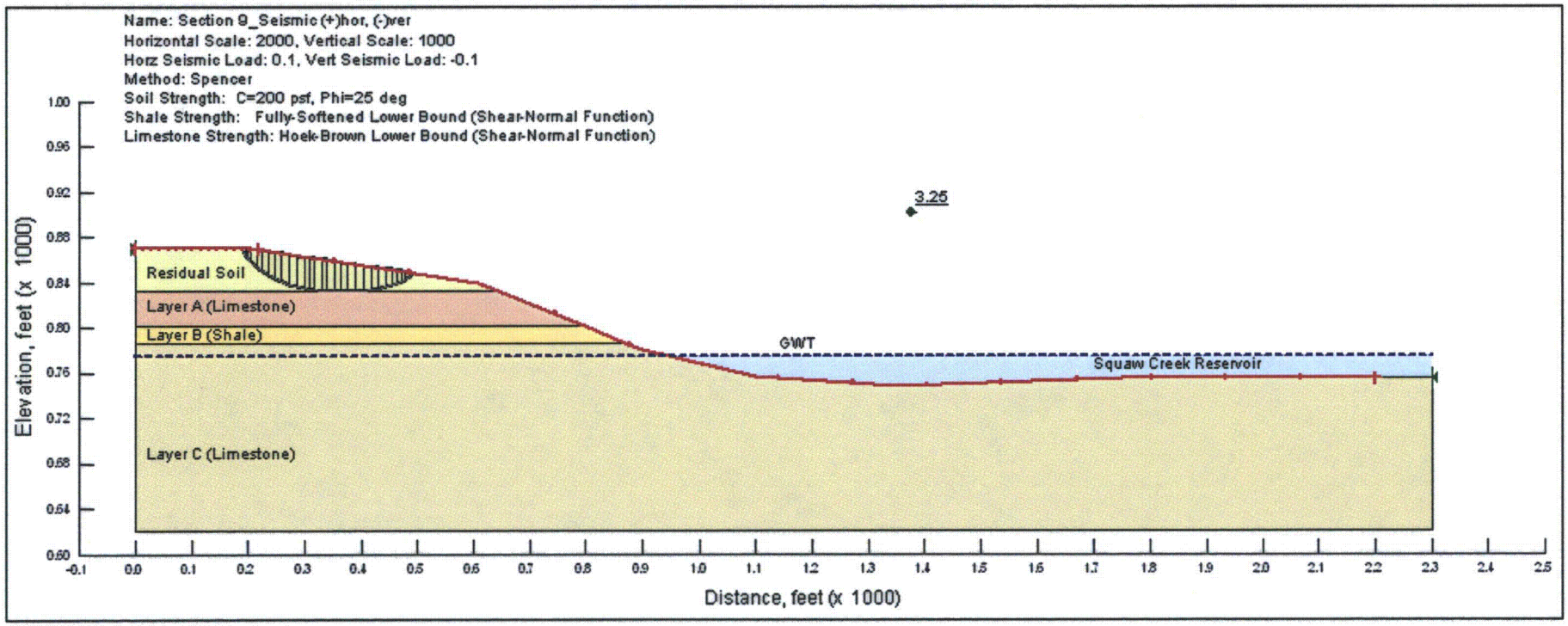
- Section 7: Model 2 (All Soil), Seismic Stability
- Vertical:Horizontal Scale Exaggeration = 3
- FS = 1.47



Landslide-Induced Seiche

Sample Results

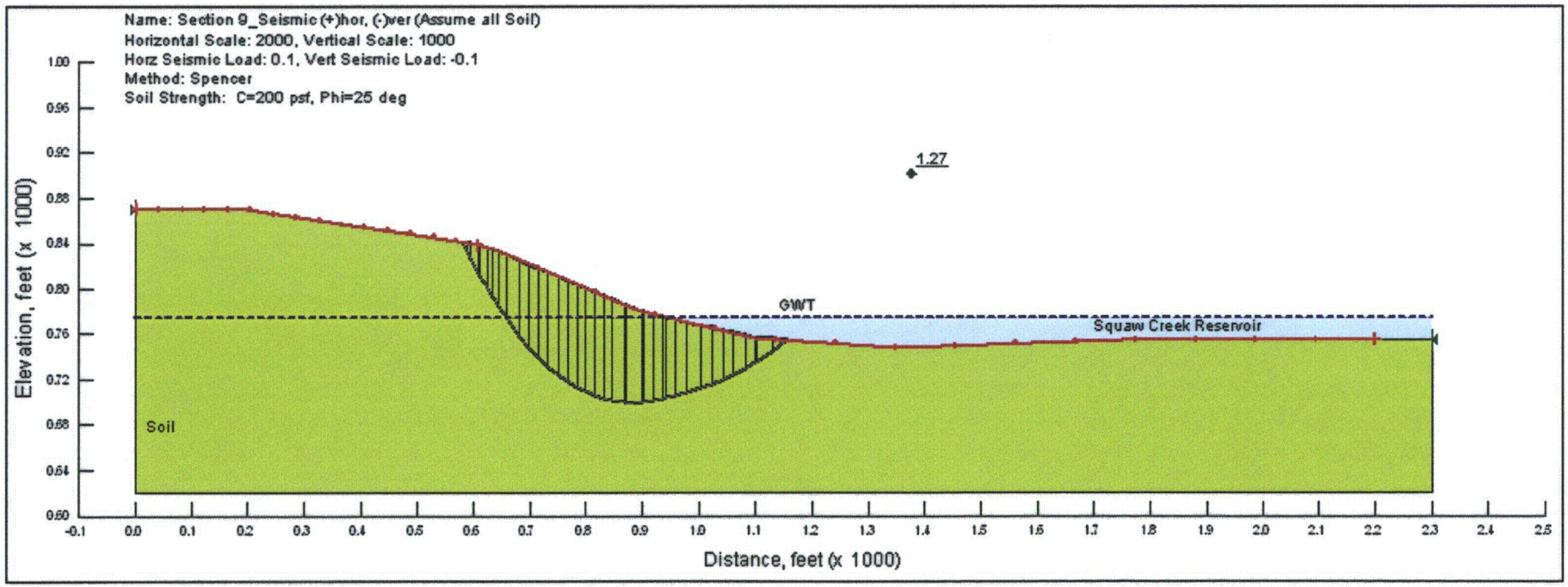
- Section 9: Model 1, Seismic Stability
- Vertical:Horizontal Scale Exaggeration = 2
- FS = 3.25



Landslide-Induced Seiche

Sample Results

- Section 9: Model 2 (All Soil), Seismic Stability
- Vertical:Horizontal Scale Exaggeration = 2
- FS = 1.27



Landslide-Induced Seiche

Summary Results for all 10 Sections

- Model 1
- Static FS > 1.5
- Seismic FS > 1.1

Section	Static Slope Stability FS	Seismic Slope Stability FS
1	13.1	3.71
2	34.2	9.12
3	27.6	8.85
4	9.3	3.92
5	11.6	3.88
6	5.8	3.88
7	7.3	3.67
8	2.9	2.05
9	8.1	3.25
10	5.8	2.66

Landslide-Induced Seiche

Summary Results for all 10 Sections

- Model 2 (All Soil)
- Static FS > 1.5
- Seismic FS > 1.1

Section	Static Slope Stability FS	Seismic Slope Stability FS
1	3.2	1.29
2	6.0	1.52
3	5.7	1.48
4	2.8	1.22
5	4.7	1.43
6	2.4	1.26
7	3.4	1.43
8	1.8	1.15
9	2.3	1.27
10	1.7	1.12

Landslide-Induced Seiche

Conclusions

- SCR shoreline slopes fairly flat
- Using very conservative lower bound subsurface material properties
  - Slope stability analyses indicate acceptable static FS
- Using very conservative upper bound seismic loading
  - Seismic stability analyses indicate acceptable seismic performance
  - No seismically induced slope displacement or failure is expected
- To examine potential variability of subsurface material
  - Worst case scenario "All Soil" condition (Model 2)
  - Results demonstrate acceptable FS
  - No slope displacement or failure is expected

Landslide-Induced Seiches are not considered likely at SCR location

Seismic Seiche

Relevant Information

1. McGarr, A. (1965), Excitation of Seiches in Channels by Seismic Waves, Journal of Geophysical Research Vol. 70, No.4.

2. McGarr, A., and R.C. Vorhis (1968), Seismic Seiches from the March 1964 Alaska Earthquake, U.S. Geological Survey Professional Paper 544-E.

3. Barberopoulou, A. (2006), Investigating the damage potential of seismic seiche: a case study of the Puget Lowland, Ph.D. Thesis, University of Washington.

4. Barberopoulou, A. (2008), A Seiche Hazard Study for Lake Union, Seattle, Washington, Bulletin of the Seismological Society of America, Vol. 98, No. 4.

Seismic Seiche

Main Factors Controlling Seiche Distribution/Size
(McGarr, 1965)

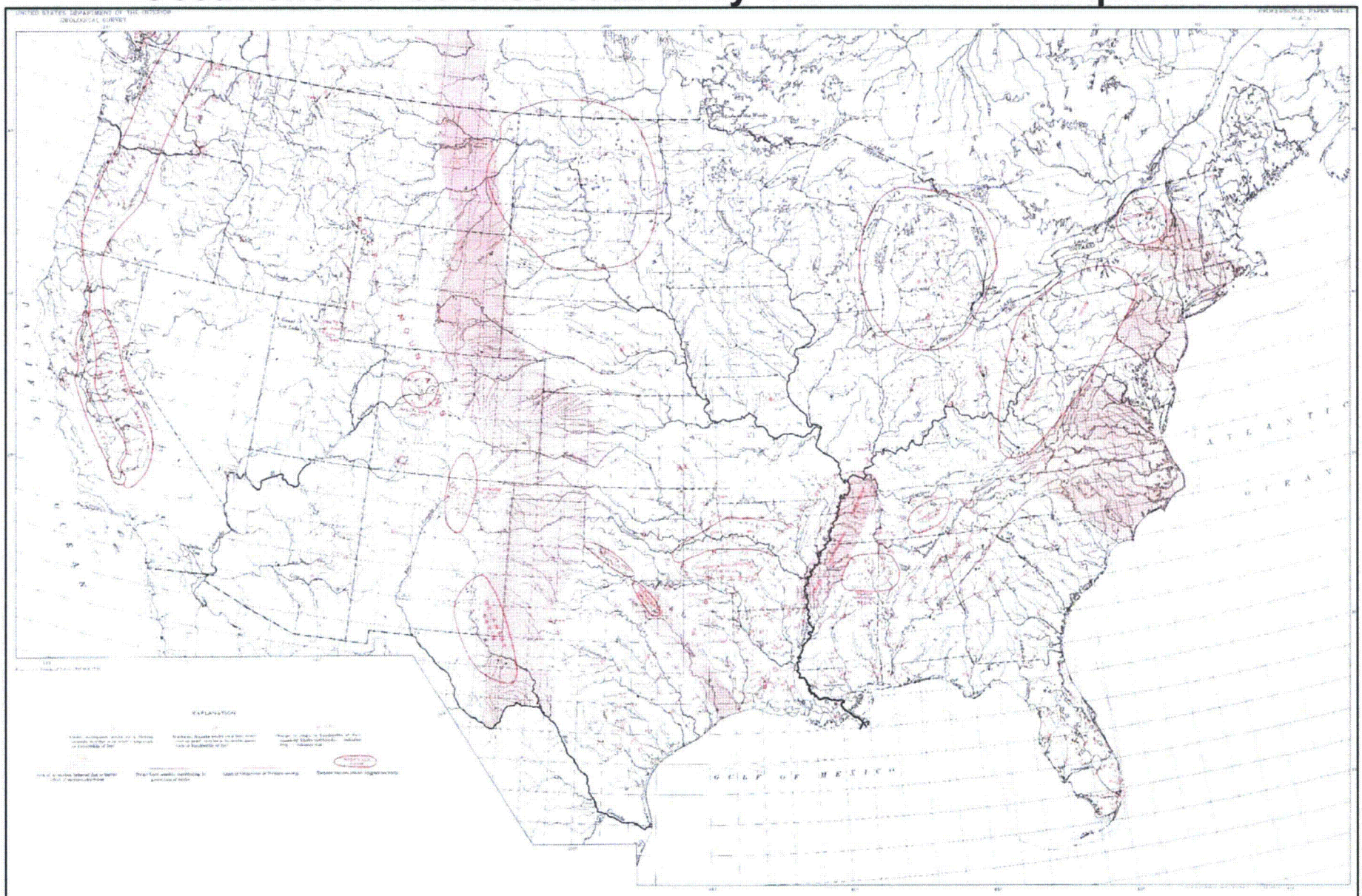
- Generated solely by seismic surface waves
- Height of seiche is directly proportional to the horizontal acceleration provided by seismic surface wave
- Height of seiche is directly proportional to $(H)^{1/2}$
  - H = depth of water body
- Seiche activity is a direct function of surface wave amplitude distribution
  - Period range of 5 to 15 seconds
- Density of seiche roughly proportional to thickness of low-rigidity sediments

Seismic Seiche

1964 Alaska Earthquake → Measurement of Seiches Across US (McGarr & Vorhis, 1968)

- 1964 Alaska Earthquake (M 9.2)
- Seismic seiches recorded at more than 850 surface water gaging stations in North America
- Nearly all were recorded 600 miles or more from the epicenter
- Densest occurrence in areas with thickest alluvium or low-rigidity sediments
- Seiches up to about 2 ft recorded on lakes, reservoirs, and ponds

Occurrence of Seiches Caused by 1964 Alaska Earthquake



MAP OF THE CONTERMINOUS UNITED STATES AND SOUTHERN CANADA SHOWING OCCURRENCE OF SEICHES FROM THE ALASKA EARTHQUAKE AND THEIR RELATION TO MAJOR TECTONIC FEATURES

Seismic Seiche

Lake Union → Comprehensive Seismic Seiche Study
(Barberopoulou, 2006 & 2008)

- Rectangular (~ 5,000 ft X 8,500 ft) with depth of about 20-50 ft
- Included simple harmonic & complex earthquake excitation
- 2002 Alaska Denali Earthquake (M 7.9)
- 2-D finite difference numerical model

Study Findings

- Long linear shorelines largest contributor to water wave heights
- Numerical results confirm: large sedimentary structure affects distribution & magnitude of seiches
- Maximum amplitude up to 5 ft estimated for Lake Union
- Maximum amplitude up to 12 ft estimated for deeper (about 160-ft) basins

Seismic Seiche

Conclusions

- SCR has irregular shape
  - Width 1,500 - 5,000 ft
  - Length about 22,000 ft
  - Depth 20 ft - 75 ft (120 ft near dam)
- Not much alluvium deposit
- Ground surface acceleration for 5 - 15 sec period is extremely low

SCR site appears less favorable than Lake Union with respect to Seismic Seiche development

- Maximum Seismic Seiche amplitude at SCR location not expected to exceed those for Lake Union (up to about 5 ft)
- CPNPP site finish grade of 822 ft is approximately 30 ft above site PMF
  - Significant margin over expected seismic seiche amplitudes

Seismic Seiches are not considered impacting CPNPP Site

Attachment 2

Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #145

Luminant

CP RAI #145
Question 02.04.13-7
Tank Failure Analysis

MNES
Mitsubishi Nuclear Energy Systems

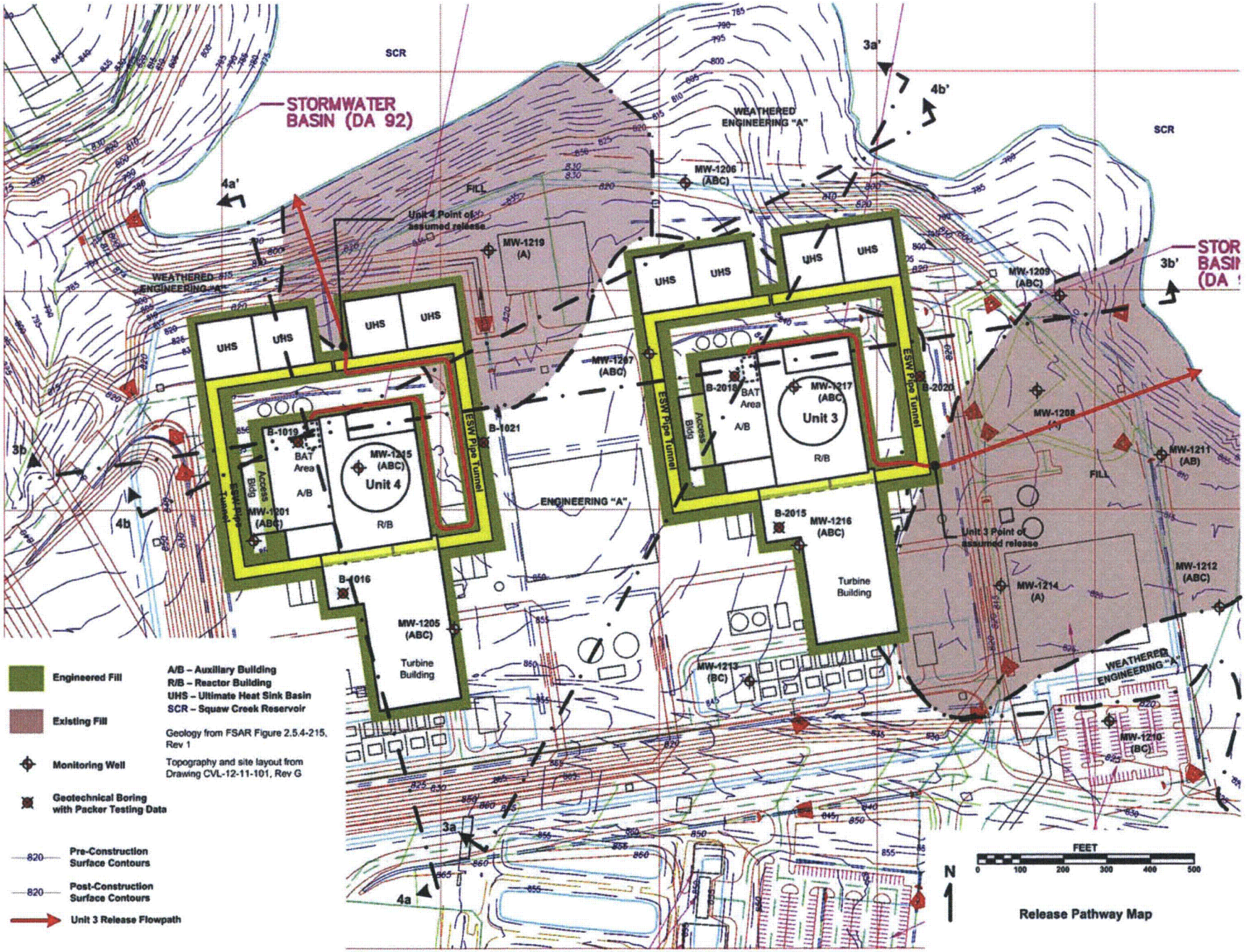
ENERCON
Excellence—Every project. Every day.

Source Term Changes

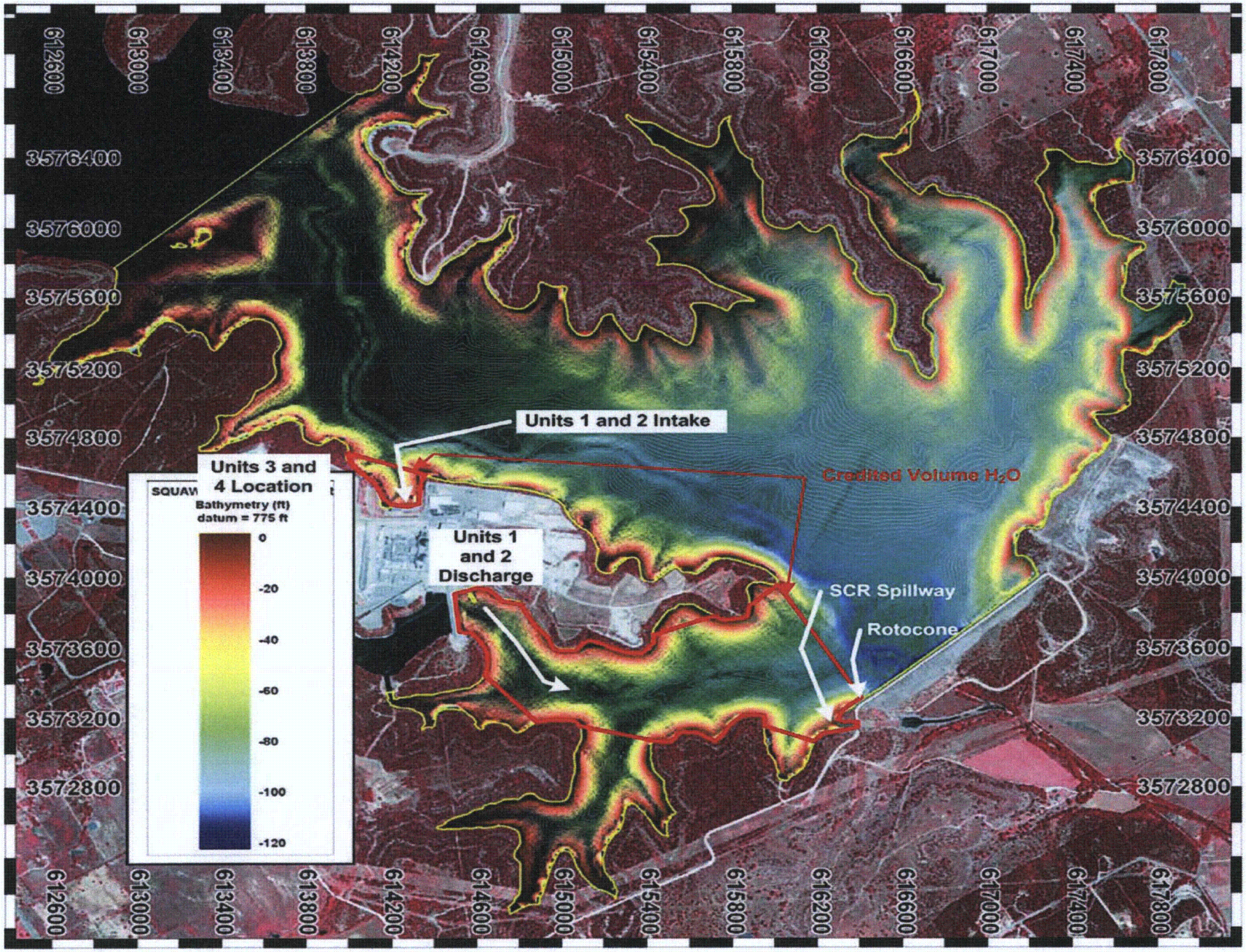
- DCD Subsection 11.2.3.2 has been revised to indicate that the source term for the tank failure analysis has been determined using ANSI 18.1-1999 (BTP 11-6) (accepted methodology for other vendors and COLA applicants) instead of the RATAF code.
- DCD Subsection 11.2.3.2 revision also includes the deletion of the site-specific analysis and a change to COL action item 11.2(3) that states: "The COL applicant is responsible for developing the site-specific hydrogeological data, and for performing an analysis to demonstrate that the potential groundwater or surface water contamination concentration resulting from the radioactive liquid containing tank failure analysis meets the 10 CFR 20, Appendix B, Table 2 ECLs."
- DCD Table 11.2-16 has been revised to delete the assumptions for the previous tank failure information.
- DCD Table 11.2-17 will be revised to provide the source term concentrations for the tanks listed based upon ANSI 18.1-1999 methodology.

Conceptual Alternate Model Revisions

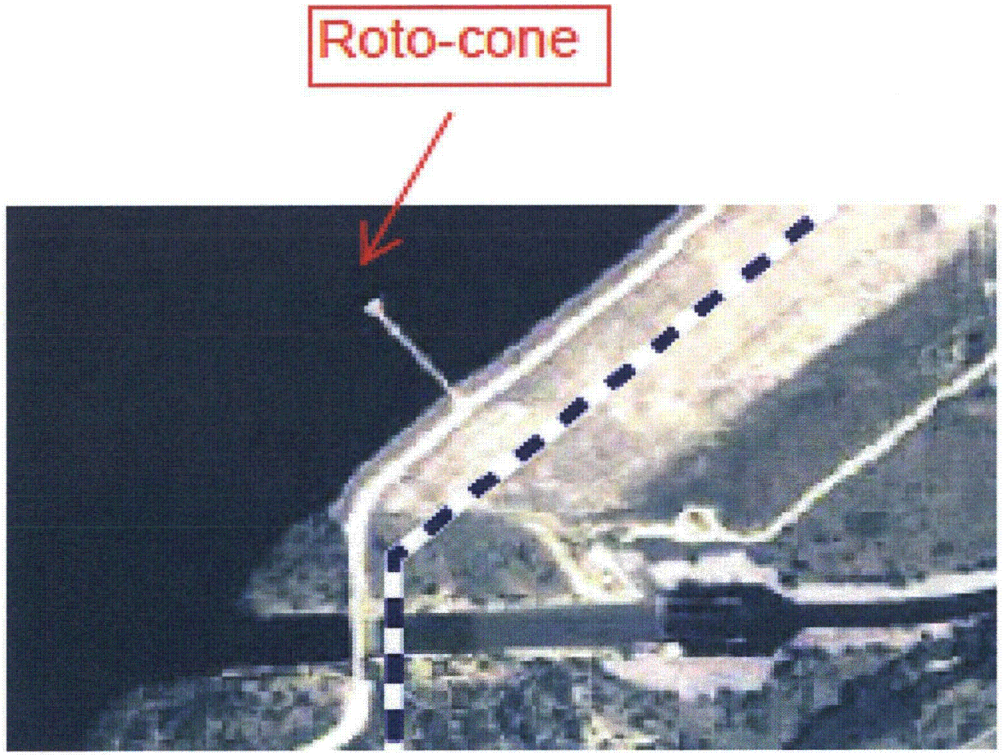
- The conservative pathway remains from the Boric Acid Tank (BAT) to Squaw Creek Reservoir (SCR) via groundwater. The unrestricted nearest potable water supply remains the discharge point Roto-cone that drains to the SCR spillway and into the Brazos River.
- The most conservative pathway for the BAT source term release is from the Unit 3 BAT via groundwater assumed exist in the engineered fill outside the Auxiliary Building (AB) to the existing fill east of Unit 3. No credit is taken for the time it takes for the BAT source term to reach the existing fill east of Unit 3, or the potential for retardation or dilution effects from groundwater assumed existing in the engineered fill. Once the source term release reaches SCR through the existing fill (calculated to be approx. 0.44 years), the source term release will enter SCR and be drawn into the Units 1 and 2 circulating water (CW) intake pumps and discharge to the south side of the peninsula at approx. 2 million gpm where it will encounter the Roto-cone drain to SCR spillway.
- The groundwater pathways leading south or west of the Unit 3 or 4 sites have been eliminated as credible pathways based upon the information provided in RAI 147. Additionally, the vertical groundwater pathway remains eliminated due to the site-specific hydrogeology previously discussed in RAI 147.



Release Pathway Map


612600
613000
613400
613800
614200
614600
615000
615400
615800
616200
616600
617000
617400
617800
3576400
3576000
3575600
3575200
3574800
3574400
3574000
3573600
3573200
3572800
Units 1 and 2 Intake
Units 3 and 4 Location
Bathymetry (ft)
datum = 775 ft
0
-20
-40
-60
-80
-100
-120
Units 1 and 2 Discharge
Credited Volume H_2O
SCR Spillway
Rotocone

Aerial Photo of Roto-cone and SCR Spillway Discharge



Travel Time to Squaw Creek Reservoir

- To determine groundwater velocity within the existing fill material, it was assumed that the engineered fill surrounding the ESW pipe tunnel (assumed release point for Unit 3 accident analysis) was saturated to a maximum predicted groundwater elevation of 820 ft msl. The following table depicts the results for the groundwater velocity calculation:

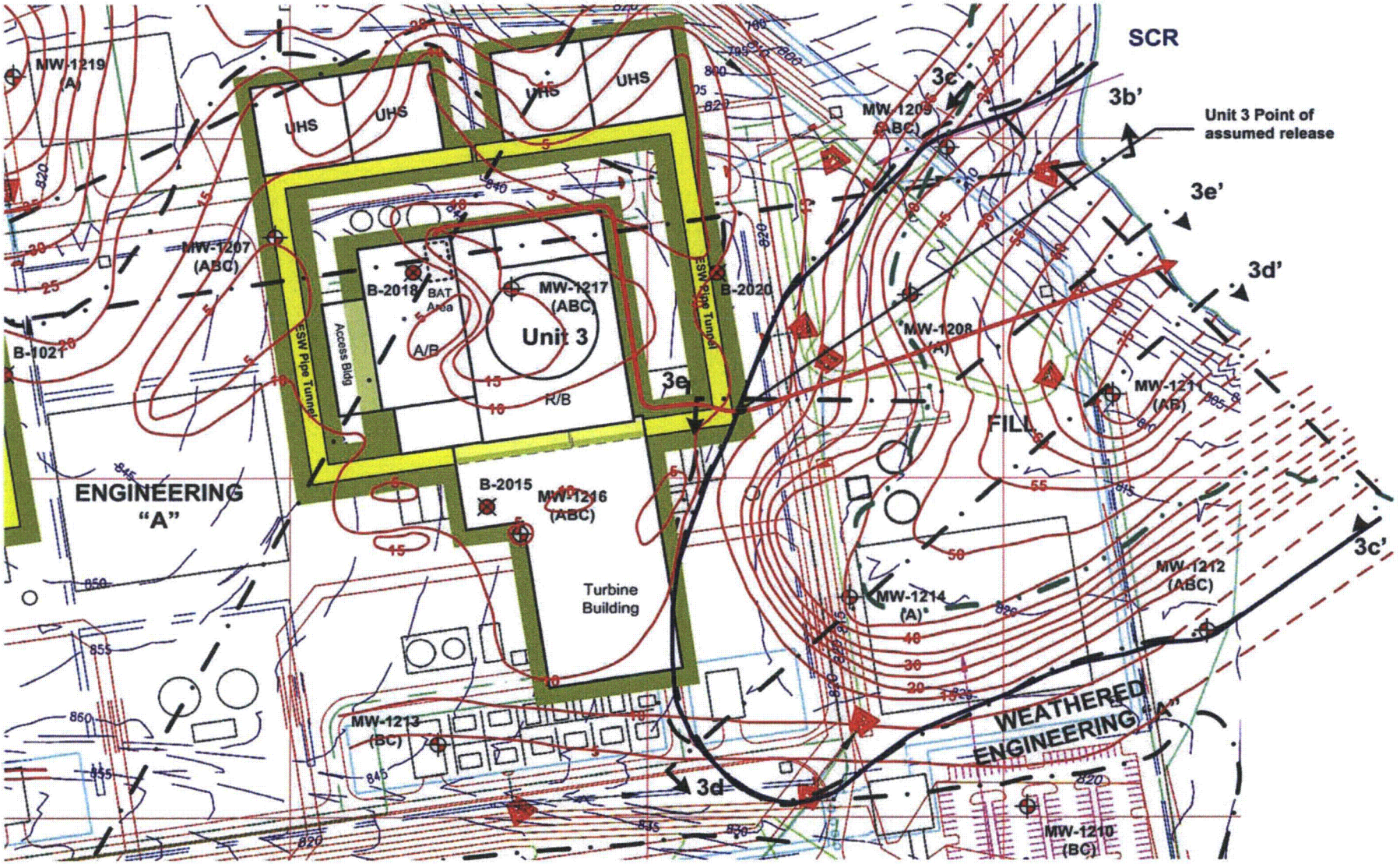
Elevation High (Eh)	820.00 ft msl
Elevation Low (El)	775.00 ft msl
Distance to SCR (L_G)	600 ft
Hydraulic Gradient (Eh-El)/L_G	0.0750 ft/ft
Hydraulic Conductivity (K_h)	3.50x10-3 cm/sec
	1.15x10-4 ft/sec
	9.9213 ft/day
Effective Porosity (η)	0.2
Velocity (V)	3.72 ft/day
Travel Time (T)	0.44 years or 161 days

Travel Time Continued

- Engineered fill is conservatively assumed as having negligible transport time.
- Eh is conservatively assumed to be the elevation of the trench drain (820 ft msl) transposed to the edge of the engineered fill.
- El is assumed to be the elevation of SCR (775 ft. msl)
- Velocity Equation: $V = (K_h (E_h - E_l)/L_G)/\eta$
- Travel Time Equation: $T = L_G/V$
- Effective porosity of 20% conservatively assumed for existing fill (large rubble, sand, gravel).
- Engineered fill is assumed fully saturated to the level of the perimeter trench drains
- K_h is used from RW - 1 Recovery test.

Groundwater Dilution Contribution in Existing Fill

- The existing fill to the east of Unit 3 is composed of large boulders, gravel, and excavated material from the construction of CPNPP Units 1 and 2. Figure 1 shows the plan view with the existing topographic contours (pre - construction) and the location of the proposed CPNPP Unit 3. Superimposed on the figure are the "depth - of - soil" contours derived from FSAR Rev 1 Figure 2.5.4 - 212. Using this information, Cross - sections 3c, 3d, and 3e were constructed to depict the shape and orientation of the existing fill material. As can be seen in cross - sections 3d and 3e, the fill material below the influence of SCR will not be affected by post - construction grading and excavations.



Depth of soil contours from FSAR Figure 2.5.4-212

Engineered Fill

Existing Fill

Monitoring Well

Geotechnical Boring with Packer Testing Data

820 Pre-Construction Surface Contours

10 Depth of Existing Fill Contours

Bottom of Existing Fill Contour Elevation 775 ft msl

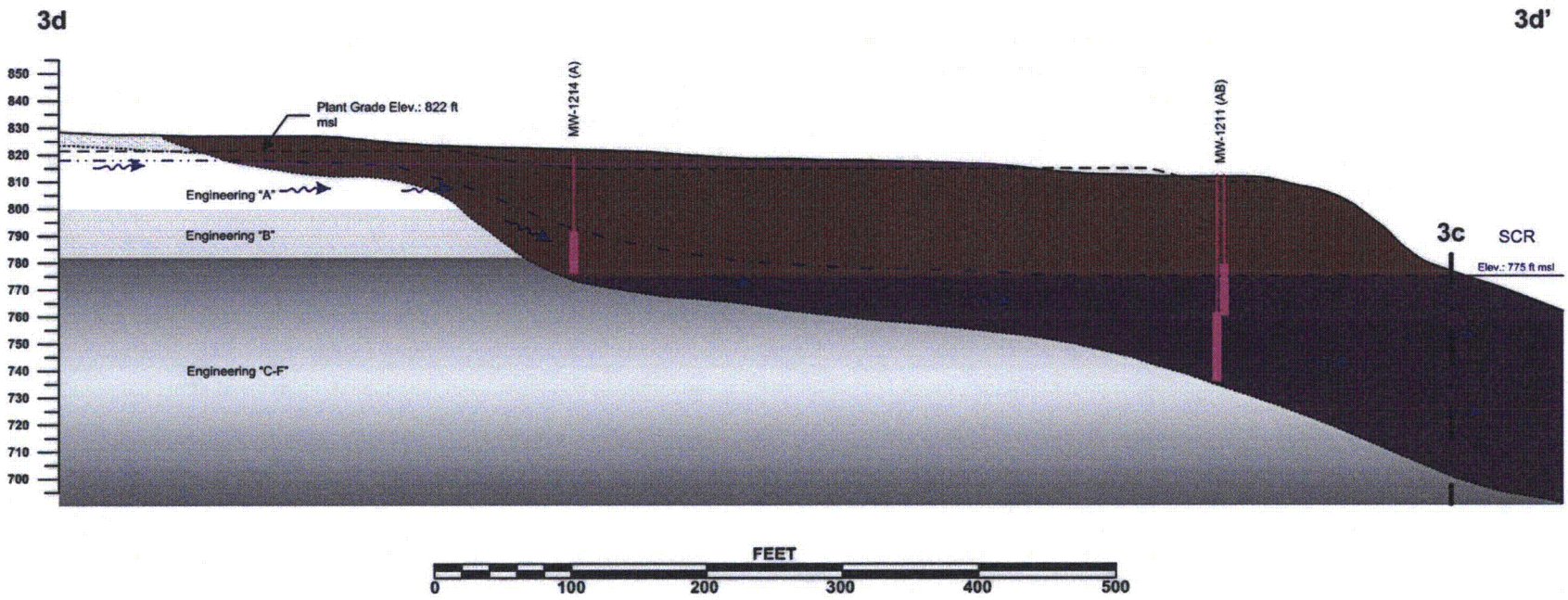
Surface Extent of Existing Fill

Unit 3 Release Flowpath

N

FEET 0 100 200 300 400 500

Figure 1
Cross Section Location Map



Projected Post-Construction Groundwater Potentiometric Surface Elevation

Projected Groundwater Flow Direction

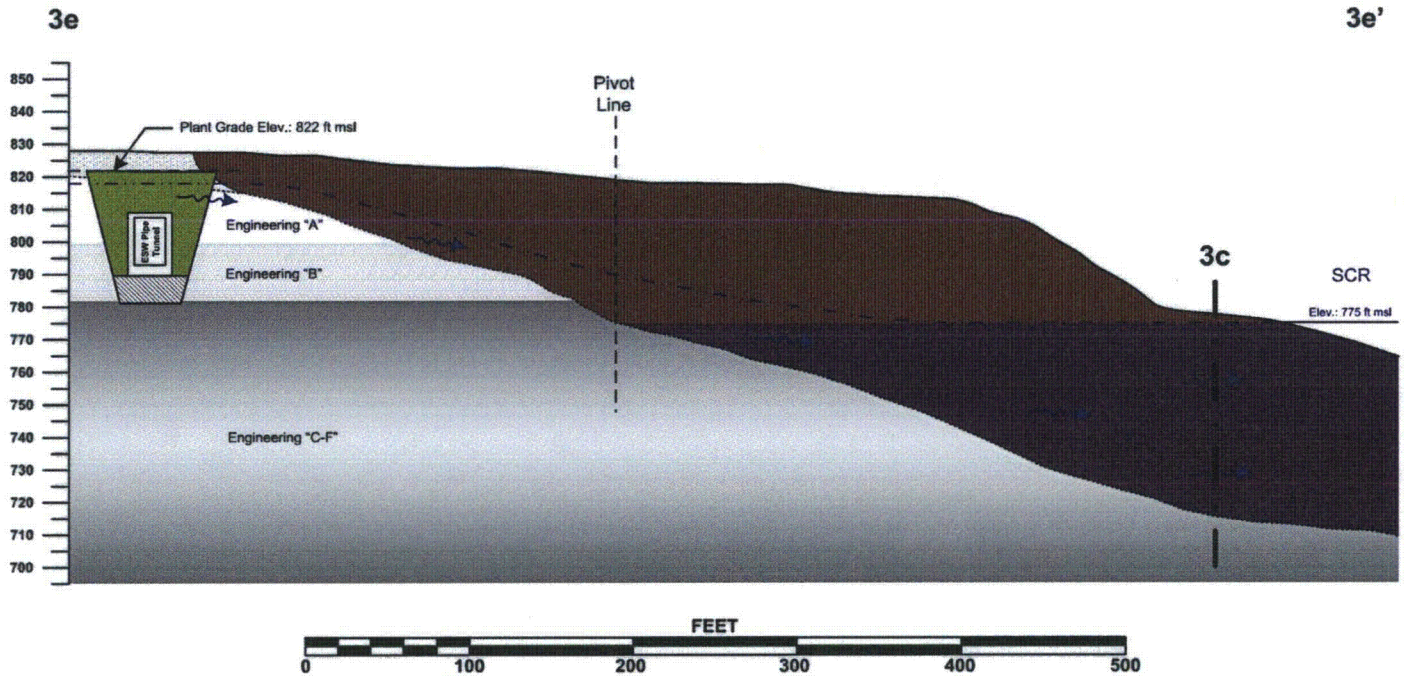
Monitoring Well with screen elevations

Existing Fill

Native Soil

Existing Fill below the SCR pool elevation (775 ft. msl)

Cross Section 3d



Projected Post-Construction Groundwater Potentiometric Surface Elevation

Projected Groundwater Flow Direction

Monitoring Well with screen elevations

Engineered Fill

Leveling Concrete

Existing Fill

Native Soil

Existing Fill below the SCR pool elevation (775 ft. msl)

Cross Section 3e

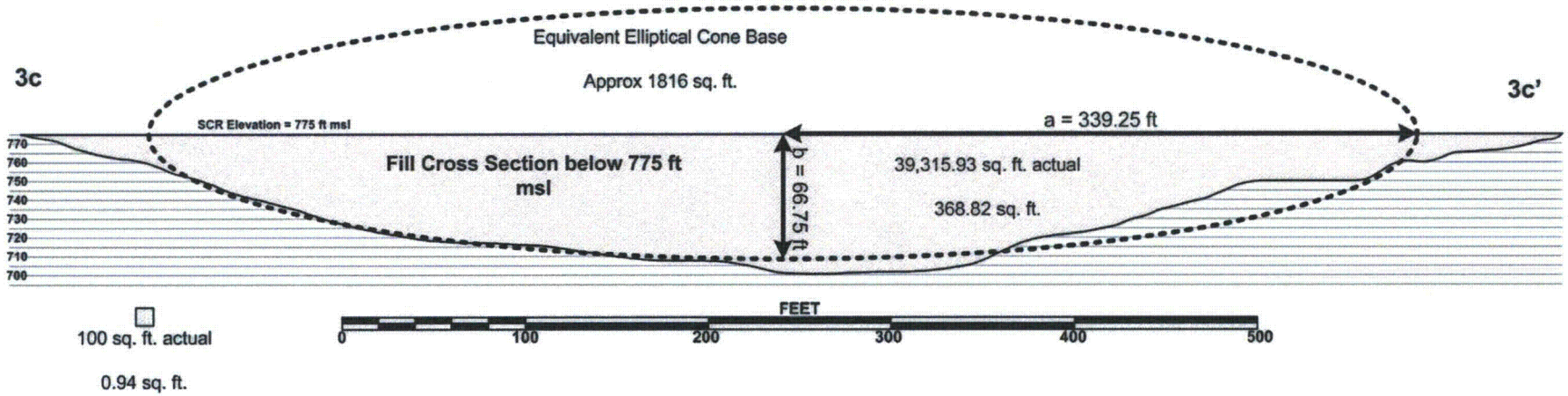
Groundwater Dilution

- The existing fill material is an irregular surface. However, the cross sections reveal that it is ½ of a reposed conical shape with an elliptical base. Therefore, the fill volume below 775 ft msl was conservatively calculated as ½ the volume of an elliptic based cone with basal surface area twice that of the calculated infiltration area from cross section 3c, and a length equivalent to the distance of the farthest existing fill base at 775 ft msl (see cross section 3c for diagram). This results in total fill volume below 775 ft msl of 7,402,713 cu. ft. and a total infiltration surface area of 39,316 sq. ft.
- Actual groundwater volume with the existing fill area was calculated by using an effective porosity of 0.2.
- Multiplying the total fill volume and infiltration area by the effective porosity of 0.2 yields a groundwater volume of approximately 11 million gallons and an effective infiltration surface area of approximately 7863 sq. ft.

Cross Section 3c Area Calculation

Surface area calculation of existing fill located below the level of Squaw Creek Reservoir
Groundwater volume within the saturated existing fill

SCR Pool Elevation = 775 ft msl



Approximate horizontal and vertical scale 1" = 80'

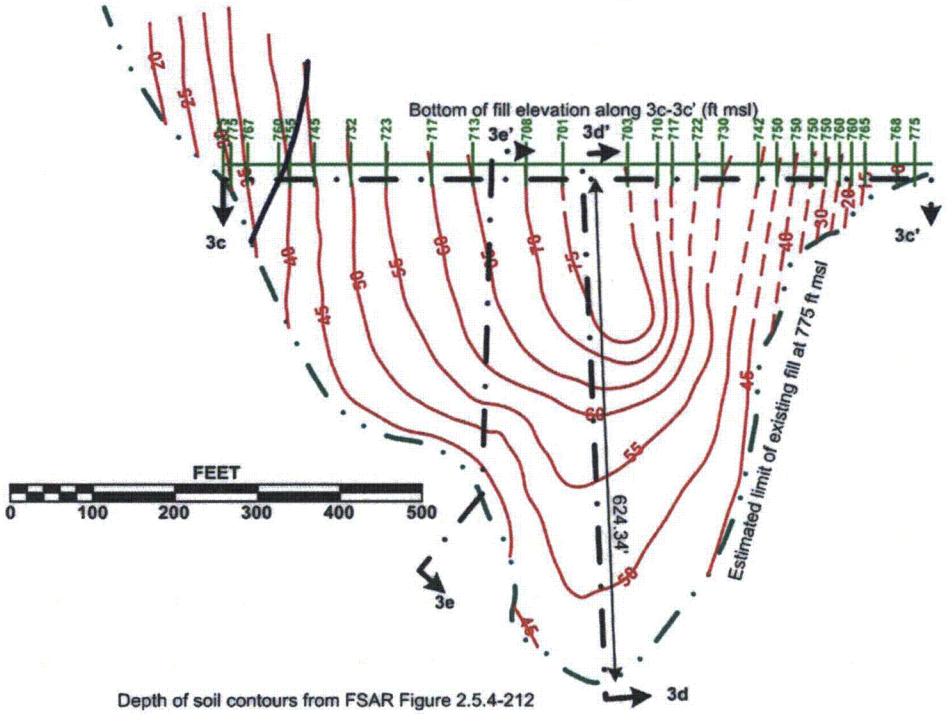
Bottom number is square footage as calculated by Visio 2003 shape area

Top number is actual square footage converted from Visio calculated area using the 100 sq. ft shape (10 ft x 10 ft) and Visio calculated area.

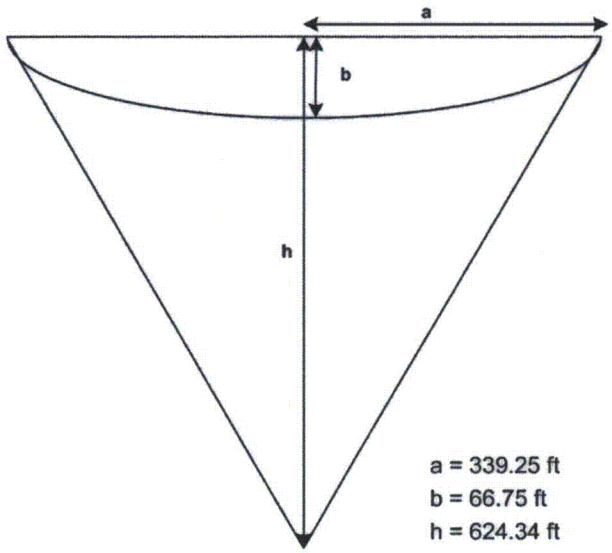
Conversion factor is 100 sq. ft. (actual) = 0.94 sq. ft. (measured); or, 1 sq ft (measured) = 106.60 sq. ft. (actual).

(Calculations performed in an Excel Spreadsheet and results rounded to 2 decimals for this presentation)

Existing Fill Groundwater Volume and Release Area Calculation



Depth of soil contours from FSAR Figure 2.5.4-212



Equivalent Half-Cone

Assuming a fill porosity of 0.2

$Area_w$ = 39,315.95 * 0.2 = 7863.19 sq. ft.

Volume (V) of the ½ elliptical cone = 0.5 ($^1/_3\pi abh$) = (πabh)/6

V = (π*339.25*66.75*624.34)/6

V = 7,402,712.94 cu. ft.

Assuming a fill porosity of 0.2

V_w = 1,480,542.59 cu. ft. = 11,075,213.63 gal

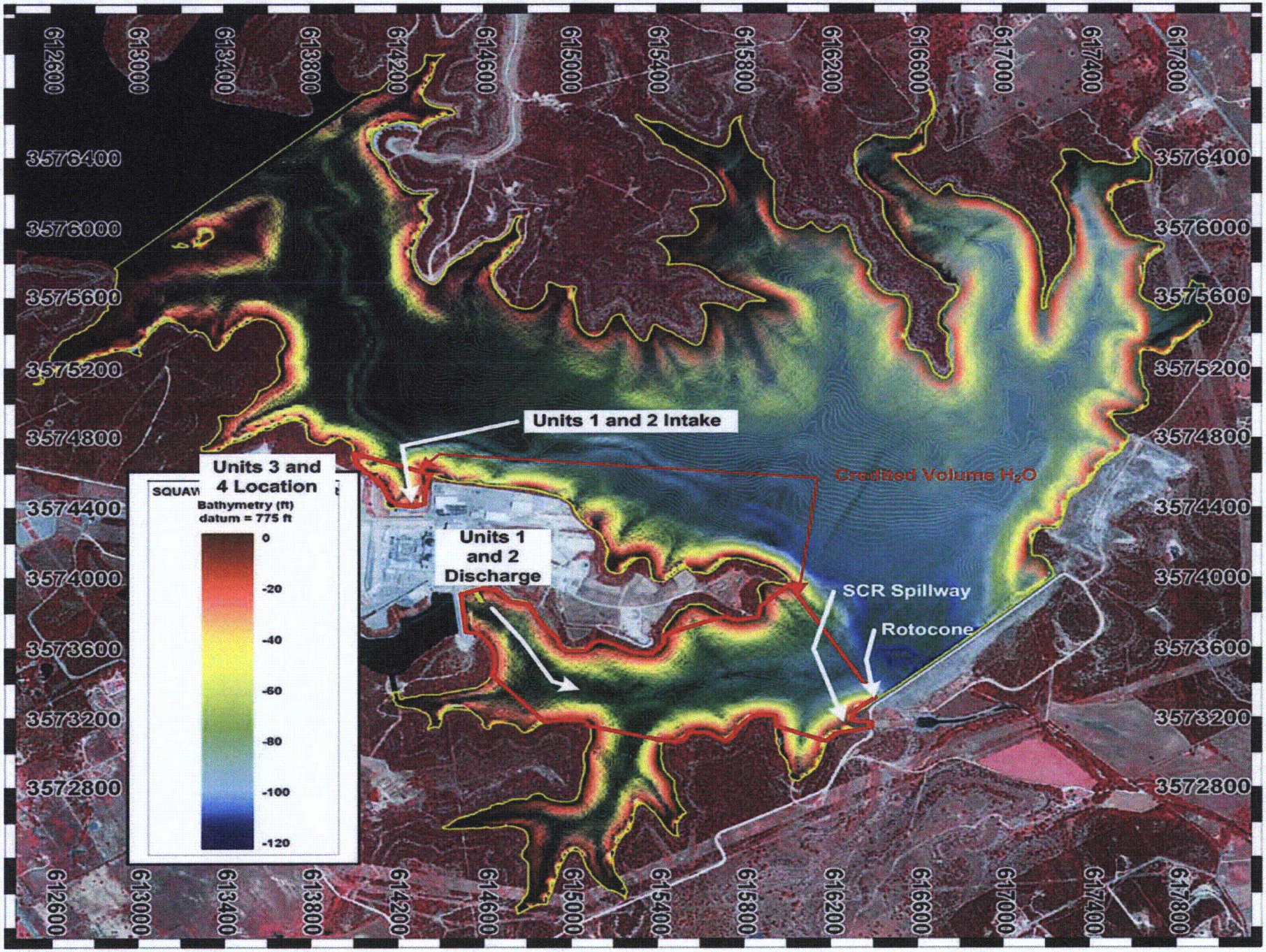
(1 cu. ft. = 7.49 gal)

Conclusion:
Using a conservative ½ cone volume (smaller than actual size) with an elliptical base to approximate the volume of the existing fill east of the proposed CPNPP Unit 3, and a conservative porosity value of 0.2:

- Groundwater volume within the fill is approximately 1,480,542 cu. ft.
- Release surface area from the fill to SCR is approximately 7863 sq. ft.

SCR Dilution Water Volume

- Due to the proximity of the Units 1 and 2 CW intake structure, it is conservatively assumed that the source term travels a relatively short distance before it is drawn into CW intake pumps.
- Upon discharge through the CW system on the other side of the peninsula, the volume of water conservatively credited includes the CW 2 million gpm discharge pathway before the water would encounter the Roto-cone drain discharge to SCR spillway (unrestricted nearest potable water supply).
- Volume was calculated using bathymetry data from a July 11, 2007 bathymetry study entitled "Bathymetry and Volume Storage of a Portion of Squaw Creek Reservoir, Hood and Somerville Counties, Texas" by Dr. Stephen K. Boss, University of Arkansas.
- Volume does not include contribution from inlets or areas where it is expected the CW discharge would not have a credible effect on dilution or mixing.


Units 1 and 2 Intake
Units 3 and 4 Location
Bathymetry (ft)
datum = 775 ft
0
-20
-40
-60
-80
-100
-120
Units 1 and 2 Discharge
Credited Volume H_2O
SCR Spillway
Rotocone
612600
613000
613400
613800
614200
614600
615000
615400
615800
616200
616600
617000
617400
617800
3576400
3576000
3575600
3575200
3574800
3574400
3574000
3573600
3573200
3572800

Calculated Dilution Effect

Dilution Concentration (µCi/ml) = Concentration (µCi/ml) at 0.4 years / GW Volume + SCR Credited Volume (ml)

- Tank Concentration was determined using ANSI 18.1-1999 methodology for realistic source term.
- 80% of the tank volume was used in the analysis in accordance with the guidance of BTP 11-6.
- Activity decay for 0.4 years is based upon the ORIGEN code, and is based upon travel time. The calculated travel time is based upon site-specific hydrogeological data and is defined as the time the source term effluent exits the engineered fill and travels through the existing fill before entering SCR. This pathway through existing fill to SCR is 600 feet. Decay time, conservatively, does not include travel time through the engineered fill.
- Volume of Groundwater Contribution = 11,075,214 gals or 4.19 E10 ml
- Volume of SCR Contribution = 4.57 E09 gals or 1.73 E13 ml
- Total Volume of Dilution = 1.73 E13 ml

Conclusion

Using the source term concentrations calculated from the ANSI 18.1-1999 methodology, and reducing the concentrations by the calculated groundwater and surface water dilution volumes, and considering the short travel time to SCR with little decay, the source term concentration from a BAT release to the environment (SCR) via groundwater is below the 10 CFR 20, Appendix B, Table 2 ECLs.

Attachment 3

Draft Public Meeting Presentation Material for Hydrology Issues in CP RAI #147

Luminant

CP RAI #147

Questions 02.04.12-8 through 02.04.12-17
Hydrology

MNES
Mitsubishi Nuclear Energy Systems

ENERCON
Excellence—Every project. Every day.

Pre-presentation Material

RAI 147 Overview

- Consists of RHEB Questions 02.04.12-8 through 02.04.12-17
- Many questions are related as to the information required for the reply with significant overlap.

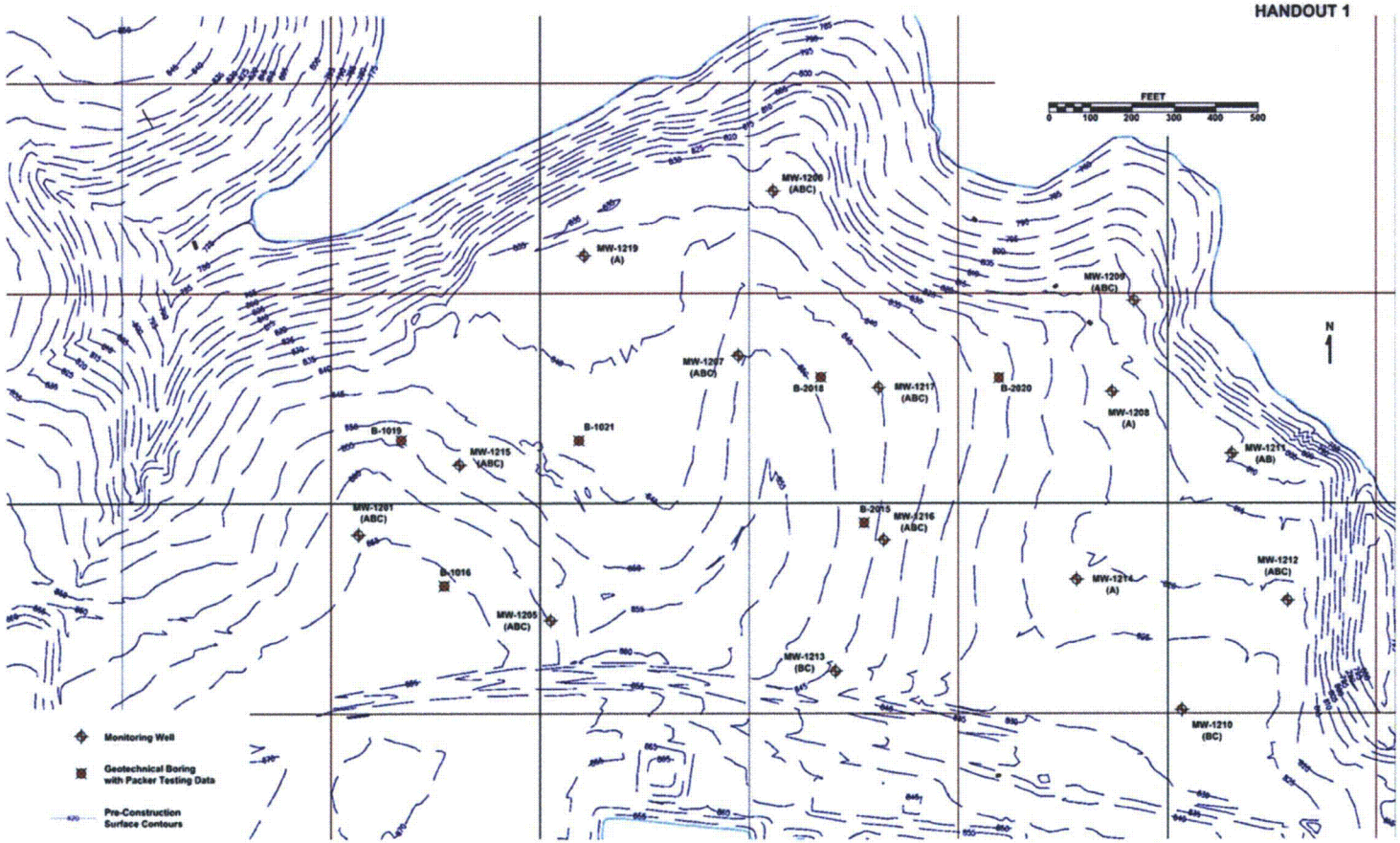
RAI 147 Discussion Topics

- Pre-Construction Groundwater Conditions.
  - Geologic Zones vs. Monitoring Well Designations.
  - Methodology for completion depth and screens for the current monitoring wells.
  - Interpretation of the monitoring well data.

- Anticipated Post-Construction site modifications and effects on groundwater conditions.

RAI 147

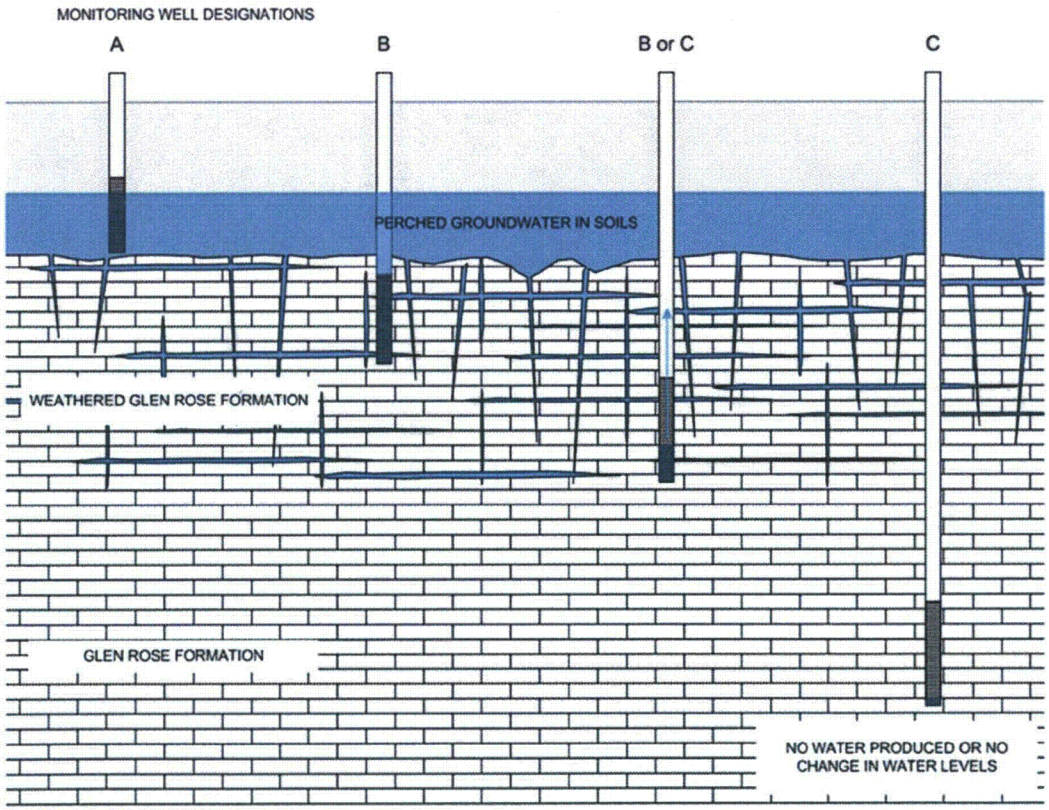
Monitoring Well Locations and Geotechnical Boring Locations w/Packer Test Data



Topography and site layout from Drawing CVL-12-11-101, Rev G

Monitoring Well Location Map (Pre-Construction Conditions)

RAI 147
Monitoring Well Installation



For illustration only: Not to scale; not project data

RAI 147
Monitoring Well Installations

- "A" Zone monitoring wells were screened in the soils above the top of bedrock. At least 10-feet of soil had to be present for the installation of an "A" Zone well.

- "B" Zone monitoring wells were screened in the upper bedrock zones. Based on review of boring logs and retrieved core inspections, these wells were screened in intervals exhibiting claystone/mudstone interbeds that could contain water. Indications of groundwater was not readily apparent during drilling at a majority of these well locations.

RAI 147
Monitoring Well Installations

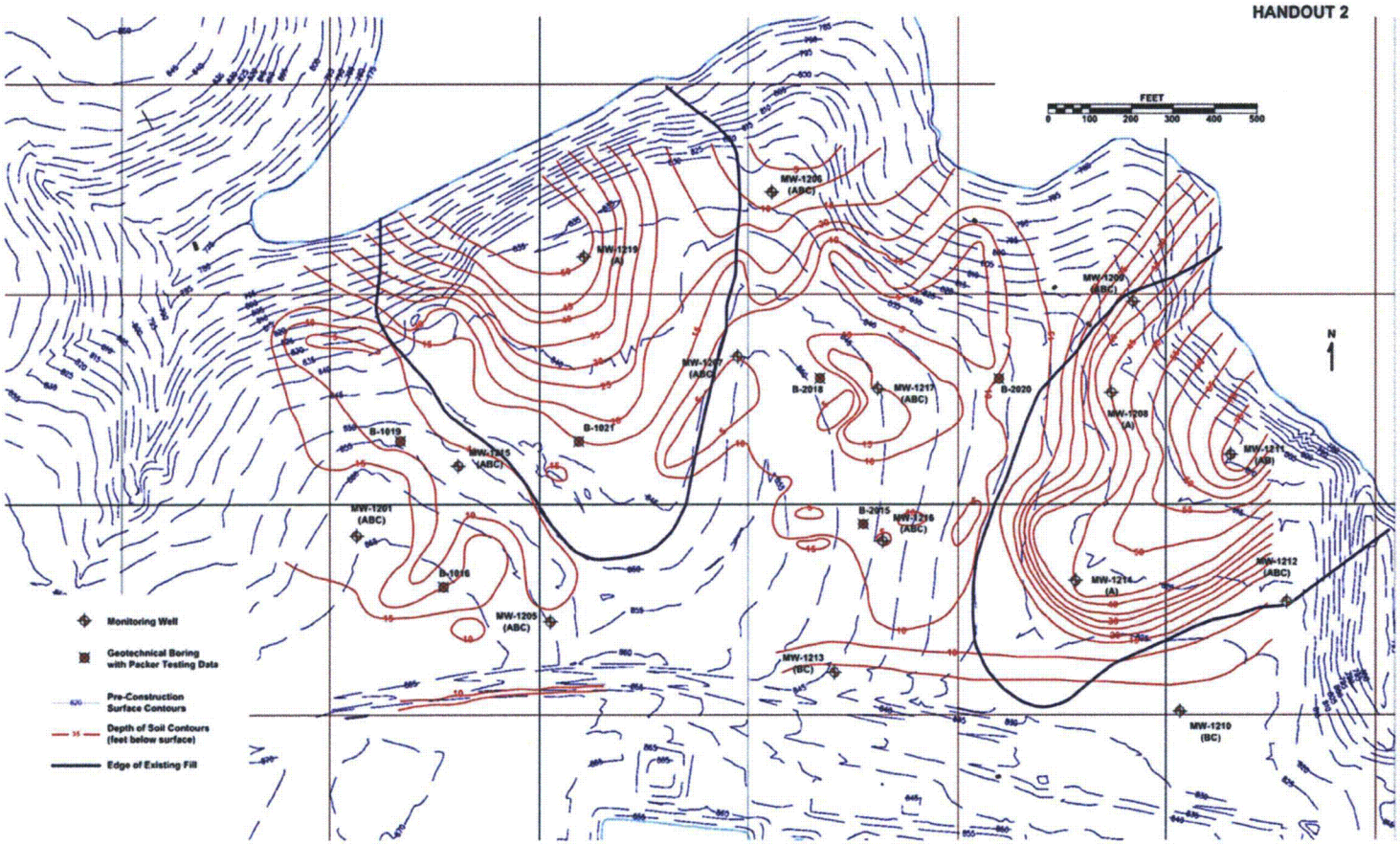
- "C" Zone monitoring wells were screened in the upper bedrock zones, but at lower elevations. Similar decision processes were employed to choose the screened interval. However, in the absence of alternating stratigraphy, screened intervals were selected based on the presence of breaks/fractures described in the lithologic boring logs and observed in the rock core. Mechanical breaks were ignored.

- These breaks/fractures appear to be localized near each boring/well location resulting in limited groundwater availability and slow to very slow responding groundwater levels in the wells.

RAI 147
Monitoring Well Installations

- If the well was screened in an area without alternating stratigraphy and limited breaks/fractures, then the well produced no groundwater or had water pooled within the screen or end cap with little to no change in water level over the course of the monitoring period.

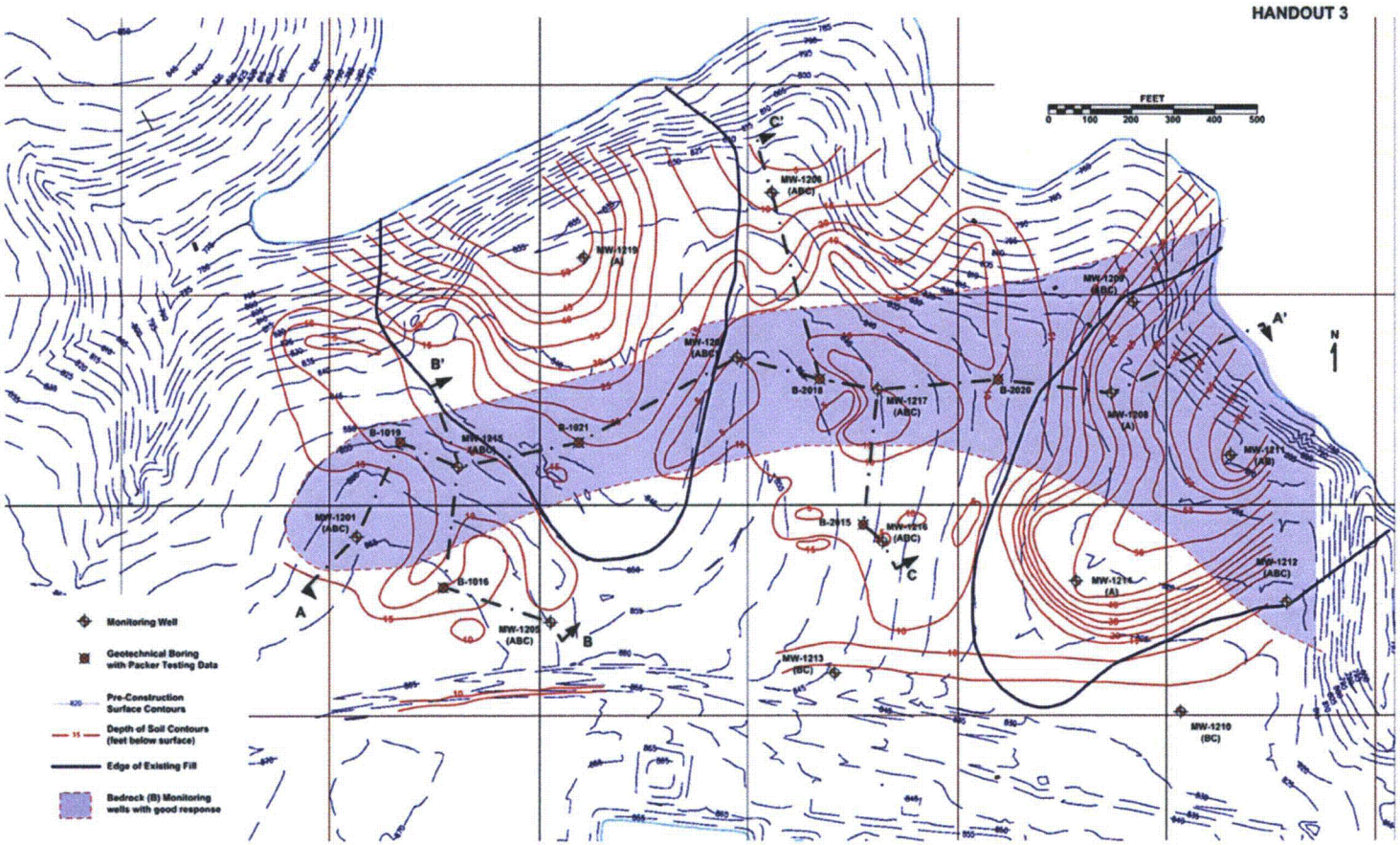
RAI 147
Pre-Construction Site Conditions



Depth of soil contours from FSAR Figure 2.5.4-212, Rev 1
Topography from Drawing CVL-12-11-101, Rev G

Soil and Existing Fill Depth Map (Pre-Construction Conditions)

RAI 147
Pre-Construction Site Conditions

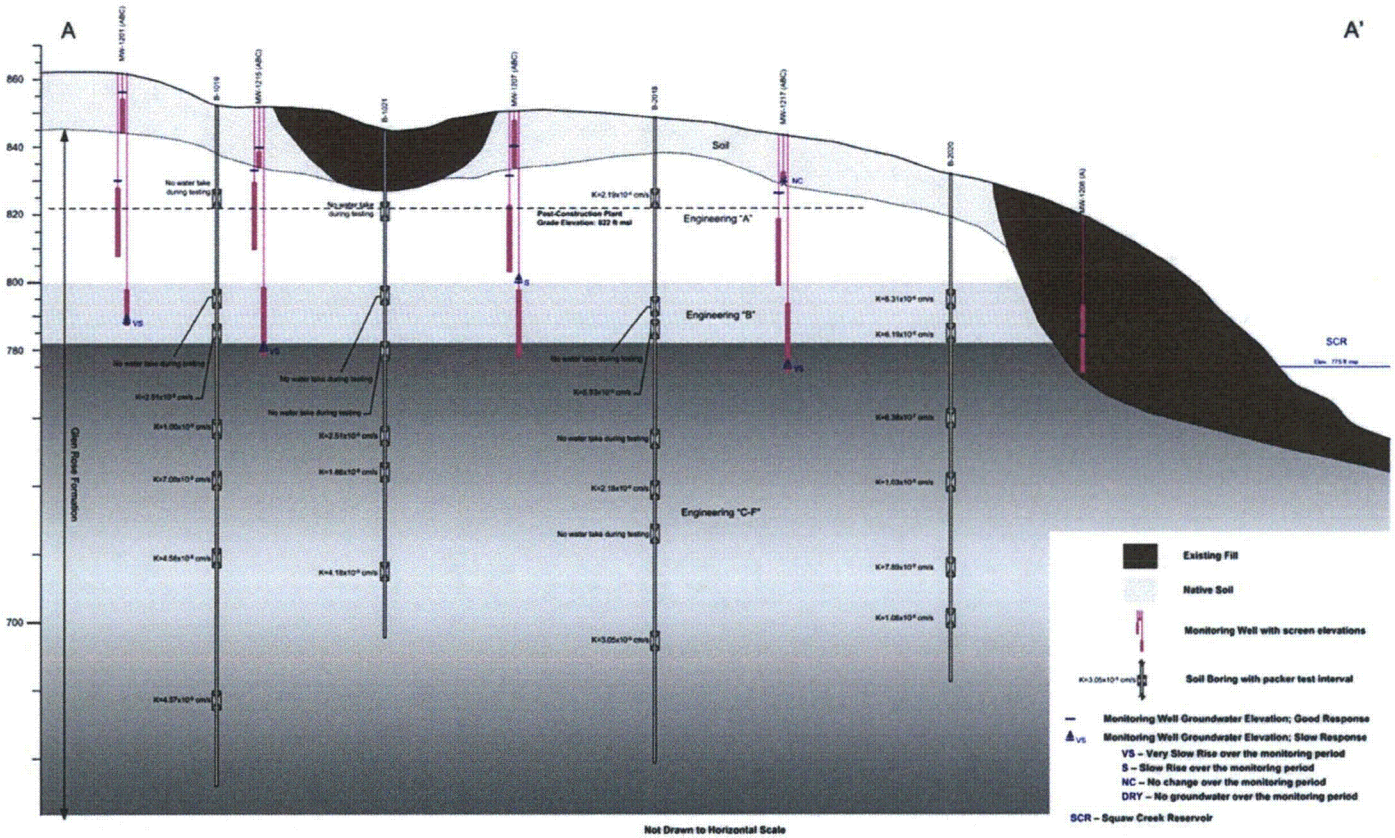


Depth of soil contours from FSAR Figure 2.5.4-212, Rev 1
Topography from Drawing CVL-12-11-101, Rev G

Monitoring Well Response Map (Pre-Construction Conditions)

RAI 147
Pre-Construction Site Conditions

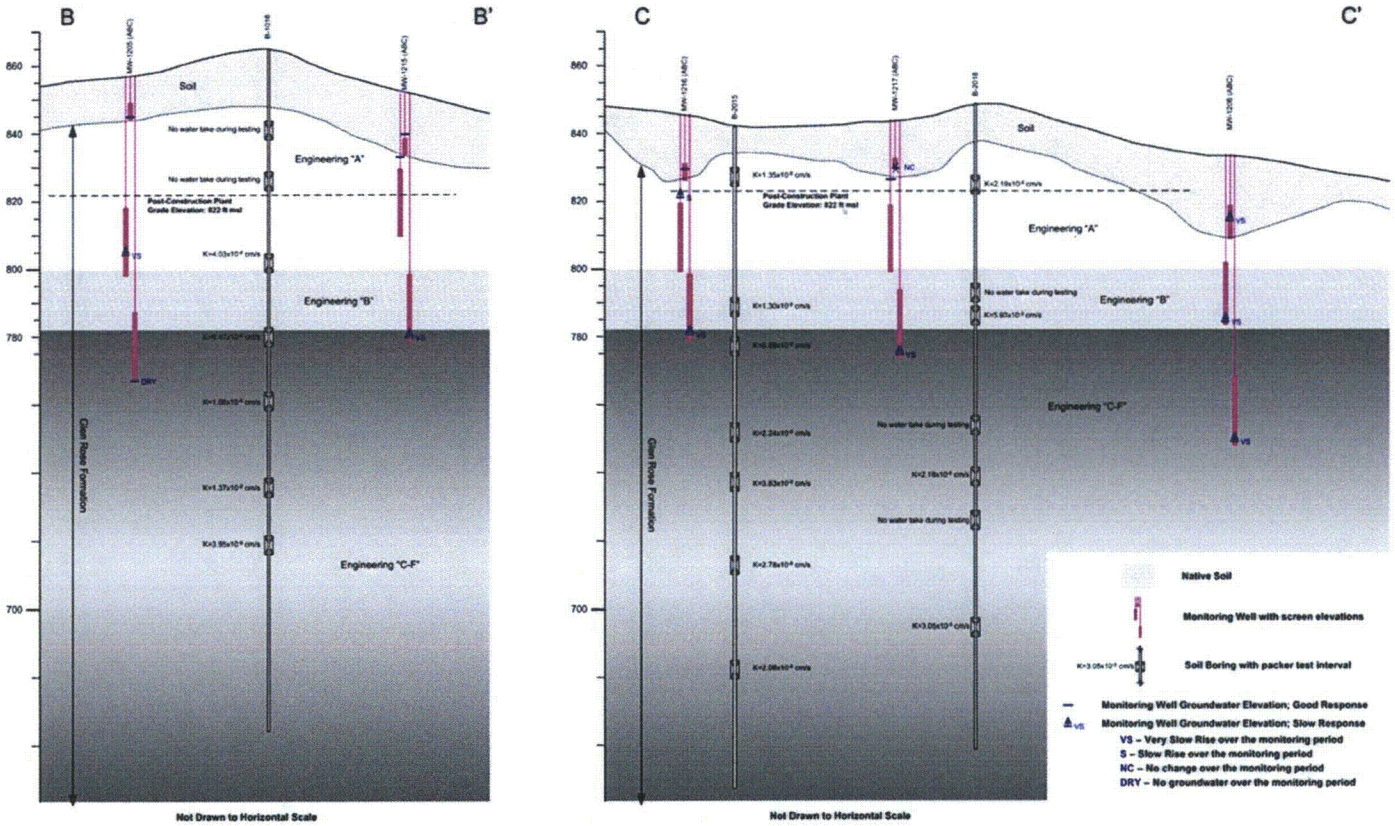
HANDOUT 4



Groundwater Elevation Comparison A-A'
(Pre Construction Conditions)

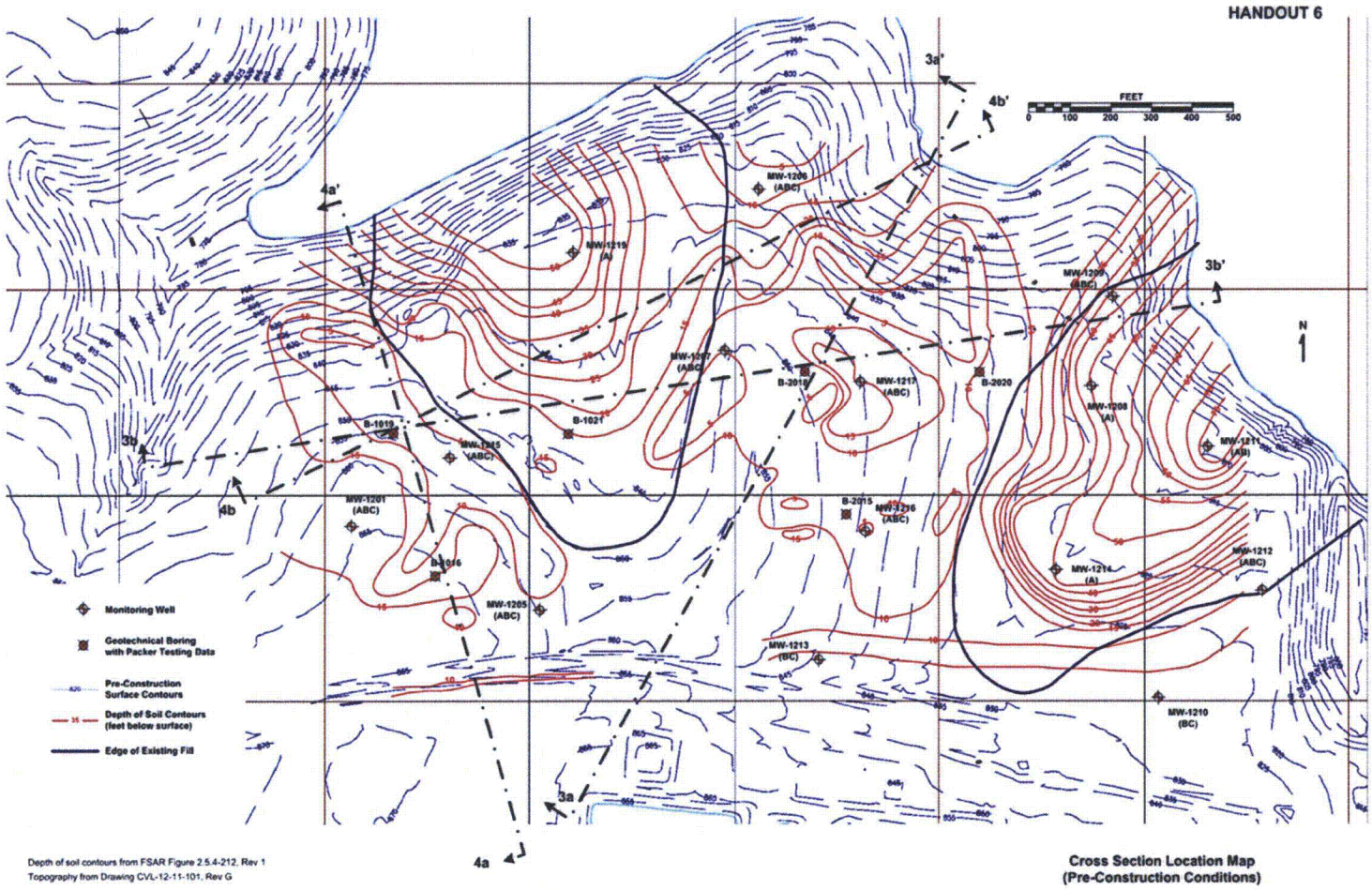
RAI 147
Pre-Construction Site Conditions

HANDOUT 5



Groundwater Elevation Comparisons B-B' and C-C'
(Pre Construction Conditions)

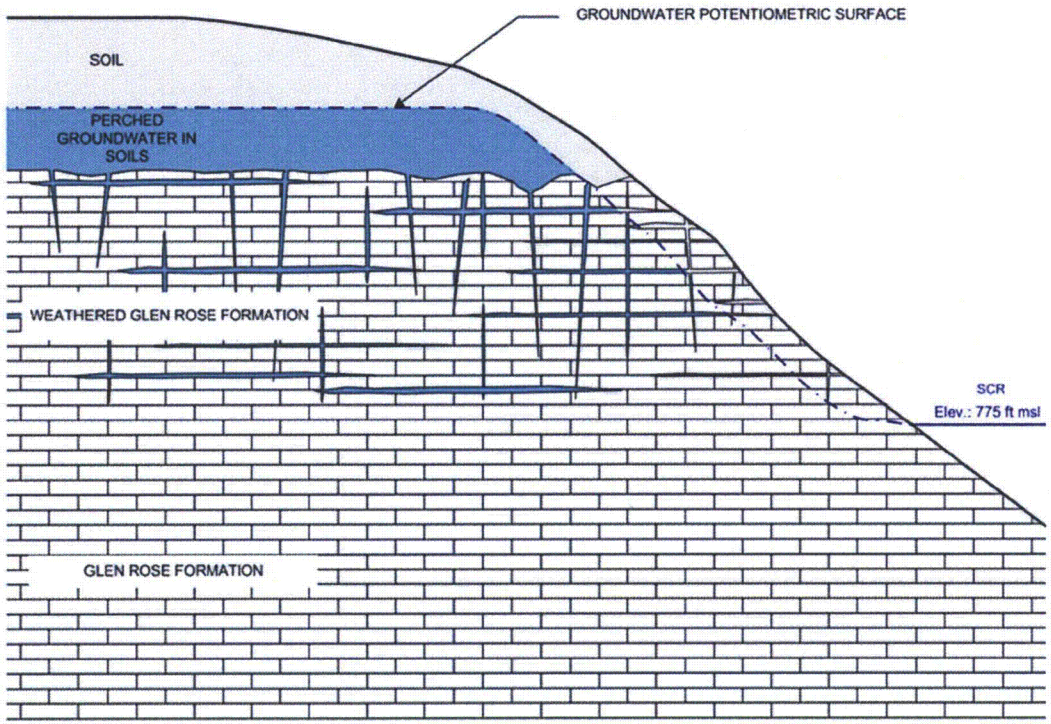
RAI 147
Pre-Construction Site Conditions



Depth of soil contours from FSAR Figure 2.5.4-212, Rev 1
Topography from Drawing CVL-12-11-101, Rev G

Cross Section Location Map (Pre-Construction Conditions)

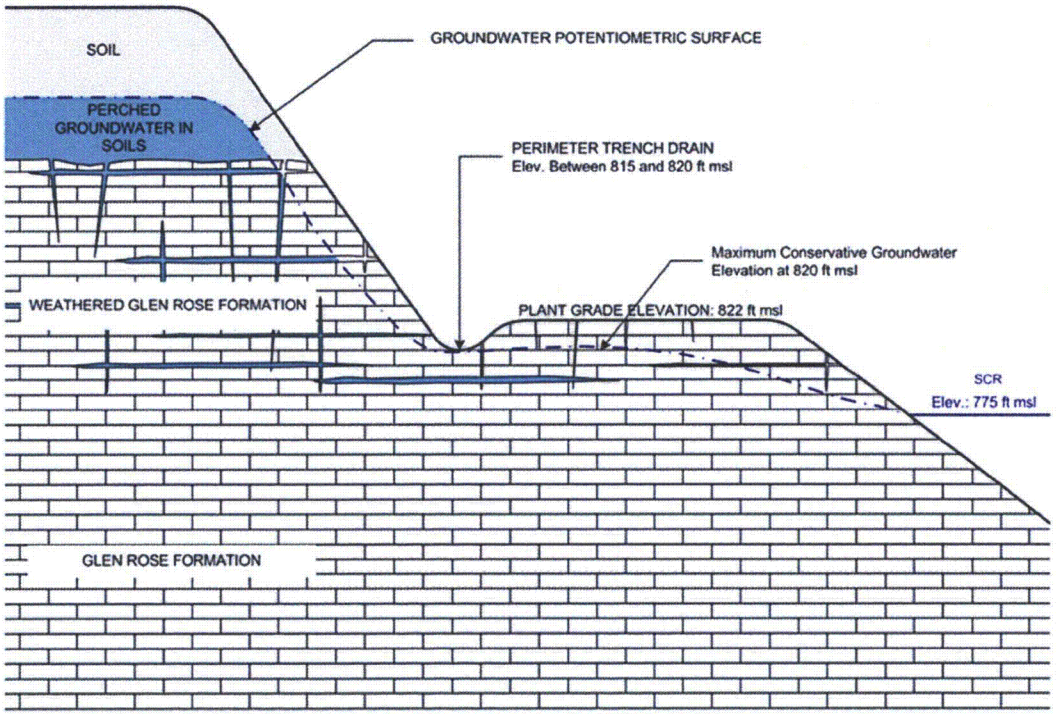
RAI 147
Post-Construction Modifications



For illustration only: Not to scale; not project data

RAI 147
Post-Construction Modifications

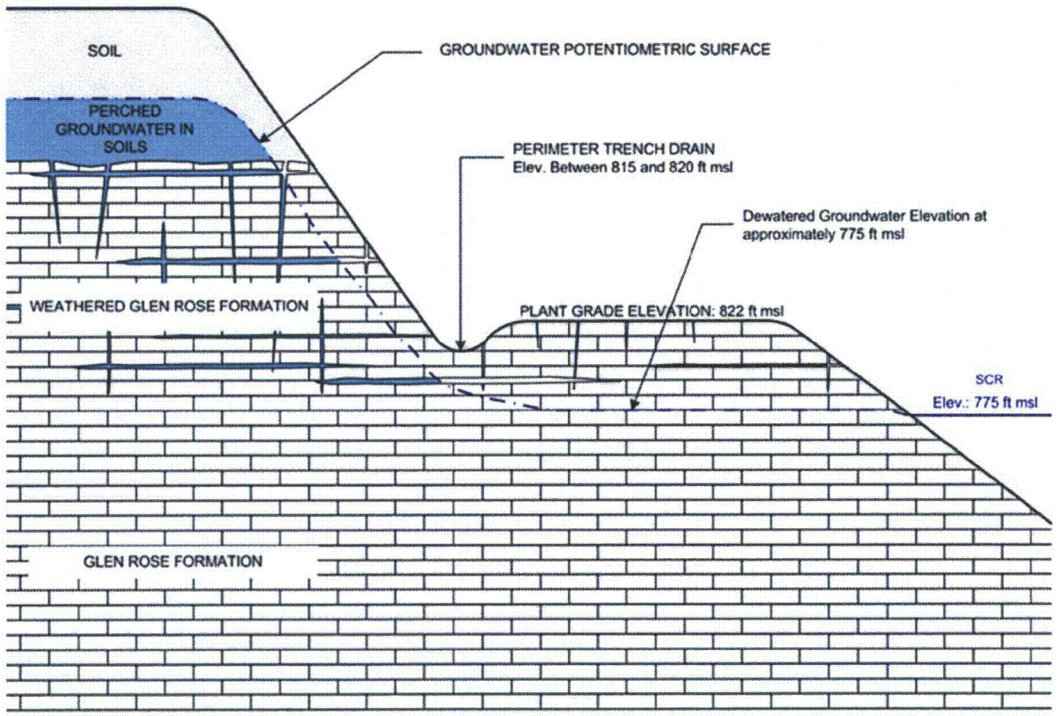
Perched groundwater in the remaining soil provides sufficient recharge to the weathered bedrock.



For illustration only: Not to scale; not project data

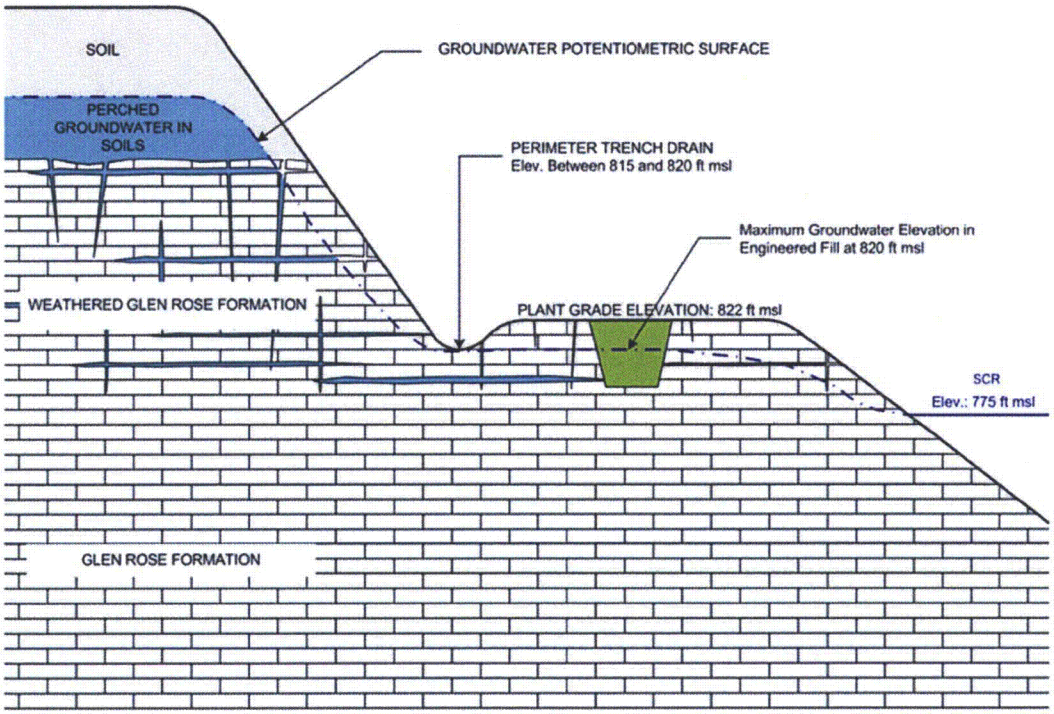
RAI 147
Post-Construction Modifications

Perched groundwater in the remaining soil does not provides sufficient recharge to the weathered bedrock.



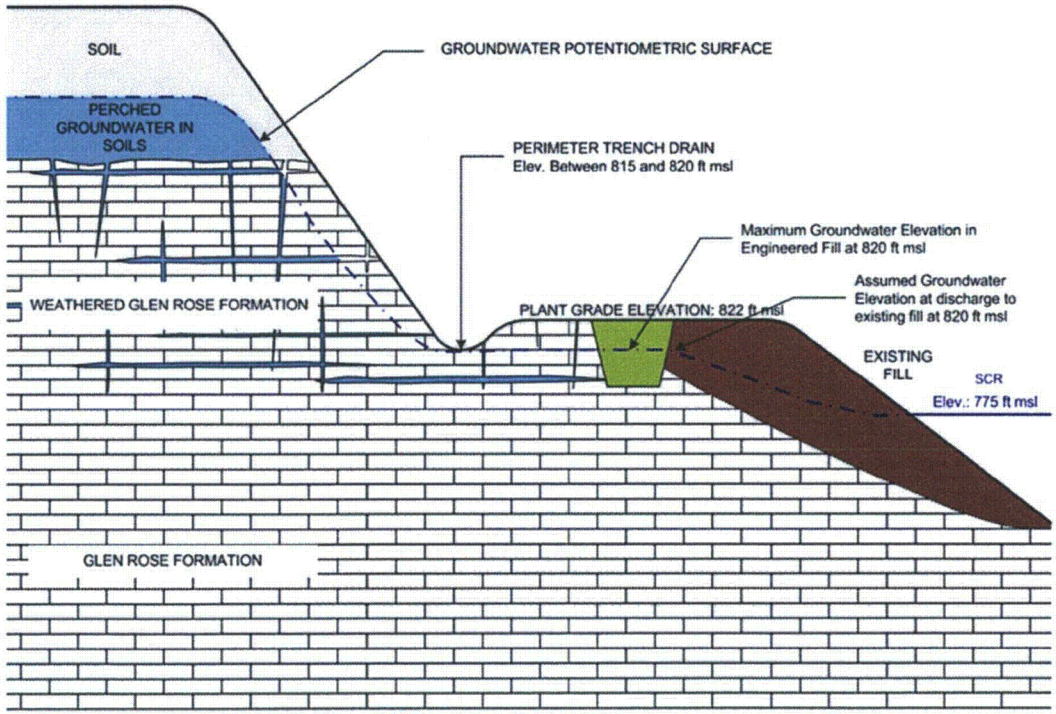
For illustration only: Not to scale; not project data

RAI 147
Post-Construction Modifications



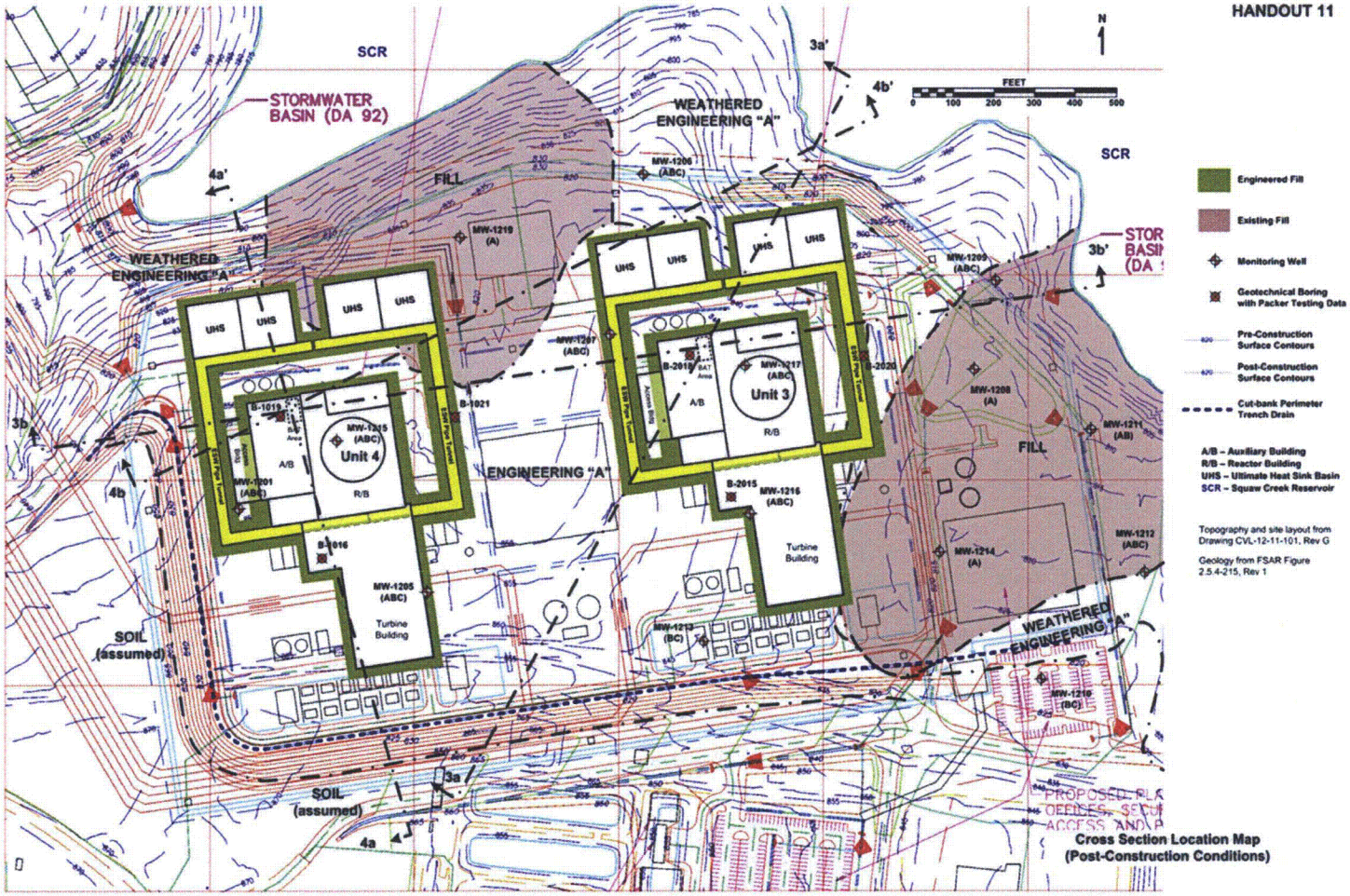
For illustration only: Not to scale; not project data

RAI 147
Post-Construction Modifications



For illustration only: Not to scale; not project data

RAI 147
Post-Construction Site Conditions



RAI 147 Topics

- Few onsite monitoring wells, with the exception of some soil (groundwater A-Zone) wells, show a correlation with rainfall data collected from the Opossum Hollow rain gage.

- We have provided more than seasonal data (18 months) to support determination of temporal variations on site groundwater wells.

- Additional and more recent data would not provide any additional useful information as we have already shown the wells do not respond to climatic changes.

RAI 147 Topics

- In addition, the maximum groundwater accumulation within the underlying formations will be controlled by the post-construction grading plan.

- Vertical migration pathways are considered improbable due to thickness and extremely low hydraulic conductivity of the lower Glen Rose limestone.
  - Packer tests in the power block areas show low hydraulic conductivities (10^{-8} to 10^{-9} cm/sec range, or no water takes) from plant grade elevation (822 ft msl) to 677 ft msl (FSAR Table 2.5.4-206).
  - Units 1 and 2 utilized diffusion for contaminant movement and assumed no groundwater transport.

RAI 147 – Questions 02.04.12-14 and 02.04.12-15

- FSAR Tables 2.5.4-209 and 2.5.4-210 presents the moisture content for various materials in the borings performed at the CPNPP site. The shale is listed as 15.0 +/- 3.9% (average), Limestone/Shale is 11.8 +/- 2.6%, and Limestone is 4.7 +/- 2.2%.

- We have used a value of 11.9% as a porosity value as a measured value of "formation porosity," i.e., the porosity of the joints, small fractures, bedding planes, and other non-primary (intergranular) porosity mechanisms.

RAI 147 – Questions 02.04.12-14 and 02.04.12-15

- The FSAR, Subsection 2.4.12.3.1 states: " *the highest hydraulic conductivity measured at the site (1.37 X 10^{-5} cm/s), … were used for the pathway analysis*".

- This hydraulic conductivity was measured from MW-1217b, a groundwater B-zone well completed in Engineering Layer "A".

- This was the highest measure hydraulic conductivity on site, with the exception of the undifferentiated fill and soils, much of which are to be removed during site grading.

RAI 147 – Question 02.04.12-16

- Requires correction of values and parameters used in FSAR Table 2.4.12-211 to allow verification of calculated values.
- Typographic errors were discovered in Table 2.4.12-211 and in Section 2.4.13.3, which will be corrected.