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January 7, 2009

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
DOCKET NO. 50-446
UNIT 2 CORE FLUX MAPS

Dear Sir or Madam:

Per discussions with the NRC, Luminant Generation Company LLC (Luminant Power) agreed to provide the NRC with the first 6 months of flux map data for Comanche Peak Unit 2, Cycle 11. The enclosure to this letter provides the subject Unit 2 Cycle 11 the flux map data.
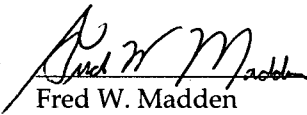
This communication contains no new licensing basis commitments regarding Comanche Peak Units 1 and 2.

Should you have any questions, please contact Mr. J. D. Seawright at (254) 897-0140.

Sincerely,

Luminant Generation Company LLC

Mike Blevins

By: _____
Fred W. Madden
Director, Oversight & Regulatory Affairs

Enclosure - Engineering Report ERX-08-004, CPNPP Fq(Z) Margin Impact of Measured Axial Offset Following RAOC Methodology Transition

c - E. E. Collins, Region IV
B. K. Singal, NRR
Resident Inspectors, Comanche Peak

A001
UPR

Luminant Generation Company LLC
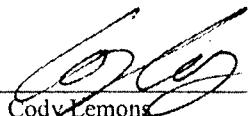COMANCHE PEAK NUCLEAR POWER PLANT

ENGINEERING REPORT

CPNPP Fq(Z) Margin Impact
of Measured Axial Offset
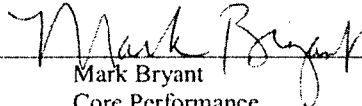Following RAOC Methodology Transition

ERX-08-004
Revision 0

12/3/08

Prepared By: _____ Date: _12-15-08_

Cody Lemons
Core Performance Engineering

Reviewed By: _____ Date: 12-15-08

Mark Bryant
Core Performance

Approved By: _____ Date: 12/18/08

Bill Reppa
System Engineering Manager

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1.0 Purpose

During the licensing process for implementation of Westinghouse Relaxed Axial Offset Control (RAOC) Methodology at Comanche Peak Nuclear Power Plant (CPNPP), discussions were held with the NRC regarding the Westinghouse Axial Offset Validity Criteria Guidance. As a result of these discussions (Reference 1 and Reference 2), it was agreed that CPNPP would not utilize the standard Westinghouse AO Validity Criteria, but rather would perform the following:

- For each Power Distribution Measurement, CPNPP would evaluate differences in the Measured and Predicted Axial Power Shape, and the impact of these differences on the available Fq Margin.

- CPNPP would revise the W(z) curves based on measured Axial Offset when appropriate. From Reference 2, (also CPNPP Commitment 3475619):

  Luminant Generation Company LLC will revise, as appropriate, the W(z) curves to ensure they are representative of the current core conditions should the value of W(z)*[Predicted P(z) / Measured P(z)] become less than 1.04. The revised W(z) curves will be calculated prior to performance of the next required surveillance. Since the W(z) function is set to 1.0 near the top and bottom of the core, this commitment does not apply to the FQ(z) measured in the exclusion zones.

- CPNPP would report to the NRC following implementation of the actions described above. Per Reference 1:

  Luminant Power will provide data regarding the completion of Technical Specification Surveillance Requirement (SR) 3.2.1.1 after the first six months of Unit 2 Cycle 11 operation.

This Engineering Report provides relevant Power Distribution Measurement and Fq(z) margin data related to Unit 2 Cycle 11 from April through November 2008.

2.0   U2C11 Fq MEAUREMENT DATA

2.1   Axial Offset Trend

CPNPP utilizes two measurement methods to complete a Power Distribution Measurement and Fq(z) surveillance. A 'MIDS Map' utilizes data from the Movable Incore Detector System to infer a measured power distribution. The results of the MIDS Map are used to perform the required Power Distribution surveillances as well as calibrate the BEACON Power Distribution Monitoring System (PDMS). A 'PDMS Map' may then be performed for following measurements using BEACON to generate a report based on the monitored power distribution.

Figure 1 shows the Axial Offset trend for full power measurements taken during U2C11, compared to Design Predictions for Hot Full Power, All Rods Out (HFP, ARO) conditions. The maximum difference for a full power map was 3.11% for Map 08 taken at a burnup of 2125 MWD/MTU.

Figure 1, CPNPP Unit 2, Cycle 11 Axial Offset Trend
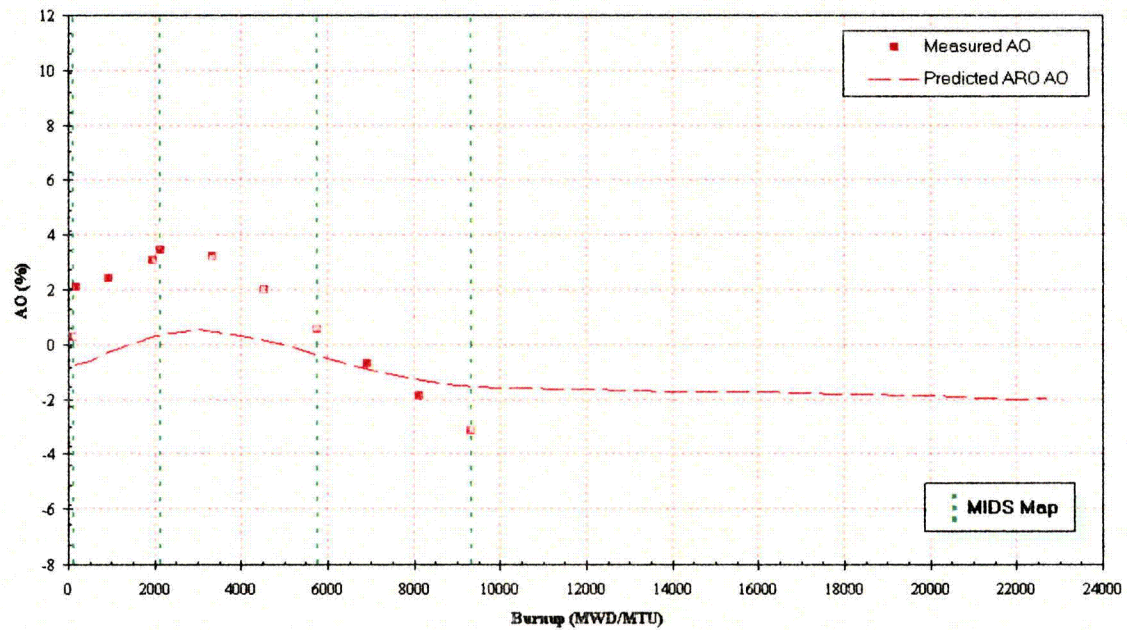
2.2 Fq(z) Measurement Results

Figure 2 shows the Fq(Z) and FqC(Z)*W(Z)/K(Z) trends for Unit 2 Cycle 11 for Full Power Flux Maps. Prior to Map #08 taken at 2125 MWD/MTU, the Core Operating Limits Report was revised to increase the width of the RAOC AFD limits to provide additional operational margin. The widening of the RAOC AFD limits was facilitated by revision to the W(Z) curves, thus the step change in the Predicted Transient Fq curve in Figure 2.

Figure 2, CPNPP Unit 2, Cycle 11 Fq(Z) Trends
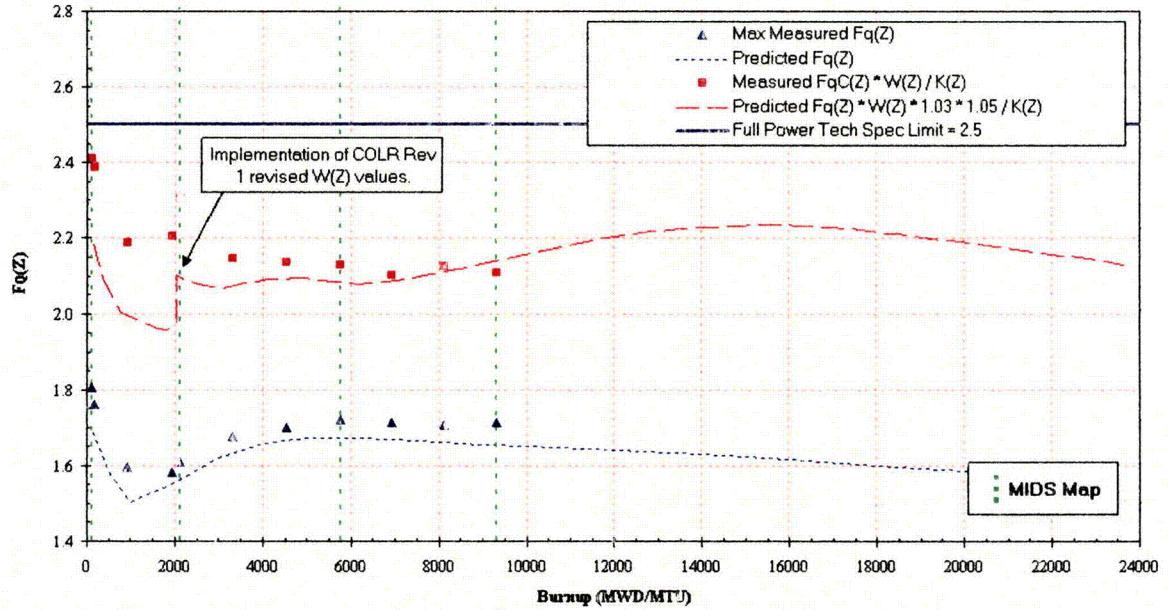
Tables 1 and 2 summarize the Fq Data for the first 6 months of operation of Unit 2 Cycle 11, including partial power measurements taken during power ascension. A description of each column of data is included in the following discussion. In the table, bolded data corresponds to MIDS Map measurements.

Table 1 – U2C11 Power Distribution Measurement Summary

Map #	Date	Power (%RTP)	Map Type	Burnup (MWD/MTU)	CBD (steps)	AO (%)	Lowest Margin FqC(Z)*W(Z)/K(Z)	Margin (%)
M01	**4/20/08**	**27.4**	**MIDS**	**7.0**	**180**	**9.0**	**2.83**	**43.4**
M02	**4/21/08**	**78.7**	**MIDS**	**27.0**	**193**	**-1.2**	**2.46**	**22.5**
M04	**4/23/08**	**99.6**	**MIDS**	**123.0**	**212**	**0.3**	**2.41**	**3.8**
M05	4/24/08	100.0	PDMS	165.5	215	2.1	2.39	4.6
M06	5/12/08	99.7	PDMS	935.1	215	2.4	2.19	12.8
M07	6/5/08	99.9	PDMS	1952.0	215	3.1	2.21	11.8
M08	**6/10/08**	**99.8**	**MIDS**	**2125.0**	**215**	**3.5**	**2.31**	**7.9**
M09	7/7/08	99.9	PDMS	3330.1	215	3.2	2.15	14.2
M10	8/4/08	100.1	PDMS	4528.5	215	2.0	2.14	14.4
M11	**9/2/08**	**100.0**	**MIDS**	**5764.0**	**215**	**0.6**	**2.13**	**14.9**
M12	9/29/08	100.0	PDMS	6935.1	215	-0.7	2.10	15.9
M13	10/27/08	99.9	PDMS	8129.9	215	-1.9	2.13	15.0
M14	**11/24/08**	**100.0**	**MIDS**	**9321.0**	**215**	**-3.2**	**2.11**	**15.6**

Table 2 – U2C11 Fq(Z) Margin Impact Summary

Map #	Power (%RTP)	Min Fq Margin HFP ARO (%)	Axial Power Dist Impact (%)	Adjusted Transient Fq Margin (%)	Minimum value from 'Updated W(Z)' output
M01	**27.4**	**5.23**	**-1.22**	**6.46**	**1.038**
M02	**78.7**	**2.82**	**0.77**	**2.05**	**1.103**
M04	**99.6**	**3.23**	**0.22**	**3.01**	**1.098**
M05	100.0	3.16	0.71	2.45	1.079
M06	99.7	10.86	-2.28	13.14	1.103
M07	99.9	11.80	-3.25	15.03	1.147
M08	**99.8**	**see note**	**-3.49**	**11.37**	**1.145**
M09	99.9	15.47	-1.44	15.60	1.138
M10	100.1	15.84	-1.10	15.52	1.127
M11	**100.0**	**17.04**	**0.28**	**14.57**	**1.126**
M12	100.0	15.59	-0.09	15.68	1.125
M13	99.9	16.46	0.34	14.64	1.108
M14	**100.0**	**16.00**	**-0.60**	**16.22**	**1.094**

Note Regarding Map 08 – For Map 08, the HFP ARO report was incorrectly generated, and the value of *Min Fq Margin HFP ARO (%)* from this report is not available. The issue was captured in the CPNPP Corrective Action Program for resolution. Since the map was taken near HFP ARO conditions, this value would have been within a few percent of the "Margin (%)" value from Table 1 (7.9% for Map 08).

<u>Map #</u> - A sequential number assigned to each flux map. Note that Map 03 was voided due to data collection issues, and Map #04 was the first Full Power Map for the cycle.

<u>Map Type</u> – PDMS if a BEACON Monitor Report was used in the Fq surveillance, MIDS if the Movable Incore Detector System was used.

<u>Burnup</u> – Total core burnup at the time of the measurement in MWD/MTU.

<u>CBD</u> – Control Bank D position at the time of the measurement. CBD is normally kept at 215 steps during normal operation, and a position of 223 steps is considered Full Out (above the active fuel region).

<u>AO</u> – The measured Axial Offset at the time of the measurement. A positive value represents power distributed towards the top of the core.

<u>Lowest Margin FqC(Z)*W(Z)/K(Z)</u> – The value of measured Fq at the limiting core location, including uncertainty, $W(Z)$ and $K(Z)$ factors.

<u>Margin (%)</u> – The Margin to the Technical Specification Fq Limit at the lowest margin location, defined as:

Margin = 100% x (Limit – Measured) / Limit

<u>Min Fq Margin HFP ARO (%)</u> – This value is determined by BEACON PDMS, and represents the available Fq Margin which would be available under HFP ARO steady state conditions. For a MIDS Map, this is determined <u>after</u> utilizing the measured incore data to calibrate BEACON Monitor. This is consistent with the description found in Reference 1 for an alternative acceptable method to determine the impact of the measured axial power distribution on the available Fq Margin. Per Reference 1:

> *"Alternatively, the BEACON Power Distribution Monitoring System may be used to perform the power distribution surveillance function. When the surveillance is performed, the BEACON 'measured' power distribution is updated to full power, steady state conditions and used to determine the 'measured' maximum transient FQ(z) x Power. To do this, the full power 'measured' steady state FQ(z) from the BEACON core model is multiplied by the W(z) curve and the result, FQW(z), is compared to the FQ(z) limit. Thus, the full power W(z) curves are appropriate since the transient FQ(z) measurement is always based on full power conditions."*

Axial Power Distribution Impact (%) – This value represents the impact of the Measured Axial Power Distribution on the Fq Margin, and is equivalent to Equation 2 from Reference 1 (shown below). This value is obtained by generating a W(Z) Update Report from the calibrated BEACON model and subtracting the 'original' and 'updated' FqW(z) margin values.

> Equation 2 from TXX-08032:
> *Effect of axial power distribution differences*
> $$= F_Q^W(z) * (SS\text{-}P(z))/(M\text{-}P(z)) - F_Q^W(z)$$

See Section 2.3 for graphical representations of the SS-P(z), M-P(z), and W(z) curves for each power distribution measurement.

Adjusted Transient Fq Margin (%) – This value is obtained by subtracting the Axial Power Distribution Impact from the lesser of (a) or (b):
  (a) Margin from the flux map (Margin (%) from Table 1), or
  (b) the Margin from the HFP ARO Report (Min Fq Margin HFP ARO (%) from Table 2).

If this value were negative, it would be concluded that the Power Distribution Impact is greater than the available margins, and Surveillance Requirement for Technical Specification 3.2.1.2 would not be satisfied. The appropriate Actions of Technical Specification would be taken, although this has not been necessary for any measurements taken during U2C11.

Minimum value from 'Updated W(Z)' output – This value represents the minimum Updated W(Z) value determined by the BEACON W(Z) Update Report described above. Note that the 'Updated W(z)' values include M-P(z) affects, and are used to assess margin impacts. Per Reference 2, CPNPP committed to revising the W(z) curves, as appropriate, should this value be less than 1.04. A description of CPNPP commitment #3475619 may be found in section 1.0.

Note that for Map 01, which was performed at 27.4% RTP, the Minimum value from 'Updated W(Z)' output was slightly less than 1.04 for two axial locations. This was evaluated in the CPNPP corrective action program, and it was determined that it was not appropriate to revise the W(z) curves based on the low power flux map. To summarize this evaluation:
  • The axial power distribution impact assessment performed at the 28% RTP plateau resulted in positive adjusted Fq margin and therefore requires no action or LCO entry.
  • Two core elevations had a resulting adjusted W(Z) slightly less than 1.04. These elevations are not the location of the limiting Fq, nor would they be if the W(Z) was limited to 1.04. Thus, the adjusted W(Z) values have no impact on the conclusion of the margin assessment.
  • Revision of the W(Z) factors based on the 28% RTP measurement would not provide representative W(Z) factors for the core conditions expected at the next required surveillance and therefore would not be "appropriate" as described in the commitment.
  • Therefore, revised W(Z) factors are not required as a result of this surveillance.

2.3 W(z) Update Function Results

Figures 3 through 15 below graphically show the results of the W(z) Update Function described in section 2.2. For each map, a plot of SS-P(z) versus M-P(z) and a plot of Original W(z) and Updated W(z) are provided. The "Minimum value from 'Updated W(Z)' output" shown in Table 2 is the minimum value from this "Updated W(z)" plot.

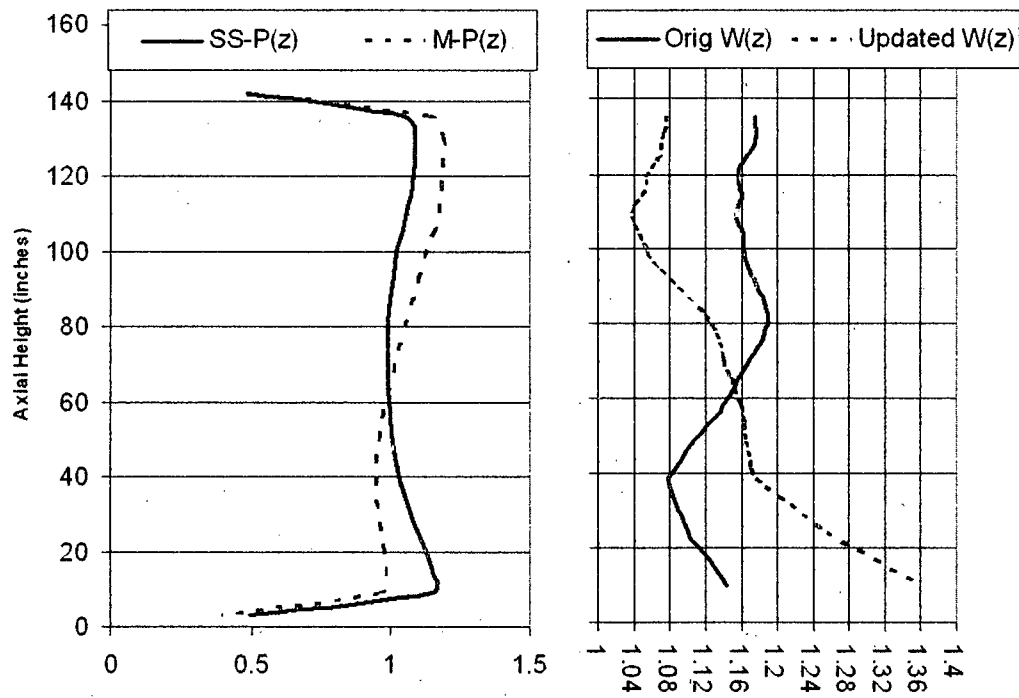Figure 3, Map 01 W(z) Update Function Results
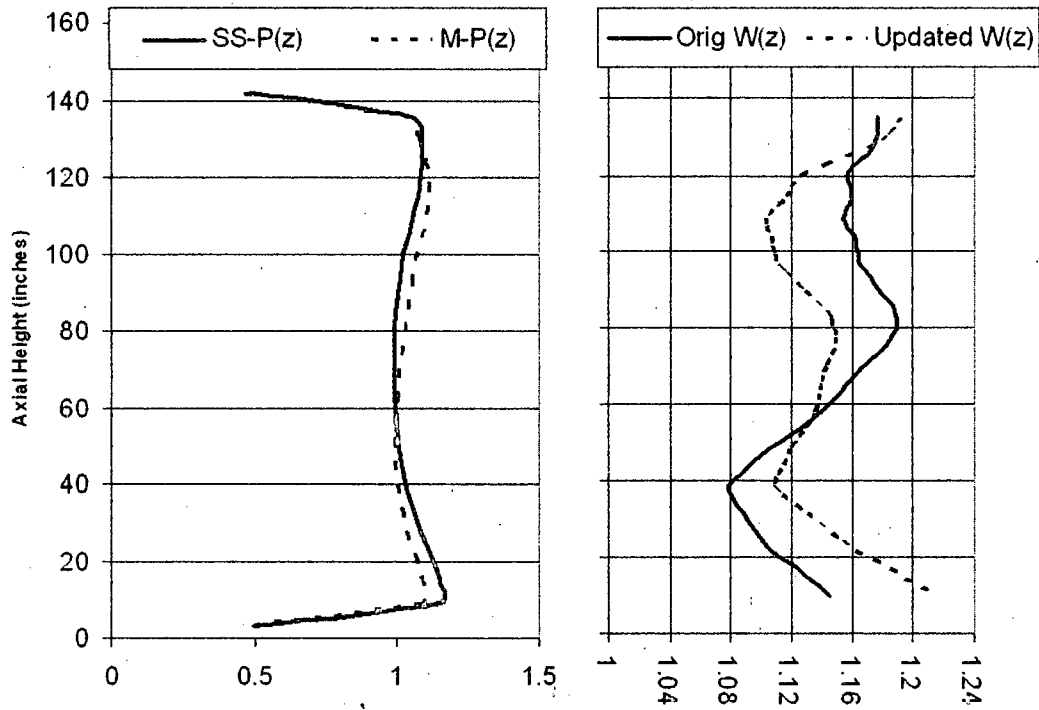
Figure 4, Map 02 W(z) Update Function Results

Figure 5, Map 04 W(z) Update Function Results
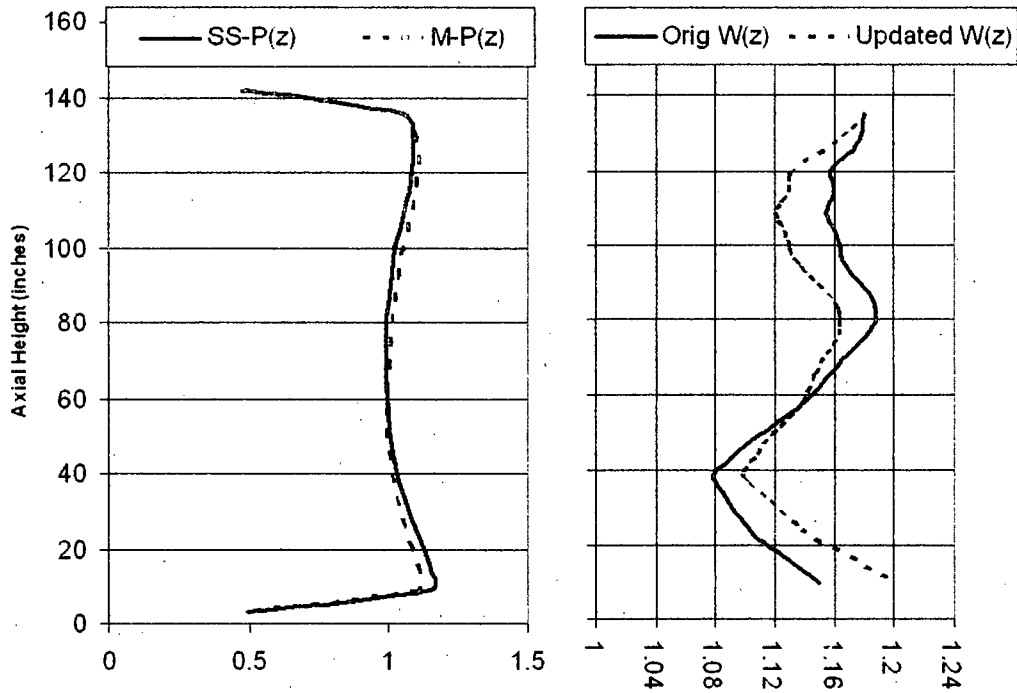
Figure 6, Map 05 W(z) Update Function Results
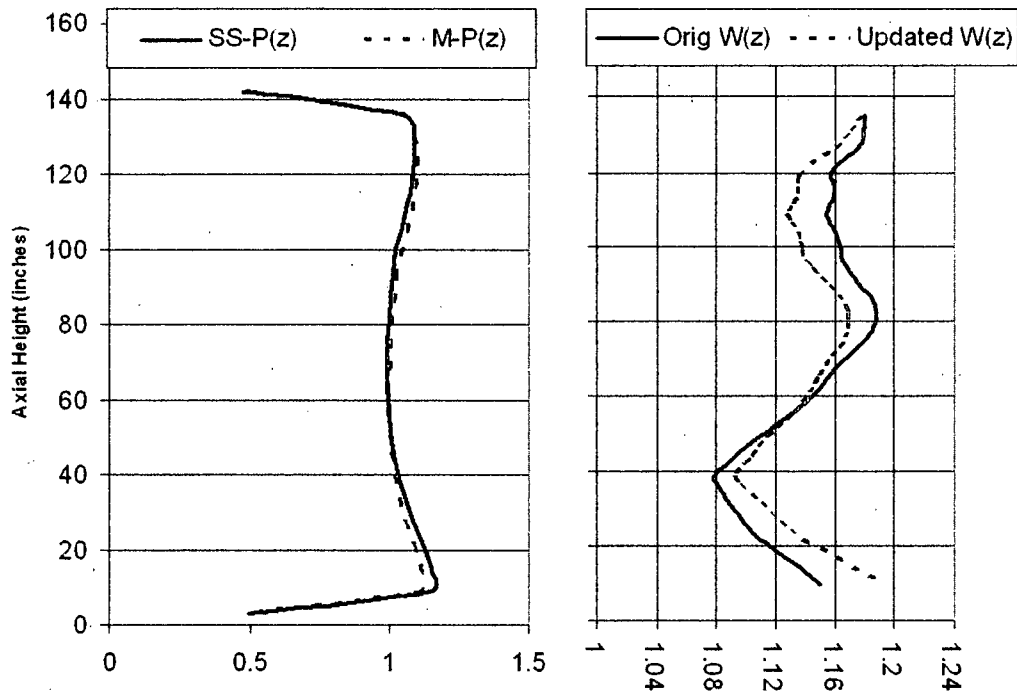
Figure 7, Map 06 W(z) Update Function Results
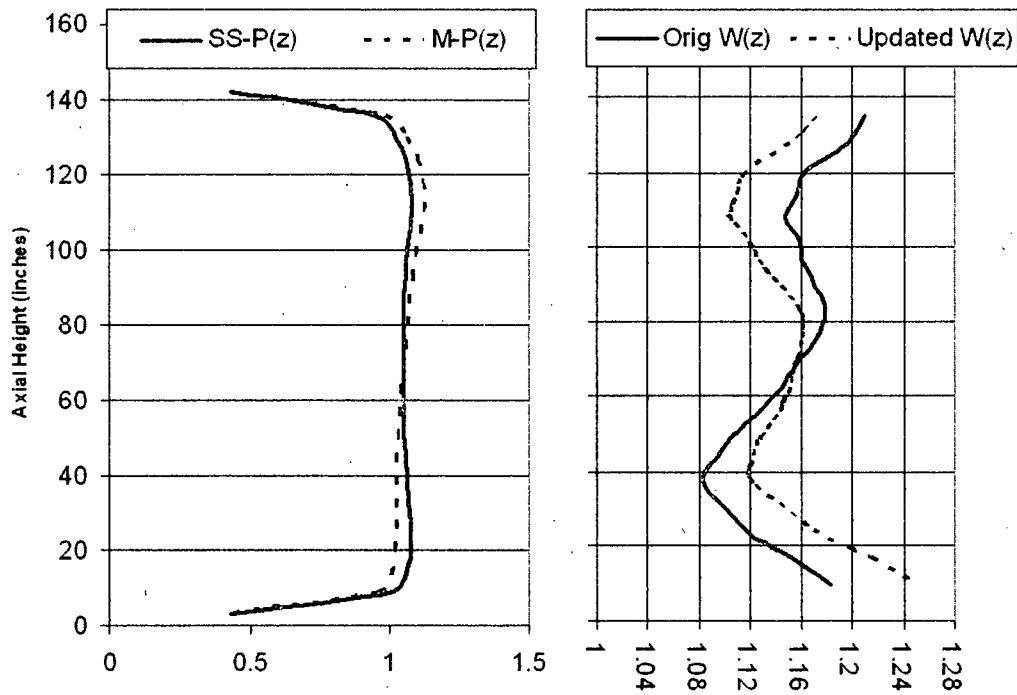
Figure 8, Map 07 W(z) Update Function Results
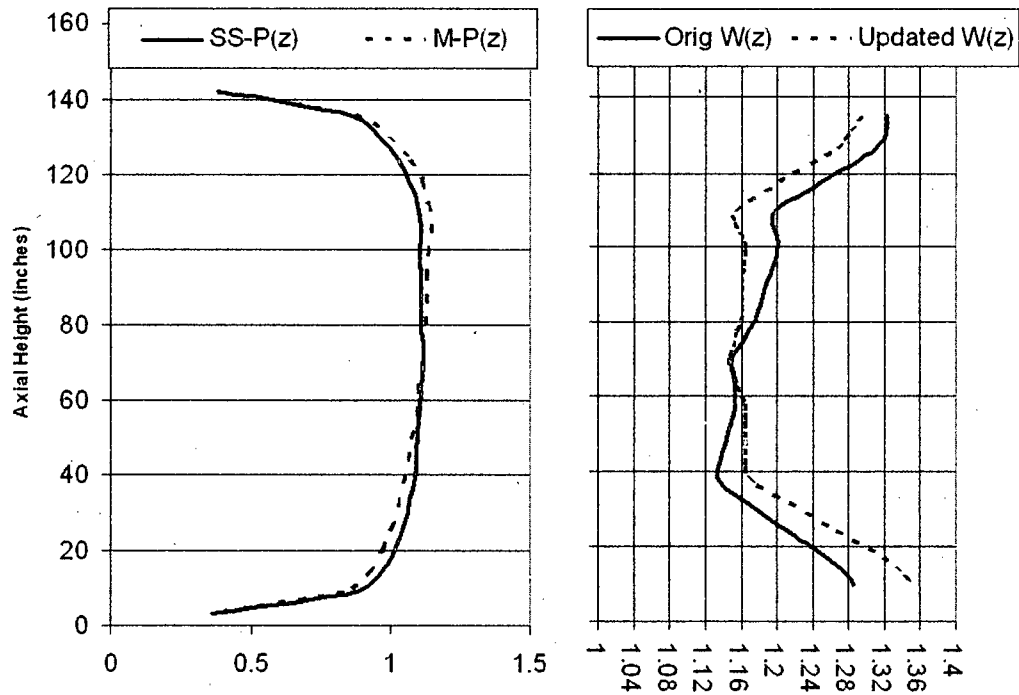
Figure 9, Map 08 W(z) Update Function Results
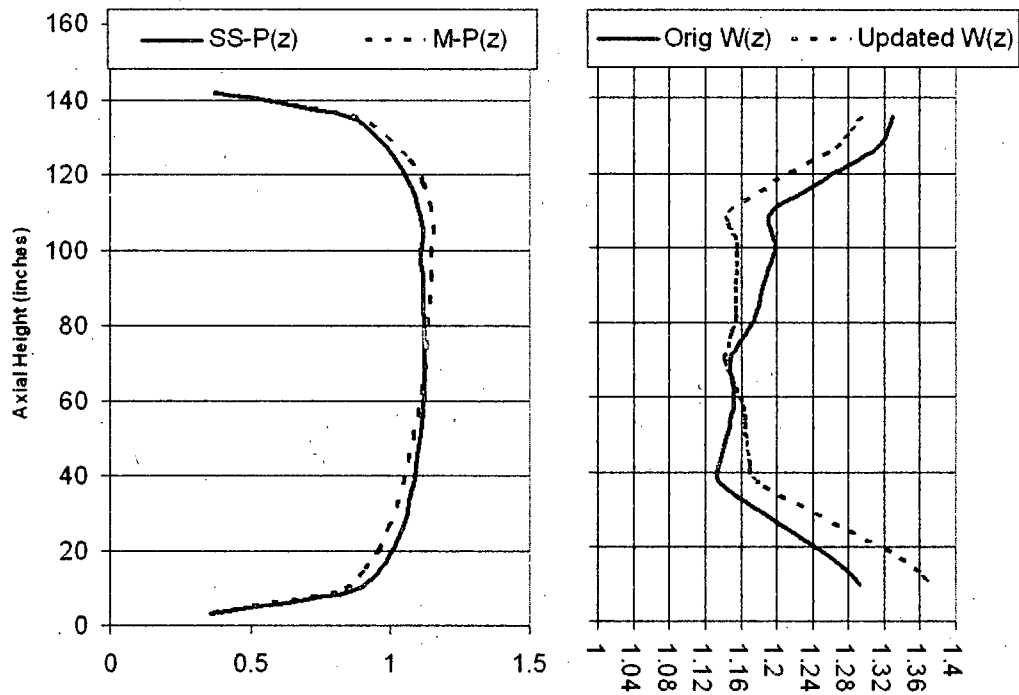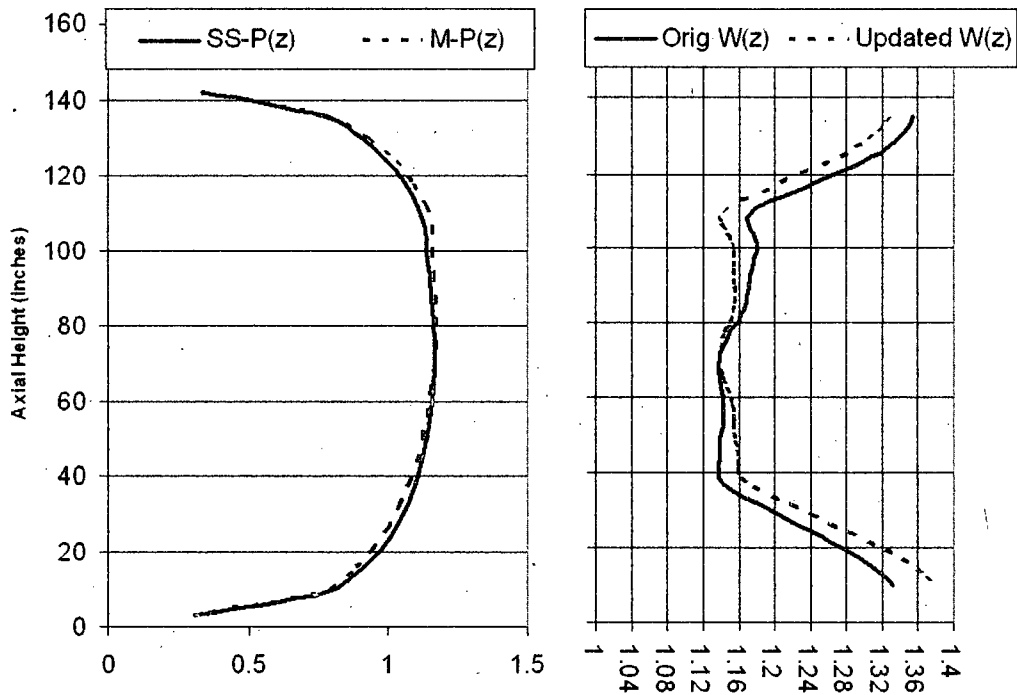
Figure 10, Map 09 W(z) Update Function Results
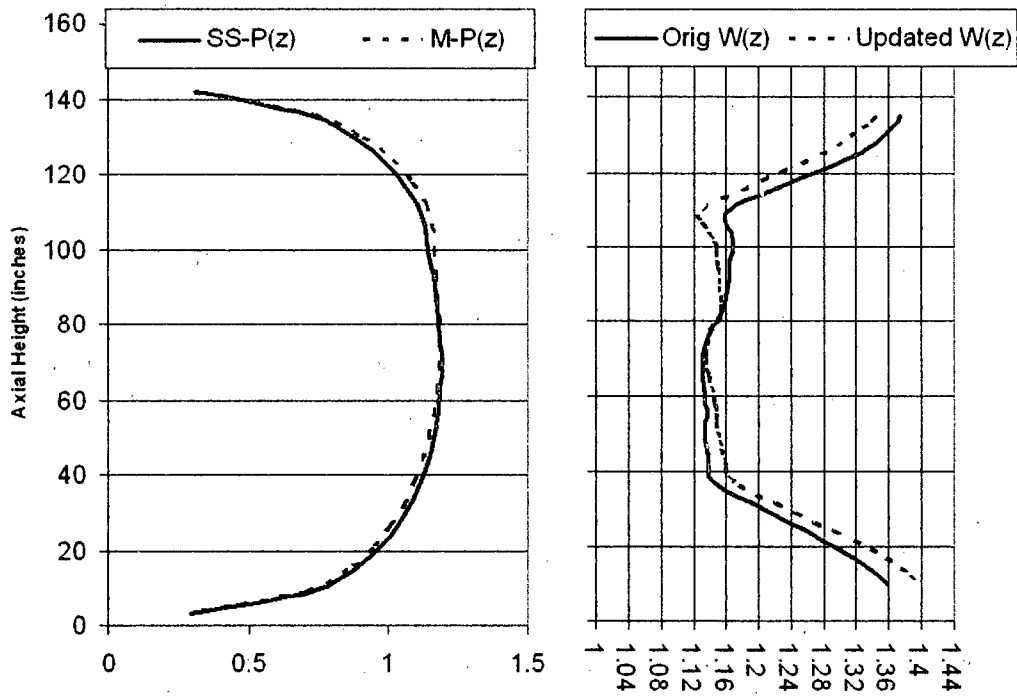

Figure 11, Map 10 W(z) Update Function Results
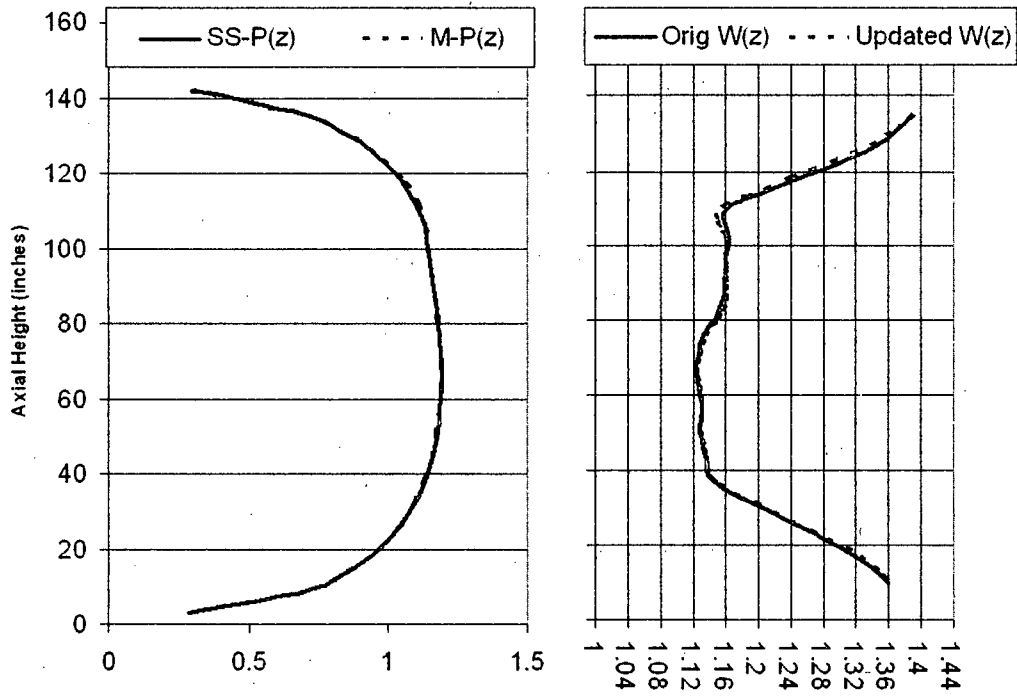
Figure 12, Map 11 W(z) Update Function Results

Figure 13, Map 12 W(z) Update Function Results
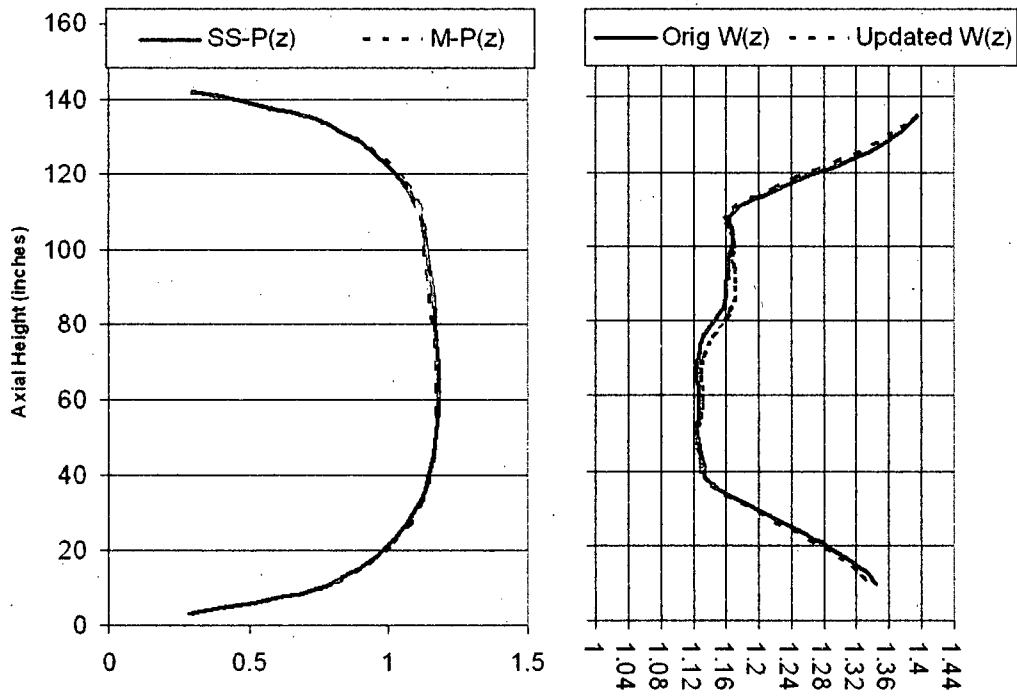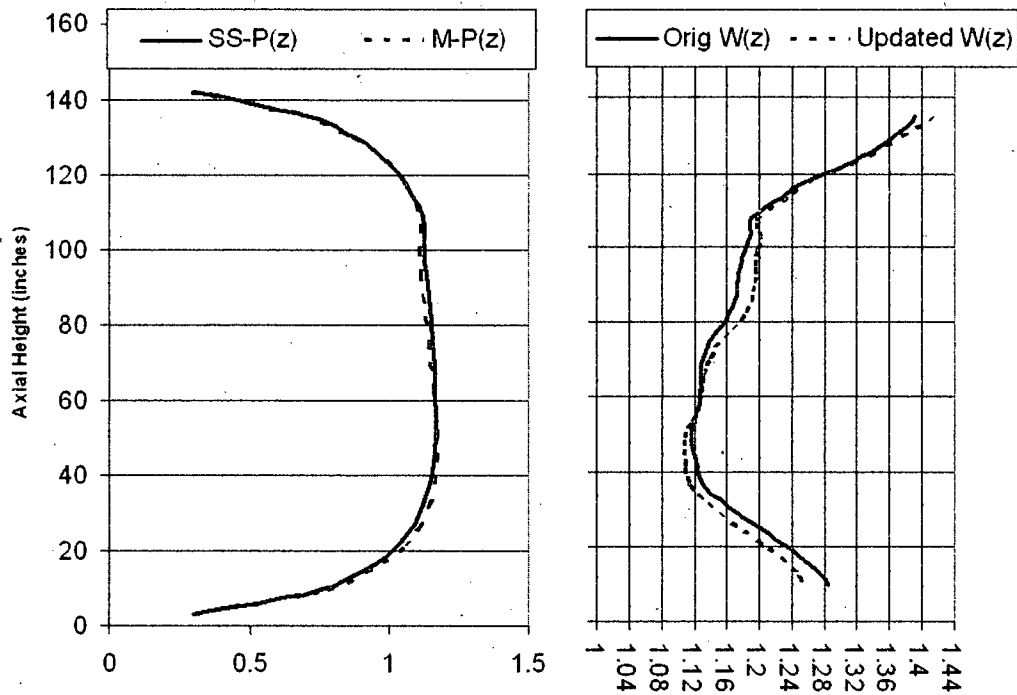
Figure 14, Map 13 W(z) Update Function Results

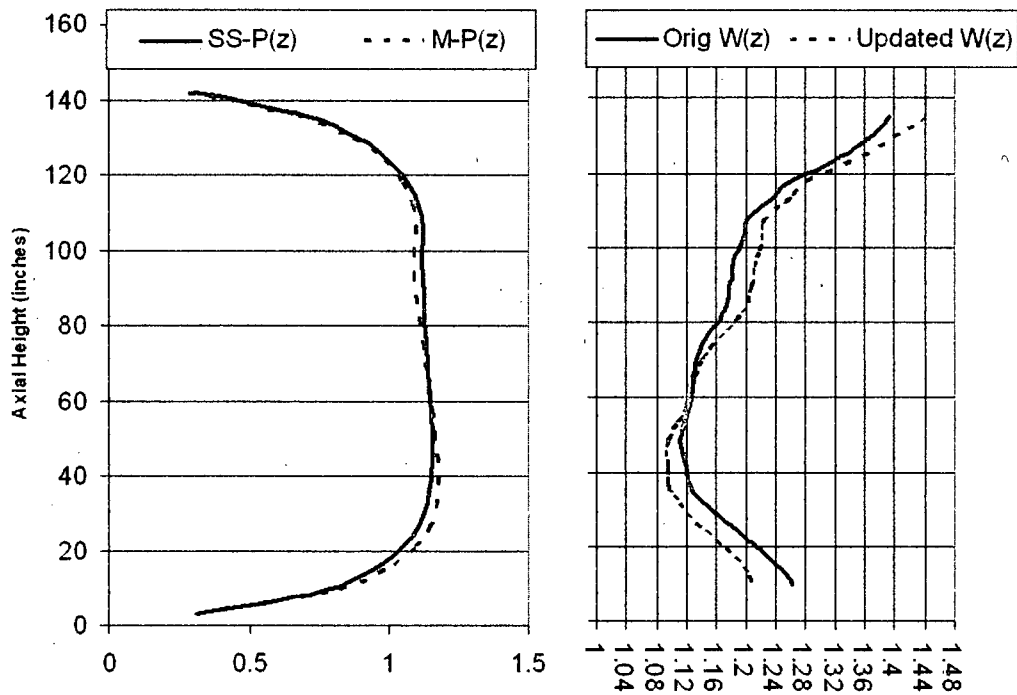Figure 15, Map 14 W(z) Update Function Results

3.0 REFERENCES

1. TXX-08032, "Supplement to License Amendment Request (LAR) 07-003 Response to Request for Additional Information Related to License Amendment Request Associated with Methodology used to Establish Core Operating Limits" (CPNPP Memo CP-200800264)

2. TXX-08054, "Supplement to License Amendment Request (LAR) 07-003 Additional Information Related to License Amendment Request Associated with Methodology used to Establish Core Operating Limits" (CPNPP Memo CP-200800455)