RESPONSE TO NRC QUESTIONS ON STEAM GENERATOR TUBE INSPECTION
PREPARED BY FLORIDA POWER AND LIGHT COMPANY
ST. LUCIE UNIT 2 - DOCKET NO. 50-389

Reference: NRC letter dated April 8, 2003, Saint Lucie Nuclear Plant, Unit 2: Upcoming Steam Generator Tube Inservice Inspection (TAC No. MB81 34)

1. Discuss whether any primary to secondary leakage existed in this unit prior to shutdown.

   Reply – Primary to secondary leakage has been less than detectable throughout Cycle 13 operation.

2. Discuss the results of secondary side pressure tests.

   Reply – No secondary side pressure tests are planned for SL2-14.

3. For each SG, provide a general description of areas examined, including the expansion criteria utilized and type of probe used in each area. Also, be prepared to discuss your inspection of the tube within the tubesheet, particularly the portion of the tube below the expansion/transition region.

   Reply – Approximate Status as of 5-2-03 at 0300

AREAS EXAMINED	EXPANSION CRITERIA	PROBE TYPE	%
Full Length Row 3-140 Straight Length Row 1-2	N/A – 100% Planned	Bobbin Probe	100%
Screening of Dings <5 Volts	N/A – 100% Planned	Bobbin Probe	100%
25% Row 1-2 U-bends	Affected SG - Remainder of Row 1&2 and 20% of Row 3	Rotating Probe	
Hot Leg Tubesheet +3"/-7" from the bottom of the expansion transition for all active hot leg tubes	N/A – 100% Planned	Rotating Probe	45%
20% Cold Leg Tubesheet +3"/-5" from secondary face	Affected SG – Remainder of Cold Leg Tubesheet	Rotating Probe	50%
20% Wear Scars in U-bends	Affected SG – Remaining Wear Scars	Rotating Probe	15%
All Dings Hot Leg Tubesheet to 1st Support Dings >5 volts 1st Support to HL Bend All Dings in HL & CL Square Bends (Row 19-140) Dings >5 volts in Horizontal Run Row 19-140 All Dings Row 1-18 U-Bends	N/A – Dents that bobbin screening is not applicable are inspected with rotating probe.	Rotating Probe	20%
20% of Dings >5 volts TSC to CL Bend	Remaining Dents >5 volts	Rotating Probe	20%

4. Discuss any exceptions taken to the industry guidelines.

Reply – The Nuclear Division S/G Management Team has approved the following exceptions:

- Installed tube plugs are examined visually in lieu of volumetric examination. Note that volumetric examination is not required under the pending Rev. 6 of the EPRI guideline.
- Bobbin probe voltage normalization achieves 5 volts on the 4-20% flat bottom holes rather than 4 volts.

5. Provide a summary of the number of indications identified to-date of each degradation mode and SG tube location (e.g., tube support plate, top-of-tubesheet, etc.). Also provide information, such as voltages, and estimated depths and lengths of the most significant indications.

Reply

St. LUCIE UNIT 2 STEAM GENERATORS – INDICATION COUNT						
	NOVEMBER 2001			APRIL 2003		
MECHANISM	SG A	SG B	TOTAL	SG A	SG B	TOTAL
Axial ODSCC – Eggcrates	97	201	298	218	164	382
Axial ODSCC – Dings	5	1	6			
Axial ODSCC – HL Tubesheet	8	16	24	9	2	11
Axial ODSCC - Freespan	- -	- -	- -	1		1
Axial IDSCC Within Tubesheet	2	0	2			
Circ. ODSCC - HL Tubesheet	4	9	13	1	5	6
OD Volumetric	0	2	2			
Wear – Foreign Objects	0	5	5			
Wear – U-bend Supports	581	397	978	615	416	1031

Initial in situ screening plots are provided for indications reported in the April 2003 inspection to provide a perspective on estimated length, depth and voltage. This initial screening is conservative in that the flaw is modeled by a bounding geometric shape. For example, a circumferential indication is treated as a rectangular-shaped crack where the maximum depth is assumed over the entire flaw length. Flaws exceeding the screening criteria are further evaluated with detailed plus point profiles and structural evaluations are then completed to determine if these flaws require in situ testing. For the flaws evaluated to date, none require in situ testing based on these evaluations.

6. Describe repair/plugging plans for the SG tubes that meet the repair/plugging criteria.

Reply – Wear indications will be plugged based on the Technical Specification plugging limit of 40% through-wall depth. Corrosion indications will be plugged on detection.

7. Discuss the previous history of SG tube inspection results, including any "look backs" performed. Specifically for significant indications or indications where look backs are used in support of dispositioning (e.g., manufacturing burnish marks).

   Reply – This information was detailed in presentation "Florida Power & Light Company, St. Lucie Nuclear Plant, UNIT 2 STEAM GENERATOR PERATIONAL ASSESSMENT FOR CYCLE 13", presented to NRR May 2, 2002.

8. Discuss, in general, new inspection findings (e.g., degradation mode or location of degradation new to this unit).

   Reply – No new degradation modes were detected in this inspection. Axial ODSCC continues to be the dominant mechanism. The number of axial indications at eggcrate tube supports is greater than expected. However, the severity of these indications does not appear to present a challenge to tube integrity.

9. If SGs contain Alloy 600 thermally treated tubing, discuss actions taken (if any) based on Seabrook's recent findings. Refer to NRC Information Notice 2002-21, Supplement 1 (ADAMS Accession Number ML03090051 7).

   Reply – N/A for St. Lucie Unit 2.

10. Discuss the use or reliance on inspection probes (eddy current or ultrasonic) other than bobbin and typical rotating probes, if applicable.

    Reply – N/A for St. Lucie Unit 2.

11. Describe in situ pressure test plans and results, if applicable and available, including tube selection criteria.

    Reply – Approximately 48 indications have been in situ pressure tested during the past 4 SG inspections without any leakage or burst. Tube selection criteria are in accordance with the latest Industry guidance, including interim guidance on hold times, intermediate hold pressures, and pressurization ramp rates.

12. Describe tube pull plans and preliminary results, if applicable and available; include tube selection criteria.

    Reply – Current SL2-14 plans do not include tube removal from the SGs.

13. Discuss the assessment of tube integrity for the previous operating cycle (i.e., condition monitoring).

    Reply – The Condition Monitoring will be performed in a similar manner as last outage, which was presented to the staff in a post-outage meeting. Indications are screened against structural limit curves by mechanism. The structural limits were pre-calculated for meeting 3xNODP following industry guidance to NEI 97-06. Uncertainties in analysis parameters were conservatively combined at a 95% probability level. The parameters subject to bounding limits for uncertainty are tubing material strength, NDE measurement technique, and burst model

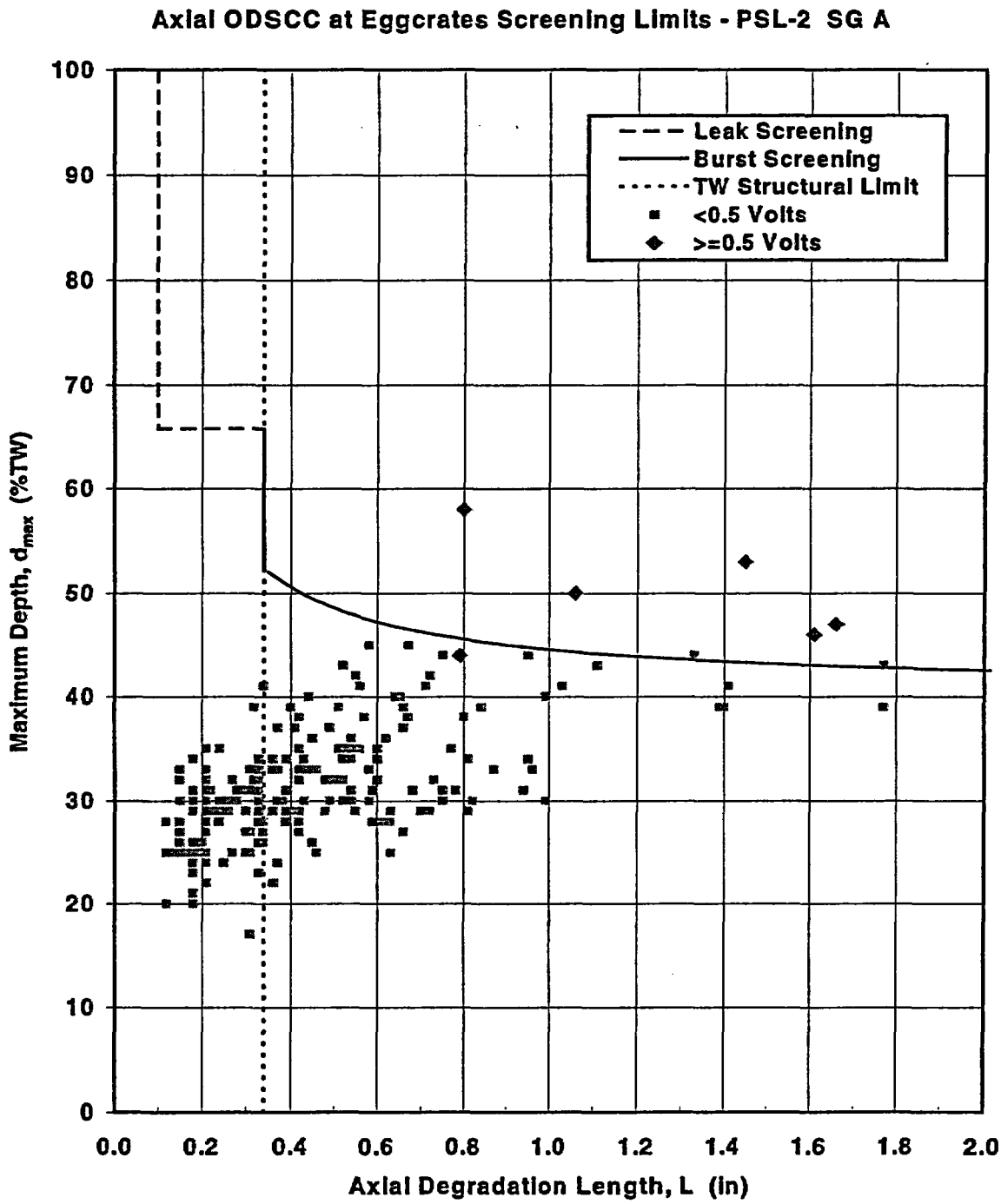
relation. In the initial screening process, the shapes of indications are conservatively modeled by bounding profiles based on previous examination data. Indications that fail initial screening are subsequently profiled for depth versus length and reanalyzed by the structural minimum method for burst. Indications that do not satisfy detailed profile evaluation are candidates for ISPT.

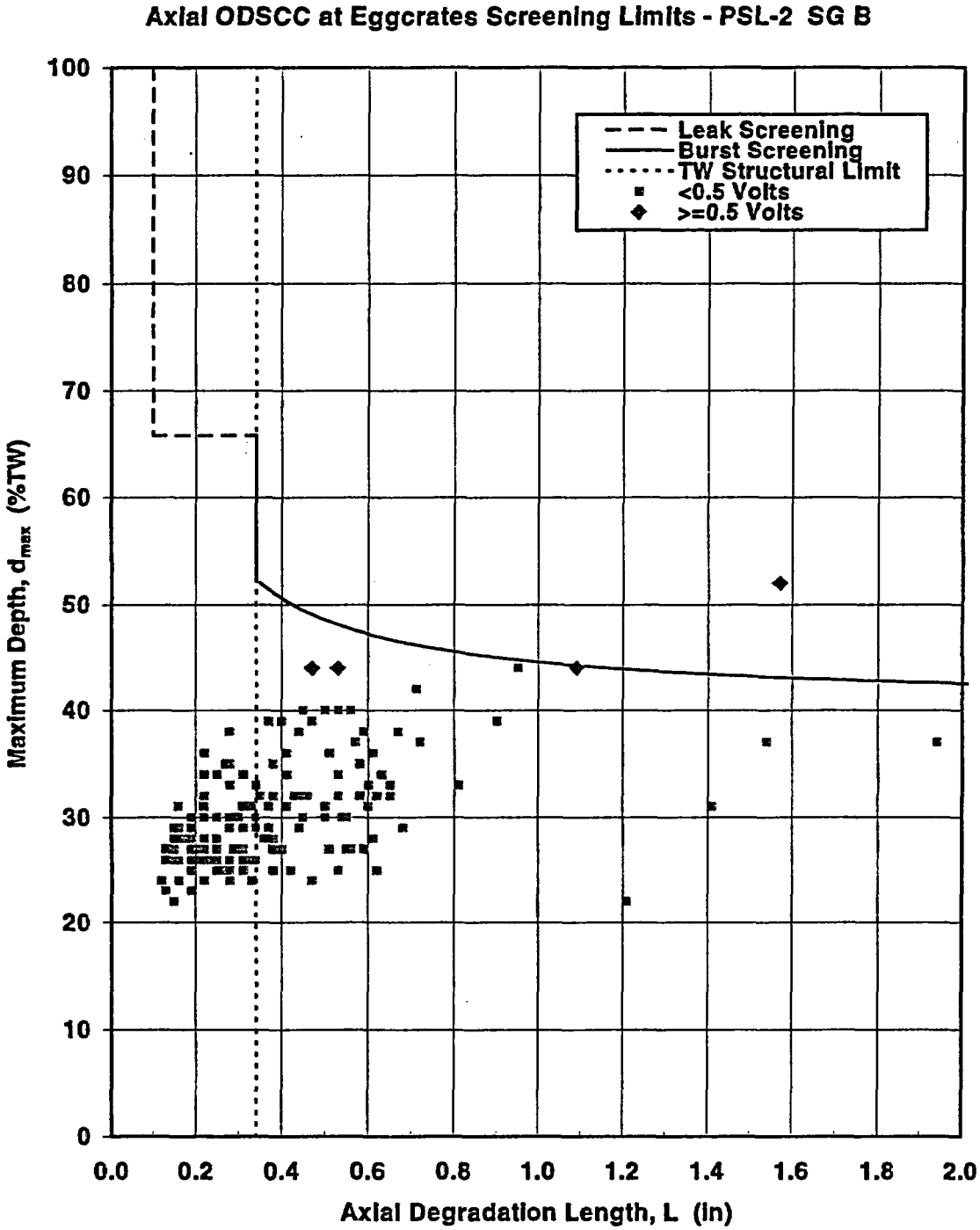
14. Discuss the assessment of tube integrity for next operating cycle (i.e., operational assessment).

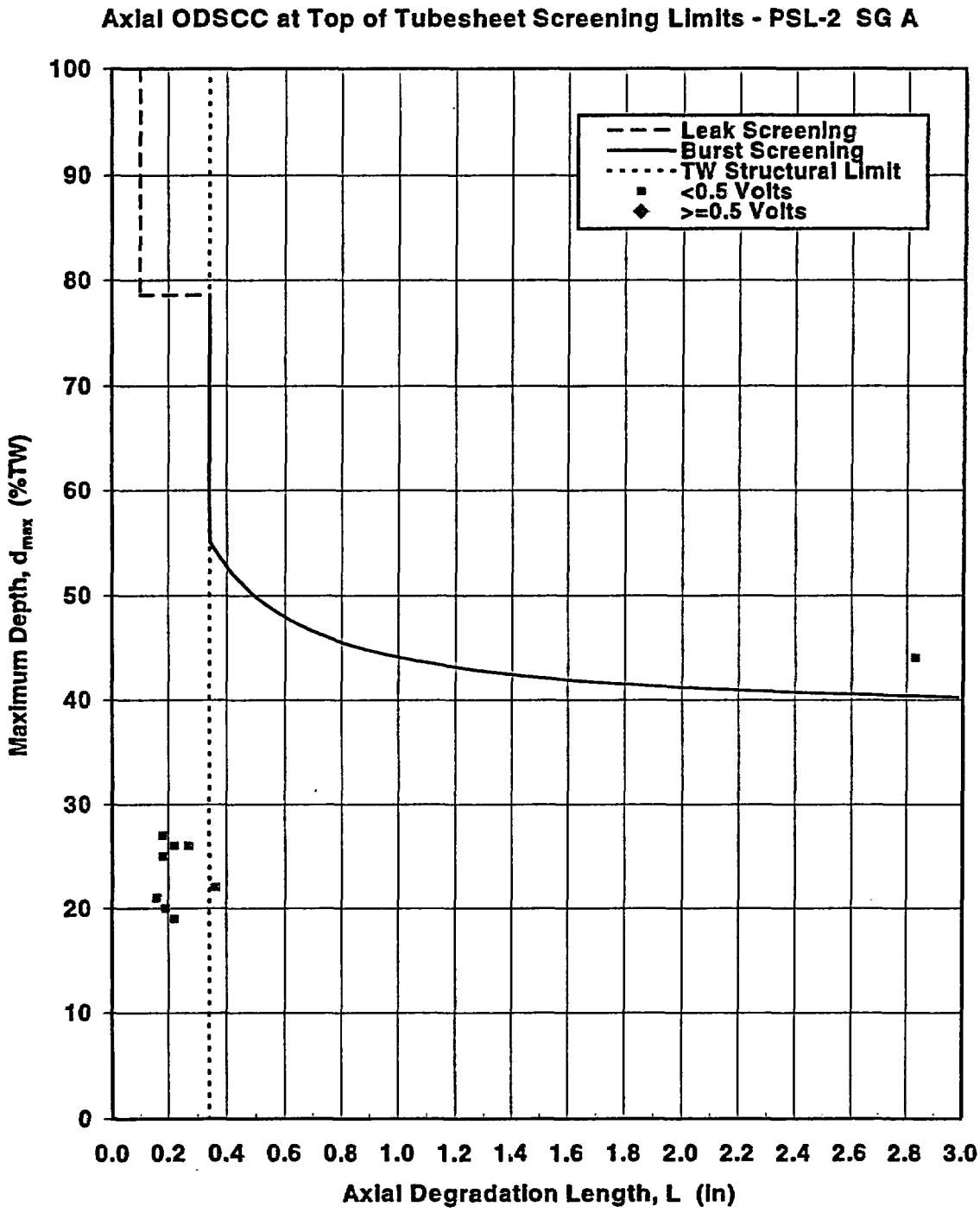
    Reply – The Operational Assessment will be performed in a similar manner as last outage, which was presented to the staff in a post-outage meeting. The assessment is based on maintaining 3xNODP to the next tube examination per industry guidelines and NEI 97-06 requirements. Degradation by axial ODSCC at eggcrate supports, tube dings, and at tube transitions at the tubesheet will be assessed by probabilistic (Monte-Carlo) multi-cycle analysis. Benchmarking will be performed to confirm assumptions for POD and degradation rates are conservative for the next cycle. Benchmarking considers from previous inspections, the number of observed indications, depth distribution of indications, observed extreme depths, and sizing uncertainties, in the prediction of end of next cycle burst and leakage probabilities. The other mechanisms will be evaluated by conservative deterministic analysis to compute the end of next cycle limiting indication depths for comparison with the Operational Assessment structural limits for each mechanism.

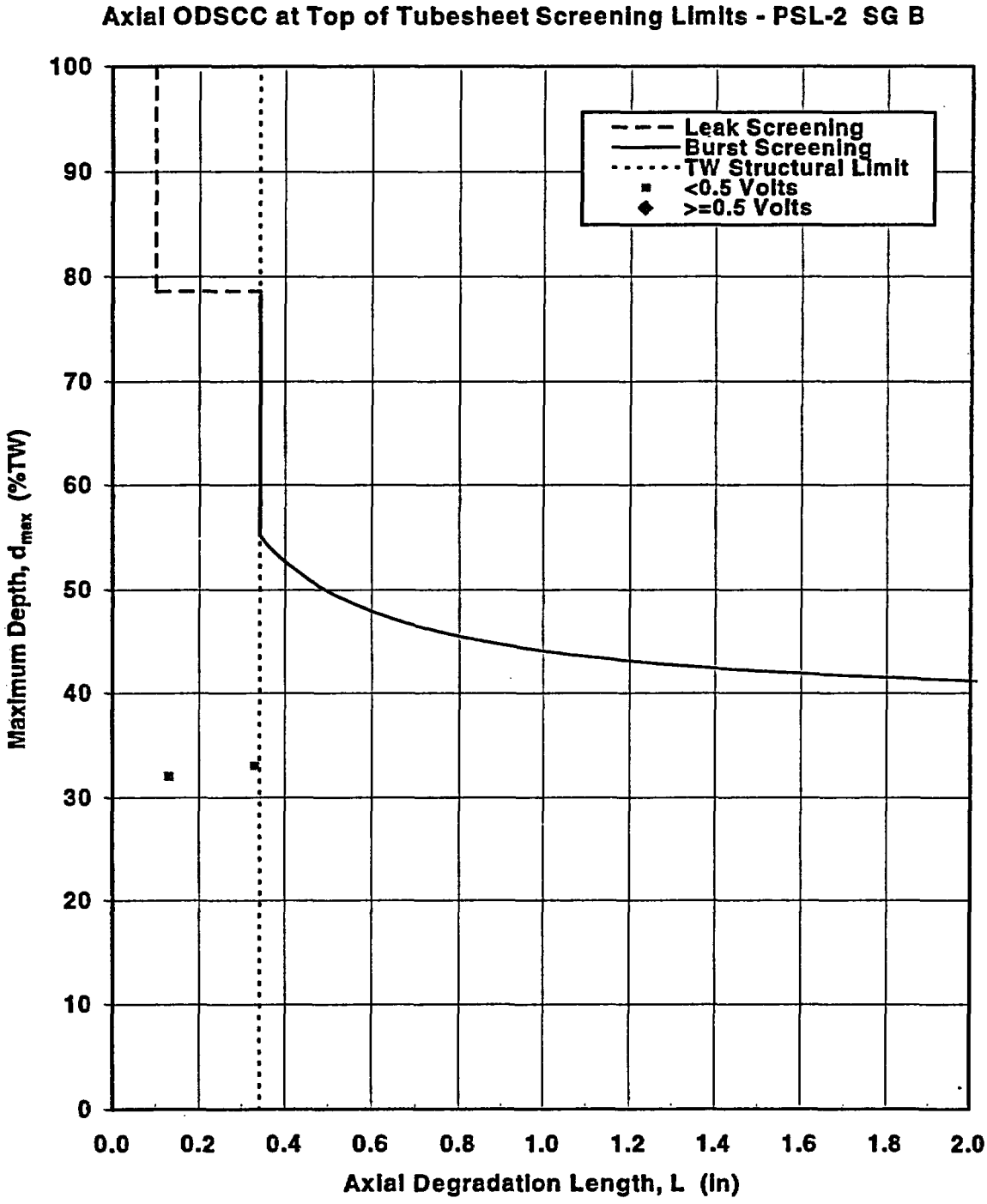
15. Provide the schedule for SG-related activities during the remainder of the current outage.

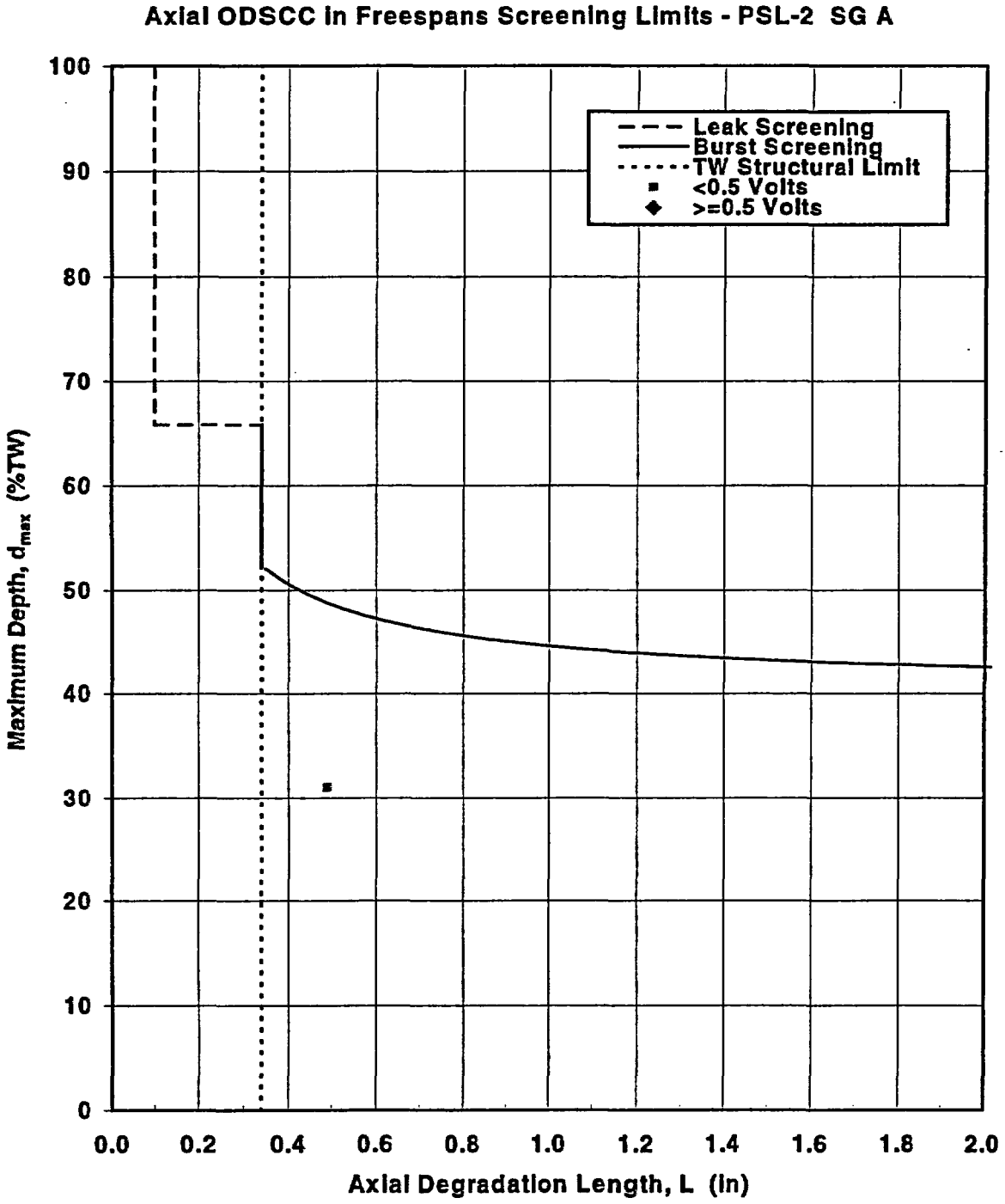
    Reply – Primary and secondary side inspections are expected to be complete by Monday May 5, 2003. Tube plugging should be complete by May 7, 2003.

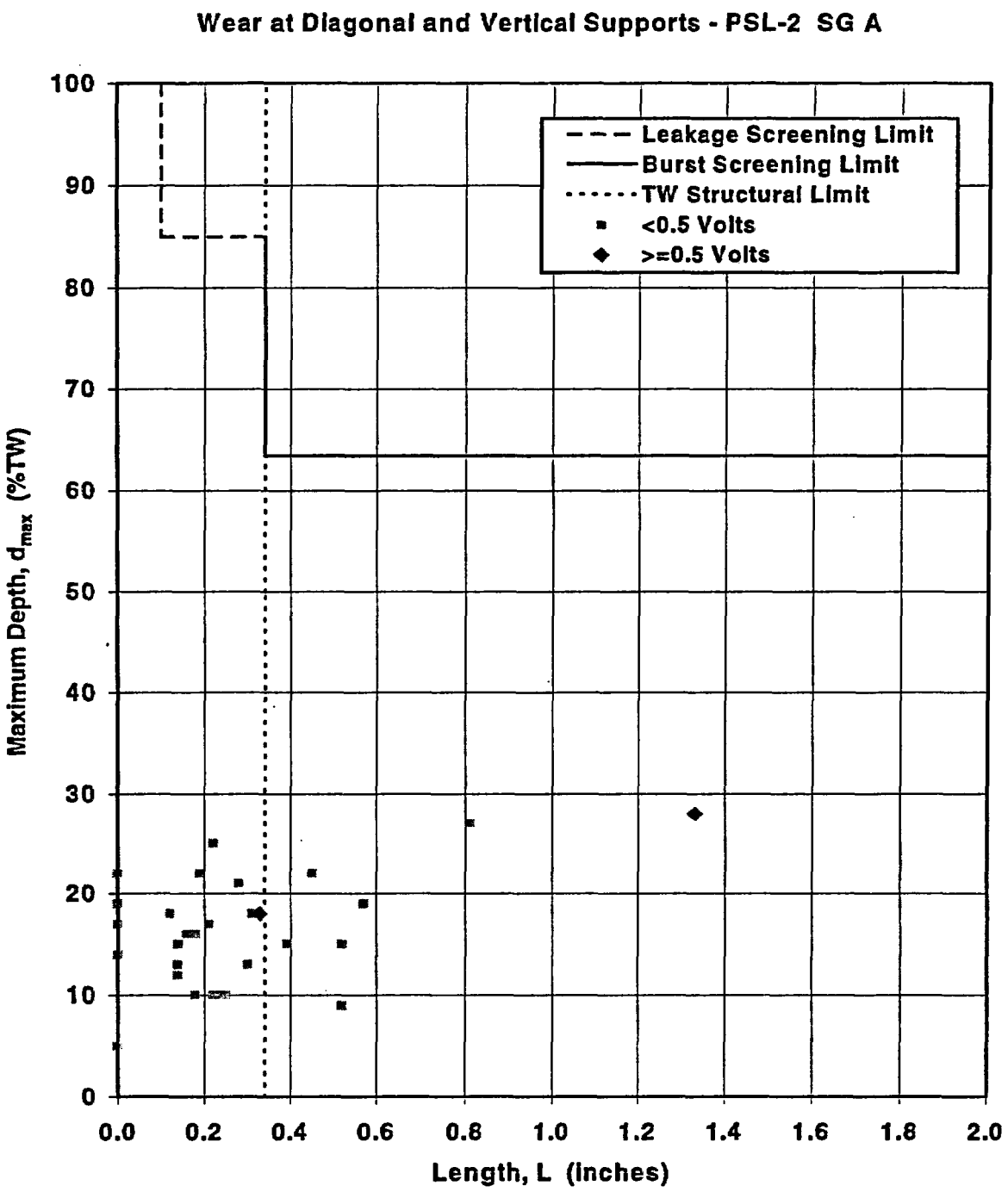

Axial ODSCC at Eggcrates Screening Limits - PSL-2 SG A
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
Axial Degradation Length, L (in)
0
10
20
30
40
50
60
70
80
90
100
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0


Axial ODSCC at Eggcrates Screening Limits - PSL-2 SG B
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
Axial Degradation Length, L (in)
0
10
20
30
40
50
60
70
80
90
100
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

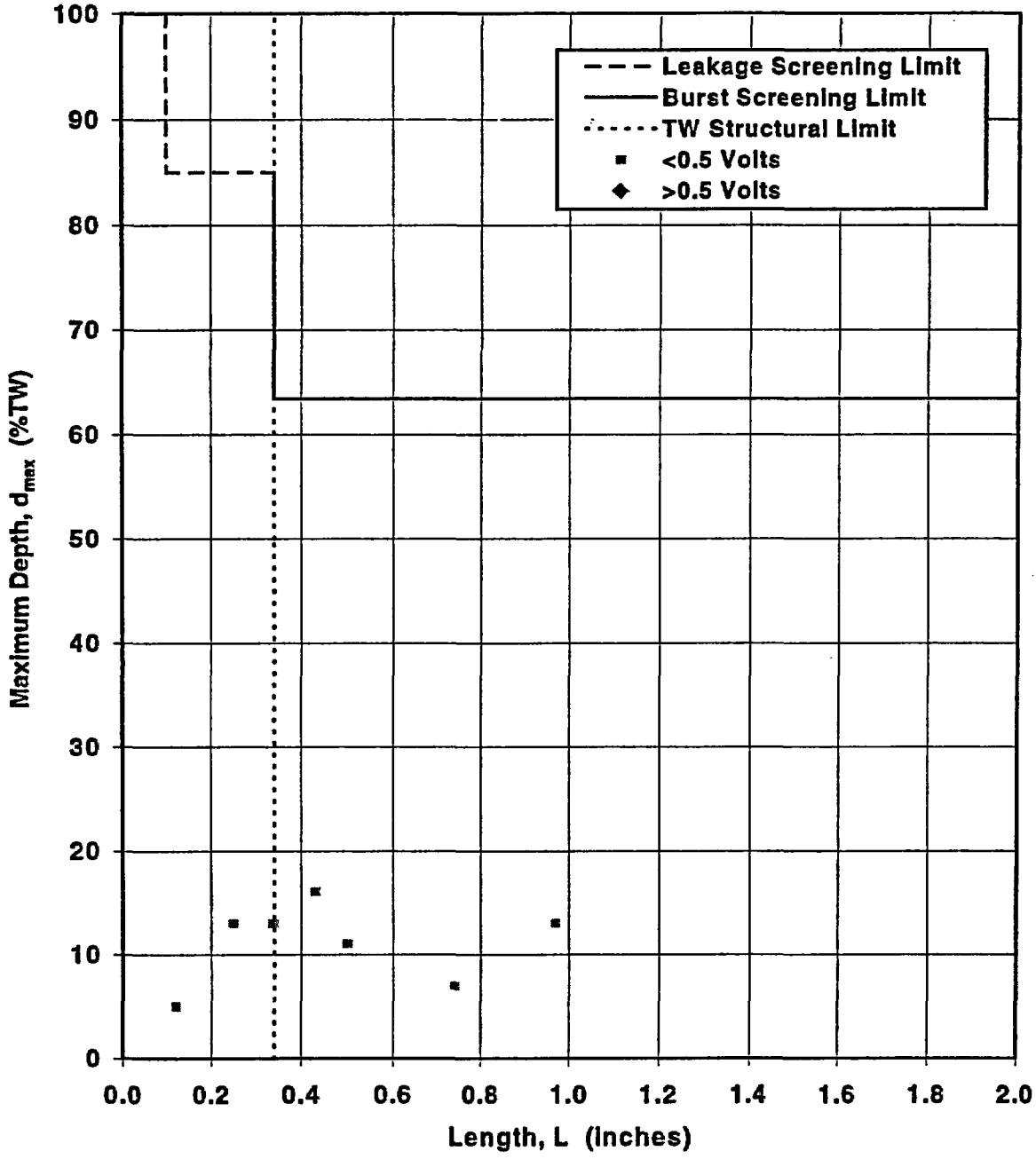

Axial ODSCC at Top of Tubesheet Screening Limits - PSL-2 SG A
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
100
90
80
70
60
50
40
30
20
10
0
0.0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0 2.2 2.4 2.6 2.8 3.0
Axial Degradation Length, L (in)

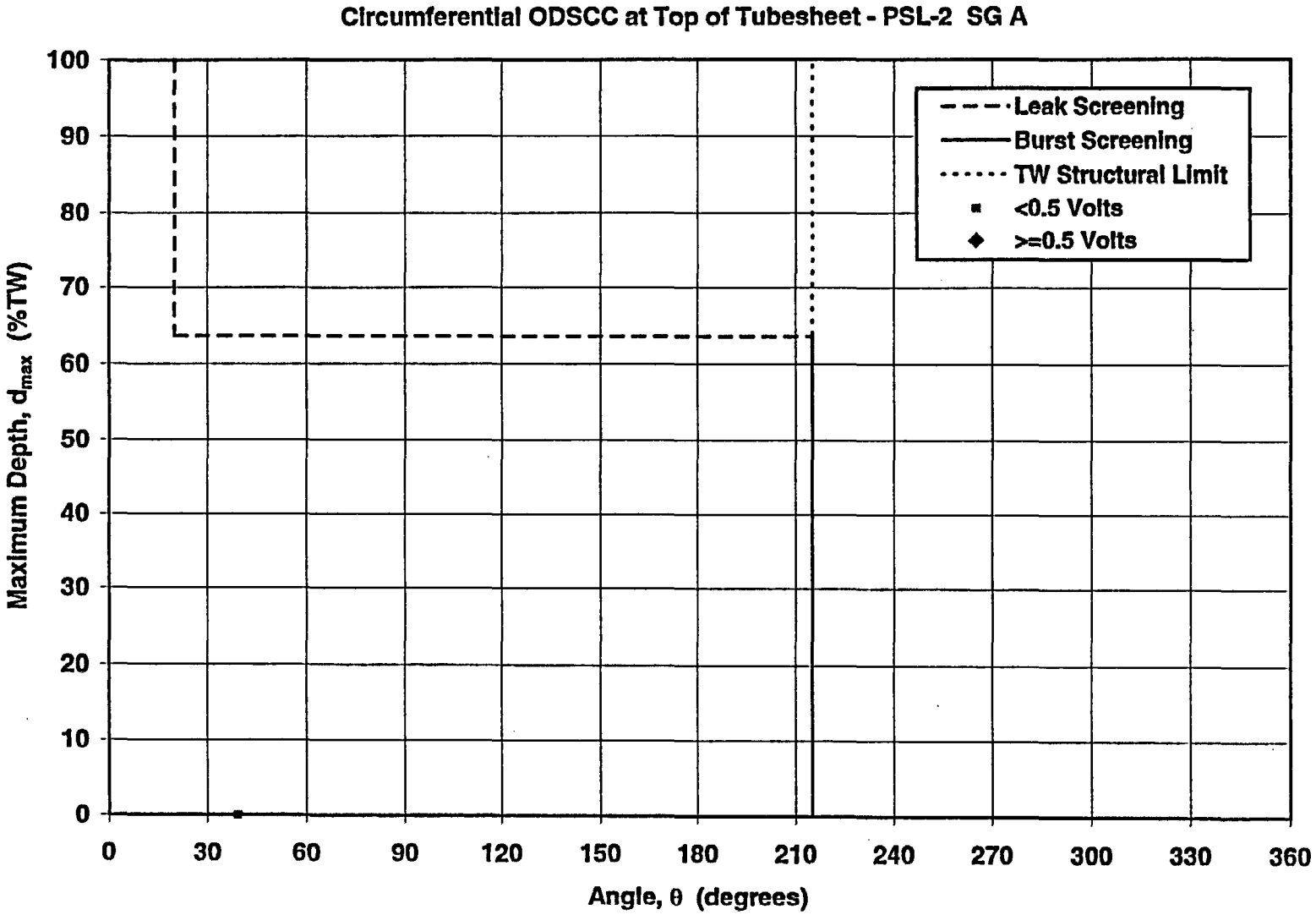

Axial ODSCC at Top of Tubesheet Screening Limits - PSL-2 SG B
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Axial Degradation Length, L (in)

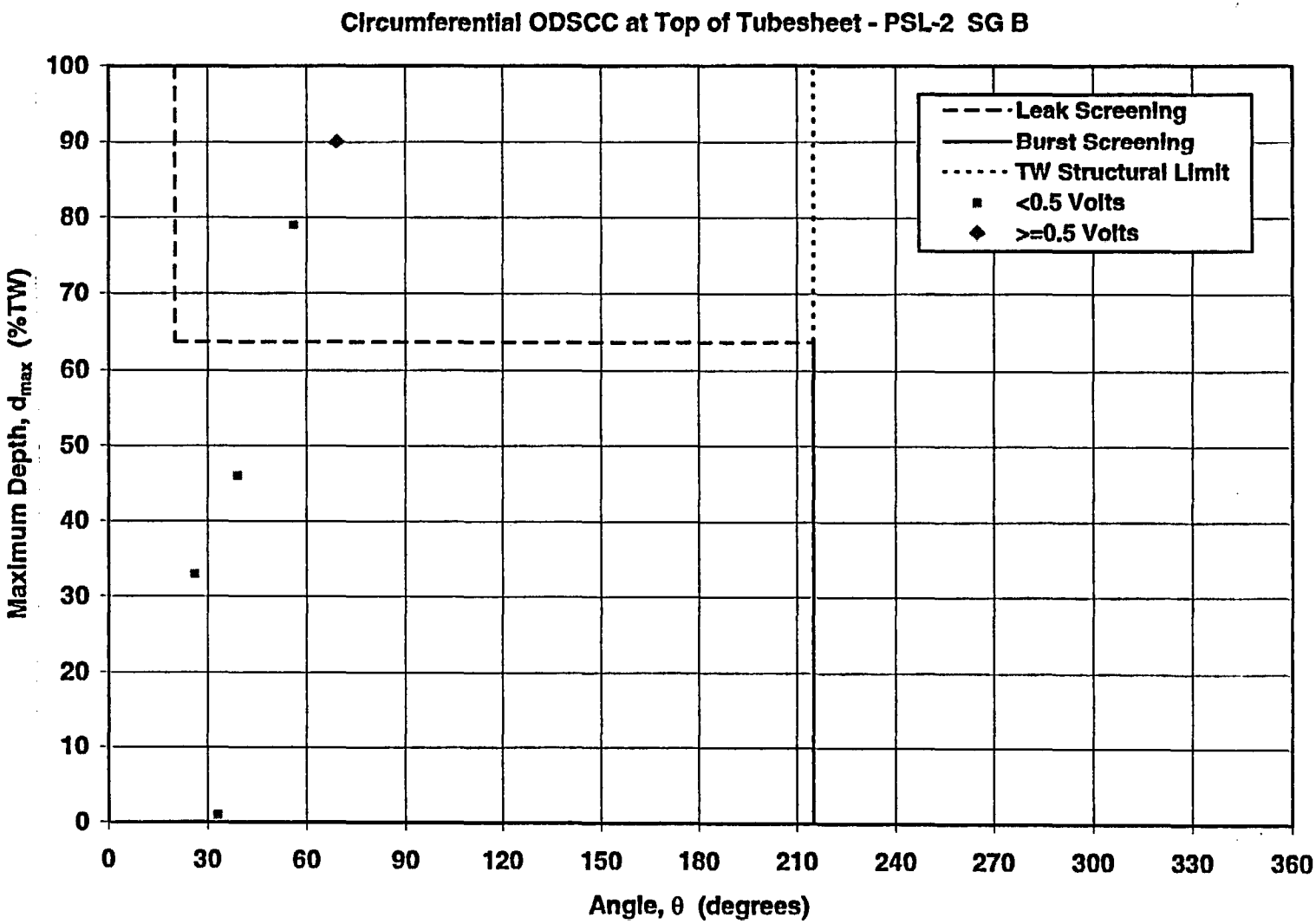

Axial ODSCC in Freespans Screening Limits - PSL-2 SG A
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
Axial Degradation Length, L (in)


Wear at Diagonal and Vertical Supports - PSL-2 SG A
Leakage Screening Limit
Burst Screening Limit
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
Length, L (inches)
0
10
20
30
40
50
60
70
80
90
100
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0

Wear at Diagonal and Vertical Supports - PSL-2 SG B




Circumferential ODSCC at Top of Tubesheet - PSL-2 SG A
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
100
90
80
70
60
50
40
30
20
10
0
0
30
60
90
120
150
180
210
240
270
300
330
360
Angle, θ (degrees)


Circumferential ODSCC at Top of Tubesheet - PSL-2 SG B
Leak Screening
Burst Screening
TW Structural Limit
<0.5 Volts
>=0.5 Volts
Maximum Depth, d_{max} (%TW)
100
90
80
70
60
50
40
30
20
10
0
0
30
60
90
120
150
180
210
240
270
300
330
360
Angle, θ (degrees)