Crane Clean Energy Center
2625 River Road
Middletown, PA 17057
www.constellation.com

TMI-24-010

December 19, 2024

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Three Mile Island Nuclear Station, Unit 1
Renewed Facility License No. DPR-50
NRC Docket No. 50-289

Subject: TMI-1 Steam Generator Inspection Report for End of Cycle 22

Reference: Constellation Energy Generation LLC letter to U.S. Nuclear Regulatory Commission, Request for Exemption from Certain Termination of License Requirements of 10 CFR 50.82 (ADAMS Accession No. ML24324A048)

On September 20, 2024, Constellation Energy Generation, LLC (CEG) announced our intent to restore Three Mile Island Nuclear Station, Unit 1 (TMI-1) to safe and reliable commercial power operation. In anticipation of the restart announcement, CEG completed an examination of the TMI-1 steam generator tubing in Spring 2024. This was the first examination of the steam generator tubing since the plant shutdown in September 2019, at the End of Cycle 22.

TMI-1 Technical Specification 6.9.6, in effect at the time of shutdown, required a report of the inspection results be submitted within 180 days after reactor coolant temperature exceeds 200 F. The enclosure to this letter documents the results of the steam generator tube examinations and is submitted in support of U.S. Nuclear Regulatory Commission reauthorization of the TMI-1 Operating License (reference).

As documented in the enclosed Steam Generator Tube Inspection Report, the observed degradation in the TMI-1 steam generators identified during the Spring 2024 inspection did not challenge structural and leakage integrity requirements during the previous operating cycle, which was the last cycle TMI-1 operated before shutdown. No primary-to-secondary leakage occurred during the previous operating cycle.

Should you have any questions concerning this letter, please contact Mr. Craig Smith at craig.smith3@constellation.com.

Respectfully,

Orth, Trevor L Digitally signed by Orth, Trevor L
Date: 2024.12.19 16:16:38 -05'00'

Trevor L. Orth
Plant Manger
Crane Clean Energy Center
Constellation Energy Generation, LLC

Enclosure: Three Mile Island Unit 1, Steam Generator Tube Inspection Report

cc: NRC Regional Administrator – Region I
NRC Director, NRR – DORL
NRC Deputy Director, NRR – DORL
NRC Project Manager, NRR-DORL – Three Mile Island, Unit 1 NRC
Project Manager, NMSS – Three Mile Island, Unit 1
Director, Bureau of Radiation Protection – Pennsylvania Department of Environmental Protection
Chairman, Board of County Commissioners of Dauphin County
Chairman, Board of Supervisors of Londonderry Township

ENCLOSURE

Three Mile Island Unit 1, Steam Generator Tube Inspection Report

Three Mile Island Unit 1

Steam Generator Tube Inspection Report

Inspection of the Three Mile Island Unit 1 Steam Generators after permanent shutdown in 2019

Inspection Completed: May 2024

Contents:

List of Figures:

List of Tables:

Introduction

On September 20th, 2019, operation of Three Mile Island (TMI) Unit 1 was permanently ceased, and the decommissioning process began. During the initial phases of this process the Enhanced Once Through Steam Generators (EOTSG) were drained via the blowdown system of all water left from operation. In May of 2024, a complete inspection of the steam generators (SGs) was performed in effort to understand the condition after having been in a drained layup condition for almost five years. These inspections were performed in accordance with the SG inspection criteria in sections 4.1 and 6.19 of the Tech Specs that were applicable when the unit ceased operation in 2019.

Design and operating parameters

TMI-1 replaced the original B&W-designed Once-Through Steam Generator (OTSGs) during the 1R18 outage in 2009 with Framatome (formerly Areva) designed Enhanced Once Through Steam Generators (EOTSGs), designated SGA and SGB. The ETOSGs are constructed in accordance with the 2001 ASME Boiler and Pressure Vessel Code with addenda through 2003, Section III and are vertically mounted once-through heat exchangers with a counterflow design. TMI-1 design information and general arrangement are shown in Table 2 and Figure 1. Table 1 below outlines the Replacement SG operating history and cycle designators.

Table 1: TMI-1 Replacement SG EFPY History

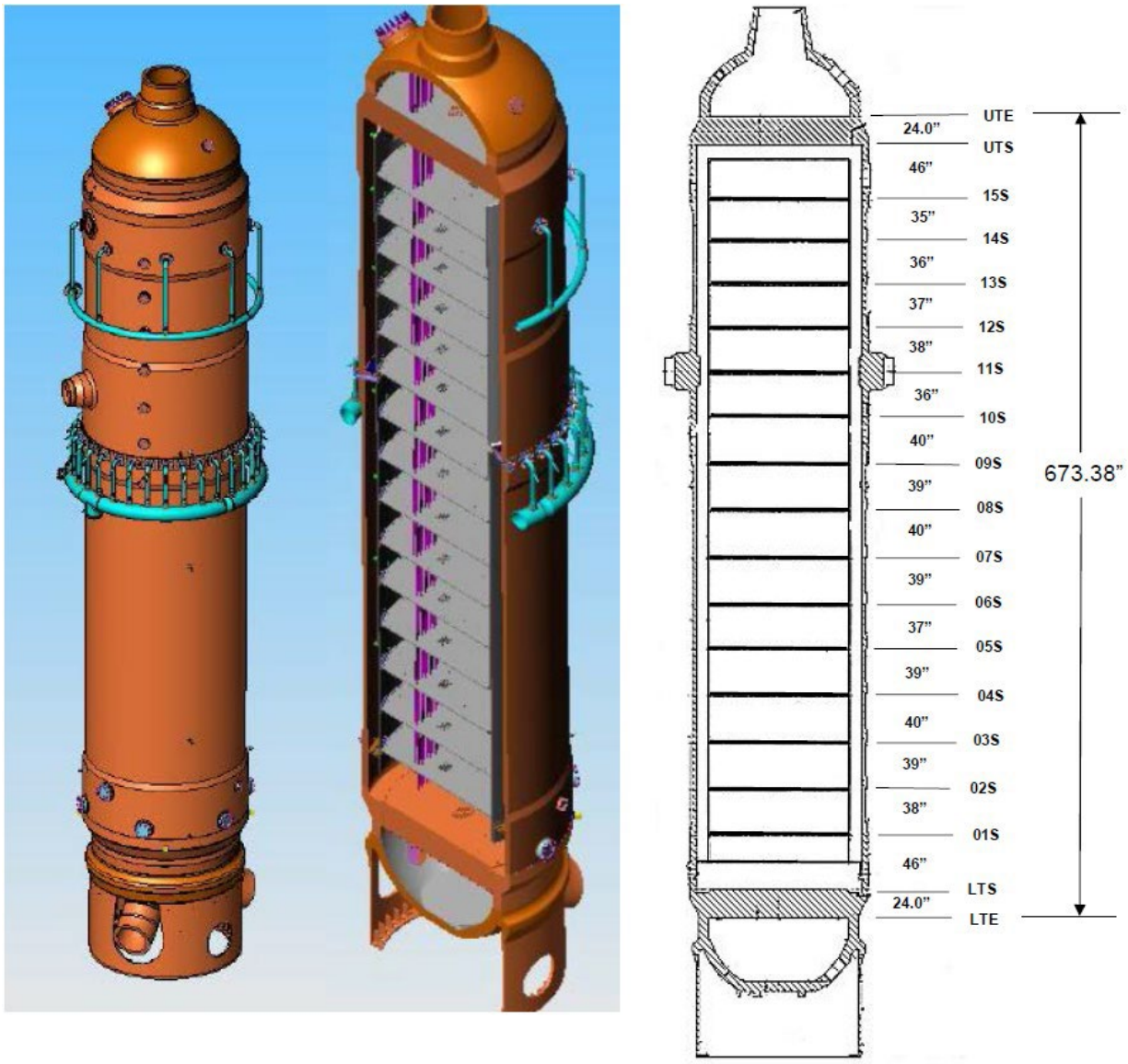
Cycle	Effective Full Power Years (EFPY)	Inspection Outage
18[1]	1.720	T1R19 (Fall 2011)
19	1.876	T1R20 (Fall 2013)
20	1.890	T1R21 (Fall 2015)
21	1.780	T1R22 (Fall 2017)
22	1.930	T1D23[2] (May 2024)

Note:
1. TMI-1 Replacement SGs were installed in T1R18 (Fall 2009) and began operation in cycle 18.
2. TMI permanently ceased operations on September 20, 2019. The outage designator used for the May 2024 inspection was T1D23 with the “D” referring to “Defueled”

Table 2: Three Mile Island Steam Generator Design and Operating Parameters

SG Model / Tube Material / Number of SGs per Unit	AREVA Enhanced Once-Through Steam Generators (EOTSG) / Alloy 690TT / 2
Number of tubes per SG / Nominal Tube Diameter / Tube Thickness	15597 / 0.625 in. / 0.037 in
Support Plate Style / Material	Broached Trefoil / Stainless Steel
Last Inspection Date	SG A – September 2015 SG B – September 2017 SG A & B - May 2024
Effective full power months (EFPM) Since Last Inspection	23.23 EFPM (T1R22 – T1D23)
Total Cumulative SG EFPY	9.20 EFPY
Mode 4 Initial Entry	October 6th, 2017, after T1R22
Observed Primary-to-Secondary Leak Rate	No observed leakage
Nominal Thot at Full Power Operation	603°F
Degradation Mechanism Sub-Population	Degradation resulting from extended shutdown (see section 3 below)
SG program guideline deviations since last Inspection	None, Plant operations permanently ceased.
SG Schematic	See Figure 1

Figure 1: Tube Support Arrangement for TMI-1 Areva Replacement SGs



(TS 6.9.6.a.) The scope of the inspections performed on each SG and if applicable, a discussion of the reason for scope expansion

Primary Side Eddy Current Scope

- Bobbin Probe Eddy Current Testing (ECT) Examinations:
    - One Hundred percent (100%) of all in-service tubes were inspected full length for the upper tube end to the lower tube end (UTELTE) with the standard bobbin coil technique. The primary probe utilized during this inspection was the 0.510 high stability bobbin probe (510HS).

- Array Probe ECT Examinations:
    - Tubes within a two-tube periphery region were inspected with a 0.510 array probe (510XP) from the first support to the tube end for potential foreign objects and associated wear (peripheral locations are where crossflow velocities are the highest)

- Special Interest Diagnostic Array Examinations
    - Bobbin indications of interest were inspected as special interest array for continued monitoring with a 0.510 array probe (510XP).
- Special Interest Diagnostic +Point Examinations
    - Select tube support wear indication were designated for testing with a 0.520 +Point probe (520PP)

Primary Side Visual Inspection Scope

Video inspection of each SGA and SGB channel heads to verify tube plug location and potential leaking plugs evidenced by boric acid build-up on tubesheet. It was noted that these plug visuals could be more challenging than prior inspections due to the prolonged shutdown condition and potentially high concentrations of residual boric acid. Trace amounts of boric acid were identified, however these were not indicators of leakage and did not interfere with the inspection.

The primary side cladding was also visually inspected in each channel head to look for rust stains or evidence of clad degradation, including the cladding in the region of the channel head and nozzle interface.

A visual (remote camera) inspection looking down the cold leg piping of both SGs for foreign objects that could potentially have been introduced during the extended shutdown.

Secondary Side Inspection Scope

Secondary Side inspections were performed to assess the effects of the extended shutdown:

- Top of tubesheet inspections were performed in both steam generators. Including general views of the tubesheet to the shell annulus region, tube to tubesheet interfaces and the minimum of 5 tubes deep into the bundle.
- An inspection of the entire anulus trough region.
- An inspection looking up at the orifice plate around the entire periphery. These views included orifice plate hardware and other supports/ structures in the area above the top of tubesheet.

Based on the 100% ECT Bobbin inspection scope and conditions identified, no scope expansion was required for either ECT or visual inspections.

The nondestructive examination techniques utilized for tubes with increased degradation susceptibility

Degradation Resulting from Extended Shutdown

Since shutdown in 2019, the TMI SGs are not known to have been maintained in any controlled layup conditions on the primary or secondary sides. The upper primary manway cover of SGA and upper primary handhole covers of both SGs were found removed as to provide a vent path for the RCS during defueling activities shortly after shutdown. Secondary side handhole covers of both SGs remained installed but the status of foreign material ingress through other openings to the secondary side since 2019 and prior to initiation of dry air layup is still mostly unknown. For development of the Spring 2024 inspection scope, it was assumed that the secondary side had been open to the atmosphere for some time since shutdown. For these reasons it was deemed appropriate to evaluate the potential for degradation not normally experienced in a typical refueling outage inspection.

There is no basis for expecting the existing degradation modes of Tube Support Plate (TSP) and Tube-to-Tube wear to be affected by the shutdown. Wear can only occur in the presence of an energy input from primary and secondary flow. ECT noise monitoring was performed on bobbin data to ensure that tube noise does not adversely affect Probability of Detection (POD). If the extended shutdown had resulted in conditions that would increase tube noise to unacceptable levels, then it would have been identified early into the inspection and addressed by evaluating the impact on the POD.

The surfaces inside the primary system are Inconel and Stainless Steel. These materials were selected for corrosion resistance. Provided the chemistry of the RCS water has not been allowed to reach detrimental levels at ambient temperature there are no realistic concerns that corrosion could have occurred.

There is no industry experience with stress corrosion cracking in Alloy 690 tubing, and for the duration of the shutdown the SGs have been at ambient temperature, which would minimize the major driving force (temperature) behind cracking. OD pitting was capable of being detected as this could have been influenced by secondary side conditions.

Since the hot leg (upper) channel heads had been open for some time, there was a potential that foreign object(s) could have entered the upper head, fallen through a tube then into the lower channel head or cold leg (lower head) piping. To address this concern, a camera inspection down the cold leg piping of both SGs was performed.

The secondary side of the SGs, having exposed carbon steel surfaces, was susceptible to corrosion, and potential tubing damage, therefore, special attention was given to eddy current and secondary side inspections from the tubesheet to the first support plate of both SGs. The visual inspection scope was the same for both SGs and included top of tubesheet, minimum 5 tubes deep into the tube bundle in various locations, general views of the annulus region and tube-to-tubesheet interfaces and the entire annulus trough region and an inspection looking up at the orifice plate around the entire periphery. These views

included orifice plate hardware and other supports/ structures in the area above the top of tubesheet. Special attention was given to evidence of abnormal corrosion of carbon steel structures. Any abnormal findings were identified and documented, with disposition on a case-by-case basis, including inspection scope expansion which was ultimately was not required.

After shutdown, trace amounts (less than ¼ inch) of sludge have collected on the top of the tubesheet in the periphery region, mainly in the trough. While this is not, specifically, degradation, sludge can be an initiation site for pitting. It was expected that Secondary Side Inspections (SSI) would see little sludge accumulation because sludge is typically concentrated in the center of the tubesheet, however bobbin ECT was used to identify sludge depth on the top of tubesheet.

(TS 6.9.6.c.) For each degradation mechanism found: The nondestructive examination technique utilized

Steam Generator eddy current examination techniques used (Table 3) were qualified in accordance with Appendix H or Appendix I of the EPRI PWR SG Examination Guidelines Revision 8. Each examination technique was evaluated to be applicable to the tubing and the degradation mechanisms found in the TMI-1 SGs during the May 2024 inspection.

Table 3: Non-Destructive Examination (NDE) Techniques for Each Existing Degradation Mechanism Found During the May 2024 Inspection.

Location	Degradation Mechanism	Orientation	Probe	EPRI ETSS[1]	EPRI ETSS[1] Rev
Tube Support Plate (TSP)	Wear	Vol	Bobbin	I-96043.4 I-96042.1	1 4
			Array	11956.3 11956.4	3 3
Tube-to-Tube	Wear	Vol	Bobbin	13091.1	0
			Array	13902.1 13902.2	0 0
			+Point	13901.1	1
Tube-to-Tie Rod[2]	Wear	Vol	Bobbin	13091.1	0
			Array	13902.1 13902.2	0 0

1. ETSS – Examination Technique Specification Sheet
2. Tie rod and tube proximity are not tube degradation mechanisms; however, the bobbin probe will be used to identify proximity from an adjacent tube or tie rod

(TS 6.9.6.d.) Location, orientation (if linear), and measured sizes (if available) of service induced indications

Volumetric wear at support structures was the primary degradation mechanism detected during the May 2024 inspection. The wear indications detected were located at both broached trefoils and drilled hole supports having been present since the first in-service-inspection (ISI). Tube-to-tube wear was also detected in both SGs and has also been present since the first ISI. Table 4 below provides a summary of indications

Table 4: Number of Indications Detected for Each Degradation Mechanism During the May 2024 Inspection.

Degradation Mechanism[1]	SGA **Indications**	SGB **Indications**	Total
Broached TSP Wear (>20%TW[2])	255	844	1099
Drilled TSP Wear (>20%TW[2])	0	11	11
Tube-to-Tube Wear	111	288	399

1. The reporting threshold for new flaws at the 2024 inspection was increased from 5%TW to 10%TW. All repeat flaws between 5% - 10% were still reported.
2. Through Wall

Broached Tube Support Plate Wear

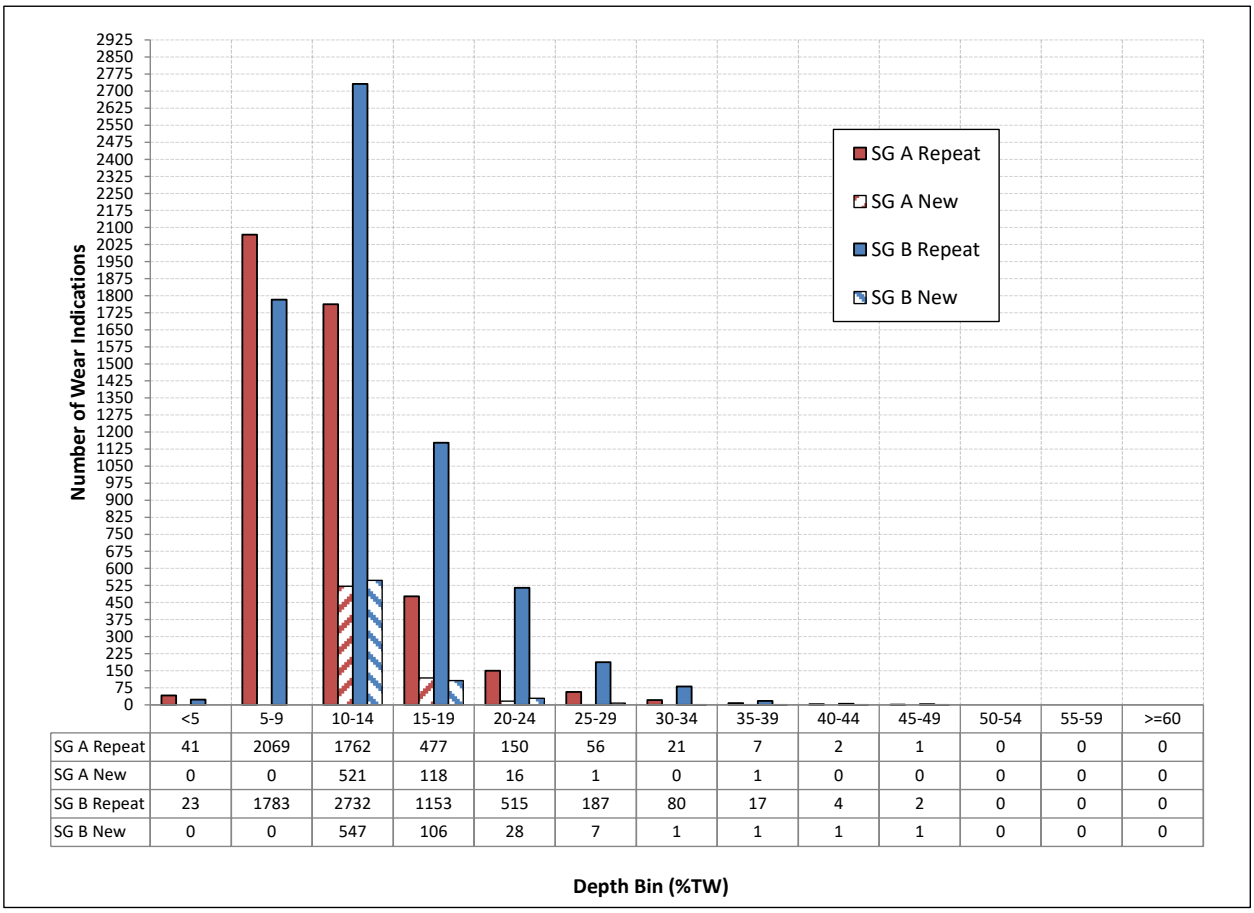
The TSP wear is located primarily at or above the 7th TSP with the highest number of indications occurring at the 8th TSP in both SGs. The deepest indications were primarily located at the 10th through 14th TSPs. The radial location of the TSP wear indications is more towards the periphery at the higher tube support plate locations.

There were 5,243 broached TSP wear indications in SG A and 7,188 in SG B identified in the 2024 inspection. The majority of these indications are located at or above the 8th TSP. The deepest indications were primarily located at the 10th through the 14th TSPs. The deepest indication (SG B tube R4 T1 at 12S) had a maximum depth of 47%TWD as measured with the bobbin coil. It is notable that while there are a large number of flaws in each SG, only a small fraction are of any significant depth, with fewer than 89 flaws in SG A (~1.7% of the flaw population) and 301 in SG B (~4.2% of the flaw population) greater than 24%TW in depth.

TSP wear flaws greater than or equal to 30%TWD, as determined by the bobbin probe, were structurally profiled to establish the number of flat vs. tapered wear flaws and to determine if wear was occurring on multiple lands. The majority of the broached TSP wear indications had tapered flaw shapes indicating a smaller equivalent depth. The deepest single flaw, SG B, R1-T4 at 12S, had a distinctly tapered profile. Figure 2 illustrates the number of broached tube support wear indications.

A complete listing of broached tube-to-tube support plate wear indications greater than 20% through wall is listed in Attachment 1.

Figure 2: Illustrates the 2024 Inspection Broached TSP Wear Depth Distributions – Both SGs



	<5	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	>=60
SG A Repeat	41	2069	1762	477	150	56	21	7	2	1	0	0	0
SG A New	0	0	521	118	16	1	0	1	0	0	0	0	0
SG B Repeat	23	1783	2732	1153	515	187	80	17	4	2	0	0	0
SG B New	0	0	547	106	28	7	1	1	1	1	0	0	0

Drilled Tube-to-Tube Support Plate Wear

All drilled support locations are located at the 15th support plate and the Spring 2024 inspection was the first time that drilled TSP wear, was depth-sized with bobbin. Previously, all sizing was done via supplementary exam with the rotating coil probe. The bobbin probe identified 58 flaws (9 in SG A and 49 in SG B), with follow up array inspections confirming 41 indications (8 in SG A, 33 in SG B). The largest flaw detected was tube R145-T7 in SG B and was sized by bobbin at 36%TWD in 2024. The same flaw was identified as Indication Not Reportable (INR) in 1R22 and applying the 2024 sizing to the bobbin signal from the 1R22 data results in a depth of 21%TWD. Of all the flaws confirmed with array, only two had no prior signal in the historical bobbin data with the maximum depth of 16%TW (SG A R2-T17 and R11-T1). Table 5 lists the drilled support wear indications greater than 20%.

Table 5: May 2024 Drilled Support Indications Greater than 20%TW

SG	Row	Tube	Location	Bobbin Depth (%TW)	Axial Extent (Inches)
A	No indications in SG A ≥20%TW				
B	7	2	15S-0.89	20	0.27
B	8	8	15S+0.21	20	0.29
B	10	6	15S+0.20	20	0.31
B	12	6	15S+-0.76	24	0.33
B	103	4	15S+0.33	23	0.33
B	108	3	15S+0.36	28	0.29
B	109	2	15S+0.39	21	0.42
B	144	6	15S+0.16	27	0.36
B	145	4	15S+0.25	20	0.38
B	145	6	15S+0.22	24	0.36
B	145	7	15S+0.18	36	0.49

Tube-to-Tube Wear

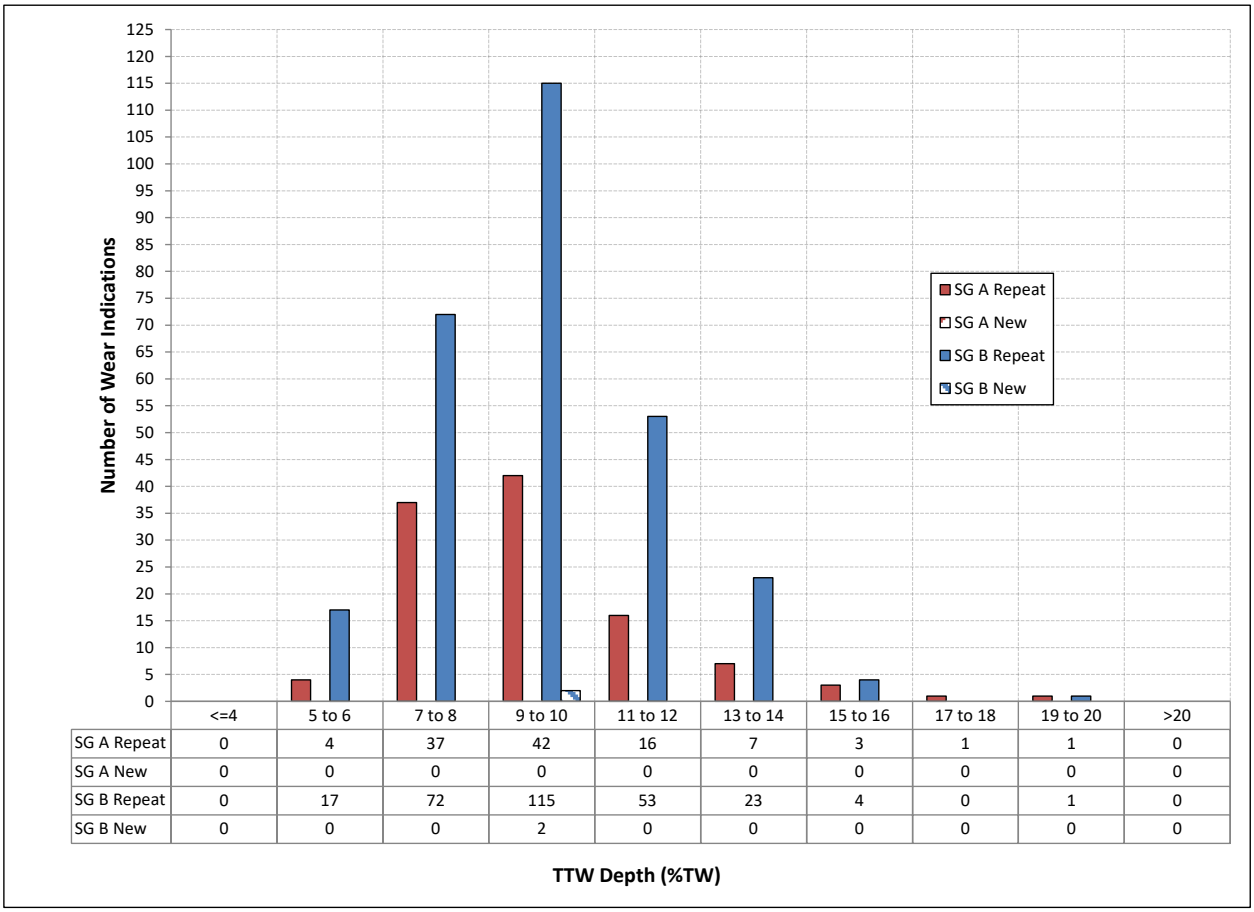
During the 2024 inspection, there were 398 indications of tube-to-tube wear (TTW) identified with the bobbin probe (111 in SG A and 287 in SG B). All of these indications were relatively shallow with the deepest measuring 20% TWD with a fixed-curve bobbin sizing technique. Tube-to-tube wear has been reported and sized by bobbin, array and +Point™ since its initial discovery, with array and +Point™ capable of distinguishing multiple wear flaws at the same axial location. Because the bobbin technique tends to conservatively oversize TTW, particularly when multiple wear flaws exist at the same axial location, and because this degradation mechanism has not challenged the Operational Assessments (OAs) for any of the OTSGs it has been identified in, it is the primary probe used for sizing.

The growth tube-to-tube wear rate has attenuated since first being identified, to a point where it is fairly stagnant compared to the prior inspections. The deepest TTW indications reported in 2024 were 20% TWD in both SGs with maximum growth rates approximately 1.0 and 2.0 %TW/EFPY in SG A and SG B, respectively.

No new TTW was identified adjacent to any tie rod locations and with all repeat indications having been confirmed as TTW during prior inspections, tie-rod wear (TRW) is not existing in either of the TMI-1 SGs as of the Spring 2024 inspection.

A complete listing of tube-to-tube wear indications greater than 20% through wall is listed in Attachment 2.

Figure 3: Illustrates the 2024 Inspection Tube-to-Tube Wear Depth Distributions – Both SGs



	<=4	5 to 6	7 to 8	9 to 10	11 to 12	13 to 14	15 to 16	17 to 18	19 to 20	>20
SG A Repeat	0	4	37	42	16	7	3	1	1	0
SG A New	0	0	0	0	0	0	0	0	0	0
SG B Repeat	0	17	72	115	53	23	4	0	1	0
SG B New	0	0	0	2	0	0	0	0	0	0

(TS 6.9.6.e.) Number of tubes plugged during the inspection outage for each degradation mechanism tubes

A total of tubes seven (7) tubes in SG A and 35 tubes in SG B were stabilized and plugged during the 2024 inspection using Alloy 690 mechanical rolled plugs. All tubes plugged in 2024 were stabilized full-length (nominal 654.375" stabilizer length), from the upper tube end. In SG A there were three (3) tubes that met Tech Spec plugging criteria of >=40%TWD, all for broached TSP wear. In SG B there were eight (8) tubes that met Tech Spec plugging criteria, all for broached TSP wear. Additional tubes in SG A and SG B were preventatively plugged based on individual flaw growth rates and deterministic projections assuming no attenuation in growth rates.

(TS 6.9.6.f.) The number and percentage of tubes plugged to date, and the effective plugging percentage in each steam generator

There were no tubes plugged during the pre-service inspection prior to T1R19. Table 3 shows the number of tubes plugged during each of the steam generator inspections and the cumulative number of tubes plugged to date.

Table 6: TMI-1 Tube Plugging History

Outage	SGA Plug History				SGB Plug History				Total Plugged
	TSP Wear	TTW	Other	SGA Total Plugged	TSP Wear	TTW	Other	SGB Total Plugged	
PSI	0	0	0	0	0	0	0	0	0
T1R19	0	4	0	4	30	3	0	33	37
T1R20	1	0	0	1	31	0	0	31	32
T1R21	3	0	0	3	131	0	0	131	134
T1R22	No inspection or plugging				52	0	0	52	52
T1D23	7	0	0	7	35	0	0	35	42
Total (Tubes)	11	4	0	15	279	3	0	282	297
Total (%)	0.10%				1.81%				0.95%
Limit (%)	5.00%				5.00%				5.00%
Limit (Tubes)	779 of 15597				779 of 15597				1558 of 31194

Note: There are 15,597 tubes per Steam Generator.

There are no sleeves or repairs other than plugs with stabilizers installed in the steam generators. The effective plugging percentage is the same as the actual plugged tube percentage. Following T1R22, the effective plugging percentage for SG B was 1.58%.

(TS 6.9.6.g.) The results of condition monitoring, including the results of tube pulls and in-situ testing

The observed degradation in the TMI-1 SGs identified during the Spring 2024 inspection was evaluated to determine if structural and leakage integrity requirements were met. The evaluation was consistent with NEI 97-06, and the applicable EPRI Guidelines. The observed degradation was shown not to present challenges to the structural integrity at the end of the operating interval or challenge required leakage integrity limits under postulated accident conditions.

No primary-to-secondary leakage occurred during Cycle 22 which was the last cycle TMI-1 operated before shutdown. No tubes were pulled, and no tubes required or were in-situ pressure tested in during the May 2024 steam generator inspections.

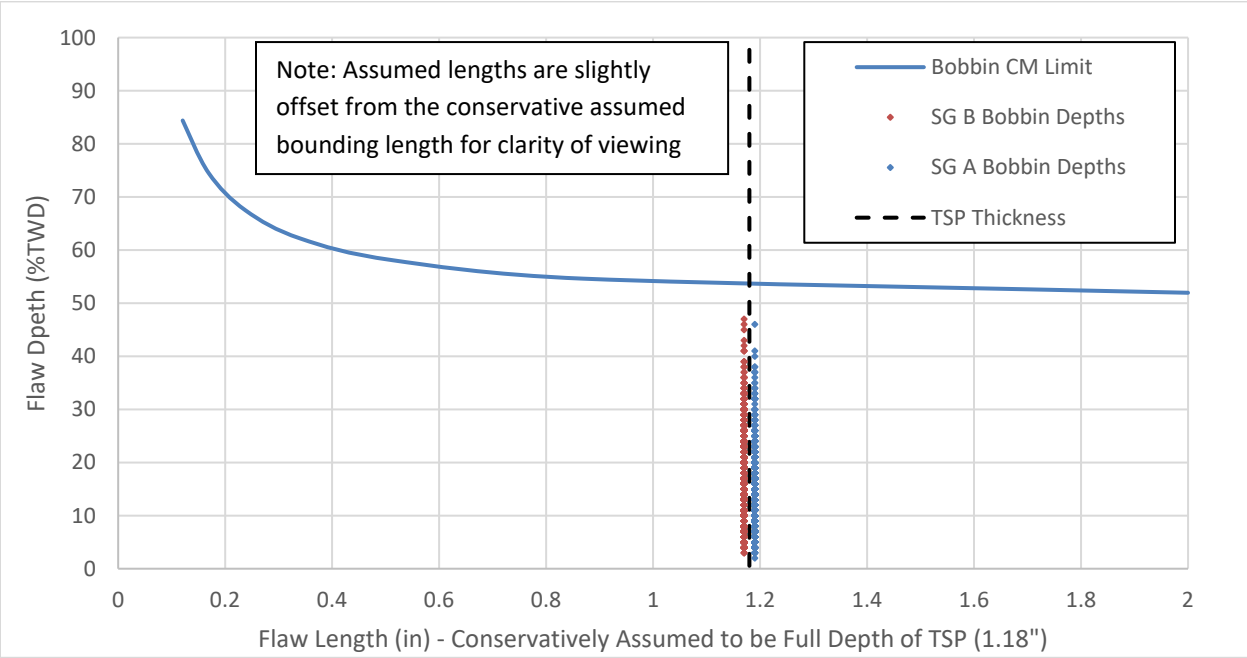
Broached Tube-to-Tube Support Plate Wear

A total of 5,243 and 7,188 bobbin probe indications of tube wear at the broached tube support plates were reported in SG A and SG B, respectively during the 2024 inspection. Using a bounding flaw structural length equal to the entire thickness of the TSPs (1.18”), all indications met the structural integrity performance criteria by analysis based on bobbin sizing (ETSS 96043.4 Rev. 1). The largest flaw detected by bobbin was in SG B tube R4 T1 at 12S at 47%. Since the largest flaw, as sized by bobbin, was shown by analysis to meet the bobbin Condition Monitoring (CM) limit, all broached TSP wear flaws therefore also met structural integrity performance criteria by analysis.

Figure 4 shows the CM limit as a function of length and depth for the bobbin coil (ETSS 96043.4) technique. As shown, the CM limit for an indication with a structural length of 1.18” is ~52%TWD by bobbin. All TSP wear indications sized by bobbin fell below that limit and passed condition monitoring analytically. In-situ pressure testing was not required for broached TSP wear and was not performed.

Large Break Loss-of-Coolant Accident (LBLOCA) conditions were also considered during the CM evaluation. For LBLOCA events, the limiting load is the axial load created by the large tube-to-shell temperature differential that develops as the tubes cool faster than the shell. Per the Framatome LBLOCA – EOTSG Degraded Tube Assessment, structural integrity is satisfied with 100%TWD wear indications at two lands of the support plate. Since none of the detected indications approached 100%TW, structural integrity under postulated LBLOCA conditions is satisfied.

Figure 4: Condition Monitoring Limit Plot for Broached TSP Wear (Bobbin)



Drilled Tube-to-Tube Support Plate Wear

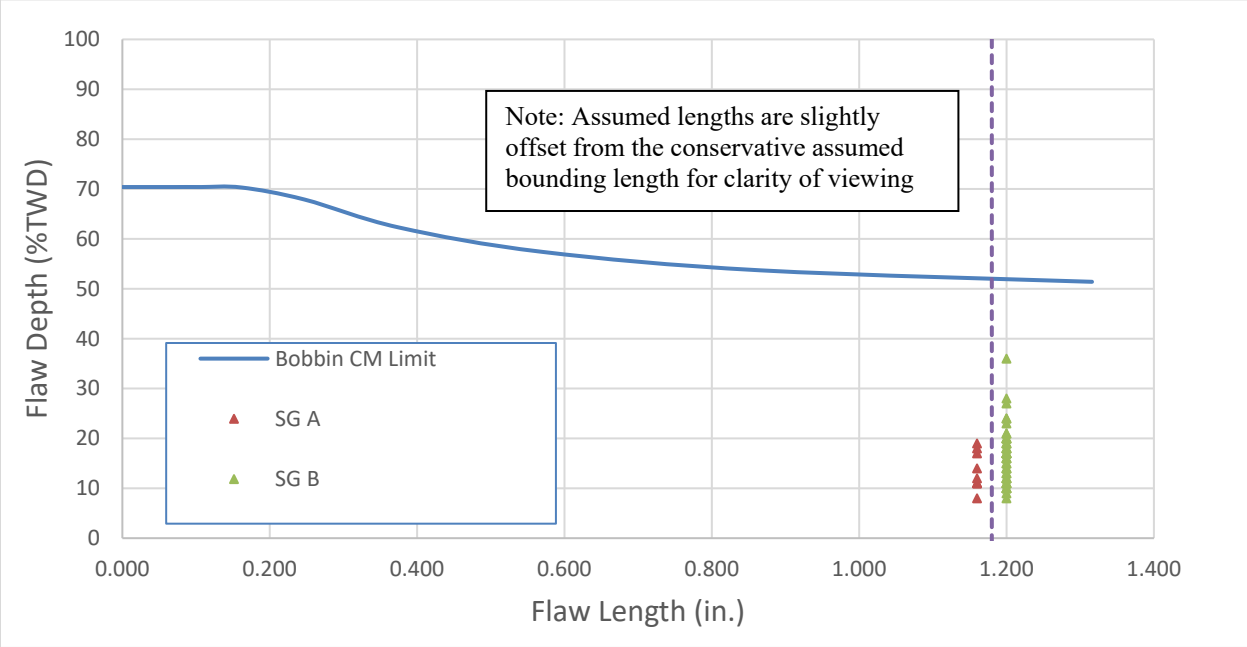
A total of 58 drilled TSP wear indications were identified by bobbin (9 in SG A, 49 in SG B), with array confirming wear at only 41 locations (8 in SG A, 33 in SG B). None of the indications identified in SG A using the bobbin probe were greater than 20% TW, while only 11 were greater than 20% TW in SG B.

The deepest indication detected (SG B R145-T7) had a measured depth of 36%TWD by bobbin, well below the CM limit of 53%TWD for a 360-degree, uniform thinning flaw with a length of 1.18" as shown in Figure 5. This is bounding the largest axial length measured by array of 0.49".

Measured circumferential extents varied from 0.42 to 1.12 inches with the max percent degraded area (PDA) of any drilled TSP flaw of 8.74 PDA, satisfying the 29.7 PDA LBLOCA acceptance criteria. Since none of the indications approached this depth, the LBLOCA criterion is also met for this mechanism.

The Spring 2024 inspection is the first where bobbin was used for sizing in addition to detection of TSP wear, all bobbin wear indications were also inspected with Array for confirmation and sizing.

Figure 5: Condition Monitoring Limit Plot for Drilled TSP Wear (Bobbin)



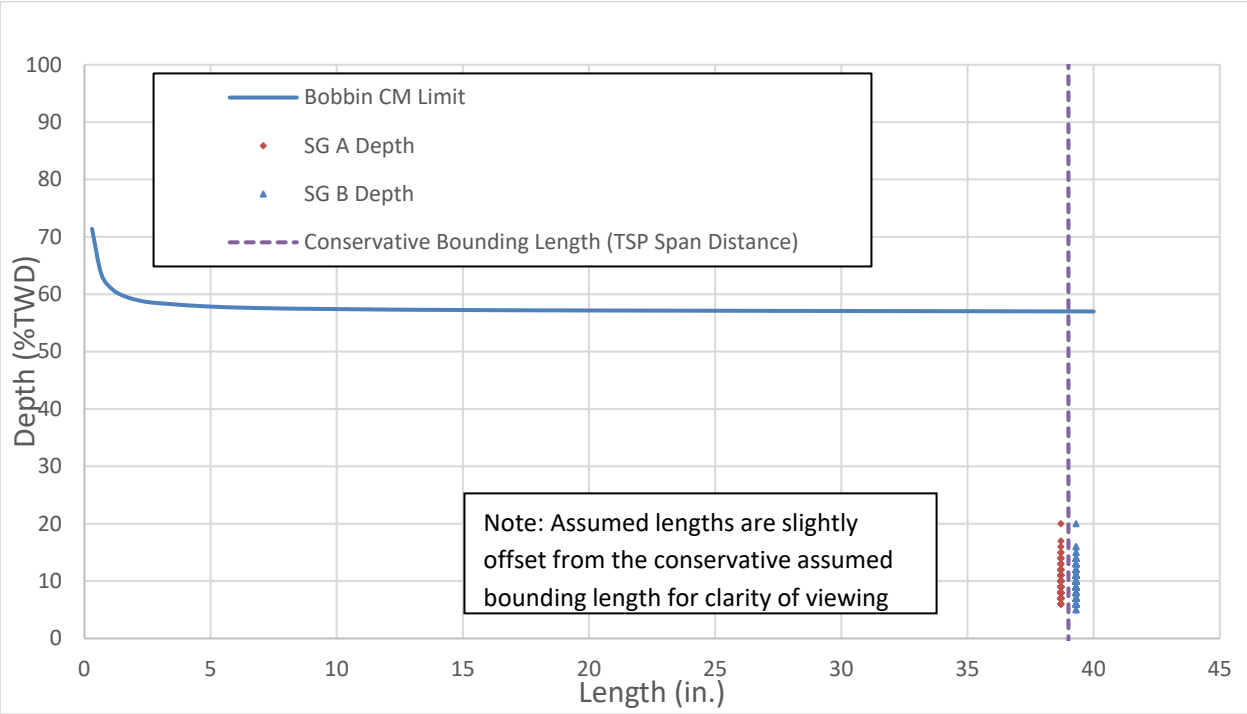
Tube-to-Tube Wear

A total of 111 and 288 indications of tube-to-tube wear (TTW) were reported in SG A and SG B, respectively, during the 2024 inspection. Bobbin ETSS 13091.1 has been used for detection and sizing of TTW since 1R21.

A majority of TTW indications in both SG A and SG B were located between the 8th and the 9th TSPs. The freespan length between the 8th - 9th and 4th - 5th TSPs is 37.82" between the edges of the two TSPs. The freespan length between the edges of the 3rd - 4th and 7th - 8th TSPs is 38.82" [7]. Therefore, a bounding structural length of 39" for all TTW flaws was used in the CM evaluation. The NDE lengths of these indications were not measured in 1R21 or 1R22 because of the slowly changing nature of TTW and the fact that the longest flaw measured in 1R20 was less than 8.2" long. Therefore, using a structural length of 39" (i.e., assuming a completely flat wear shape along the entire TSP span) is extremely conservative. Using this bounding structural length, all indications of tube-to-tube wear met the structural integrity performance criteria with ample margin.

Figure 6 shows the CM limits as a function of length and depth for the bobbin coil TTW technique. As shown in the figure, the CM limit for an indication with a bounding structural length of 39" is approximately 56%TW. Since the deepest NDE depths were 20%TW (R70-T100 in SGA, and R22-T63 in SGB) all tube-to-tube wear indications passed condition monitoring analytically. In-situ pressure testing was not required for TTW and was not performed.

Figure 6: Condition Monitoring Limit for Tube-to-Tube Wear (Bobbin)



Axial loading acting on the circumferential extent of the wear scar was also considered and is not limiting.

Large Break Loss of Coolant Accident (LBLOCA) conditions were also considered during the CM evaluation. For LBLOCA events, the limiting load is the axial load created by the large tube-to-shell temperature differential that develops as the tubes cool faster than the shell. Per the Framatome LBLOCA – EOTSG Degraded Tube Assessment, structural integrity is satisfied with 100%TWD wear indications with a total circumferential extent of 107 degrees. Converting this to a PDA gives a PDA of 29.7.

During the 1R19 inspection, all of the tube-to-tube wear indications were measured for circumferential extent. The 1R19 flaws generally had circumferential extents of 50 to 70 degrees. During 1R20, there was one tube with four tube-to-tube wear flaws in the same span. These indications had a combined circumferential extent of 147 degrees. Based on the allowable PDA of 29.7, an allowable depth of 59.4%TW is obtained for a postulated bounding 180-degree circumferential extent (29.7 PDA x 360 / 180). Since none of the measured TTW depths in 1R22 approached this value, structural integrity under postulated LBLOCA conditions is satisfied.

Summary

This report meets the reporting requirements for Technical Specification 6.9.6. Attachment 1 and 2 contained herein provides a complete list of service-induced indications for TMI-1 SG A and SG B

Attachments

Indications Reports:

Attachment 1 – Broached TSP Wear Indications Greater than 20% TW, Sized by Bobbin Probe


TMI 2024 Broached
TSP Wear.pdf

Attachment 2 – Tube-to-Tube Wear Indications Sized by Bobbin Probe


TMI 2024
Tube-Tube wear.pdf

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	1	3	13S	-0.7	22
SGA	1	4	14S	-0.84	22
SGA	1	5	12S	-0.76	26
SGA	1	6	13S	-0.78	21
SGA	1	8	13S	-0.91	30
SGA	1	11	13S	-0.78	20
SGA	1	12	13S	-0.7	32
SGA	2	8	13S	-0.74	22
SGA	2	10	10S	-0.73	34
SGA	2	12	10S	-0.68	26
SGA	2	16	10S	-0.73	32
SGA	2	18	13S	-0.75	25
SGA	2	23	13S	-0.81	23
SGA	2	26	10S	-0.69	25
SGA	3	7	10S	-0.72	25
SGA	4	7	10S	-0.71	22
SGA	4	8	10S	-0.73	25
SGA	4	10	13S	-0.84	21
SGA	4	39	13S	-0.75	21
SGA	5	6	10S	-0.69	28
SGA	5	7	10S	-0.69	25
SGA	5	11	10S	-0.78	22
SGA	5	23	10S	-0.73	20
SGA	5	33	13S	-0.83	21
SGA	6	4	13S	-0.72	23
SGA	6	11	10S	-0.69	22
SGA	6	12	10S	-0.71	20
SGA	6	14	10S	-0.77	29
SGA	6	15	10S	-0.71	25
SGA	6	17	10S	-0.76	21
SGA	6	22	10S	-0.73	23
SGA	6	24	10S	-0.75	24
SGA	6	25	10S	-0.72	26
SGA	6	26	13S	0.16	20
SGA	6	26	10S	-0.7	24
SGA	6	28	10S	-0.75	25
SGA	6	29	13S	-0.84	22
SGA	6	30	09S	0.33	21
SGA	6	31	13S	-0.82	24
SGA	6	33	13S	0.25	20
SGA	7	13	11S	-0.76	26
SGA	7	15	10S	-0.76	25
SGA	7	20	10S	-0.76	46
SGA	7	21	10S	-0.73	38
SGA	7	26	10S	-0.83	20
SGA	7	31	10S	-0.79	20
SGA	8	3	13S	-0.73	22
SGA	8	4	10S	-0.72	32
SGA	8	5	10S	-0.69	32
SGA	8	40	09S	0.4	26
SGA	8	50	13S	0.29	23
SGA	9	4	10S	-0.7	25
SGA	9	5	10S	-0.73	25
SGA	9	9	10S	-0.71	22
SGA	9	10	10S	-0.72	29
SGA	9	11	10S	-0.73	23
SGA	9	39	13S	0.24	20
SGA	10	3	10S	-0.57	40
SGA	10	10	10S	-0.72	23
SGA	10	42	09S	0.36	24
SGA	10	62	13S	-0.76	21
SGA	11	11	10S	-0.67	25
SGA	11	12	10S	-0.68	24
SGA	12	9	10S	-0.75	27
SGA	12	14	10S	-0.7	21
SGA	13	2	14S	0.25	23
SGA	13	6	10S	-0.71	24
SGA	13	8	14S	0.2	22
SGA	13	12	14S	0.09	20
SGA	14	19	09S	0.35	27
SGA	14	60	10S	0.29	28
SGA	15	7	10S	-0.69	37
SGA	15	8	10S	-0.72	24
SGA	15	61	10S	0.24	24
SGA	15	69	09S	0.29	21
SGA	15	74	13S	-0.78	24
SGA	16	65	09S	0.36	29
SGA	16	67	10S	0.29	21
SGA	16	67	09S	0.36	30
SGA	16	68	09S	0.36	24
SGA	16	69	09S	0.38	22
SGA	18	9	09S	-0.69	20

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	19	6	14S	0.23	20
SGA	19	80	13S	0.25	21
SGA	20	80	13S	0.25	20
SGA	20	81	13S	-0.76	22
SGA	21	88	12S	-0.78	24
SGA	22	7	10S	-0.75	22
SGA	22	86	13S	-0.78	20
SGA	22	86	13S	0.22	20
SGA	22	91	13S	-0.8	22
SGA	23	8	10S	-0.73	28
SGA	24	90	13S	-0.78	23
SGA	25	35	09S	0.32	20
SGA	25	96	13S	-0.73	37
SGA	26	97	13S	-0.77	23
SGA	27	64	08S	-0.71	20
SGA	28	7	10S	-0.71	24
SGA	28	60	08S	0.37	20
SGA	29	67	08S	-0.62	23
SGA	32	60	08S	0.31	25
SGA	38	83	08S	0.38	23
SGA	39	113	10S	-0.73	22
SGA	40	115	10S	-0.73	26
SGA	43	116	10S	-0.7	24
SGA	44	115	10S	-0.71	20
SGA	44	117	10S	-0.71	23
SGA	44	117	13S	-0.72	24
SGA	45	117	10S	-0.67	36
SGA	46	118	10S	-0.65	27
SGA	47	118	10S	-0.72	33
SGA	48	121	10S	-0.6	33
SGA	51	98	08S	0.31	20
SGA	51	98	08S	-0.75	22
SGA	51	119	10S	-0.71	28
SGA	52	98	08S	0.35	26
SGA	53	24	09S	-0.75	21
SGA	53	103	08S	0.31	22
SGA	53	121	09S	0.35	20
SGA	54	98	08S	0.38	23
SGA	54	100	08S	0.33	22
SGA	54	101	08S	0.33	22
SGA	54	105	08S	0.33	21

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	54	121	09S	0.37	24
SGA	54	122	09S	0.4	20
SGA	55	118	09S	0.33	20
SGA	55	120	09S	0.35	26
SGA	55	124	10S	-0.71	34
SGA	56	101	08S	0.33	27
SGA	56	102	08S	0.38	22
SGA	56	103	08S	0.33	25
SGA	56	105	08S	0.31	25
SGA	56	119	09S	0.32	25
SGA	56	125	10S	-0.75	26
SGA	57	103	08S	0.33	23
SGA	58	102	08S	0.35	21
SGA	58	103	08S	0.36	23
SGA	59	22	09S	-0.74	20
SGA	60	107	08S	0.36	24
SGA	63	109	08S	0.31	21
SGA	64	108	08S	0.35	23
SGA	65	107	08S	0.36	20
SGA	65	126	10S	-0.71	27
SGA	65	130	10S	0.35	22
SGA	68	112	08S	0.33	22
SGA	68	131	10S	0.24	23
SGA	69	129	13S	-0.84	21
SGA	69	131	10S	0.34	22
SGA	70	131	10S	0.31	28
SGA	71	110	08S	0.35	23
SGA	71	112	08S	0.38	24
SGA	71	131	10S	0.29	26
SGA	72	131	10S	0.29	34
SGA	73	107	08S	0.35	20
SGA	73	131	10S	0.22	22
SGA	74	123	10S	0.22	20
SGA	83	109	08S	-0.72	20
SGA	83	111	08S	-0.7	20
SGA	98	4	10S	-0.77	23
SGA	99	6	11S	0.28	22
SGA	117	1	12S	-0.78	37
SGA	121	1	12S	-0.84	20
SGA	121	2	11S	-0.77	27
SGA	122	1	12S	-0.84	24

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	122	7	10S	-0.73	21
SGA	125	2	12S	-0.77	25
SGA	125	3	11S	-0.8	30
SGA	127	1	14S	0.13	20
SGA	128	88	11S	0.23	23
SGA	129	2	12S	-0.77	23
SGA	131	2	11S	-0.77	24
SGA	131	2	12S	-0.75	24
SGA	132	2	12S	-0.74	20
SGA	132	89	14S	-0.91	20
SGA	133	2	12S	-0.77	38
SGA	134	1	12S	-0.8	25
SGA	134	2	11S	-0.75	20
SGA	135	8	10S	-0.73	24
SGA	135	77	11S	0.32	21
SGA	135	83	14S	-0.83	25
SGA	136	1	12S	-0.8	24
SGA	136	75	11S	0.34	24
SGA	137	8	10S	-0.75	32
SGA	137	63	11S	0.32	20
SGA	137	64	11S	0.3	29
SGA	137	65	11S	0.32	23
SGA	137	78	11S	-0.72	23
SGA	138	1	12S	-0.8	25
SGA	138	8	10S	-0.77	26
SGA	138	15	11S	-0.82	28
SGA	138	16	10S	-0.75	21
SGA	138	17	10S	-0.74	22
SGA	138	18	10S	-0.73	31
SGA	138	20	10S	-0.73	27
SGA	138	75	11S	-0.75	23
SGA	139	12	10S	-0.77	21
SGA	139	13	10S	-0.73	35
SGA	139	17	10S	-0.73	27
SGA	139	19	10S	-0.73	21
SGA	139	59	11S	0.32	23
SGA	139	61	11S	0.25	21
SGA	139	62	11S	0.32	28
SGA	139	66	11S	0.34	33
SGA	139	69	11S	0.34	20
SGA	139	73	11S	-0.72	22

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	140	4	12S	-0.73	21
SGA	140	6	10S	-0.73	23
SGA	140	63	11S	0.36	29
SGA	140	64	11S	0.39	23
SGA	141	3	12S	-0.73	23
SGA	141	55	11S	0.27	32
SGA	142	4	12S	-0.71	41
SGA	142	52	11S	0.34	22
SGA	142	62	11S	0.41	20
SGA	142	62	12S	0.36	21
SGA	143	50	11S	0.36	21
SGA	143	51	11S	0.34	26
SGA	143	55	10S	0.3	22
SGA	145	14	10S	-0.7	32
SGA	145	17	10S	-0.72	22
SGA	145	38	11S	0.34	29
SGA	146	9	10S	-0.73	27
SGA	146	11	10S	-0.73	23
SGA	146	18	11S	-0.75	20
SGA	146	36	11S	0.32	21
SGA	147	7	10S	-0.7	28
SGA	147	8	10S	-0.69	21
SGA	147	15	10S	-0.74	23
SGA	147	19	10S	-0.77	23
SGA	147	32	11S	0.34	20
SGA	147	32	12S	0.27	22
SGA	148	3	12S	-0.77	27
SGA	148	4	10S	-0.7	21
SGA	148	14	10S	-0.77	23
SGA	148	15	10S	-0.77	23
SGA	148	35	12S	0.34	22
SGA	149	2	12S	-0.75	22
SGA	149	3	11S	-0.76	20
SGA	149	3	12S	-0.73	20
SGA	149	4	11S	-0.75	24
SGA	149	4	12S	-0.73	35
SGA	149	5	11S	-0.79	23
SGA	149	6	12S	-0.75	25
SGA	149	6	11S	-0.73	32
SGA	149	7	11S	-0.75	29
SGA	149	16	10S	-0.63	30

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGA	149	17	10S	-0.75	21
SGA	149	35	12S	0.39	22
SGA	150	2	12S	-0.75	22
SGA	150	3	12S	-0.75	23
SGA	150	4	12S	-0.77	32
SGA	150	5	12S	-0.77	24
SGA	150	6	12S	-0.77	30
SGA	150	7	12S	-0.73	20
SGA	150	26	12S	-0.7	24

END SG A

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	3	35	14S	-0.81	23
SGB	3	35	13S	0.25	25
SGB	4	1	13S	-0.76	20
SGB	4	1	13S	0.14	22
SGB	4	1	12S	0.41	24
SGB	4	1	12S	-0.71	47
SGB	4	2	12S	-0.74	25
SGB	4	3	13S	-0.78	20
SGB	4	3	10S	-0.77	22
SGB	4	3	12S	-0.73	36
SGB	5	1	14S	0.21	23
SGB	5	2	10S	-0.75	20
SGB	5	3	12S	-0.73	20
SGB	5	4	10S	-0.75	20
SGB	5	5	11S	-0.71	27
SGB	5	6	12S	-0.77	21
SGB	5	6	12S	0.37	29
SGB	5	6	11S	-0.71	39
SGB	5	7	10S	-0.71	20
SGB	5	7	12S	-0.76	22
SGB	5	7	12S	0.35	28
SGB	5	7	11S	-0.66	43
SGB	5	8	10S	-0.71	21
SGB	5	8	12S	0.32	24
SGB	5	8	11S	-0.73	35
SGB	5	9	12S	0.27	21
SGB	5	9	11S	-0.73	26
SGB	5	13	11S	-0.75	28
SGB	5	13	11S	0.37	28
SGB	5	18	11S	-0.79	30
SGB	5	20	11S	-0.75	38
SGB	5	23	12S	0.3	22
SGB	5	24	12S	-0.77	31
SGB	5	25	12S	0.28	26
SGB	5	27	13S	0.18	21
SGB	5	27	12S	-0.71	33
SGB	5	28	13S	0.25	20
SGB	5	28	12S	-0.8	21
SGB	5	29	12S	0.28	20
SGB	5	29	11S	-0.78	26
SGB	5	29	12S	-0.73	26

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	5	29	11S	0.34	30
SGB	5	31	10S	-0.75	20
SGB	5	31	14S	-0.83	21
SGB	5	31	12S	0.32	22
SGB	5	32	12S	0.27	27
SGB	5	33	12S	0.32	23
SGB	5	34	14S	-0.81	20
SGB	5	34	12S	0.32	22
SGB	5	34	11S	0.36	26
SGB	5	34	11S	-0.72	33
SGB	5	35	12S	0.34	21
SGB	5	35	11S	0.34	25
SGB	5	35	11S	-0.71	28
SGB	5	36	11S	-0.7	29
SGB	5	36	12S	0.29	33
SGB	5	37	11S	-0.71	20
SGB	5	37	12S	0.3	20
SGB	5	39	12S	-0.64	22
SGB	5	40	14S	-0.84	24
SGB	5	40	12S	-0.68	37
SGB	5	42	14S	0.27	26
SGB	6	1	14S	0.16	23
SGB	6	1	13S	0	25
SGB	6	1	12S	-0.65	46
SGB	6	4	12S	-0.73	28
SGB	6	5	10S	-0.73	23
SGB	6	7	10S	-0.73	28
SGB	6	8	10S	-0.73	29
SGB	6	9	12S	0.27	25
SGB	6	9	10S	-0.7	26
SGB	6	10	10S	-0.73	20
SGB	6	10	11S	0.32	25
SGB	6	11	14S	-0.75	20
SGB	6	11	10S	-0.77	24
SGB	6	11	11S	-0.71	27
SGB	6	12	14S	-0.82	21
SGB	6	12	12S	0.3	24
SGB	6	16	12S	-0.76	21
SGB	6	16	11S	-0.74	27
SGB	6	17	12S	-0.8	22
SGB	6	18	11S	-0.74	25

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	6	18	10S	-0.83	27
SGB	6	19	10S	-0.75	23
SGB	6	19	11S	-0.73	25
SGB	6	20	10S	-0.76	23
SGB	6	20	11S	-0.74	30
SGB	6	22	11S	-0.76	20
SGB	6	24	12S	0.18	20
SGB	6	25	10S	-0.79	22
SGB	6	25	11S	0.27	25
SGB	6	25	12S	0.18	26
SGB	6	26	12S	0.25	23
SGB	6	26	11S	0.32	24
SGB	6	27	11S	0.34	23
SGB	6	28	11S	0.32	22
SGB	6	28	11S	-0.76	33
SGB	6	29	11S	-0.75	21
SGB	6	29	11S	0.34	24
SGB	6	30	12S	0.25	21
SGB	6	30	11S	0.35	24
SGB	6	30	11S	-0.76	28
SGB	6	31	11S	0.36	24
SGB	6	31	12S	0.25	24
SGB	6	31	11S	-0.73	29
SGB	6	36	11S	0.32	21
SGB	6	36	12S	0.28	25
SGB	6	44	10S	0.34	23
SGB	6	44	12S	-0.74	30
SGB	6	45	10S	0.32	23
SGB	6	45	14S	-0.82	24
SGB	6	46	14S	0.23	20
SGB	6	46	14S	-0.76	26
SGB	7	1	13S	-0.6	23
SGB	7	2	13S	-0.8	24
SGB	7	5	12S	0.32	27
SGB	7	11	10S	-0.73	20
SGB	7	11	11S	0.3	20
SGB	7	11	11S	-0.76	28
SGB	7	13	12S	0.28	21
SGB	7	13	15S	-0.78	21
SGB	7	13	10S	-0.71	23
SGB	7	13	11S	-0.73	25

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	7	14	12S	0.28	24
SGB	7	14	15S	-0.79	25
SGB	7	14	11S	-0.78	38
SGB	7	15	12S	0.25	23
SGB	7	15	11S	0.34	24
SGB	7	15	11S	-0.77	28
SGB	7	16	11S	0.28	24
SGB	7	16	11S	-0.73	32
SGB	7	17	11S	-0.77	22
SGB	7	17	15S	-0.78	32
SGB	7	18	11S	-0.76	24
SGB	7	19	10S	-0.75	21
SGB	7	19	11S	-0.77	24
SGB	7	20	11S	-0.76	23
SGB	7	20	10S	-0.73	30
SGB	7	21	11S	-0.77	27
SGB	7	21	10S	-0.75	30
SGB	7	23	11S	-0.73	24
SGB	7	24	11S	0.3	23
SGB	7	24	11S	-0.74	24
SGB	7	26	11S	0.28	22
SGB	7	26	11S	-0.78	23
SGB	7	27	15S	-0.83	24
SGB	7	28	11S	0.32	24
SGB	7	29	11S	0.34	21
SGB	7	32	11S	0.3	22
SGB	7	33	11S	0.34	30
SGB	7	35	12S	0.3	22
SGB	7	35	11S	0.32	25
SGB	7	35	11S	-0.78	26
SGB	7	38	12S	0.25	20
SGB	7	46	14S	-0.8	29
SGB	7	48	14S	-0.82	23
SGB	7	48	10S	0.36	24
SGB	7	48	14S	0.23	34
SGB	8	1	12S	0.37	28
SGB	8	1	12S	-0.73	32
SGB	8	2	12S	0.32	21
SGB	8	2	12S	-0.76	24
SGB	8	2	13S	-0.76	24
SGB	8	2	14S	0.14	39

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	8	3	11S	-0.78	23
SGB	8	3	13S	-0.27	30
SGB	8	3	14S	-0.53	33
SGB	8	4	14S	-0.78	21
SGB	8	4	12S	0.34	23
SGB	8	4	14S	0.18	29
SGB	8	8	10S	-0.73	29
SGB	8	10	14S	-0.85	20
SGB	8	10	10S	-0.71	23
SGB	8	14	14S	0.18	20
SGB	8	15	11S	0.32	21
SGB	8	16	11S	-0.76	22
SGB	8	16	11S	0.35	28
SGB	8	20	11S	0.3	21
SGB	8	21	10S	-0.73	29
SGB	8	22	10S	-0.74	30
SGB	8	23	10S	-0.75	20
SGB	8	24	14S	0.21	20
SGB	8	25	11S	0.3	21
SGB	8	26	11S	0.3	20
SGB	8	27	15S	-0.78	21
SGB	8	28	10S	-0.75	22
SGB	8	28	11S	0.3	23
SGB	8	30	11S	0.3	20
SGB	8	31	11S	0.32	22
SGB	8	34	11S	0.32	24
SGB	8	35	11S	0.32	21
SGB	8	36	11S	0.32	31
SGB	8	37	15S	-0.78	21
SGB	8	37	11S	0.32	29
SGB	8	38	11S	0.36	27
SGB	8	40	11S	0.32	21
SGB	8	45	14S	-0.84	24
SGB	8	46	14S	-0.8	24
SGB	8	49	14S	-0.78	23
SGB	8	50	14S	0.2	28
SGB	8	51	10S	0.34	21
SGB	8	51	13S	0.23	21
SGB	8	51	14S	-0.82	24
SGB	8	51	14S	0.25	26
SGB	8	53	13S	0.25	27

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	8	53	14S	-0.48	35
SGB	8	53	14S	0.45	35
SGB	8	54	14S	-0.84	22
SGB	8	54	13S	0.23	25
SGB	9	1	12S	-0.76	23
SGB	9	2	12S	-0.69	20
SGB	9	3	12S	0.37	20
SGB	9	3	12S	-0.71	42
SGB	9	4	12S	0.27	27
SGB	9	13	10S	-0.71	30
SGB	9	16	11S	0.35	28
SGB	9	18	11S	-0.73	24
SGB	9	18	11S	0.3	26
SGB	9	19	11S	0.27	21
SGB	9	21	11S	0.32	26
SGB	9	22	11S	0.34	21
SGB	9	23	11S	0.3	20
SGB	9	27	11S	0.3	23
SGB	9	28	11S	0.27	21
SGB	9	31	11S	0.28	20
SGB	9	36	11S	0.32	23
SGB	9	38	11S	0.32	22
SGB	9	39	11S	0.32	20
SGB	9	52	15S	0.23	23
SGB	9	53	14S	-0.8	20
SGB	9	55	14S	-0.32	22
SGB	9	56	13S	0.25	21
SGB	9	56	10S	0.25	22
SGB	9	56	14S	0.23	30
SGB	9	57	14S	0.23	20
SGB	9	57	10S	0.32	25
SGB	9	57	14S	-0.82	25
SGB	10	3	12S	0.31	23
SGB	10	4	13S	-0.76	22
SGB	10	4	14S	-0.78	23
SGB	10	5	12S	0.29	23
SGB	10	6	14S	-0.78	21
SGB	10	10	15S	0.07	20
SGB	10	15	10S	-0.73	22
SGB	10	15	11S	0.32	24
SGB	10	21	11S	0.28	20

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	10	34	10S	-0.75	21
SGB	10	39	11S	0.3	20
SGB	10	56	14S	-0.77	20
SGB	10	57	14S	0.27	26
SGB	10	59	14S	0.25	26
SGB	10	60	13S	0.23	22
SGB	10	60	14S	-0.74	24
SGB	10	65	13S	0.3	24
SGB	10	65	12S	-0.66	32
SGB	11	9	15S	0.14	28
SGB	11	10	15S	0.14	21
SGB	11	16	11S	0.32	24
SGB	11	16	10S	-0.71	29
SGB	11	17	11S	0.32	22
SGB	11	18	11S	-0.73	20
SGB	11	18	11S	0.32	23
SGB	11	42	11S	0.25	21
SGB	11	58	11S	0.3	20
SGB	11	61	14S	-0.8	20
SGB	11	62	14S	0.25	23
SGB	11	64	14S	-0.75	22
SGB	11	68	12S	0.39	20
SGB	11	68	12S	-0.76	24
SGB	11	68	13S	0.3	24
SGB	12	1	12S	-0.71	33
SGB	12	2	14S	0.05	21
SGB	12	7	10S	-0.7	24
SGB	12	8	14S	0.16	22
SGB	12	9	15S	0.17	20
SGB	12	10	14S	0.21	25
SGB	12	16	09S	0.34	23
SGB	12	16	10S	-0.68	23
SGB	12	17	11S	0.32	28
SGB	12	68	12S	-0.64	30
SGB	13	5	10S	-0.71	24
SGB	13	7	10S	-0.71	35
SGB	13	8	10S	-0.71	24
SGB	13	18	11S	0.18	22
SGB	13	70	12S	-0.71	22
SGB	13	71	11S	-0.72	21
SGB	13	71	12S	-0.73	28

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	13	73	12S	0.36	27
SGB	13	73	13S	-0.75	32
SGB	13	73	12S	-0.68	34
SGB	13	74	12S	0.37	20
SGB	13	74	10S	0.34	25
SGB	14	1	12S	-0.71	22
SGB	14	2	12S	-0.67	20
SGB	14	6	10S	-0.71	25
SGB	14	14	10S	-0.73	22
SGB	14	15	11S	0.37	23
SGB	14	16	10S	-0.64	22
SGB	14	16	11S	0.23	22
SGB	14	17	11S	0.3	29
SGB	14	20	11S	0.3	26
SGB	14	20	10S	-0.73	33
SGB	14	21	11S	0.28	20
SGB	14	68	11S	0.32	22
SGB	14	73	12S	0.37	20
SGB	14	77	12S	0.34	20
SGB	15	2	12S	-0.67	20
SGB	15	2	11S	-0.7	25
SGB	15	6	12S	0.18	22
SGB	15	9	10S	-0.73	26
SGB	15	67	12S	0.32	34
SGB	15	75	12S	0.32	29
SGB	15	76	12S	0.39	20
SGB	15	76	12S	-0.62	24
SGB	15	76	11S	-0.71	25
SGB	15	78	12S	-0.7	25
SGB	16	1	12S	-0.76	23
SGB	16	5	12S	0.32	23
SGB	16	7	12S	0.35	21
SGB	16	8	12S	0.34	24
SGB	16	9	10S	-0.76	27
SGB	16	9	11S	-0.8	27
SGB	16	9	11S	0.21	27
SGB	16	10	11S	0.32	25
SGB	16	76	12S	-0.75	21
SGB	16	76	12S	0.29	23
SGB	16	77	12S	-0.73	23
SGB	16	77	12S	0.37	29

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	17	9	15S	-0.74	20
SGB	17	9	11S	0.37	24
SGB	17	11	11S	0.35	26
SGB	17	79	12S	-0.73	22
SGB	17	80	12S	-0.76	25
SGB	17	80	11S	-0.74	28
SGB	18	7	10S	-0.73	27
SGB	18	8	11S	0.37	20
SGB	18	9	10S	-0.73	24
SGB	18	10	10S	-0.77	23
SGB	18	77	14S	-0.82	28
SGB	18	78	11S	0.37	29
SGB	18	81	11S	0.36	29
SGB	18	81	12S	0.34	33
SGB	18	82	12S	-0.77	23
SGB	18	82	12S	0.37	24
SGB	18	82	11S	-0.69	38
SGB	19	5	13S	-0.82	20
SGB	19	9	11S	0.37	26
SGB	19	11	11S	0.37	23
SGB	19	12	11S	0.34	25
SGB	19	79	14S	-0.75	24
SGB	19	80	11S	0.37	29
SGB	19	83	11S	-0.71	30
SGB	19	83	11S	0.37	30
SGB	19	84	11S	-0.75	20
SGB	19	87	13S	0.16	22
SGB	20	11	11S	0.34	20
SGB	20	12	11S	0.3	20
SGB	20	81	11S	0.34	41
SGB	20	82	11S	-0.75	22
SGB	20	82	11S	0.34	30
SGB	20	85	12S	0.25	20
SGB	20	85	11S	-0.76	30
SGB	20	85	11S	0.37	30
SGB	20	86	11S	-0.72	20
SGB	20	86	11S	0.39	32
SGB	20	87	11S	-0.76	21
SGB	21	1	13S	-0.75	23
SGB	21	7	15S	0.18	22
SGB	21	9	11S	0.21	25

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	21	9	10S	-0.73	26
SGB	21	11	11S	0.32	26
SGB	21	82	11S	0.34	30
SGB	22	2	11S	-0.77	24
SGB	22	3	11S	-0.76	20
SGB	22	7	11S	0.37	22
SGB	22	8	10S	-0.73	32
SGB	22	9	12S	0.3	21
SGB	22	27	08S	0.45	20
SGB	22	63	07S	0.5	20
SGB	22	63	08S	-0.75	24
SGB	22	67	08S	-0.63	20
SGB	22	87	11S	0.34	34
SGB	22	88	11S	0.32	33
SGB	22	89	11S	0.39	37
SGB	22	90	11S	0.39	31
SGB	22	91	11S	-0.75	24
SGB	23	1	11S	-0.74	20
SGB	23	6	15S	0.23	20
SGB	23	8	10S	-0.61	33
SGB	23	9	15S	-0.55	21
SGB	23	9	11S	0.16	22
SGB	23	10	10S	-0.72	23
SGB	23	11	11S	0.3	23
SGB	23	43	08S	-0.77	20
SGB	23	54	08S	0.36	24
SGB	23	61	08S	0.36	22
SGB	23	68	08S	0.34	21
SGB	23	68	07S	0.55	23
SGB	23	86	11S	0.34	34
SGB	23	93	11S	-0.7	27
SGB	23	94	12S	-0.71	21
SGB	24	8	11S	0.28	21
SGB	24	42	07S	0.53	20
SGB	24	42	08S	-0.73	20
SGB	24	47	08S	0.37	27
SGB	24	53	08S	-0.71	22
SGB	24	90	11S	-0.7	25
SGB	25	5	11S	-0.76	20
SGB	25	7	11S	0.23	20
SGB	25	12	11S	0.32	20

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	25	35	07S	0.52	20
SGB	25	96	11S	-0.74	31
SGB	26	10	11S	0.32	21
SGB	26	32	08S	0.25	22
SGB	26	61	08S	-0.74	27
SGB	26	69	07S	0.53	20
SGB	26	98	11S	-0.7	21
SGB	26	99	12S	-0.74	31
SGB	27	9	11S	0.3	23
SGB	27	31	08S	0.39	23
SGB	27	64	08S	-0.74	27
SGB	27	70	08S	0.37	24
SGB	27	70	08S	-0.76	28
SGB	27	71	08S	-0.7	21
SGB	27	73	08S	-0.74	21
SGB	27	99	11S	0.39	30
SGB	27	100	11S	0.21	22
SGB	28	1	12S	0.25	21
SGB	28	6	10S	-0.59	22
SGB	28	8	11S	-0.74	27
SGB	28	46	08S	-0.83	20
SGB	28	57	08S	-0.74	20
SGB	28	71	08S	-0.64	29
SGB	29	31	08S	0.3	21
SGB	29	67	08S	-0.8	21
SGB	29	73	08S	0.37	22
SGB	29	73	08S	-0.74	23
SGB	29	103	11S	0.25	23
SGB	29	104	13S	-0.77	20
SGB	30	60	08S	-0.75	20
SGB	30	63	08S	-0.73	24
SGB	30	104	11S	0.3	21
SGB	31	5	14S	-0.99	20
SGB	32	9	10S	-0.75	24
SGB	32	25	08S	0.41	26
SGB	32	55	08S	0.32	21
SGB	32	102	11S	0.43	20
SGB	33	7	11S	0.25	20
SGB	33	25	08S	0.25	21
SGB	33	61	09S	-0.75	20
SGB	33	61	09S	0.32	20

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	33	61	08S	-0.73	23
SGB	33	76	08S	0.28	21
SGB	33	99	14S	-0.78	25
SGB	33	100	14S	-0.77	31
SGB	33	104	11S	0.42	22
SGB	34	1	11S	-0.68	21
SGB	34	85	08S	0.41	22
SGB	34	87	08S	-0.76	22
SGB	34	105	14S	-0.74	20
SGB	34	105	14S	0.35	20
SGB	34	106	11S	0.39	25
SGB	35	82	08S	0.39	22
SGB	35	99	14S	-0.8	21
SGB	35	101	14S	-0.8	25
SGB	35	103	14S	-0.81	27
SGB	35	108	11S	0.38	22
SGB	35	111	11S	0.3	25
SGB	36	41	08S	-0.8	20
SGB	36	86	08S	0.37	24
SGB	36	105	14S	-0.78	27
SGB	36	105	14S	0.37	27
SGB	36	106	14S	-0.74	23
SGB	36	112	11S	0.28	20
SGB	36	113	11S	0.48	21
SGB	37	4	12S	-0.66	20
SGB	37	6	12S	-0.73	20
SGB	37	61	08S	-0.75	20
SGB	37	85	08S	0.39	24
SGB	37	87	08S	-0.76	23
SGB	37	88	08S	-0.76	20
SGB	37	102	14S	-0.82	28
SGB	37	104	14S	0.21	23
SGB	37	104	14S	-0.76	32
SGB	37	110	11S	0.39	25
SGB	37	114	11S	-0.62	22
SGB	37	114	11S	0.46	32
SGB	38	4	11S	0.39	20
SGB	38	57	08S	-0.75	23
SGB	38	57	09S	0.3	28
SGB	38	67	08S	-0.7	22
SGB	38	112	11S	0.47	21

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	39	5	14S	0.35	20
SGB	39	7	11S	-0.73	21
SGB	39	111	11S	0.37	20
SGB	39	116	11S	-0.72	20
SGB	40	95	08S	-0.71	20
SGB	41	85	08S	-0.77	21
SGB	42	5	15S	0.35	27
SGB	42	26	08S	0.37	21
SGB	42	111	10S	-0.67	30
SGB	42	112	12S	0.34	20
SGB	44	5	15S	0.37	26
SGB	44	6	15S	0.37	24
SGB	45	1	14S	0.32	23
SGB	45	5	15S	0.36	21
SGB	45	118	11S	-0.66	27
SGB	46	1	14S	0.28	24
SGB	46	5	15S	0.39	23
SGB	46	6	15S	0.29	31
SGB	46	113	11S	0.38	24
SGB	46	115	11S	0.33	31
SGB	46	118	12S	0.27	21
SGB	47	3	10S	0.41	21
SGB	47	76	08S	0.38	25
SGB	47	118	11S	0.43	22
SGB	48	1	14S	0.34	24
SGB	48	94	08S	0.34	21
SGB	48	113	11S	0.31	23
SGB	48	113	11S	-0.74	25
SGB	48	114	11S	-0.74	24
SGB	48	115	11S	-0.74	20
SGB	48	115	11S	0.36	20
SGB	48	116	14S	0.31	22
SGB	48	116	11S	-0.71	26
SGB	48	120	11S	-0.69	25
SGB	48	120	10S	0.4	26
SGB	48	120	12S	-0.69	27
SGB	49	2	14S	0.3	20
SGB	49	4	14S	0.27	22
SGB	49	113	11S	0.36	25
SGB	49	114	11S	0.36	31
SGB	49	115	11S	0.38	26

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	49	120	12S	-0.72	20
SGB	49	120	10S	-0.76	23
SGB	49	120	11S	-0.69	24
SGB	49	120	10S	0.36	26
SGB	49	122	12S	-0.74	27
SGB	50	82	08S	-0.71	31
SGB	50	98	08S	0.29	22
SGB	50	116	11S	-0.71	20
SGB	50	116	10S	0.33	28
SGB	50	116	11S	0.31	30
SGB	50	118	11S	0.38	21
SGB	51	2	14S	0.34	20
SGB	51	112	11S	0.33	20
SGB	51	114	11S	0.35	20
SGB	51	115	11S	0.38	22
SGB	51	118	12S	-0.73	29
SGB	52	89	08S	-0.76	20
SGB	52	117	11S	0.37	22
SGB	52	118	11S	0.35	28
SGB	52	123	11S	-0.73	24
SGB	53	117	11S	0.37	26
SGB	53	120	12S	-0.71	22
SGB	53	120	11S	0.38	28
SGB	53	120	10S	-0.62	31
SGB	53	121	11S	0.42	20
SGB	53	122	12S	-0.73	20
SGB	54	1	12S	0.5	26
SGB	54	5	12S	0.39	23
SGB	55	4	11S	-0.71	20
SGB	55	6	11S	-0.7	21
SGB	55	122	10S	-0.73	28
SGB	55	122	11S	0.38	28
SGB	55	123	11S	0.42	26
SGB	55	124	11S	0.42	21
SGB	55	124	10S	-0.69	28
SGB	56	123	12S	-0.73	22
SGB	56	123	10S	-0.73	25
SGB	56	123	11S	-0.71	27
SGB	56	123	11S	0.38	29
SGB	56	126	12S	-0.71	20
SGB	56	127	12S	-0.71	20

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	57	38	08S	-0.72	22
SGB	57	119	11S	0.29	23
SGB	57	124	10S	0.31	31
SGB	58	125	11S	0.33	22
SGB	59	124	11S	-0.68	20
SGB	59	124	10S	-0.73	23
SGB	59	124	11S	0.38	31
SGB	60	127	10S	-0.69	21
SGB	60	129	11S	-0.71	24
SGB	61	128	10S	-0.71	22
SGB	62	123	10S	-0.73	22
SGB	62	123	11S	0.35	24
SGB	62	124	10S	-0.71	22
SGB	63	5	11S	0.32	24
SGB	64	125	10S	-0.71	22
SGB	64	125	11S	0.38	22
SGB	65	130	11S	0.31	20
SGB	65	130	12S	-0.71	21
SGB	66	4	12S	0.43	26
SGB	66	124	10S	-0.71	21
SGB	66	129	11S	-0.73	21
SGB	67	4	12S	0.43	20
SGB	67	33	08S	-0.72	26
SGB	67	126	10S	-0.74	25
SGB	67	127	10S	-0.71	28
SGB	67	129	10S	-0.73	23
SGB	67	129	11S	-0.73	24
SGB	68	131	12S	-0.71	22
SGB	68	131	11S	-0.71	24
SGB	69	128	10S	-0.71	20
SGB	69	129	10S	-0.73	22
SGB	69	131	11S	-0.73	23
SGB	70	127	10S	-0.71	22
SGB	70	128	10S	-0.73	20
SGB	71	131	10S	-0.7	30
SGB	72	7	12S	-0.73	20
SGB	72	127	11S	0.29	21
SGB	73	101	08S	-0.73	23
SGB	73	128	10S	-0.76	23
SGB	74	131	11S	-0.84	21
SGB	75	129	10S	-0.66	33

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	76	124	10S	-0.73	21
SGB	76	124	11S	0.34	24
SGB	76	125	10S	-0.73	26
SGB	76	128	10S	-0.76	32
SGB	77	1	13S	-0.62	20
SGB	77	131	10S	-0.71	28
SGB	78	1	13S	-0.71	23
SGB	78	126	10S	-0.75	21
SGB	78	128	10S	-0.73	20
SGB	78	130	10S	-0.73	20
SGB	79	125	10S	-0.73	22
SGB	79	131	10S	-0.71	27
SGB	80	126	10S	-0.75	32
SGB	80	127	10S	-0.75	29
SGB	80	128	10S	-0.68	41
SGB	81	128	12S	0.2	20
SGB	81	128	10S	-0.62	41
SGB	81	132	13S	0.31	22
SGB	82	127	10S	-0.76	27
SGB	82	128	10S	-0.73	21
SGB	82	130	10S	-0.7	26
SGB	83	128	10S	-0.73	33
SGB	84	1	13S	-0.69	24
SGB	84	2	13S	-0.64	23
SGB	84	127	10S	-0.76	24
SGB	84	128	10S	-0.71	39
SGB	84	131	10S	-0.76	31
SGB	85	2	13S	-0.62	25
SGB	85	127	10S	-0.73	22
SGB	85	129	10S	-0.73	30
SGB	87	127	10S	-0.75	27
SGB	87	128	10S	-0.71	36
SGB	88	126	10S	-0.71	33
SGB	89	1	13S	-0.6	29
SGB	89	127	10S	-0.73	26
SGB	89	128	10S	-0.75	20
SGB	90	125	10S	-0.73	21
SGB	90	127	10S	-0.71	25
SGB	92	6	09S	-0.68	22
SGB	92	126	10S	-0.7	29
SGB	93	1	13S	-0.66	22

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	94	126	10S	-0.71	21
SGB	95	1	13S	-0.64	33
SGB	95	3	13S	-0.66	24
SGB	96	1	13S	-0.71	26
SGB	96	125	10S	-0.7	27
SGB	96	127	10S	-0.7	21
SGB	97	1	13S	-0.64	20
SGB	97	104	08S	-0.75	32
SGB	97	119	09S	0.36	23
SGB	97	121	10S	-0.72	25
SGB	97	123	10S	-0.72	23
SGB	97	126	10S	-0.71	22
SGB	98	118	10S	-0.74	36
SGB	98	120	13S	0.28	24
SGB	98	122	10S	-0.7	20
SGB	98	123	09S	-0.66	20
SGB	99	118	10S	-0.74	26
SGB	99	119	10S	-0.7	30
SGB	99	120	10S	-0.72	36
SGB	99	122	10S	-0.72	24
SGB	100	4	14S	-0.66	28
SGB	100	4	15S	0.42	35
SGB	100	5	14S	-0.68	21
SGB	100	116	10S	-0.73	22
SGB	100	119	10S	-0.73	28
SGB	101	5	15S	0.34	27
SGB	101	5	14S	-0.73	33
SGB	101	118	10S	-0.73	22
SGB	101	120	10S	-0.75	21
SGB	102	4	14S	-0.67	27
SGB	102	4	15S	0.3	31
SGB	102	114	10S	-0.73	22
SGB	102	121	10S	-0.73	22
SGB	103	1	14S	-0.68	28
SGB	103	4	14S	-0.71	28
SGB	103	5	15S	0.36	20
SGB	103	5	14S	-0.7	21
SGB	103	120	10S	-0.73	24
SGB	104	1	14S	-0.73	20
SGB	104	1	13S	0.55	22
SGB	104	1	13S	-0.64	33

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	104	115	10S	-0.75	25
SGB	104	117	10S	-0.77	31
SGB	104	121	10S	-0.75	27
SGB	105	113	10S	-0.74	21
SGB	105	115	10S	-0.7	23
SGB	105	116	10S	-0.72	29
SGB	105	117	10S	-0.68	22
SGB	106	3	14S	-0.69	20
SGB	106	114	10S	-0.74	23
SGB	106	116	10S	-0.74	30
SGB	106	117	10S	-0.73	24
SGB	107	114	10S	-0.74	21
SGB	107	115	10S	-0.7	23
SGB	108	3	14S	-0.71	26
SGB	109	1	14S	-0.69	24
SGB	110	77	08S	-0.74	20
SGB	110	84	08S	0.32	20
SGB	110	86	08S	0.36	20
SGB	110	109	10S	-0.75	20
SGB	110	112	10S	-0.73	34
SGB	111	87	08S	0.39	20
SGB	111	114	10S	-0.7	22
SGB	112	113	10S	-0.68	24
SGB	112	115	10S	-0.73	28
SGB	113	1	13S	-0.61	25
SGB	114	113	10S	-0.75	21
SGB	114	115	10S	-0.68	21
SGB	115	1	13S	-0.62	22
SGB	115	111	10S	-0.73	23
SGB	115	112	10S	-0.73	28
SGB	116	81	08S	0.34	23
SGB	116	111	10S	-0.7	29
SGB	117	1	13S	-0.71	27
SGB	120	6	13S	0.3	21
SGB	121	6	13S	0.34	20
SGB	121	105	10S	-0.75	31
SGB	122	2	13S	-0.73	23
SGB	122	104	10S	-0.7	21
SGB	123	2	13S	-0.71	24
SGB	123	7	13S	0.32	22
SGB	123	39	09S	-0.76	21

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	123	103	10S	-0.61	22
SGB	124	11	14S	-0.8	21
SGB	125	100	13S	0.18	20
SGB	125	101	10S	-0.75	20
SGB	126	1	13S	-0.73	20
SGB	126	5	13S	0.32	21
SGB	126	65	08S	-0.77	23
SGB	128	4	13S	0.37	23
SGB	128	7	10S	-0.73	22
SGB	128	53	08S	-0.75	20
SGB	129	12	14S	-0.67	22
SGB	130	91	13S	-0.75	22
SGB	130	91	13S	0.21	23
SGB	131	1	13S	-0.73	30
SGB	131	8	09S	-0.72	21
SGB	132	8	09S	0.36	24
SGB	132	87	13S	0.27	20
SGB	134	1	13S	-0.73	26
SGB	134	7	09S	-0.72	27
SGB	134	80	10S	0.27	21
SGB	134	82	13S	0.23	20
SGB	135	8	09S	-0.68	22
SGB	135	45	14S	0.11	24
SGB	135	78	10S	0.34	22
SGB	136	8	09S	-0.73	27
SGB	137	6	13S	-0.71	21
SGB	137	40	14S	-0.89	21
SGB	137	65	09S	0.37	25
SGB	137	67	10S	0.27	20
SGB	137	74	10S	0.34	22
SGB	138	44	14S	-0.86	23
SGB	138	62	09S	0.27	20
SGB	138	68	10S	0.37	21
SGB	139	61	12S	-0.69	20
SGB	139	67	09S	0.32	21
SGB	140	8	09S	-0.7	31
SGB	140	12	09S	-0.73	22
SGB	140	30	14S	-0.69	20
SGB	141	7	09S	-0.72	22
SGB	141	8	09S	-0.68	21
SGB	141	14	09S	-0.67	29

SG A and SG B, Broached TSP Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	141	53	10S	0.32	25
SGB	141	55	11S	-0.78	20
SGB	141	63	12S	-0.82	26
SGB	142	11	10S	-0.76	20
SGB	142	12	10S	-0.77	29
SGB	142	14	10S	-0.72	20
SGB	142	15	10S	-0.7	22
SGB	142	46	14S	-0.94	21
SGB	142	47	14S	-0.84	20
SGB	142	50	14S	-0.87	20
SGB	142	50	10S	0.32	24
SGB	142	51	10S	0.32	31
SGB	142	62	13S	0.32	24
SGB	142	65	12S	-0.85	21
SGB	143	4	10S	-0.7	20
SGB	143	12	10S	-0.7	20
SGB	143	21	09S	0.36	26
SGB	143	32	14S	-0.83	20
SGB	143	40	14S	-0.86	26
SGB	143	48	10S	0.34	21
SGB	143	49	10S	0.34	23
SGB	144	2	13S	0.16	20
SGB	144	5	10S	-0.72	20
SGB	144	6	14S	-0.68	22
SGB	144	8	10S	-0.76	22
SGB	144	8	14S	-0.79	25
SGB	144	9	15S	0.18	22
SGB	144	9	10S	-0.68	33
SGB	144	10	10S	-0.74	28
SGB	144	21	11S	-0.76	22
SGB	144	45	10S	0.34	23
SGB	145	6	14S	0.3	20
SGB	145	6	14S	-0.81	35
SGB	145	7	10S	-0.77	29
SGB	145	7	14S	-0.66	45
SGB	145	8	10S	-0.77	20
SGB	145	17	10S	-0.75	24
SGB	145	19	13S	-0.76	23
SGB	145	20	09S	-0.75	30
SGB	145	21	09S	-0.75	26
SGB	145	33	09S	0.38	21
SGB	145	34	09S	0.34	21
SGB	145	37	09S	0.36	20
SGB	145	39	10S	0.36	23
SGB	145	41	10S	0.36	20
SGB	145	43	10S	0.34	25
SGB	145	49	10S	0.37	28
SGB	146	11	09S	0.39	24
SGB	146	20	09S	-0.79	23
SGB	146	29	13S	0.23	21
SGB	146	31	13S	0.23	25
SGB	146	37	10S	0.32	21
SGB	146	44	12S	0.25	23
SGB	146	45	10S	0.37	20
SGB	146	46	10S	0.34	24
SGB	147	14	10S	-0.74	21
SGB	147	16	10S	-0.79	21
SGB	147	17	10S	-0.69	20
SGB	147	27	13S	0.23	24
SGB	148	11	10S	-0.71	21
SGB	148	20	13S	-0.84	20
SGB	148	22	13S	-0.82	20
SGB	149	31	09S	0.37	23
SGB	150	8	13S	-0.75	25
SGB	151	9	14S	-0.87	23

END SG B

SG A and SG B, Tube-to-Tube Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	23	46	08S	17.7	14
SGA	24	45	08S	18	14
SGA	27	43	08S	18.9	7
SGA	27	44	08S	18.6	7
SGA	28	38	08S	19.2	10
SGA	28	39	08S	19.8	7
SGA	28	44	08S	18.5	8
SGA	31	39	08S	18	10
SGA	31	40	08S	17.9	8
SGA	31	57	08S	18.7	13
SGA	31	58	08S	18.7	13
SGA	32	47	08S	18.7	8
SGA	33	49	08S	19.3	8
SGA	34	72	08S	18.1	8
SGA	35	73	08S	18.5	7
SGA	36	84	08S	18.5	12
SGA	37	85	08S	18.4	12
SGA	38	37	08S	18.6	8
SGA	38	38	08S	19.1	7
SGA	45	96	08S	20.3	9
SGA	45	97	08S	19.4	10
SGA	47	26	08S	18.7	15
SGA	47	72	07S	22.1	8
SGA	48	27	08S	19.3	9
SGA	48	28	08S	18.6	14
SGA	48	73	07S	21.5	8
SGA	48	98	08S	19.3	8
SGA	49	99	08S	19	7
SGA	50	29	08S	17.7	8
SGA	50	32	08S	17.9	8
SGA	50	99	08S	18.3	7
SGA	51	29	08S	18	8
SGA	51	30	08S	18.3	8
SGA	51	32	08S	18	8
SGA	51	33	08S	18.2	8
SGA	54	104	08S	18.3	8
SGA	55	104	08S	18	9
SGA	55	105	08S	17.9	10
SGA	56	23	08S	19.1	14
SGA	57	24	08S	19.4	16
SGA	57	29	08S	18.7	10
SGA	58	28	03S	20.5	9
SGA	58	29	08S	18.2	9
SGA	59	106	08S	18.8	7

			Location		
SG	Row	Col	TSP	Offset	%TW
SGA	59	107	08S	19.1	7
SGA	60	29	08S	19.5	10
SGA	60	34	08S	18.7	6
SGA	60	109	08S	18	8
SGA	61	26	08S	18.4	10
SGA	61	29	08S	18.8	11
SGA	61	34	08S	19.8	7
SGA	61	35	08S	19.8	7
SGA	61	110	08S	19	9
SGA	62	25	08S	18.7	11
SGA	62	31	08S	19.3	10
SGA	62	32	08S	19.4	9
SGA	62	34	08S	19.7	6
SGA	62	35	08S	19.4	7
SGA	63	25	08S	19.8	9
SGA	64	25	08S	19.5	7
SGA	70	100	08S	19.1	20
SGA	70	101	08S	19.5	8
SGA	70	103	08S	19	10
SGA	71	101	08S	19.1	17
SGA	71	102	08S	19.2	9
SGA	71	104	08S	19.2	8
SGA	78	41	08S	18.7	10
SGA	79	35	08S	19.2	10
SGA	79	42	08S	19.6	6
SGA	80	35	08S	18.7	10
SGA	81	48	08S	17.9	11
SGA	81	49	08S	17.7	10
SGA	85	91	07S	20.7	6
SGA	85	92	07S	20.7	9
SGA	87	107	08S	18.7	7
SGA	88	107	08S	18.4	8
SGA	90	30	08S	19	9
SGA	90	31	08S	19.1	10
SGA	90	34	08S	19	8
SGA	90	38	08S	18.9	10
SGA	90	39	08S	18.8	8
SGA	91	34	08S	19.3	10
SGA	91	35	08S	18.7	12
SGA	92	34	08S	19.3	11
SGA	93	36	08S	19	10
SGA	94	37	08S	19	10
SGA	99	46	08S	18.7	11
SGA	100	46	08S	18.5	12

SG A and SG B, Tube-to-Tube Wear Indications, Sized by Bobbin Probe

		Location			
SG	Row	Col	TSP	Offset	%TW
SGA	110	33	08S	20.2	9
SGA	110	45	08S	17.7	11
SGA	111	33	08S	19.7	9
SGA	111	36	08S	19.6	11
SGA	111	37	08S	18.9	9
SGA	111	45	08S	17.7	12
SGA	112	36	08S	19.5	10
SGA	113	43	08S	19.9	10
SGA	114	41	08S	18.6	13
SGA	114	42	08S	19.8	12
SGA	117	39	08S	18.7	8
SGA	117	40	08S	18.2	15
SGA	117	46	08S	18.1	9
SGA	118	39	08S	18.8	10
SGA	118	40	08S	18.3	10
SGA	118	45	08S	18.5	9
SGA	119	40	08S	18.5	12
SGA	120	39	08S	18.2	11
SGA	120	47	08S	18	10
SGA	120	48	08S	18.3	10
SGA	120	52	08S	18.1	9
SGA	121	52	08S	17.7	11
SGA	121	53	08S	17.8	10

END SG A

		Location			
SG	Row	Col	TSP	Offset	%TW
SGB	22	52	08S	20.2	11
SGB	22	53	08S	19.4	11
SGB	22	62	08S	17.8	15
SGB	22	63	08S	18.2	20
SGB	22	67	08S	18.4	11
SGB	23	46	08S	18.5	9
SGB	23	47	08S	19.1	9
SGB	23	52	08S	19	7
SGB	23	60	08S	17.9	10
SGB	23	61	07S	20.7	7
SGB	23	61	08S	17.4	7
SGB	23	62	07S	18.7	10
SGB	23	63	08S	18.2	12
SGB	23	67	08S	18.5	10
SGB	24	50	08S	18.3	10
SGB	24	55	08S	18.3	7
SGB	25	29	08S	18.8	12
SGB	25	33	08S	19.2	14
SGB	25	39	08S	18.5	14
SGB	25	48	08S	18.8	10
SGB	25	59	08S	18.5	10
SGB	26	29	08S	19.1	9
SGB	26	30	08S	19.4	13
SGB	26	33	08S	19.1	13
SGB	26	39	08S	18.6	14
SGB	26	43	08S	18.8	11
SGB	26	49	08S	18.6	10
SGB	26	68	08S	19.3	6
SGB	27	44	08S	18.2	11
SGB	27	49	08S	19.1	8
SGB	27	50	08S	18.8	9
SGB	27	63	08S	17.9	7
SGB	27	69	08S	17.3	9
SGB	28	32	07S	21	9
SGB	28	63	08S	18.4	8
SGB	28	68	08S	18	9
SGB	29	31	08S	17.8	11
SGB	29	32	07S	21	6
SGB	29	32	08S	17.9	14
SGB	29	33	08S	18.6	9
SGB	29	38	08S	18.7	8
SGB	29	39	08S	18.2	9
SGB	29	42	08S	19.1	9
SGB	29	68	08S	17.9	11

SG A and SG B, Tube-to-Tube Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGB	29	69	08S	18	12
SGB	29	80	08S	18.5	9
SGB	30	31	08S	18.8	13
SGB	30	32	08S	17.9	13
SGB	30	33	08S	18.5	12
SGB	30	34	08S	18.8	9
SGB	30	35	08S	19.1	10
SGB	30	36	08S	18.7	10
SGB	30	37	08S	19	9
SGB	30	42	08S	19.2	10
SGB	30	73	08S	18.7	10
SGB	30	74	08S	19.7	8
SGB	30	80	08S	18.8	9
SGB	30	81	08S	18.8	13
SGB	31	32	08S	18.2	10
SGB	31	35	08S	18.9	12
SGB	31	38	08S	18.5	8
SGB	31	41	08S	18.7	8
SGB	31	45	08S	18.4	9
SGB	31	56	08S	18.3	11
SGB	31	64	08S	19	8
SGB	31	65	08S	18.7	7
SGB	31	73	08S	18	11
SGB	32	25	08S	19.1	11
SGB	32	26	08S	18.9	10
SGB	32	27	08S	18.2	12
SGB	32	28	08S	18.2	8
SGB	32	29	08S	18.2	13
SGB	32	34	08S	20.2	10
SGB	32	35	08S	18.8	9
SGB	32	40	08S	17.7	8
SGB	32	44	08S	18.7	9
SGB	32	55	08S	18.9	9
SGB	32	56	08S	18.4	9
SGB	32	59	08S	18.8	9
SGB	32	67	08S	18.6	8
SGB	32	68	08S	18.6	7
SGB	32	69	08S	18.1	7
SGB	32	73	08S	19.2	9
SGB	32	77	08S	18.3	8
SGB	33	26	08S	19.9	8
SGB	33	27	08S	19.5	10
SGB	33	28	08S	18.5	10
SGB	33	30	08S	18.5	11

			Location		
SG	Row	Col	TSP	Offset	%TW
SGB	33	48	08S	18.4	8
SGB	33	49	08S	18.6	9
SGB	33	61	08S	19.1	12
SGB	33	69	08S	18.6	9
SGB	33	75	08S	18.5	9
SGB	33	79	08S	18.8	8
SGB	33	82	08S	18.8	9
SGB	34	25	08S	19.7	10
SGB	34	26	08S	20	10
SGB	34	27	08S	20	14
SGB	34	78	08S	19.2	8
SGB	34	84	08S	18.5	9
SGB	34	86	07S	20	12
SGB	34	87	07S	20.1	9
SGB	35	25	08S	19.9	10
SGB	35	26	08S	18.4	12
SGB	35	27	08S	20	12
SGB	35	28	08S	19.2	10
SGB	35	30	08S	19.5	9
SGB	35	31	08S	19	6
SGB	35	34	08S	19.6	8
SGB	35	35	08S	19.3	6
SGB	35	36	08S	18.8	6
SGB	35	79	08S	18.5	9
SGB	36	30	08S	18.8	9
SGB	36	31	08S	18.1	11
SGB	36	34	08S	21.1	6
SGB	36	35	08S	18.3	8
SGB	36	37	08S	18.3	9
SGB	38	33	08S	19.9	9
SGB	38	74	08S	19.1	8
SGB	38	75	08S	18.9	8
SGB	39	33	08S	19.9	10
SGB	39	34	08S	18.4	10
SGB	39	90	08S	18	9
SGB	39	91	08S	17.8	10
SGB	40	33	08S	18.4	9
SGB	40	34	08S	18.1	13
SGB	40	90	08S	17.9	9
SGB	40	91	08S	17.8	9
SGB	40	95	08S	17.4	10
SGB	40	96	08S	18.2	7
SGB	41	89	08S	17.8	9
SGB	41	92	08S	19.1	8

SG A and SG B, Tube-to-Tube Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGB	42	25	08S	20.3	10
SGB	42	26	08S	18.8	10
SGB	42	27	08S	17.2	11
SGB	42	87	08S	18.5	8
SGB	42	89	08S	17.8	9
SGB	42	90	08S	17.8	9
SGB	43	24	08S	18.8	11
SGB	43	25	08S	20.4	10
SGB	43	26	08S	19.3	11
SGB	43	32	08S	18.1	10
SGB	43	91	08S	18.5	7
SGB	44	24	08S	19	11
SGB	44	32	08S	17.9	9
SGB	44	33	08S	19	10
SGB	45	24	08S	19.2	10
SGB	45	28	08S	19.8	12
SGB	45	32	08S	19.2	9
SGB	45	84	08S	18.4	13
SGB	46	24	08S	19.1	8
SGB	46	25	08S	18.9	10
SGB	46	26	08S	20.1	10
SGB	46	29	08S	19.4	11
SGB	46	32	08S	19.4	10
SGB	46	83	08S	19.1	11
SGB	46	84	08S	18.8	16
SGB	46	85	08S	18.7	11
SGB	46	99	08S	18	11
SGB	46	103	08S	18.6	11
SGB	47	97	08S	18.1	8
SGB	47	98	08S	18.7	9
SGB	47	101	08S	18.3	14
SGB	47	102	08S	17.9	14
SGB	48	99	08S	18.3	8
SGB	50	103	08S	18.7	15
SGB	50	104	08S	19.4	12
SGB	51	31	08S	19	10
SGB	51	103	08S	18.9	13
SGB	52	31	08S	19	10
SGB	52	104	08S	19.3	10
SGB	52	106	08S	18.9	12
SGB	53	100	08S	18.6	8
SGB	53	101	08S	18.8	6
SGB	53	104	08S	18.7	11
SGB	53	105	08S	19.2	9

			Location		
SG	Row	Col	TSP	Offset	%TW
SGB	54	103	08S	18.7	8
SGB	54	105	08S	18.7	10
SGB	54	106	08S	19.7	9
SGB	55	104	08S	18.3	10
SGB	55	106	08S	18.7	9
SGB	56	34	08S	19.7	11
SGB	56	107	08S	18.1	7
SGB	56	108	08S	18.6	10
SGB	57	31	08S	19.7	9
SGB	57	34	08S	18.9	11
SGB	57	111	08S	19	11
SGB	58	32	08S	19.3	8
SGB	58	112	08S	18.1	12
SGB	61	111	08S	17.5	11
SGB	61	112	08S	19.9	10
SGB	66	83	07S	20.2	8
SGB	66	84	07S	20.3	10
SGB	68	112	08S	18.3	7
SGB	68	113	08S	18.8	8
SGB	68	114	08S	18	14
SGB	69	113	08S	18.3	16
SGB	69	114	08S	17.9	13
SGB	70	112	08S	18.1	13
SGB	76	110	08S	19.3	8
SGB	77	112	08S	18.8	8
SGB	78	101	04S	19.4	12
SGB	79	102	04S	19.3	11
SGB	79	102	08S	19.3	8
SGB	79	103	08S	19.6	6
SGB	79	114	08S	18.8	7
SGB	80	26	08S	18.8	10
SGB	80	114	08S	18.7	10
SGB	81	27	08S	18.7	9
SGB	81	34	08S	19	6
SGB	82	34	08S	19.6	6
SGB	85	109	08S	18.6	8
SGB	86	22	08S	19.8	13
SGB	86	107	08S	18.3	7
SGB	86	108	08S	18.9	10
SGB	86	109	08S	18.5	10
SGB	87	22	08S	19.4	12
SGB	87	109	08S	19.6	10
SGB	88	110	08S	18.6	12
SGB	89	111	08S	18.9	11

SG A and SG B, Tube-to-Tube Wear Indications, Sized by Bobbin Probe

			Location		
SG	Row	Col	TSP	Offset	%TW
SGB	90	100	04S	19.6	10
SGB	90	100	08S	18.6	7
SGB	91	102	04S	19.5	11
SGB	91	102	08S	19.1	7
SGB	91	110	08S	19.1	7
SGB	91	111	08S	19.1	8
SGB	92	30	08S	18.5	8
SGB	93	23	08S	19.1	10
SGB	93	30	08S	19.5	8
SGB	93	103	08S	17.8	6
SGB	94	24	08S	19.3	9
SGB	94	26	08S	20.2	10
SGB	94	103	08S	17.9	5
SGB	95	26	08S	20.2	9
SGB	95	100	08S	17.7	6
SGB	96	100	08S	18.5	5
SGB	97	103	08S	17.9	9
SGB	97	104	08S	18	9
SGB	98	102	08S	18.1	10
SGB	99	95	08S	18.6	6
SGB	99	101	08S	17.9	9
SGB	99	102	08S	17.8	10
SGB	100	32	08S	18.6	7
SGB	100	94	08S	17.9	6
SGB	100	100	08S	18.1	9
SGB	101	32	08S	18	8
SGB	101	94	08S	17.7	10
SGB	101	95	08S	17.4	10
SGB	105	92	08S	18	7
SGB	105	95	08S	18.6	8
SGB	106	78	04S	18.8	13
SGB	106	92	08S	17.9	9
SGB	106	95	08S	18.8	9
SGB	107	77	04S	19	12
SGB	107	77	08S	19	11
SGB	107	78	08S	18.9	11
SGB	112	71	08S	19.1	8
SGB	113	71	08S	19	9
SGB	114	42	08S	17.5	7
SGB	115	37	07S	20.3	11
SGB	115	42	08S	17.9	7
SGB	115	83	08S	18.2	8
SGB	115	84	08S	18.2	8
SGB	116	34	08S	18.2	10
SGB	116	35	08S	18	11
SGB	116	37	07S	20.6	9
SGB	116	37	08S	18	8
SGB	116	38	08S	17.7	9
SGB	116	86	08S	18.5	8
SGB	116	87	08S	17.7	10
SGB	117	83	08S	18.5	7
SGB	118	35	08S	18	13
SGB	118	36	08S	18	13
SGB	118	82	08S	18.2	10
SGB	118	83	08S	18.4	8
SGB	119	75	08S	18.5	7
SGB	119	78	08S	18.2	11
SGB	119	79	08S	18.1	11
SGB	119	81	08S	18.5	10
SGB	119	82	08S	17.7	10
SGB	120	73	08S	18.9	6
SGB	121	71	08S	18.8	8
SGB	122	70	08S	19.3	7
SGB	123	66	08S	17.7	7
SGB	123	67	08S	17.5	7
SGB	124	48	08S	17.9	8
SGB	124	49	08S	17.4	9

END SG B