

NRR-3

ORIGINATING OFFICE NRR

AUTHOR \_\_\_\_\_

DATE:(or time period covered) 3/31 - 4/12/79

DESCRIPTION OF DOCUMENT CONTENTS: HANDWRITTEN NOTES RE BORON  
CONCENTRATION - TMI-2

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OTHER IDENTIFYING PARTICULARS: \_\_\_\_\_

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\_\_\_\_\_  
\_\_\_\_\_

7906070054

228 028

P

Heise Gauge - Highest Priority

Filter in Aux Tank

Filter on Air Ejector

Cooldown to decay phase & cooldown from 280° to 230°

J.T. - 2400 M.A. 2000 X

Know Heise 2-T Back to Dent

Who makes decision when PER level lost  
proced. for MU TRUCKS

② Taking PLANT water solid

Manitop 5000 NaOH - PH 8.5

you must

BWST

Caustic Spray sys  
suction line of HP&I

Valve on caustic line

went 4800 -

18' of caustic in Prandy

good packaging job

ionize & collect part of it  
not going to collect all

messy to deal with  
internal standard

X 4062 Ann Gibbs - (removal  
4225 of Method  
don't see bias  
Particulates

leach Boron off Particle

Est. 4.00

Problem with unbuffered Soln

2.8-4.9 = HIGH pH

4.9-8.5 Boron not a  
buffer

Small trace would

For Next 24 hrs. or until Boron  $\leq 2110$  ppm add DW.

Note # of gal of DW added and time and Boron reduction

Note Assume Initial Boron Conc 3000 ppm B

Assume 86000 gal volume

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Assume 86,000 gal volume

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ppm final =  $\frac{(Vol)(C_{diff})}{(Vol)(C_{init})}$

added ~~4~~ 23/50

added 508 g

Added 23 gal

ADDED 155 gal

ADDED 200 gal

ADDED 260 gal

ADDED 210 gal

ADDED 220 gal

added 274 gal

added 220 gal

added 804 gal

added 330 gal

added 350 gal

added 330 gal

added 253 gal

246 gal

Est ppm 2775 Boron

EST ppm 2758 Boron

EST ppm 2750 Boron

EST ppm 2735 Boron

EST ppm 2728 Boron

EST 2720 Boron

EST 2713 Boron

EST 2706 Boron

EST 2699 Boron

" 2692 "

" 2667 "

" 2654 "

" 2645 "

" 2634 "

" 2626 "

" 2618 "



4/15/79 0117

0325

0545

0755

0946

1131

1250

1446

1645

1845

2155

4/16/79 0110

0330

0603

20925

2281256

031

FOR THE NEXT 24 HOURS Add DW or until Boron  $\leq$  220 ppm b.

NOTE #1 gal DW added and Boron reduction:

NOTE	Assume	Volume	EST New ppm	PPM Final	(Vol) (Ref ppm)
4/14/74	Assume	86,000 gal	2984	2945	(Vol) + (CAL ADD)
0415	"	"	2973	2931	450 gal DW
1126	Assume	86,000 gal	2959	2917	300 gal DW
1230	Assume	86,000 gal	2945	2903	400 gal DW
1330	Assume	86,000 gal	2931	2889	400 gal DW
1545	Assume	86,000 gal	2917	2875	400 gal DW
1945	Assume	86,000 gal	2889	2861	400 gal DW
4/14/74 2000	"	86,000 gal	2875	2841	400 gal DW
0237	"	86,000 gal	2861	2833	400 gal DW
0515	"	86,000 gal	2841	2819	400 gal DW
0835	"	86,000 gal	2833	2806	400 gal DW
1154	"	86,000 gal	2819	2797	400 gal DW
1507	"	86,000 gal	2806	2790	400 gal DW
1545	"	86,000 gal	2797	2783	400 gal DW
1445	86,000 gal	86,000 gal	2790	2783	254 gal DW
2210	86,000 gal	86,000 gal	2783		204 gal DW
2310	86,000 gal	86,000 gal	2783		219 gal DW

JG Herlein M

4/7 12:30 p.m. Conference Call

Lainas  
Grimes  
Schroeder  
Richings  
in Beth.  
Mattom  
and Stello  
at 3MI

increasing 1800-2200 ppm boron not  
worth the risk

IE says to already 2200 ppm and has  
been there for a long time - Sample on  
April 1 showed that  $\phi$  makeup has  
been there every since  
probably more than it needs to be - 1800 ppm  
~~is~~ is good enough unless you  
can get rods out in which case  
you'd want 2200

extreme geometry situation is OK  
with either 1800 or 2200 ppm.

3000 ppm would end all questions  
with recriticality

let down flow capability comes  
and goes  $\phi$  increasing boron  
could exacerbate the problem  
because of boron concentration.

Grimes says it could be because  
of the relief valve setting up stream  
of the 1e down filters

1500 - 1600 ppm @ 300F

with no rods

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with rods in criticality

with 4500 - 6000 ppm

@ all temperatures 200 - 300F

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with damaged core

~ 200 lbs w/ boron w/ <sup>10</sup>B reflector

~ 300 lbs w/ <sup>10</sup>B reflector

infinite <sup>n</sup> cylinder 15" diam

solid sphere cannot go  
critical - must have water

1500 ppm of boron always  
below critical

B&W claims measurement  
shows 1500 to 2100 ppm

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# Shutdown Margin (Temperature Defect)

@ 280°F - using 100 PPM / 10% DR/K (FSAR)

$\alpha_m = -3 \times 10^{-4} \text{ DR/K/OF}$	900 PPM
$-2 \times 10^{-4} \text{ DR/K/OF}$	600 PPM
$\rightarrow -1 \times 10^{-4} \text{ DR/K/OF}$	300 PPM

@ 180°F

$\alpha_m = -3 \times 10^{-4} \text{ DR/K/OF}$	1200 PPM
$-2 \times 10^{-4} \text{ DR/K/OF}$	800 PPM
$-1 \times 10^{-4} \text{ DR/K/OF}$	400 PPM

944-4756

1785

1012

Nat'l  
Guard  
Permit



Blanked out photo plates

w/ P-5

plating out on glass vials

put acid in & leach off

& Re run

Very

Read in Spectrometer

After emptying bottle well

measure that

Mass Spectrometry

B<sup>10</sup>

B<sup>11</sup>

Sep. B as Sodium tetraborate Diss in sulfuric acid Develop a colorimetric procedure

# Ehrington Plan

BFW

BOX 38A 5111

2196

900

Problem

dilution w/ I  
Carr's

Bins # High

Colorimetric

takes too long

Mass spect overdoing it

Accuracy good

—  
specific masses rather  
than total

o.k. as long as ~~if~~ you

Sledge to crack a nut.

# Boron Concentration Comparison 4-12-79

Primary Coolant Sample taken 4-11-79

## Source of Analysis

	Bettis	B&W	ORNL	SRL
SA. #, An	7.65	8.5	8.0	7.7
Boron, PPM	*	3409 ± 15	3580 ± 200	① <del>2600</del> ± 200 ② 3100 ± 50
Technique	colorimetric	<del>High</del> Methanol	MASS Spectrometer	Carbon Rod Atomic Absorption
Investigator Contact	Bogart	Hicks	Schultz	Gibbs & Overman
Phone	412 462 5000 X 6527	804 384 5111		803 279 2714

\* Expected ~~2100~~ <sup>0800</sup> ~~4/11/79~~ <sup>4/13/79</sup> \*\*

\*\* Strong function of sample turbidity

228 038

Howie

Can't see source  
Mult. see at few %  
maybe 10%?  
30% for sure.

@ 10% by boron  
dil. '100's see of  
period by boron dil  
turnaround by B457  
1 HP in few min.

Call

228 039

c

3/31 ~~11:30 pm~~ 11:50 pm

- Novak concerned w/Boron reduction due to plateau
- can we activate on line measurements to detect potential decrease in shutdown margin or detect return to "criticality."

Howe Richings

Sy Weis

Marv Drummerfeld

Dan Fieno

Walt Brooks

Howe Richings

Called to Ross @ 12:00 midnight on 3/31

- not very sensitive
- not reasonable for power distribution until 1-30%
- if approaching critical then would see multiplication of the source (< 1% power) way down in the noise level.
- should see something at a few % power (possibly 10% if you can discern from the noise)
- at 10 or 20% power by boron dilution it would be very slow increase

1000 sec period

100 or 1000 sec period range  
by the time it reaches

at a few percent period

at 20% power could  
turn power back around  
in minutes with BWS  
or injection via one pump  
or two (2x faster with 2)

at 20% power could

turn power back around