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HANFORD ENGINEER WORKS

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FROM 100-D

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TO:

MESSAGE  
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DATE AND  
INITIAL

Major J. F. Sally

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Subject: Monthly Report On 100-Areas, 1 - 24 February.

1. Submitted herewith is a report covering the operational status of the 100-Areas, ending 24 February.

HANFORD

HAN-45803

I Chronology of Events in 100 Areas.

100-B

<u>Day</u>	<u>Time</u>	<u>Power</u>	<u>Remarks</u>
1	0001	240	
1	1710	245	Prior to rise, reserve reactivity was about 25 ih.
4	2215	250	At design capacity, Reserve reactivity 24.6 ih prior to rise in power.
22	0733	0	Shutdown, <sup>for 10 PA peak 87,000 AF</sup> To discharge 76 channels of 2406 slugs with an MWD of 968.8
22	1530	0	Two channels, containing corrosion study slugs, discharged.
<del>22</del>	<del>1630</del>	<del>0</del>	<del>Discharge of remaining 76 channels PA started.</del>
23	0430	0	PA Discharge of channels completed.
23	0738	0	Start-up to power.
23	0829	33	Classification Cancelled (Change to UNCLASSIFIED)
23	0841	100	By Authority of CH6 NOT
23	0851	150	2 TO CG-PR-2
23	0911	200	By DL SAMPLES 4-26-91, CLASSIFICATION
23	0921	225	10 Johns removed 5/1/91
23	0936	200	Temperature of hottest tubes too high, necessitating drop in power.
23	1140	220	
23	2345	225	
24	0418	250	

APPROVED FOR  
PUBLIC RELEASE  
By PNNL 4/26/1991

Johns  
7/10/98

OFFICER  
5-15-91

1

by 24 of each of these destroyed by Dana Fulmer 1949

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100-D

<u>Day</u>	<u>Time</u>	<u>Power</u>	<u>Remarks</u>
1	0001	235	Running at this level at beginning of month.
4	1040	240	27.5 ih in reserve prior to power rise.
5	1030	245	26.5 ih in reserve prior to power rise.
11	1015	250	At design capacity.
15	1054	0	Accidental scrambling of circuit. Time required to discover cause, too long, resulting in a forced shutdown.
15	2217	0	Start-up.
15	2300	2	
15	2400	150	
16	0015	235	
16	0036	250	
16	0412	220	Temperature of hottest tubes too high, necessitating reduction in power.
16	0955	235.	
16	1505	250.	

100-F (See yellow sheet)

2	1730		Construction completed its work in 105-F.
10	---		100-F Area accepted by Operation.
15	0430		Loading of X-metal started Each channel to contain 35 slugs.
15	2110		Dry critical loading reached. Self-sustaining chain reaction producible by 359 tubes.
19	0932		Loading of 100-F Pile completed.

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II Comparison of the B and D Piles for 0800, 24 Feb.

	<u>B</u>	<u>D</u>
Power Level	250	250
Accrued MWD	15674	13504
MWD Pushed	1885	4.6
Slugs Pushed (7.9# ea)	8147	35
No. of Slugs in Pile	65957	70108
Inlet Water Temperature	6.6°C	6.7°C
Outlet Water Temperature	37. °C	38. °C

III Notes

1. The 105 B Pile contains one centrally located poison channel, No. 2374, consisting of the following sequence: 15 poison slugs, 5 lead slugs, 6 bismuth slugs, 5 lead slugs, 15 poison slugs. The absorbing capacity of the channel is about 35 ih.

2. The 105-D Pile contains one poison channel, No. 2176, consisting of ten lead slugs, 30 poison slugs, and 10 lead slugs. The absorbing capacity of the channel is about 60 ih.

3. The 105-F Pile contains seven permanent poison channels loaded in an approximate ratio of 3 lead to 1 poison slug, making a total of 49 slugs per channel of which 11 are poison slugs. There are 3 temporary poison channels consisting of 49 poison slugs. These arrangements are subject to change.

$$\begin{array}{r} 832 \\ 93 \\ \hline 915 \\ 969 \\ \hline 1883 \\ 188 \\ \hline 1697 \\ 34 \\ \hline 1357 \end{array}$$

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4. The approximate cold reactivities of the piles, without poison, are as follows: B, 600 ih; D, 635 ih; and F, 650 ih. For comparative purposes, they are to be considered as rather rough.

5. The following is a comparison of the dry critical values.

<u>Pile</u>	<u>Day</u>	<u>Time</u>	<u>Slugs/ Channel</u>	<u>Dry Critical</u>
B	14 Sept. 44	0245	32	404 channels
D	6 Dec. 44	1715	35	375 channels
F	15 Feb. 45	2110	35	359 channels

*f. A. Valente*  
 F. A. VALENTE,  
 Captain, Corps of Engineers,  
 Army Field Engineer, 100-Areas.

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# Loading of the "F" Unit

COMPLETED

DATE 19 February 1945

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2000  
1900  
1800  
1700  
1600  
1500  
1400  
1300  
1200  
1100  
1000  
900  
800  
700  
600  
500  
400  
300  
200  
100  
0

0430 - Start of Loading

0 4 8 12 16 20 24 4 8 12 16 20 24 4 8 12 16 20 24 4 8 12 16 20 24 4 8 12

← 15 \* 16 \* 17 \* 18 \* 19

Dry Critical = 359 tubes Occurred at 2110

0932 - Completed Loading of tubes

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# MATERIALS

8 - 100 AREA MONTHLY REPORTS  
1945 and 1946

HANFORD NUMBER

HAN-45803

RETURN TO: RECORDS SERVICE CENTER  
BUILDING 712 100 AREA  
BOX NUMBER A00739 BIN 0182

A00739

0182

Classification Cancelled (Change to

DECLASSIFIED )

By Authority of CHG NOT 2

TO CG-PR-2

By DL SAMPLES 4/26/91

Markings removed by

JD Johns 5/7/91

JK Rice 5-15-91

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Progress Report of the 100 Area  
for the Monthly Period Ending 25 May 1945

A. Narrative

a. 100 Area, General

1. The plan of elevating the power of the piles above their design capacities of 250 Mw was realized at least in part during the month. At 1030 of 8 May 1945, the 100-D Unit was raised to 265 Mw as the first step towards attaining early in June the set objective of 280 Mw. It is intended to follow the same plan with respect to the 100-F Unit except that the ultimate aim will be accomplished approximately one month later.

2. In connection with the problem of raising the power level of the piles, a valuable development followed as a result of the poison redistribution made in some of the channels during the shutdown of the three piles on 20 May 1945. For example, it was found that the maximum observed temperature rises above those of the inlet water dropped approximately 3° C. to 4° C. in 0.240-inch zone of the 100-D pile. This is an important gain since, in terms of power, it means that the piles could be run about 15 Mw higher without exceeding what is now considered to be the safe limiting temperature rise above that of the inlet water. With the current limit fixed at 50° C. in the 0.240-inch orifice zone, it would seem as if the level of 280 Mw should be reached, and possibly surpassed, without difficulty.

3. The origin of a few of the scrams experienced by the piles has been traced to faults of various descriptions of the 230 KV Power System.

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Short circuits produced by lightning, falling objects (Japanese balloon), and sudden changes in the load of the power system are some of the faults which have been known to occur. With the view in mind of correcting certain defects in the relay and switching equipment (the purpose of which is to take a faulting line immediately out of service) a series of tests were planned. On 20 May 1945 the piles of the three 100-Areas were shut-down in order to permit the contemplated work. The Project Technical Group and the BPA test engineers ran numerous experiments. It is believed that the knowledge thus acquired will result in measures being taken to improve operating conditions.

4. During the month, observation of some of the four-inch cross-header screens of the 100-F pile showed black spots which proved to be tarry or asphaltic material. The source of these spots was traced to the clearwells, and it appears that the asphaltic substance adjacent to the cork filler of the expansion and contraction joints of the ceiling seeped and fell into the water of the clearwells, eventually reaching the cross-header screens. The joints have been scraped free of the extruded material, and it is believed that scraping several times a week for a short period will correct the fault; if not, some mechanical protection will probably be required. Inspection of the 100-B clearwells have shown them to be in good condition in this regard.

5. Refrigeration, which has been provided for the 100-D and 100-F Units, has been used to a moderate extent to date. Towards the end of the month, 5000-7000 tons were being used daily at 100-D; and approximately 4000 tons at 100-F. The cooling plants were operating well below one-half

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their respective rated daily capacities of 15000 tons and 10000 tons of equivalent ice.

6. Further studies of corrosion rates of the aluminum jackets of slugs have continued to show very satisfactory results. Slugs, which were in the 100-D Unit for approximately 138 days, show an average corrosion rate of 0.00006 inch per month and a maximum of 0.00008 inch per month. When these values are compared with the tolerance limit of 0.001 inch per month, the degree of effectiveness of the anti-corrosion measures can be gaged; and the further fact that no pitting was observed is another indication that the applied control measures are adequate.

7. On 29 April and 1 May, the power level control galvanometers in the 100 Areas showed violent oscillations, indicating earth tremors of some kind. Subsequent reports from outside sources asserted that earthquakes had occurred at approximately the times noted in the 100 Areas. No harmful effects were observed.

8. A note of minor interest is the fact that the Columbia River has risen well over ten feet since 5 March as a result of melting snows which provided water for the tributaries of this great river.

9. Except for planned or scheduled shutdowns, the 100-F pile has operated continuously without accidental scrams from 23 March to 25 May.

B. Shipments

a. On 5 May 1945, the first relatively large-scale shipment of soda pulp was made from the 100-B Area substantially in accordance with the program outlined in the conference held in Richland on 20 February 1945. The shipment consisted of seventy units of soda pulp which had been charged in

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the 100-B pile on 9 March and discharged on 26 April. As a result of the neutronic irradiation, a quantity of postum was produced which was estimated as equivalent to 210 cases.

C. The Effect of River Pollution on Fish Life

a. Fears have been expressed by some of those concerned with the fishing industries of the Northwest that the Project effluent into the Columbia River would cause deleterious effects on fish life, endangering thereby the existence of a major enterprise of this region. Although there was reason to believe that these fears were groundless, nevertheless it was considered expedient to make detail studies of the effect of river pollution on fish life. With this view in mind, a fully equipped laboratory was completed sometime ago in the 100-F Area. Actual operation is expected to start early in June, and the experimental studies will be conducted under the direction of Dr. Lauren Donaldson, a fishery expert of the State University of Washington; and the local supervision will be under Mr. Richard Foster, a former associate of Doctor Donaldson.

D. Chronology of Pile Events

<u>Date</u>	<u>Time</u>	<u>Power, Mw</u>	<u>Remarks</u>
27 April	1700	250	
29	1322	250	Control Room galvanometers recorded earth tremor.
7 May	1250	---	Scram. Cause unknown. Lost time: 24 min.
7	1353	250	
9	1649	---	Scram. Cause: short-circuit in instrument wiring. Lost [REDACTED] min.

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<u>Date</u>	<u>Time</u>	<u>Power, Mw</u>	<u>Remarks</u>
17 May	0626	---	Scram. Cause: Beckman failure. Lost time: 19 min.
	1706	---	Scram. Cause: Electrical surge, lost time: 17 min.
20	0740	0	Planned shutdown. Principle purpose to run BPA power level tests. About ten short tons of hot X-metal discharge having 2087.5 MWD.
21	0433	0	First signs of pile activity observed.
	0725	200	
	0745	100	Reduction in power necessitated by too high localized temperatures.
	1550	250	
	2230	245	High spot temperatures required reduction in power.
	2300	240	High spot temperature required reduction in power.
22	0155	250	Normal operation
25	2359	250	Normal operation

100-D File

28 April	0413	0	Scram, cause: operational error
	0425	250	
29	1322	250	Control room galvanometers recorded earth tremor.
	1743	0	Scram. Cause: Safety rod dropping into unit during a check test.
	1800	250	
3 May	0120	0	Scheduled shutdown. Ten short tons of hot X-metal with an MWD of 1870 were discharged.
	1754	1	Unit started
	1955	250	Normal operation



<u>Date</u>	<u>Time</u>	<u>Power, Mw</u>	<u>Remarks</u>
8	1030	265	Raised power to new level
12	1637	0	Scram. Cause unknown
	1659	265	Normal operation
20	0750	0	Scheduled shutdown. Principle purpose to run BPA power line tests. About ten short tons of hot X-metal with an MWD content of 1822.3 discharged.
	2337	1	Startup. First signs of pile activity shown
21	0116	255	
	0900	265	Normal operation
25	2359	265	Normal operation

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100-F Pile

3 May	0400	250	Normal operation
	0450	0	Scheduled shutdown. Purpose was to carry out a purge of the pile with a slurry of 50 ppm of diatomaceous earth.
	2250	0	Startup. First signs of pile activity indicated.
	2324	215	
4	1350	250	
20	1315	0	Scheduled shutdown. Principle purpose to run BPA power line tests. No metal discharge. A purge with a slurry of 100 ppm of diatomaceous earth carried out.
21	0050	0	Startup. First signs of pile activity indicated.
	0310	235	
	1320	250	
23	1530	0	Critical electrical power condition caused by broken insulator in 230 KV line required shutdown.
24	0140	0	Startup. First signs of pile activity indicated.
	0315	250	Normal operation
25	2359	250	Normal operation

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E. Comparison of B, D, & F Piles -- 2358, 25 May 1945

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	<u>B</u>	<u>D</u>	<u>F</u>
Day since start-up	242	160	90
Power	250	265	250
Accrued MWD	38218	35475	20578
Slugs pushed	23418	12880	0
Product pushed in MWD	12007	7621	0
No. slugs in pile	66402	68818	69969
No. channels (poison)	7	7	4
No. channels (dummies)	1	0	1
No. channels (soda pulp)	5	6	0
Inlet water temp. (ave.)	12.8° C.	10.5° C.	11.2/11.7° C.
Outlet " " "	44.1° C.	43° C.	43.5° C.
Scrams from 25 April to 25 May	3	5	0

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A. Narrative

b. 100 Area, General

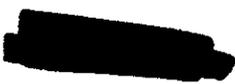
1. Further progress was made in elevating the power of two of the piles above their design capacities. At 0900, of 9 June, 1945, the 100-D ~~unit~~<sup>pile</sup> was given an additional increment of 15 MW by raising it from 265 MW to 280 MW. Similarly, the 100-F ~~Unit~~<sup>pile</sup> was raised <sup>at 0805 on 13 June 1945</sup> from 250 MW to 265 MW, and the current plan is to increase the latter level to 280 MW in July.

Both Units have performed in a gratifying manner at their new power outputs.

2. A circuit improvement in the wiring of the safety systems of the 100-D and 100-B piles, consisting of the installation of time delay relays, has resulted in cutting down the number of scrams produced by power surges. On 16 June 1945, a BPA surge shutdown the 100-F ~~Unit~~<sup>pile</sup>, which had no time delay relay, but did not affect the operation of the 100-D and 100-B piles. As soon as the opportunity arises, a similar device will be installed ~~in~~<sup>at</sup> the 100-F ~~Unit~~<sup>pile</sup>.

3. Near the end of the month the amount of refrigeration used reached about 8500 tons at <sup>100</sup>D and about 6000 tons at <sup>100</sup>F. ~~The amounts~~  
61 and 60% respectively of the rated capacity of the refrigeration plants.

4. Further corrosion rate studies of the aluminum jackets of slugs have continued to show very satisfactory results. Slugs which had been in the 100-D ~~unit~~<sup>pile</sup> for about 170 days, the severest test to date, showed an average corrosion rate of 0.00006 inch per month and a maximum of 0.0001 inch per month. Although the maximum is considered to be about the greatest to date, it is, nevertheless, about ~~0.00006~~<sup>10% of the standard operating</sup> standard.



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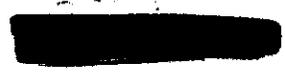
5. The work of replacing the old sealing over the expansion contraction joints on the clearwell roof in the 100-F Area is proceeding as rapidly as current conditions permit. The old flashing and old compound have been removed, and the surfaces scraped and cleaned. Some of the timbers have been set and some of the new plastic sealing compound has been applied preparatory to laying the roofing paper. A rough estimate indicates that about 40% of the job has been complete. Similar work on the 100-B and 100-D clearwells has not been started as yet.

C. Chronology of Pile Events

I. 100-B Pile

<u>Date</u>	<u>Time</u>	<u>Power MW</u>	<u>Remarks.</u>
25 May	2359	250	Normal operation.
31 May	0745	0	Unit shut down for pushing metal. 2592 pieces with an MWD value of 2095.3 were discharged; Three soda pulp channels discharged, containing about 200 pieces.
31 May	2346 2400	50 MW	Unit started to power.
1 June	0010	100 MW	Unit was raised to ultimate level in small increments of power, varying from about 75 MW to 5 MW, in order to avoid thermal shock and too intense hot spots.
5 June	1848	0	Scram caused by trouble on BPA System. Lost time: 16 minutes.
14 June	0700	0	Scheduled shutdown. 2520 pieces with an MWD content of 2175.8 were discharged
14 June	2125	0	Unit started.
14 June	2355	250 MW	Ultimate level attained by small increments of power in order to avoid thermal shock and too intense hot spots.
25 June	2359	250 MW.	

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2.

100-D File

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<u>Date</u>	<u>Time</u>	<u>Power MW</u>	<u>Remarks</u>
25 May	2359	265	Normal operation
4 June	0750	0	Unit shut down for purging and pushing. 1384 pieces were discharged with an MWD content of 1049.2
5 June	0406	0	Unit re-started.
	0515	255	
	1020	265	Before 265 MW was reached, development of hot spots necessitated a cut-back in power.
9 June	0900	280	Level raised from 265 MW to 280 MW.
12 June	0650	0	Unit scrambled as a result of an error in switch manipulation during Vertical Safety Rods check. Lost time: 10 min.
20 June	2150	0	Unit shut down for purging and pushing. 3710 pieces with an MWD content of 3251.2 were discharged.
21 June	1714	0	Unit re-started.
	2020	280	Ultimate level attained in small increments of power in order to avoid thermal shock and too intense hot-spots.

3.

100-F File

<u>Date</u>	<u>Time</u>	<u>Power MW</u>	<u>Remarks</u>
25 May	2359	250	Normal operation
1 June	0832	220	Power reduced for testing purposes.
1 June	1636	250	Power level restored.
6 June	1248	0	Unit scrambled as a result of an error in switch manipulation. Lost time: 18 minutes.
9 June	1358	0	Scram caused by an outside source of trouble, believed to be lightning. Lost time: 12 minutes.
12 June	0805	220	Level reduced for testing purposes.
12 June	1605	250	Level restored.

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100-F File continued

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<u>Date</u>	<u>Time</u>	<u>Power MW</u>	<u>Remarks</u>
13 June	0805	265	Level raised from 250 MW to 265 MW.
16 June	0606	0	Scram caused by trouble on BPA System. Pile was kept at zero level to carry out purging operation perviously scheduled for several hours later.
16 June	2215		Unit re-started.
17 June	0014) 0019)	- - -	Scrams caused by too rapid power rise before #4 Beckman was reset. Lost time: 18 minutes.
	0037	265	Power level restored.
25 June	2359	265	

d. <sup>100, 100, 100</sup> Comparison of B, D, & F - 2359, 25 June 1945

Day since startup	B 273	D 191	F <del>110</del> 121
Power Level	250	280	265
Accrued MWD	<del>4550</del> 46691.3	<del>4341</del> 43452	<del>28307</del> 28281.4
Slug pushed	28531	17952	0
Product pushed in MWD	16277.5	11905.9	0
Slugs in Pile	66410	68450	69969
No. of Channels (poison)	7	7	4
No. of Channels (dummy)	1	-	1
No. of Channels (soda pulp)	2	4	0
Inlet water temp. (ave)	16.9°C	12.9°C	14.5°C
Outlet water temp. (" )	48.1°C	46.5°C	46.5°C
OUTLET WATER TEMP (HOTTEST TUBE)	57.5°C	56.4°C	64.4°C
Scrams 25 May to 25 June.	1	1	3

\* \* \* \* \*

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Major F. A. Valente

Progress Report of the 100-Areas for the  
Monthly Period Ending 25 August 1945.

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b. 100 area operation

100-Areas, General

1. Pile Power

At 0915 of 11 August 1945, the power level of the 100-F unit was raised to 280 MW; and thus, the second step of operating the chilled piles at successively higher outputs was realized since the 100-D unit had been performing very well at 280 MW from 9 June to 25 August. Subsequently, a material reduction in the power levels of the three piles was applied for the technical reasons ~~briefly discussed below~~ mentioned under Significant Developments, Pile Power Limitations.

Authoritative information received by this Site indicates that concentrations of plutonium exceeding 200 grams per ton of uranium (roughly, 200 MWD per ton) contain an amount of  $Pu^{240}$  which is considered to be detrimental to the ultimate use of the product by the customer.

If the power levels of the piles were maintained at the maxima reached prior to the reductions, blends of rich and lean discharged slugs could be compounded to give the desired product concentration. The amount of hot metal pushed would have to be increased in order to meet quantities of plutonium scheduled for shipment. In turn, the cold metal requirements would be increased, with the possibility of overtaxing the slug manufacturing facilities of the 300 Area. As an alternative, it was decided to reduce the power levels of the piles, at least temporarily, until the problem could be studied in detail.

During the shutdown of the 100F Unit on 24 August, channels with an average, overall product enrichment of about 190 MWD were selected for discharge in order to comply with the above-mentioned product concentration requirement.

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Corrosion

2.

Corrosion studies completed on slugs removed from the 100-D unit on 27 July 1945, and the 100-F unit on 9 August 1945, have given very satisfactory results. Despite the fact that these slugs have been subjected to longest exposures to date (221 days in the case of the 100-D unit, and <sup>153</sup>~~226~~ days in the case of the 100-F unit), the corrosion has neither exceeded the average of 0.00007 inch per month nor the maximum of <sup>0</sup>1.00010 inch per month, the latter being less than tolerance by approximately a factor of ten.

Charging machine

3.

Short, practical tests of the hydraulic charging machine were made on the 17th and 24th of August during the scheduled shutdown of the 100-F unit. Longer tests, although desirable, would have upset the discharging schedule and the program of required maintenance work, with the ultimate possibility of interfering with production. The results show that apparently such machines will give the excellent performance expected of them as soon as the few improvements indicated by the tests are applied. The hydraulic pressure of 125 pounds per square inch is not fully adequate, but a small increase may give the desired results.

Refrigeration

The amount of refrigeration used in chilling the inlet water of the piles was approximately 12,000 tons in case of the 100-D unit; and about 8,500 tons in case of the 100-F unit.

The experimental work with fish, being conducted in Building 146-F, continues according to plan. Preliminary results, which are by no means to be considered final, appear to indicate that fish in the process water do not gain weight as fast as those in normal river water.

Shipments

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On 2 August 1945, scheduled shipments of soda pulps to the processing agency were made by airplane. The load consisted of 14 boxes containing 140 units of soda pulp with an ~~estimated~~ <sup>equivalent</sup> ~~phatum~~ equivalent of 651 cases.

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S.

Chronology of Pile Events

100-B Pile

<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 July	2359	250	Normal Operation.
5 Aug.	0451	0	Unit scrammed manually due to grade "Y" power condition.
	1543	0	Unit started to power.
	2220	250	Normal capacity reached.
	2359	220	Level reduction necessitated by a too rapid rise in graphite temperature.
6 Aug.	0630	250	Normal operation resumed.
25 Aug.	0900	225	Reduced operating level from 250 MW to 225 MW. for reasons relating to 49 concentration.
26 Aug.	2359	225	Normal operation.

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Chronology of Pile Events

DECLASSIFIED

100-D Pile

<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 July	2359	280	Normal operation.
26 July	0750	0	Scheduled shutdown for pushing of metal: 2520 pieces with an MWD content of 2397.7 were discharged.
	2013	0	Unit started to power.
27 July	1145	280	Normal operation resumed. Rate of power rise limited because of too rapid rise in graphite temperature.
5 August	0500	0	Unit scrammed manually due to grade "Y" power condition.
	1805	0	Unit started to power.
	1958	280	Normal operation resumed.
9 August	0700	0	Scheduled shutdown for pushing of metal: 3150 pieces with an MWD content of 3054.8 were discharged.
	1944	0	Unit started to power.
	2053	280	Normal capacity reached.
11 August	1910	0	Unit scrammed because of an electrical power surge.
	1931	280	Normal operation resumed. Lost time, 21 Minutes.
16 August	0755	0	Scheduled shutdown for pushing of metal: 3570 pieces with an MWD content of 3245.7 were discharged.
	1815	0	Unit started to power.
	2017	280	Normal operation resumed.
25 Aug.	0830	250	Reduced operating level from 280 to 250 MW.-- For reasons relating to 49 concentration.
26 Aug.	2359	250	Normal operation.

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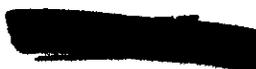
Chronology of Pile Events.

100-F Pile

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 July	2359	265	Normal operation.
27 July	0738	0	Scheduled shutdown for pushing of metal: 2520 pieces with an MWD content of 2148.8 were discharged.
	2130	0	Unit started to power.
	2343	175	The unit was scrammed manually because the shimrod pumps failed to operate properly.
28 July	0435	0	Unit started to power.
	2315	250	
29 July	1140	265	Normal operation resumed. Rate of power rise was limited by hot tubes.
1 August	0738	0	Scheduled shutdown for pushing metal: 3150 pieces with an MWD content of 2750.4 were discharged.
	2318	0	Unit started to power.
2 August	1945	265	Normal operation resumed. Rate of power rise was limited by too rapid rise in graphite temperature.
5 August	0453	0	Unit scrammed manually due to grade "Y" power condition.
	1704	0	Unit started to power.
6 August	0325	265	Normal capacity reached.
11 August	0915	280	Operating level raised.
17 August	0726	0	Scheduled shutdown for pushing of metal: 2790 pieces with an MWD content of 2580.8 were discharged.
	2258	0	Unit started to power.

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**Chronology of Pile Events**

100- F File Cont'd

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
18 August	1325	280	Normal operation resumed. Rate of power rise was limited by hot tubes.
24 August	0726	0	Scheduled shutdown for pushing of metal: 3360 pieces with an MWD content of 2500.0 were discharged.
	2140	0	Unit started to power.
	2332	225	Normal operation resumed at a reduced power level of 225 MW, for reasons relating to 49 concentration.
26 August	2359	225	Normal operation.

Comparison of B. D. and F Areas,  
at 2359, 26 August 1945.

	<u>B</u>	<u>D</u>	<u>F</u>
Day Since startup	335	253	183
Power level, MW.	225	250	225
Accrued MWD	<del>66300</del> <del>60341.1</del> 66075	<del>59791</del> <del>50801.8</del> 59540	<del>42613</del> <del>43585.8</del> 43388
Slugs pushed	36012	30519	14610
Product pushed (in MD)	22776.8	25336.9	9947.7
Slugs in pile	66159	67163	68801
No. of Channels (poison)	11	9	9
No. of Channels (dummy)	1	0	1
No. of Channels (soda pulp)	2	4	0
Inlet water temperature. (ave)	19.7	15.1	16.5
Outlet water temp. (ave.)	47.8	44.2	44.0
Scrams, 25 July to 26 August	1	1	0

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Progress Report of the 100-Areas for the  
Monthly Period Ending 25 September 1945.

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Narrative100-Area General

Pile operations at reduced power levels of 225 MW for B, 250 MW for D, and 225 MW for F continued satisfactorily during the month.

The study of corrosion effects on slugs as a consequence of water action and radiation exposure continued; and the results are considered satisfactory as may be gathered from the table given below.

<u>Date</u>	<u>Unit</u>	<u>Channel</u>	<u>Corrosion</u>		<u>Exposure, Days</u>
			<u>Maximum, in/mo.</u>	<u>Average, in/mo.</u>	
30 Aug. 45	D	2382	0.00009	0.00006	256
		2487	0.00008	0.00005	256
5 Sept 45	B	2382	0.00014	0.00008	224
6 Sept 45	D	2461	0.00007	0.00005	263
		1776	0.00010	0.00007	230

In this connection it is well to recall that for the purpose of comparison the upper limit on the corrosion rate is 0.001 in/mo.

The experimental model of the new automatic charging machine was modified to use air under pressure instead of water as the actuating or slug-driving medium. Extensive use of the pneumatic machine with the F-pile has given very good results, and it is now planned to build another. If the new one works as well as expected, five additional units will be constructed for service with the B- and D-Piles. The use of these machines will result in less channel wear, and fewer damaged slugs; and will effect a reduction in the number of men required during the discharging and charging operation.

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Separation of slugs having product contents below and above 200 MWD per ton is achieved by the use of a box-like device at the foot of the discharge chute in the storage basin of the 100-F pile. The richer slugs are trapped in the box, and the poorer ones drop, as before, on the floor of the basin. It is expected that similar devices will be in use in the other areas.

The amount of refrigeration produced will be reduced according to present plans. In the near future, the 100-F Area will use only that which is produced by two of the four machines; after 25 September, four of the six refrigeration machines will be used in the 100-D Area.

The fish which were being studied in Laboratory Building 146-F for possible deleterious effects as a result of their habitation in process water will be released to the river; and their place in the laboratory tanks will be taken by spawns, a shipment of which is expected to arrive sometime in October.

As per schedule, a shipment of soda pulp was made to the processing agency via ATC. One hundred and eighty pounds of soda pulp, contained in nine boxes, and with an estimated postum equivalent of 591 cases, constituted the load.

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Chronology of Pile Events

100-B Pile

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
26 Aug.	2359	225.0	Normal Operation.
29 Aug.	0745	0.0	Scheduled shutdown for pushing of metal; 4212 pieces with an MWD content of 3601.3 were discharged.
	2348	0	Unit started to power.
30 Aug.	0204	225.0	Normal operation resumed.
5 Sept.	0745	0	Scheduled shutdown for pushing of metal; 4220 pieces with an MWD content of 3412.9 were discharged.
	2139	0	Unit started to power.
	2345	225	Normal operation resumed.
12 Sept.	0755	0	Scheduled shutdown for pushing of metal; 4187 pieces with an MWD content of 3410 were discharged.
	2112	0	Unit started to power
	2234	225	Normal capacity reached.
13 Sept.	0205	210	Level reduced due to excessive rate of graphite temperature rise.
	0351	225	Normal operation resumed.
19 Sept.	0745	0	Scheduled shutdown for pushing of metal; 4210 pieces with an MWD content of 3270.0 were discharged.
	2145	0	Unit started to power.
	2359	175	
20 Sept.	0020	225	Normal capacity reached.
	0056	0	No. 1 scram due to #4 Beckman trip.
	0137	225	Normal operation resumed. Lost time 41 minutes.
25 Sept.	2359	225	Normal operation.

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Chronology of Pile Events

100-D Area

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
26 Aug.	2359	250	Normal operation.
30 Aug.	0800	0	Scheduled shutdown for pushing of metal; 4215 pieces with an MWD content of 3494.9 were discharged.
	2253	0	Unit started to power.
31 Aug	0007	250	Normal operation resumed.
6 Sept	0800	0	Scheduled shutdown for pushing of metal; 4197 pieces with an MWD content of 3397.1 were discharged.
	1930	0	Unit started to power.
	2112	250	Normal operation resumed.
15 Sept	1306	0	No. 1 scram; cause of trip unknown.
	1328	250	Normal operation resumed. Lost time 22 min.
20 Sept	0745	0	Scheduled shutdown for pushing of metal; 4216 pieces with an MWD content of 3292.0 were discharged. Bismuth tubes, 0980 and 3880 were pushed and recharged with bismuth material.
	2246	0	Unit started to power.
	2359	218	
21 Sept.	0005	250	Normal operation resumed.
25 Sept	2359	250	Normal operation.

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Chronology of Pile Events

100-F Area



<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
26 Aug	2359	225	Normal operation.
31 Aug	0728	0	Scheduled shutdown for pushing of metal; 4200 pieces with an MWD content of 3523.5 were discharged.
	2045	0	Unit started to power.
	2245	225	Normal operation resumed.
7 Sept.	0650	0	Scheduled shutdown for pushing of metal; 2205 pieces with an MWD content of 2004.8 were discharged.
	1923	0	Unit started to power.
	2123	225	Normal operation resumed.
14 Sept	0745	0	Scheduled shutdown for pushing of metal; 1995 pieces with an MWD content of 1980.3 were discharged.
	2023	0	Unit started to power.
	2123	225	Normal capacity reached.
	2253	0	Unit shutdown due to low pressure in tube 0574, caused by dirty screens.
15 Sept	0245	0	Unit started to power.
	0400	225	Normal operations resumed.
22 Sept	0740	0	Scheduled shutdown for pushing of metal; 4200 pieces with an MWD content of 3275.4 were discharged. Four poison columns were re-arranged decreasing the poison content of the pile by about 45 ih's.
	2103	0	Unit starting to power.
	2215	225	Normal operation resumed.
25 Sept	2359	225	Normal operation continues.

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Comparison of B, D, and F  
at 2359, 25 Sept. 1949

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	B	D	F
Days since startup	365	283	213
Power level M.W.	225	250	225
Accrued MWD	66465.3	66828.9	49952.9
Slugs pushed	52844	44827	24420
Product pushed in MWD	36488.9	35520.9	20730.7
Slugs in Pile	65583	66503	67721
No. of channels (poison)	11	9	9
No. of channels (dummy)	1	0	1
No. of channels (bismuth)	2	4	0
Inlet water temperature (ave)	17.3	14.3	14.1 & 14.7
Outlet water temp (ave)	45.6	43.0	41.8
Scrums, 26 Aug to 25 Sept.	0	1	0

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Progress Report of the 100-Areas for the  
Monthly Period Ending 25 October 1945

Narrative

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100-Area General

Pile performance at the reduced levels of 225 MW for B and F, and 250 MW for D continued to be very satisfactory during the month.

During the shutdown of the B-Pile on 30 October 1945, it is planned to charge one four-inch test sample of myrnaloy and one of neptunium. The myrnaloy sample may be discharged on 15 November for the purpose of conducting preliminary studies, yielding information of value in the use of this material in the pile as a poison substitute and as a source of uranium-233.

The study of corrosion effects on the X-metal slugs continued in the normal manner. The joint effect of water corrosion and radiation exposure is indicated by the measurements reported in the table below. Since the maximum tolerance is 0.001 in ch/month, it is apparent that the results are very satisfactory.

<u>Date</u>	<u>File</u>	<u>Channel</u>	<u>Corrosion</u>		<u>Exposure, Days.</u>
			<u>Maximum, in/mo</u>	<u>Average, in/mo.</u>	
11 Oct. '45	F	2281	0.00008	0.00004	229
11 Oct. '45	F	2379	0.00007	0.00004	229

Refrigeration units, employed in the D and F Area for the purpose of reducing the temperature of the pile cooling water were shutdown on 8 October '45 for the winter months.

One phase of the study on the effect of process water on fish life was completed on 26 September 1945 when the Chinook salmon fingerlings were released to the Columbia River, after an observation of a few months, from the laboratory troughs in Building 146-F. The steel-head trout, however, are still under observation.

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Another phase of the study was begun when, on 24 October 1945, salmon eggs were placed in the troughs for exposure to process water.

Shipments

On 4 October, a shipment of soda pulp consisting of eight boxes, was made via ATC to the processing agency. The equivalent of 664 cases of postum were contained in the 160 pounds of the soda pulp slugs.

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Chronology of Pile Events

100-B Pile

<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 Sept.	2359	225	Normal operation.
2 Oct.	0700	0	Schedule shutdown for pushing of metal: 2496 pieces with an MWD content of 1824.7 were discharged.
	2155	0	Unit started to power.
	2316	225	Normal operation resumed.
25 Oct.	0900	197	Production test made by the Technical Department.
	1400	225	Normal operation resumed.
	2359	225	Normal operation continues.

100-D Pile

25 Sept.	2359	250	Normal operation
4 Oct.	0730	0	Scheduled shutdown for pushing of metal: 3360 pieces with an MWD content of 2617.8 were discharged.
	1930	0	Unit started to power
	2050	250	Normal operation resumed.
6 Oct.	1803	0	No. 2 scram occurred due to improper manipulation of SN bypass switch.

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
6 Oct.	1815	250	Normal operation resumed. Lost time 12 minutes.
9 Oct.	0735	0	Scheduled shutdown for pushing of metal: 2811 pieces with an MWD content of 3321.9 were discharged.
	1930	0	Unit started to power.
	2022	250	Normal operation resumed.
11 Oct	1615	250)	(Power level fluctuated due to shortage of ) (water in "B" testhole. It is believed that ) (test samples are ruined. Cause, undetermined. )
	2112	198) -----	
	2215	250)	
18 Oct.	0605	0	Scheduled shutdown for pushing of metal; 2555 pieces with an MWD content of 1991.5 were discharged. The unit was given a solids purge.
	2128	0	Unit started to power.
	2304	250	Normal operation resumed.
25 Oct	0735	0	Scheduled shutdown for pushing of metal: 3317 pieces with an MWD content of 3943 were discharged.
	1954	0	Unit starting to power.
	2056	250	Normal operation resumed.
	2359	250	Normal operation continues.

100-F File

25 Sept.	2359	225	Normal operation.
27 Sept	0730	0	Scheduled shutdown for pushing of metal: 3360 pieces with an MWD content of 2558.9 were discharged.
	2005	0	Unit started to power.
	2150	2	Held at this level on account of control trouble on the emergency generator in 184 Bldg.
	2240	225	Normal operation resumed.

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
11 Oct.	0730	0	Scheduled shutdown for pushing of metal: 3370 pieces with an MWD content of 3256.2 were discharged.
12 Oct.	0018	0	Unit starting to power.
	0115	225	Normal operation resumed.
16 Oct.	0730	0	Scheduled shutdown for pushing of metal: 3360 pieces with an MWD content of 2603.7 were discharged.
	2133	0	Unit starting to power.
	2240	225	Normal operation resumed.
25 Oct.	2359	225	Normal operation continues.

Comparison of B, D, and F Areas  
at 2359, 25 Oct. 1945

	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup	395	313	243
Power Level, MW	225	250	225
Accrued MWD	73066.5	73810.1	56056.7
Slugs Pushed	55340	56870	34010
Product Pushed (in MWD)	38313.6	46805.4	28819.7
Slugs in Pile	66583	65756	66899
No. of Channels (poison)	11	9	9
No. of Channels (dummy)	1	0	1
No. of Channels (soda pulp)	2	4	0
Inlet Water Temperature (ave.)	14.7	14.6	14.5
Outlet Water Temperature (ave)	42.0	43.0	42.0
Scrams, (25 Sept to 25 Oct.)	0	1	0

Major F. A. Valente

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Progress Report of the 100-Areas for the  
Monthly Period Ending 25 <sup>Nov</sup> October 1945.

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Narrative

100-Area General

File performance continued satisfactory at the reduced levels of 225 MW for 100-B and 100-F, and at 250 MW for 100-D with the following minor exceptions.

An unexpected interruption in the operation of the 100-B File occurred on 1 November resulting from a break in a bleeder in the main steam line to the 115 Building. The shutdown consumed approximately one and one-half hour.

During the scheduled shutdown of the 100-B File on 15 November it became necessary to curtail operations because helium gas leaked from some of the thimbles about the vertical safety rods. The rate of efflux of the gas was roughly 1000 cubic feet per hour. At that time, temporary seals were made; and the mode of making permanent repairs is being studied.

During the past month, some of the slugs of the hot metal discharges from the 100-Area piles showed the presence of blisters. It was found that, roughly, one out of every 200 of those inspected was a blistered slug. Although the actual cause or causes have not been ascertained, to date there is no evidence that some of the slugs originated from batches in which the canning was not up to standard. There is some slight evidence that channels containing the metal with the highest concentration of plutonium possess the largest number of blistered slugs. It is intended to determine the canning date of one out of every twenty good slugs for the purpose of seeing whether or not a correlation exists between the canning

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date and the frequency of blisters. It is further planned to strip one of the blistered slugs for a more detailed inspection.

As a result of the large amount of hot metal discharges, the reserve reactivity of the piles has in general stopped increasing and has remained at a relatively steady value for some time in the case of the B and D units. But, with respect to the 100-F pile, a loss in reactivity was indicated; and, in order to compensate for it, an amount of poisoning equivalent to 40 ihs was removed.

The causes of the process water leaks from the retention basins of the 100-Areas were still under investigation, but repair of suspected faults was carried on nevertheless. The maximum leakage from 107-F and 107-D were estimated as less than 100 gallons per minute. From this value the subsequent leakage rates diminished steadily. In the case of 107-B, no definite evidence of large leaks is apparent. The situation is not viewed seriously.

According to measurements, the flow of warm process water from the retention basins of the three 100-Areas has produced a rise in temperature of the Columbia River of about 0.1°C.

#### Shipments

On 2 November two shipments of soda pulp consisting of 19 boxes, were made via ATC to the processing agency. The equivalent of 847 cases (revised calculation; on old basis, it amounts to 1159 cases) of postum were contained in 170 slugs or 340 pounds of soda pulp.

An irradiated sample of myrnaloy, weighing about 10 grams, was shipped on 15 November to Site C via ATC. The sample was charged in 100-B pile on 31 October and discharged on 15 November.

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Chronology of Pile Events

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>100-B Pile</u>	<u>Remarks</u>
25 Oct.	2359	225		Normal Operation.
26 Oct.	0953	0		No. 1 scram caused by BPA switching on 230 KV System.
	1003	225		Normal operation resumed. Lost time, 10 Minutes.
30 Oct.	0720	0		Scheduled shutdown for pushing of metal: 3462 pieces with an MWD content of 2781.4 were pushed. Special pieces 1 and 2 were charged. A solids purge of about 10 minutes duration was made.
31 Oct.	0240	0		Unit started to power.
	0350	225		Normal operating level attained.
	0419	200		Level reduced due to rate at which rods were going in.
	0910	225		Normal operation resumed.
1 Nov.	1051	0		Unit shutdown on account of a broken steam line to 115 building.
	1120	0		Unit starting to power.
	1224	225		Normal operation resumed.
15 Nov.	0455	0		Scheduled shutdown for pushing of metal: Special piece, No. 1 (thorium) was discharged and shipped via ATC. Only 2069 pieces with an MWD content of 1858.8 were discharged. Discharge operation cut short due to gas leaks.
16 Nov.	0104	0		Unit started to power.
	0224	225		Normal operating level attained.
	0417	215		Level reduced due to excessive rate of graphite temperature rise.
	0735	225		Normal operating level attained.
	1253	215		Level reduced due to excessive rate of graphite temperature rise.
	1450	225		Normal operation resumed.

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100-E Pile Continued

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
20 Nov.	0735	0	Scheduled shutdown to push metal. Balance of metal scheduled for 15 November push was discharged. 1664 pieces with an MWD content of 1352.4 were discharged. Unit was given a solids purge.
	2201	0	Unit started to power.
21 November	0035	225	Unit reached operating level.
25 Nov.	2359	225	Normal operation continues.

100-D Pile

25 Oct.	2359	250	Normal operation
6 Nov.	0725	0	Scheduled shutdown for pushing of metal: 3374 pieces with an MWD content of 2675.0 were discharged.
	2035	0	Unit started to power.
	2157	250	Normal operation resumed.
13 Nov.	0721	0	Scheduled shutdown for pushing of metal: 3356 pieces with an MWD content of 2976.5 were discharged.
	2135	0	Unit started to power.
	2332	250	Normal operation resumed.
20 Nov.	0735	0	Scheduled shutdown for pushing of metal: 3360 pieces with an MWD content of 2670.6 were discharged.
	2037	0	Unit started to power.
	2247	250	Normal operation resumed.
25 Nov.	2359	250	Normal operation continues.

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100-F File

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 Oct.	2359	225	Normal operation
1 Nov.	0725	0	Scheduled shutdown for pushing of metal: 3010 pieces with an MWD content of 3672.5 were discharged.
	2221	0	Unit started to power.
	2339	225	Normal operation resumed.
7 Nov.	1350	0	Unit scrambled; cause unknown.
	1425	225	Normal operating level attained.
8 Nov.	0500	0	Scheduled shutdown for pushing of metal: 2590 pieces with an MWD content of 2056.5 were discharged.
	2103	0	Unit started to power.
	2221	225	Normal operation resumed.
21 Nov.	0630	0	Scheduled shutdown for pushing of metal: 2765 pieces with an MWD content of 3550.0 were discharged.
	2105	0	Unit started to power.
	2220	225	Normal operation resumed.
25 Nov.	2359	225	Normal operation continues.

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Comparison of B, D, F : 2359, 25 Oct. 1945

		D	F
Days since startup	418	344	274
Power level, MW	225	250	225
Accrued MWD	79456.2	81082.9	62564.9
Slugs Pushed	62535	66960	42375
Product Pushed (in MWD)	44306.2	56127.5	38098.7
Slugs in Pile	65492	65426	66182
No. of Channels (poison)	11	9	9
No. of Channels (dummy)	1	0	1
No. of Channels (soda pulp)	4	4	0
Inlet Water Temperature (ave.)	10.5	10.9	10.9
Outlet Water Temperature (ave)	38.5	39.6	36
Scrams, (25 Oct. to 25 Nov.)	1	0	1

*Frank A. Valente*  
FRANK A. VALENTE  
Major, Corps of Engineers,  
Chief, Operations Units.

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Progress Report of the 100 Areas for  
the Monthly Period Ending 25 December 1945.

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Narrative

100-Area General

A serious interruption in pile operation occurred during the month. The 100-B was shut down on 11 December 1945 for a job of major repair. Ten thimbles, sheaths about vertical safety rods, were found damaged to an extent requiring immediate replacements. On 26 December 1945, the new thimbles were all in place; but the subsequent work of realignment of rods and reassembling of accessory parts will consume additional time, indicating that the 100-B pile will not attain its normal power level of 225 MW before 31 December 1945.

Borescopic examinations of some of the vertical safety rod thimbles of the 100-D and 100-F piles, and similar inspections of some of the thimbles of the horizontal control and regulating rods of the 100-B and 100-F units show them to be in good condition, requiring no replacements.

The cause of the disintegration of the bottom portion of the thimbles is not known at this time, but one possible cause might be the presence <sup>of</sup> acidulated, condensed moisture; presumably, nitric acid would be the active agent of corrosion.

As a matter of general information, the activity at the thimbles was about 1,000 mr/hr when 70 inches of the thimbles <sup>were</sup> out of the pile. At ten feet, the activity dropped to 15 mr/hr. The kind of safety measures required can be gauged from these data.

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As a temporary measure, intended to offset partially the loss incurred in production as a result of the prolonged shutdown of the 100-B pile, the 100-D and 100-F units were raised to 275 MW and 250 MW from their previous levels of 250 MW and 225 MW.

A blistered slug, taken from the 100-B pile, had its aluminum coating removed. An examination of the exposed metal surface indicated the same type of formations that were observed previously on the aluminum surface. Further studies are in progress.

During the shutdown of 6 December 1945, a crack on the downcomer of 100-D was found and subsequently repaired. The cause is not definitely known, but the crack is probably a result of continued vibration.

Salmon eggs, placed in the experimental troughs of 146-F Building, hatched without marked differences being observed despite the fact that the waters of the several troughs contained varying proportions of process water.

Condenser water of the 100-F area is being returned and mixed with the raw water supply to filter plant. This is being done to improve settling of the floc.

#### Graphite Problem

Some atoms of graphite are displaced or dislocated from their natural positions as a result of repeated collisions with neutrons. When this displacements occur, the physical properties of the graphite, such as thermal conductivity, are altered; furthermore, the atoms possess more energy in the new positions than in their old positions. This phenomenon is known as the Wigner Effect or Wigner Disease. Theory and

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observations indicated that these alterations in the physical characteristics of the graphite could be cured either partially or practically completely by annealing at moderate or relatively high temperatures. Szilard pointed out that this annealing process would result in the release of heat (by the displaced graphite atoms returning to their original positions, thereby giving up stored energy) which would raise the graphite temperature; this in turn would produce, successively, more annealing and another rise in temperature, finally culminating in temperature rise of explosive rapidity.

An interim report on the Wigner and Szilard Effects has just been completed. It is a compendium of the results obtained, both experimentally and theoretically, relating to the solutions of the graphite problems.

According to the interim report, a sudden rise in temperature of  $100^{\circ}\text{C}$  of heavily irradiated test samples of graphite occurred in 10 seconds when the sample was raised to a critical temperature after removal from the pile.

If a pile temperature rise of  $100^{\circ}\text{C}$  is superimposed on  $100^{\circ}\text{C}$  of a sudden energy release, a jump of  $200^{\circ}\text{C}$  in temperature of the matrix of the pile would occur. Under such operating conditions, the following consequences might follow.

1. The thimbles may reach a temperature of roughly  $350^{\circ}\text{C}$  which is well below  $660^{\circ}\text{C}$ , the melting point of aluminum.

2. The graphite may increase in dimensions by 0.5 inch which, it is believed, would not have serious consequences.

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3. The quick liberation of energy in the graphite would put an extra load on the water. If the water were lost by boiling, the reactivity would increase by about 2%. However, the graphite in its present irradiated condition is a much poorer conductor of heat, having a characteristic period for transfer of heat from graphite to water of about 40 minutes. The cooling water requires  $1\frac{1}{2}$  second to traverse the active part of the pile. If the power level is under control, it seems that the transfer of heat to the water would be too diffuse in point of time to cause serious damage.

4. The most serious effect of a temperature rise of 200°C. would be a sudden jump in reactivity of roughly 140 ih; for 100 ih the power would become 2.7 times greater at the end of 15 seconds; for 200 ih, it would reach the same level in 3 seconds. The fear of the possible loss of water in such cases is then well-founded. This loss of water might thus be followed, subsequently by a further and dangerous rise in power level.

As a practical and useful consequence of earlier studies on the graphite problems, conditions of pile operation were defined under which there was a small probability of the rapid release of stored energy. Based on these conditions, a procedure for pile start-ups was adopted and put into effect last July. The latest results of this interim <sup>report</sup> / bearing on this procedure show that the procedure as established is conservative.

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Early studies demonstrated the existence and the magnitude of thermal curing producible by temperature annealing. It appears that there is a second process which contributes to curing; namely, neutron bombardment.

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The thermal conductivity of the irradiated graphite test samples has been reduced to date by a factor of approximately 26 times. As the length of exposure time increases, there appears to be no indication that this decrease has stopped. Similarly, the amount of stored energy of the irradiated graphite is increasing with time. The other physical properties, apparently, have attained a maximum change.

Shipments.

On 5 December 1945, two shipments of soda pulp consisting of 19 boxes were made via ATC to processing agent. The equivalent of 1054 cases of postum were contained in 186 slugs or 372 pounds of soda pulp.

Chronology of Pile Events

<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>100-B Pile</u>	<u>Remarks</u>
25 Nov	2359	225		Normal operation.
4 Dec.	0430	0		Scheduled shutdown for pushing of metal; 3466 pieces with an MWD content of 2824.0 were discharged.
5 Dec	1150	0		Unit started to power.
	1312	225		Normal operation resumed.
6 Dec.	1251	0		Scheduled shutdown to recharge two (2) temporary poison tubes with X-metal.
	1535	0		Unit started to power.
	1657	225		Normal operation resumed.
11 Dec.	0101	0		Scheduled shutdown to inspect vertical safety rod thimbles and shimrod thimbles.

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
Dec. 11	continued		Also to make necessary repairs as required. 7922 pieces with an MWD content of 10,443.3 were discharged.
25 Dec.	2359	0	Unit down for repairs.

100-D File

25 Nov.	2359	250	Normal operation
5 Dec.	0357	0	Unit scrambled because of power troubles on BPA system.
	0432	250	Normal operation resumed. Lost time 36 minutes.
6 Dec.	0650	0	Scheduled shutdown for pushing of metal. 4165 pieces with an MWD content of 3347.7 were discharged.
	2332	0	Unit started to power.
7 Dec.	0012	250	Normal operation resumed.
13 Dec.	0645	0	Scheduled shutdown for pushing of metal; 2511 pieces with an MWD content of 1978.0 were discharged. Boroscoped two vertical rod thimbles and one shimrod thimble. Thimbles appear satisfactory.
	1959	0	Unit started to power.
	2300	250	Normal operation resumed.
19 Dec.	1100	275	Normal power level raised from 250 MW to 275 MW.
22 Dec.	1522	0	No. 1 Scram due to improper testing of emergency alternator.
	1547	275	Normal operation resumed. Lost time 25 minutes.
25 Dec.	2359	275	Normal operation continues.

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100-F File

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<u>Date</u>	<u>Time</u>	<u>Power, MW</u>	<u>Remarks</u>
25 Nov.	2359	225	Normal operation.
29 Nov.	0730	0	Scheduled shutdown for pushing of metal. 3360 pieces with an MWD content of 2601.9 were discharged.
	2045	0	Unit started to power.
	2205	225	Normal operation resumed.
14 Dec.	0600	0	Scheduled shutdown to boroscope one horizontal and two vertical safety rod thimbles. Thimbles found in good condition.
	2154	0	Unit started to power.
	2250	225	Normal operation resumed.
19 Dec.	0950	250	Normal power level raised from 225 to 250 MW.
25 Dec.	2359	250	Normal operation continues.

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Comparison of B, D, and F, Areas at 2359, 25 December 1945

	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup	456	374	304
Power Level	0	275	250
Accrued MWD	82495.3	88391.7	69185.7
Slugs Pushed	74246	73636	45735
Product Pushed (MWD)	57867.7	61453.2	40700.6
Slugs in Pile	64821	65150	65894
No of channels (poison)	21	9	9
No of channels (dummy)	1	0	1
No. of channels (soda pulp)	4	4	0
Inlet water temperature (ave.)	7.1	7.5	7.7
Outlet water temperature (ave.)	7.1	39.6	36.5
Scrams (26 Nov to 25 Dec.)	0	2	0

82495  
 88391  
 69186  
 240072  
 223  
 17

*Frank A Valente*  
 Frank A. Valente, *by A.S.*  
 Major, Corps of Engineers,  
 Chief, Operations Units.

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Progress Report of the 100-Areas for the Monthly Period Ending  
25 January 1946

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NARRATIVE

The replacement of the defective vertical rod thimbles in the 100-B Pile was completed; and the unit, shutdown since 11 December 1945, was started to power on 29 December 1945. Altogether ten thimbles (15, 34, 38, 35, 29, 37, 36, 21, 28, 10) were found defective and were replaced.

All vertical rod thimbles and three horizontal rod thimbles in the 100-D and the 100-F piles were examined with the boroscope, and were found to be satisfactory.

It was believed that if a blistered slug were cut in two, information explaining the formation of the blisters would be obtained; but serious difficulties were encountered in efforts to accomplish this purpose. A turning lathe was installed under water in the inspection pit of the 100-B Area. An attempt was then made to cut a slug in two sections, using remote control on the lathe. With the initial trial only a cut of small depth could be obtained, and the subsequent examination of freshly exposed metal surface did not give any information that would explain the blistering. Further attempts were made to cut through the slug, but were unsuccessful because, as the depth of cut increased, harder metal was encountered and the tool was dulled and the metal dragged. Finally, one slug, with solid supports at each end, was broken in two by a blow at its center. A preliminary examination did not reveal any information of importance but further study is being made.

The operating levels of the Hanford piles were changed as follows:

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100-D, on 30 December 1945, from 275 MW to 225 MW; 100-F, on 1 January 1946, from 250 MW to 225 MW; 100-B on 29 December 1945, was raised to 225 MW, its former nominal value.

It had been observed that the top of the piles have been rising at the rate of approximately 0.1 inch per month. It was believed that the changes in the crystalline structure of graphite were responsible, but other causes could not be discarded a priori. In the case of the 100-B Pile, it was decided to select three special channels, discharge them of their contents and determine whether or not "bowing" of the aluminum tubes had occurred. The examination showed that the channel near the top had "bowed" about 1.7 inches, an amount sufficient to prevent sighting through it. Similar inspections of the 100-F Pile indicated a corresponding movement of approximately 1 inch. Examinations of similarly selected channels of the 100-D Pile will be made later. The neoprene gas-seal at the edges of the 100-B Pile shows some bulging effect.

A burial ground to receive discarded, radio-active equipment and materials was established in 100-D Area.

Changes of the poison pattern of the 100-D and 100-F Piles are being made to conform to the pattern now in use in the 100-B Pile, thereby improving flattening.

An irradiated sample of neptunium, charged on 31 October 1945, was discharged on 20 January 1946. Readings were taken to determine the necessary amount of shielding required. The weight of the completed container is about 160 pounds; and, in dimensions, it is roughly 10" x 10" x 10". It will be shipped by train on 29 January 1946.

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Further studies have been made in 100-B Area in reference to leakage out of the 107 retention basin. Tests indicate that the leakage from the south basin in 100-B was found to be about 100- gpm and this amount, per se, is not considered serious. Regular inspections will be continued in the case of all retention basins.

During shutdown of 100-F Pile on 20 January, the oil in the horizontal rod control system was changed, the valves were examined and new leathers were installed where necessary. It is hoped that this will prevent any repetition of the control rod sticking.

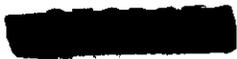
SHIPMENTS.

On 18 January 1946, thirteen boxes, containing 248 pounds of irradiated soda pulp with a postum equivalent of 766 cases, were shipped to the processing agency via ATC.

CHRONOLOGY OF PILE EVENTS, 100-B PILE. 26 Dec. '45 to 25 Jan. '46

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 Dec. '45	2359	0	Unit still down for repairs.
29 Dec. '45	1508	0	Unit started to power,
	1643	--	Unit scrambled, cause unknown.
	1834	225	Nominal power level attained.
	1922	212	Power level reduced because of excessive rate of graphite temperature rise.
	2140	215	
	2210	220	
30 December	1039	0	Scheduled shutdown for pushing of 5 poison tubes. Tubes recharged with x-metal.
	1100	0	Unit started to power.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
30 Dec '45	1402	225	Nominal power level attained.
	1645	220	Power level reduced because of excessive rate of graphite temperature rise.
	1655	215	
	1750	210	
	1905	215	
	1950	225	Nominal power level attained.
31 Dec.'45	0246	210	Power level reduced because of excessive temperature of biological shield, graphite, steel and thermal shield.
	1500	225	Nominal power level attained.
1 Jan.'46	1350	220	Power level reduced because of excessive temperature in biological shield, graphite, steel and thermal shield.
	1455	225	Normal operation resumed.
5 Jan '46	0900	200	
	1900	225	Made a production test for Technical Department.
8 Jan.'46	0600	0	Scheduled shutdown for pushing of metal consisting of 2672 pieces and an MW content of 2184 were discharged. Two "B" channels were also pushed and re-charged with virgin "B" material.
	1920	0	Unit started to power.
	2233	225	Nominal power level attained.
20 Jan '46	0745	0	Shutdown made to meet request of BPA, to push metal, and to determine whether or not structural changes in graphite were causing the pile to "Bow". 630 pieces, with an MW content of 492.0 were discharged.
21 Jan '46	0210	0	Unit started to power.
	0411	225	Normal operation resumed.
25 Jan '46	2359	225	Normal operation continues.



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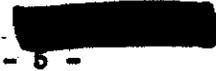
<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
25 Dec. '45	2359	275	Normal operation.
30 Dec. '45	0900	225	Normal operating level reduced.
31 Dec. '45.	0645	0	Scheduled shutdown for pushing of metal; 2544 pieces with an MWD content of 1997.0 were discharged. Four poison tubes, (3169, 3179, 1569 and 1579), were "strengthened".
	1855	0	Unit started to power.
	2005	225	Normal operation resumed.
18 Jan '46	0600	0	Shutdown made in order to complete program of boroscoping vertical and horizontal thimbles, and to push metal. In all, 4320 pieces with an MWD content of 3537.0 were discharged.
21 Janu'46	1359	0	Unit started to power.
	1550	225	Normal operation resumed.
22 Jan '46	0745	0	Scheduled shutdown to replace temporary poison tubes with metal.
	1025	0	Unit started to power.
	1156	225	Normal operating level attained.
	1455	215	Level lowered because of excessive packing (graphite) temperature.
	1900	225	Normal operation resumed.
25 Jan '46	2359	225	Normal operation continues.

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100-F File

25 Dec '45	2359	250	Operations normal.
27 Dec '45	0720	0	Scheduled shutdown for pushing of metal; 2520 pieces with an MWD content of 1950.0 were discharged.
	2025	0	Unit started to power.
	2230	250	Normal operation resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
1 Jan '46	0000	225	Operating level reduced.
3 Jan '46	0715	0	Scheduled shutdown for pushing of metal: 4179 pieces with an MWD content of 3134.0 were discharged.
	2128	0	Unit started to power.
	2228	225	Normal operation resumed.
20 Jan '46	0700	0	Shutdown made in order to complete program of boroscoping vertical and horizontal thimbles, and to push metal. In all, 3549 pieces with an MWD content of 2823 were discharged.
23 Jan '46	2233	0	Unit started to power.
	2345	225	Normal operating level attained.
24 Jan '46	1200	0	Scheduled shutdown to push temporary poison tubes.
	1450	0	Unit started to power.
	1600	225	Normal operation resumed.
25 Jan '46	2359	225	Normal operation continues.

COMPARISON OF B, D, & F AREAS. At 2359 - 25 JANUARY 1946.

	<u>B</u>	<u>D</u>	<u>F</u>
Day since startup	487	405	335
Power Level (MW)	225	225	225
Accrued MWD	88238	94664	75160
Slugs Pushed since startup	77151	80500	55983
Product Pushed (in MWD)	60302	66987	48608
Slugs in Pile	65052	64974	65502
No of Channels (poison)	11	10	9
No of Channels (dummy)	2	0	2
No. of channels (soda pulp)	4	4	0
Inlet Water Temp. (Ave.) °C	6.3	6.5	6.5
Outlet Water Temp. (Ave.) °C	35.7	33.2	33.0
Scrams, 25 Dec. 45 to 25 Jan '46	1	0	0

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 Frank A. Valente  
 FRANK A. VALENTE,  
 Major, Corps of Engineers,  
 Chief, Operations Units.

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Progress Report of the 100-Areas for the Monthly Period Ending  
25 January 1946  
*Feb.*

NARRATIVE

Request piece No. 1 from 100 B Area was delivered to M. I. on 28 January 1946 for shipment.

The north retention basin in the 100-B Area was tested for leakage. The basin level dropped from a maximum of  $20\frac{1}{2}$  inches per day to approximately 12 inches per day during a test of several days. The  $20\frac{1}{2}$  inches per day represents approximately 450 gallon per minute. The basin was not completely emptied and studies are now being made as to methods for removing the active material that has accumulated in the bottom of the basin. No decision has been made as to permanent repairs. An attempt will be made to install coffer dams around the expansion and construction joints and use asphalt as a sealing agent.

A burial ground to receive discarded, radio-active equipment and materials was established in the 100-F Area. The burial ground in 100-B Area is also being used as a storage area for equipment and materials that may be used again but which are too radioactive to store in the warehouses.

During the shutdown of 7 February 1946 in 100-F, an attempt was made to check the "bowing" of the pile with a mechanical device; this method was not entirely satisfactory. A new method using a column of water or mercury is now under development.

A schedule for a uniform method of examining the pile tubes and thimbles is under preparation and is to be started in the near future.

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A vertical thimble was set up in the 190-B building to facilitate the study of instruments for measuring any movement or other abnormal condition which may affect the operation of the vertical safety rods.

The study of Pomona pumps was continued. Tests were made in 100-D Area to determine if there was any flow of electric current through the river pumps that might cause electrolysis.

The new-type charging machines have been pronounced as satisfactory and the manufacture of additional machines is continuing; however, the assembling of the machines is being delayed by having to wait for parts on order.

A few steelhead trout have been under observation in the process water troughs, these specimens are not gaining weight satisfactorily. A fair percent of the salmon eggs placed in the process water troughs have hatched. However, these fingerlings have had a very high mortality rate and do not gain in weight satisfactorily. In the tanks which have 1 part process water to 100 parts of river water the hatching of the eggs and the growth of the fingerlings has been satisfactory.

Tube #2076 in 100-D was charged as a papoose tube during shutdown of 12 February. Three carbon papooses were installed. ✓

Of all the discharged slugs examined (all slugs are now being examined), only 0.3% have been found "blistered". A total of 197 "blistered" slugs have been found, distributed as follows: 100-B Area, 77; 100-D Area, 16; and 100-F Area, 104.

Of the total number of slugs examined, 3% have come from normal concentrated tubes; at 100-F, 21 blistered slugs were found in one tube which is the maximum found in one tube to date.

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The neoprene seals on the pile are being watched closely and tests are being made on a sample of the seal to determine the failure point. The tension on the test sample is being increased 5% per day.

CORROSION TUBES

The following tubes were discharged from the 100-F Pile on 20 January 1946.

<u>Tube No.</u>	<u>Days Exposure</u>	<u>Penetration in Inches Per Month</u>	
		<u>Average</u>	<u>Maximum</u>
2274	330	0.00003	0.00006
2580	330	0.00004	0.00007
3576	330	0.00004	0.00007
* 3586	330	0.00004	0.00005

\* Only the down stream 17 slugs were included.

SHIPMENTS

On the 8th of February 1946, 13 boxes, containing 248 pounds of irradiated soda pulp with a postum equivalent of 880 cases (on the revised basis of calculation) were shipped to the processing area via ATC. In addition, this shipment contained approximately 240 pieces of bismuth consisting of 120 unactivated canned slugs.

Earth tremors were experienced in all Areas as indicated by severe movements of the galvanometers during the time from 1918 to 1925 (7 min). No other indications noted.

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CHRONOLOGY OF PILE EVENTS, 1

JANUARY TO 25 FEBRUARY 1946.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL</u>	<u>REMARKS</u>
25 Jan. 1946	2359	225	Normal Operation
5 Feb	0400	0	Scheduled shutdown for pushing of metal; 4829 pieces with an MWD content of 3095 were discharged.
6 Feb	0431	0	Unit starting to power.
	0624	200	
	0830	100	Power level reduced due to excess reactivity gained by the pile because of prolonged shutdown.
	0922	200	
	1815	225	Normal operation resumed.
17 February	1522	0	Unit scrambled due to a fuse blowing in No. 2 Beckman.
	1556	225	Normal operation resumed. Lost time, 34 minutes.
18 Feb.	1612	0	Unit scrambled by tube failure in No. 3 Beckman trip controller.
	1635	225	Normal operation resumed. Lost time, 23 minutes.
19 February 1946	0715	0	Scheduled shutdown for pushing of metal: 4196 pieces with an MWD content of 3222 were discharged. Tube #4574 was charged with lead for inspection purposes.
	2257	0	Unit starting to power.
	2359	100	
20 Feb	0035	225	Normal operating level attained.
	0906	210	Level reduced due to excessive rate of graphite temperature rise.
	1200	225	Normal operation resumed.
25 Feb	2359	225	Normal operation continues.

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100-D PILE

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL MW</u>	<u>REMARKS</u>
25 January 1946	2359	225	Normal operation.
29 Jan	0720	0	Scheduled shutdown for pushing of metal: 3362 pieces with an MWD content of 2553 were discharged, also 2 "B" channels were discharged and recharged.
	2110	0	Unit started to power.
	2240	225	Normal operating level attained.
30 Jan	0215	215	Lowered level due to excessive packing temperature.
	0445	225	Nominal level attained.
	0550	215	Lowered level due to excessive packing temperature.
	0745	225	Normal operation resumed.
12 Feb	0700	0	Scheduled shutdown for pushing of metal: 3380 pieces with an MWD content of 2652 were discharged.
	2134	0	Unit starting to power.
	2300	225	Normal operation resumed.
21 Feb	0830	195	Power level was reduced to 195 MW for a production test.
	1230	225	Normal operation resumed.
25 Feb	2359	225	Normal operation continues.

100-F PILE

25 January 1946	2359	225	Normal operation.
7 Feb	0640	0	Scheduled shutdown for pushing of metal: 4192 pieces with an MWD content of 3217.0 were discharged.
8 Feb	0125	0	Unit starting to power.
8 Feb	0300	225	Normal operation resumed.
21 Feb	0630	0	Scheduled shutdown for pushing of metal: 3348 pieces with an MWD content of 2562 were discharged.

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[REDACTED]

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
21 Feb	2110	0	Unit starting to power.
	2227	225	Normal operation resumed.
25 Feb.	2359	225	Normal operation continues.

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Comparison of B D & F Areas, at 2359 25 February 1946

	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup	518	436	366
Power Level (MW)	225	225	225
Accrued MWD	94782	101344	81790
Slugs pushed since startup	84976	87242	63523
Product pushed (in MWD)	66619	72192	54387
Slugs in File	64939	64824	65322
No. of Channels (poison)	11	10	9
No. of Channels (dummy)	3	0	2
No. of Channels (soda pulp)	4	4	0
Inlet Water Temp (Ave) °C	6.9	6.8	6.7
Outlet Water Temperature (Ave) °C	35.3	33.5	33.8
Scrams	2	0	0

FRANK A. VALENTE,  
Major, Corps of Engineers,  
Chief, Operations Units.

*Arthur Z. Lassila*  
Arthur Z. Lassila

94782  
101344  
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AZL/ ABS

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Progress Report of the 100-Areas for the Monthly Period Ending 25 March 1946.

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*Check Mr. Page's 4x5  
radiation chart.  
HES*

NARRATIVE

The observed expansion of the graphite packing in the piles has reached proportions to which serious consideration is being given to the eventual possible consequences of following effects.

Bowing of Process Tubes

Eventually the following consequences are expected: Inability to discharge or charge channels; strain the Van Stone joints to breaking point; jam the gun barrels, possibly to the point of making it impossible to replace broken graphite.

Bowing of Vertical Thimbles.

These tubes, if bowed sufficiently, may be ruptured by the falling vertical safety rods thereby permitting the escape of radioactive gases.

Bowing of Horizontal Thimbles.

These tubes, if bowed sufficiently, would make horizontal control rods inoperative.

Expansion of Neoprene Seals.

If the expansion attains sufficient magnitude, the seals will rupture thereby permitting escape of radioactive gases. Preliminary tests indicate stretching neoprene to 55% of its original length results in rupture.

Formation of Shield "Windows."

The expansion may become sufficient to cause the biological shields to separate thus forming a "window" through which pile radiation will escape into the Pile building and Area.

Pile Stability

The expansion may become such as to tilt the biological shield causing its weight to outwardly be concentrated on a much smaller area of the base concrete thereby causing the concrete to crumble.

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It has been observed that near the tops of the piles, the aluminum channels were bowed upwards to the following extent: 100-B, about  $1\frac{1}{8}$  inches; 100-F, about  $1\frac{1}{4}$  inch. The bowing is increasing approximately at the rate of 0.1 inch per month.

On 6 March 1946 General Nichols visited the Project. During his stay the above-noted problems connected with the expansion of the graphite packing were discussed with the Contractor's representatives, in particular, Mr. R. M. Evans; and one result of the above-noted discussion was the decision to place the 100-B unit in the standby condition.

The power level of the 100-B Pile was reduced from 225 MW to 150 MW on 14 March 1946 in order to conduct pile studies or production tests. On 15 March 1946, the level was reduced to 0.5 MW, and the indicated studies continued. Finally, on 19 March 1946, the pile was shutdown for an indefinite period, but it will be held in a standby condition. It is expected that its reactivation to full power, if required, can be accomplished within thirty days.

On 16 March 1946 the operating level of the 100-D Pile was raised from 225 MW to 250 MW, while the operating level of 100-F was reduced from 225 MW to 200 MW on 15 March 1946.

On 26 March 1946, thirty-three, four-inch myrnaloy slugs, weighing 79 pounds were charged in 100-D Pile for a period of irradiation of about two months. As a result of this amount of exposure, about 10 grams of product 23 will be produced. These myrnaloy slugs were substituted for the poison slugs in channel 1474, and they possess an absorbing capacity of about 36 ih as compared with the previous value of about 34 ih for this channel. The irradiation was authorized by the District Engineer in his letter of 5 October 1945 to Mr. R. M. Evans of the Contractor's Wilmington Office.

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During the assortment of the slugs which were discharged during the shutdown of the 100-B Pile on 19 March 1946, nine blistered slugs have been found so far. These pieces were found among the so-called "over-age", highly enriched slugs. The cause of the "blistering" is not definitely known, but several theories of uncertain merit are extant.

The corrosion studies have been continued; and the results are satisfactory as may be seen from the following tabulation especially when comparison is made with the accepted tolerances of 0.001 inch/mo.

<u>Channel</u>	<u>Exposure, Days</u>	<u>Corrosion, Inch/Mo.</u>	
		<u>Average</u>	<u>Maximum</u>
2369 D	176	0.00003	0.00006
2574 D	228	0.00004	0.00006
2974 D	197	0.00005	0.00007
3885 D	246	0.00004	0.00005
1661 B	282	0.00004	0.00006
2978 B	261	0.00005	0.00008

Irradiation of Special Samples in the Hanford Piles

A review of the requests for the irradiation of special samples in the Hanford Piles is made in the letter of 8 March 1946 to the District Engineer from the Area Engineer, Site C. In general, the subsequent study of these irradiated samples is expected to yield information of importance in the design and construction of future piles, processing chemistry, postum substitutes, etc. A brief summary of the requests and their current status is submitted herewith. The official numerical designations, known as Request Numbers are listed below when assigned.

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<u>Material to be Irradiated</u>	<u>Request Number</u>	<u>Remarks</u>
Myrnaloy	--	79 pounds or 33 slugs charged in 100-D on 26 March 1946.
Lithium Fluoride	15	Four cans received, will be charged in pile in near future.
Beryllium Nitride	13	Not received. Will produce C <sup>14</sup> .
Beryllium Oxide	9	Not received.
Neptunium-237	7	5 mg received and canned, will be inserted in pile in near future.
Uranium-Aluminum Alloy	14	Not received.
Uranium-238	8	7.8 g received and canned; will be inserted in pile in near future.
Uranium-235	12-A	Not received
Uranium-233	6	5 mg received and canned; will be inserted in pile in near future.
Radium	11	Not received, May not be submitted.
High G T Plutonium	12-B	Not received.
<sup>241</sup> 95	16	Not received.
Samarium Oxide	10A	Not received.
Gadolinium Oxide	10B	Not received.
Graphite	17	A 16-pound cylinder shipped to Site C on 22 March 1946.
X-metal Slugs	4	Six high Exposure slugs shipped to Site C on 22 March 1946.
Poison Cadmium Slugs	18	Not shipped.

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The following additional samples of materials may be submitted for irradiation by the Metallurgical Laboratory in the next few months according to the letter of 7 March 1946 to the District Engineer from the Area Engineer, Site C:

Mixture of isotopes of elements 95 and 96;  
Protoactinium-231;  
Thorium-230;  
Thallium;  
Thorium;  
Uranium-232;  
Plutonium-238.

SHIPMENTS

During the past month, three shipments were made from the 100-Areas.

One hundred twenty-four slugs or 248 pounds of irradiated soda pulp, having a postum equivalent of 752 cases, were shipped to the processing agency on 15 March 1946 via ATC.

An irradiated rod of graphite,  $3\frac{1}{2}$  inches in diameter and 30 inches long, having received an exposure of 921 megawatt days per central ton was shipped to Site C on 22 March 1946. This shipment is known as Request No. 17 in the list of special samples which are being irradiated, or are to be submitted for irradiation, in the 100-Area piles.

Six high-exposure slugs of X-metal (Request No. 4) were shipped to Site C on 22 March 1946 via rail. These slugs had received a pile exposure of 292 days corresponding to 580 megawatt-days per adjacent standard ton.

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CHRONOLOGY OF PILE EVENTS, 26 FEBRUARY 1946 TO 25 MARCH 1946, INCLUSIVE.

100-P Pile

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
25 Feb. 1946	2359	225	Normal operation.
27 Feb. 1946	0821	0	No. 2 scram due to #36 verticle rod slipping.
6 March 1946	0130	0	Scheduled shutdown for pushing of metal; 3677 pieces with an MWD content of 3159 were discharged. Two bismuth tubes were also discharged. The unit was given a solids purge of 1½ hour duration. The unit was inspected for pile "bowing".
8 March 1946	0230	0	Unit starting to power.
	0347	200	
	0502	170	Level lowered due to excessive tube temperatures.
	1232	225	Normal operation resumed.
	0945	0	Scheduled shutdown to push temporary poison tubes.
9 March	0020	0	Unit starting to power.
	0112	225	Normal operation level attained.
	0515	220	Level reduced because of excessive rate of graphite temperature rise.
	0800	225	Normal operation resumed.
11 March	0910	0	Unit scrambled due to trouble on the BPA System.
	0925	0	Unit starting to power.
	0941	225	Normal operation resumed.
14 March	1335	150	Level lowered preparatory to shutdown. Technical Department making production and xenon saturation tests.
15 March	0830	0.5	Level reduced to continue special tests.
16 March	0911	0	Scheduled shutdown to add two (2) poison tubes.
	1049	0.5	Resumed special tests at power level of 0.5 MW.
19 March	0400	0.0	Scheduled shutdown for the purpose of placing unit in standby condition.
25 March	2359	0	Unit in standby condition.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL</u>	<u>REMARKS</u>
25 February '46	2359	225	Normal operation continues.
26 February	0600	0	Scheduled shutdown for pushing of metal: 4178 pieces with an MWD content of 3339 were discharged. Tube No. 4674 was inspected for bowing and recharged with dummies. The Unit was purged with super-cel for a period of 45 minutes.
	2202	0	Unit starting to power.
	2320	225	Normal operations resumed.
11 March	0910	0	Unit scrambled due to trouble on the BPA System.
	0924	0	Unit starting to power.
	0945	225	Normal operation resumed.
12 March	0515	0	Scheduled shutdown for pushing of metal: 2500 pieces with an MWD content of 2000 were discharged. The unit was given a solids purge of 1½ hour duration.
	1917	0	Unit starting to power.
	2037	225	Normal operation resumed.
16 March	1006	250	Nominal operating level was raised from 225 to 250 MW.
18 March 1946	1157	0	No. 1 scram due to water failure from 190 Bldg. caused by improper switching of circuit breakers in 151 Building.
	1217	0	Unit starting to power. Lost time, 20 minutes.
	1236	250	Normal operation resumed.
25 March 1946	2359	250	Normal operation continues.

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<u>DATE</u>	<u>TIME</u>	<u>POWER L</u>	<u>REMARKS</u>
25 February '46	2359	225	Normal operation.
5 March	0500	0	Scheduled shutdown for pushing of metal; 4132 pieces with an MWD content of 3350 were discharged. A solids purge of 45 minutes duration was made.
6 March	0205	0	Unit starting to power.
	0315	225	Normal operations resumed.
11 March	0910	0	Unit scrambled due to trouble on the BPA System.
	0951	0	Unit starting to power.
	1111	225	Normal operation resumed.
15 March	1000	200	The nominal operating level was reduced from 225 to 200 MW.
21 March	0735	0	Scheduled shutdown for pushing of metal: 4192 pieces with an MWD content of 3411 were discharged. Four bismuth metal channels were charged into Pile.
22 March	0022	0	Unit starting to power.
	0132	200	Normal operation resumed.
25 March	2359	200	Normal operation continues.

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COMPARISON OF B, D, & F AREAS, AT 2359 25 MARCH 1946.

	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup	546	464	394
Power Level (MW)	0	250	200
Accrued MWD	98107	107579	87465
Slugs pushed since startup	97399	93920	71907
Product pushed (in MWD)	77984	77531	61148
Slugs in Pile	56068	64642	65034
No Channels (poison)	21	10	11
No Channels (dummy)	267	1	2
No Channels (soda pulp)	0	4	4
Inlet water Temperature (Ave.) <sup>°C</sup>	7.7	7.3	6.9
Outlet Water Temperature (Ave.) <sup>°C</sup>	7.7	36.7	31.3
Scrams	2	2	1

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FRANK A. VALENTE,  
Major, Corps of Engineers,  
Operations Officer.

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Progress Report of the 100-Areas for the Monthly Period

Ending 25 April 1946

NARRATIVE

During the past month, the work required to place the 100-B Area in a standby condition continued. For example, such work consisted of inspecting pumps, motors, fans, and compressors and the cleaning of equipment pieces which are to be taken out of service. All parts or surfaces of such pieces which are subject to corrosion and dirt were given protective coatings. Many instruments have been taken out of service and only those required during the stand-by period are being kept in use.

With the exception of 4 papoose samples, the storage basin of 105B is now empty of metal. Roughly 29,000 dummy slugs have been buried because of their high radioactivity. The re-use of these pieces in the 100-D and 100-F piles would involve serious health hazards in handling the slugs.

The circulation of helium through 100-B pile has been cut down from about 2700 cubic feet per minute to about 1100 cubic feet per minute.

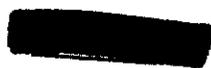
The flow of process water through the 100-B pile has been reduced in successive steps from about 31,000 gallons/minute to approximately 4,000 gallons/minute; no temperature rise has been observed at this rate of flow. The heat generated as a result of the radioactivity of these slugs and pile materials is estimated roughly to be a quarter of a megawatt, or about 50 per cent lower than the heat developed during normal operational shutdowns.

After a total of 269 channels of x-metal had been discharged from the 100-B pile, and then recharged with dummy slugs and poison slugs, a wet critical test was carried out 27 March 1946. In the test, when all the rods were withdrawn, the pile still remained "dead". This shows that, under the current stand-by condition of loading, the pile does not meet the reactivity requirements for startup.

The 100-B pile has been shutdown for well over a month. At the end of this time no dimensional changes have been observed in the pile structure. This appears to indicate that no alterations in the packing have since occurred.

At the completion of the work necessary to put the 100-B pile in a stand-by condition, a complete summary of the

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CHRONOLOGICAL OF FILE EVENTS  
26 MARCH 1946 TO 25 APRIL 1946, INCLUSIVE

100-B File

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
25 March 1946	2359	0	Unit being prepared for stand-by condition.
25 April 1946	2359	0	Work required to place unit in stand-by condition continues.

100-D File

25 March 1946	2359	250	Normal operation continues.
26 March 1946	0645	0	Scheduled shutdown for pushing of metal; 4200 pieces with a MWD content of 3385 were discharged. Poison tube No. 1474 was discharged and recharged with 33 pieces of thorium.
	2117	0	Unit started to power.
	2235	250	Operating power level reached.
27 March 1946	0100	235	Power level reduced because rate of graphite temperature rise became excessive.
	0700	250	Normal operation resumed.
9 April 1946	0545	0	Scheduled shutdown for pushing of metal; 2528 pieces with a MWD content of 2063 were discharged. The unit was purged with 100 ppm of supercel for a duration of one hour.
	2134	0	Unit started to power.
	2258	250	Nominal operating level attained.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
10 April 1946	0305	240	Level reduced because tube temperatures became too hot.
	0430	250	Normal operation resumed.
16 April 1946	0730	0	Scheduled shutdown for pushing of metal; 2528 pieces with a MWD content of 2085 were discharged. 20 vertical safety rod thimbles were tested for leaks with an air pressure of 85 psi.
	2237	0	Unit started to power.
	2349	250	Operating level reached.
	0446	240	Level reduced because rate of graphite temperature rise became excessive; and a tube temperature too high.
17 April 1946	0900	250	Normal operation resumed.
	0735	0	Scheduled shutdown for pushing of metal; 2528 pieces with a MWD content of 2087 were discharged. In addition, two bismuth channels were discharged, and recharged with bismuth.
23 April 1946	2045	0	Unit started to power.
	2210	250	Normal operation resumed.
	2359	250	Normal operation continues.
25 April 1946			

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100-F File

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
25 March 1946	2359	200	Normal operation continues.
2 April 1946	0630	0	Scheduled shutdown for pushing of metal; 2536 pieces with a MWD content of 2062 were discharged. Request No. 6 was charged in tube No. 3282; and Request Nos. 8 and 15, in Channel No. 3378. No other channels which were discharged were recharged with X-metal.
	2048	0	Unit started to power.
	2200	200	Normal operation resumed.
11 April 1946	0645	0	Scheduled shutdown for pushing of metal; 2536 pieces with a MWD content of 2037 were discharged. All the tubes discharged contained X-metal, and were recharged with X-metal.
	2100	0	Unit started to power.
	2205	200	Normal operation resumed.
13 April 1946	1446	0	No. 1 Scram resulted from causes induced in the testing of an emergency alternator.
	1500	0	Unit started to power. Lost time: 14 Minutes.
	1525	200	Normal operations resumed.
18 April 1946	0510	0	Scheduled shutdown for pushing of metal. 2528 pieces with a MWD content of 1994 were discharged. Request Nos. 8 and 15 were discharged from tube No. 3378. Request Nos. 12-B

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100-F (Continued)

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, KW</u>	<u>REMARKS</u>
18 April (Continued)			and 16-II were charged into tube No. 3378. Twenty vertical safety rod thimbles were tested with an air pressure of approximately 90 psi.
	2059	0	Unit started to power.
	2140	200	Normal operation resumed.
24 April 1946	0400	0	No. 1 Scram caused by vacuum tube failing in No. 1 Beckman control box.
	0427	0	Unit started to power. Lost time 27 minutes.
	0442	200	Normal operations resumed.
25 April 1946	2359	200	Normal operations continue.

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COMPARISON OF B, C, & F AREAS,

AT 2359 25 APRIL 1946.

	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup.	577	495	425
Power Level (MW)	-0-	250	200
Accrued MWD	98107	114663	98254
Slugs pushed since startup.	97400	105704	79507
Product pushed (in MWD).	77984	87151	67241
Slugs in Pile.	56068	64570	64826
No Channels (Poison)	21	9	11
No Channels (Dummy)	267	1	2
No Channels (Soda Pulp)	-0-	4	4
Inlet Water Temperature (Ave.)°C.	9.0	8.7	8.6
Outlet Water Temperature (Ave.)°C.	9.0	38.0	33.0
Sorams.	-0-	-0-	2

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Supplement to the 100 Monthly Progress Report  
for the Period Ending 25 April 1946

The following tables summarize briefly the information on several request samples with respect to the status of pile irradiation, dates of receipt and dates of completion.

Pile Status of Samples

<u>REQUEST NO.</u>	<u>MATERIAL</u>	<u>DATE CHARGED</u>	<u>DATE DISCHARGED</u>	<u>PILE</u>	<u>REMARKS</u>
3	Thorium	26 March 1946		D	33 slugs
6	U <sup>233</sup> oxide	2 April 1946		F	1 slug
8	U <sup>238</sup>	2 April 1946	18 April 1946	F	1 slug
15	LiF	2 April 1946	18 April 1946	F	3 slugs
18	Lead-Cadmium	4 June 1945	18 Jan. 1946	D	1 poison slug

Samples Received During April 1946

<u>REQUEST NO.</u>	<u>MATERIAL</u>	<u>DATE RECEIVED</u>	<u>DATE CHARGED</u>	<u>DATE DISCHARGED</u>	<u>PILE</u>	<u>REMARKS</u>
9A, B	BeO, Be-U oxide	6 April				6 slugs
		13 April				17 slugs
10A	Sm <sub>2</sub> O <sub>3</sub>	6 April				1 slug
12B	Pu <sup>239</sup>	6 April	18 April		F	1 slug
13	Be <sub>3</sub> N <sub>2</sub>	6 April				8 slugs
16-I	95 <sup>241</sup>	6 April				1 slug
16-II	95 <sup>241</sup>	6 April	18 April		F	1 slug

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Disposition of Request Nos. Received to Date at Hanford

<u>REQUEST NOS.</u>	<u>STATUS</u>	<u>REQUEST NOS.</u>	<u>STATUS</u>	<u>REQUEST NOS.</u>	<u>STATUS</u>
1	Completed, Shipped	7	Received	13	Received
2	Completed, Shipped	8	Discharged	15	Discharged
3	In File	9A	Received*	16-I	Received
4	Completed, Shipped	9B	Received*	16-II	In File
5	Completed, Shipped	10A	Received	17	Completed, Shipped
6	In File	12B	In File	18	Discharged

\*The combined number of 9A and 9B promised was 24. To date 23 have been received.

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Progress Report of the 100-Areas for the Monthly Period

Ending 25 May 1946

*Mr. Hageman*  
*Sgt. Parker HES*

NARRATIVE

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General. - Instruments for detecting the movements of the pile structures are now installed on the piles of the three 100 Areas. At present, these instruments consist of Ames gauges, tight horizontal wires, and plumb bobs.

During the past month, weekly shutdowns of the 100-D and 100-F piles were made for the purpose of discharging x-metal.

Two semi-automatic charging machines have been further improved and are now operating in what is considered a satisfactory manner.

At the end of the current period, the river level at 100-D was 393.6 feet above mean sea level. On 25 May 1945, the corresponding river level was 388 feet. The maximum level attained was 393.3 feet and was reached on 7 June 1945.

100-B. - The work required to place the pile and building 105 of the 100-B area in a standby condition was completed on 6 May 1946. It is expected that the entire 100-B area will be in a standby status by the end of the current month. This work was begun on 19 March 1946 when the 100-B pile was shut down for an indefinite period.

100-D. - During the shutdown of 30 April 1946, request numbers 9-1, and 13 were charged into channel 3574.

Two of the six refrigerator units were started on 7 May and two more were put into operation on 23 May 1946. The cooling effect at this time was approximately equivalent to 6,000 tons of ice. Last year it was necessary to put the refrigerator units into operation on 20 April 1945.

Horizontal rod number 9 is still out of service because of an apparent constriction in the thimble. It is planned to discharge request number 9-1, and 13 on 28 May 1946 and it is expected that these will be shipped to Site C on or about 12 June 1946.

All of the vertical rod thimbles have been tested at an air pressure of 90 pounds per square inch and found to be satisfactory.

100-F. - Considerable leakage had been observed from the clear wells of the 100-F area. The clear wells were drained successively, and the suspected leaks in the expansion and construction joints were repaired. As a result, the leakage from the clear wells has been reduced considerably.

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Refrigeration of the cooling water was started on 6 May 1946 by placing into operation two of the four units. This operation was put into force because the inlet water had exceeded the maximum temperature limit of 10° C. On this basis, refrigeration in this area was begun last year on 21 April.

Pneumatic tests at 84 pounds per square inch were made on all of the vertical thimbles of the pile and the results indicated the thimbles to be in a satisfactory condition.

100-F. - On 2 May 1946 requests 7, 9-3, 10-A, and 16-I were charged into channel 1565.

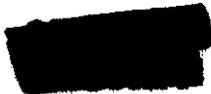
Contamination. - Recently, alpha counts were made on the wooden crates which are used as carriers of irradiated soda pulp. The measurements indicated the presence of large amounts of radioactive contamination, presumably postum. The contamination was not expected because the slugs are hermetically sealed in aluminum cans. An investigation of the causes is being initiated; and, it is expected that suitable remedies will be found. The contaminated crates have been buried, and replacements have been fabricated.

The storage basin of 100-B was found to be contaminated. This contamination occurred when an abrasive underwater cutting wheel was used to sever the capsule, containing four graphite samples, from its physical bond to the uranium slug. It appears that the wheel cut into the uranium, dispersing fine particles of this metal in the water besides exposing its surface to water action. Although the extent of the contamination is of some concern, it is expected to be reduced to negligible proportions by increasing the rate of overflow of the water in the storage basin.

Shipments. - On 2 May 1946, 12 boxes of 120 slugs, or 240 pounds of soda pulp, containing an estimated equivalent of 1062 cases of postum were shipped to the processing agency via ATC.

Requests 8, 15, and 18 were shipped to Site C on 2 May via ATC. To date, a total of 8 special request samples have been completed and shipped to Site C.

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COMPARISON OF B, D, & F AREAS  
AT 2359, 25 MAY 1946

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	<u>B</u>	<u>D</u>	<u>F</u>
Days since startup.	607	525	455
Power Level (MW)	--0--	250	200
Accrued MWD	98107	121418	98675
Slugs pushed since startup	97435	114138	86207
Product pushed (in MWD)	78004	94071	72734
Slugs in Pile	56033	64392	64718
No. Channels (Poison)	21	9	11
No. Channels (Dummy)	268	2	2
No. Channels (Soda Pulp)	0	4	4
Inlet Water Temperature (Ave.) ° C.	12.0	11.1	11.1
Outlet Water Temperature (Ave.) ° C.	12.0	40.5	34.1
Scrams	0	3	2

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<u>DATE</u>	<u>TIME</u>	<u>POWER</u>	<u>REMARKS</u>
25 April 1946	2359	2	Normal Operation continues.
30 April 1946	0650	0	Scheduled shutdown for pushing of metal; 2509 pieces with a MWD content of 2036 were discharged. Two request No's., 9 and 13, were charged into tube No. 3574.
		0	Unit starting to power.
		250	Normal Operation level attained
1 May 1946	0345	245	Level lowered because of excessive rate of graphite temperature rise.
	0855	250	Normal operation resumed.
7 May 1946	0545	0	Scheduled shutdown for pushing of metal; 1664 pieces with a MWD content of 1359 were discharged.
	2225	0	Unit starting to power.
8 May 1946	0035	250	Normal Operation resumed.
14 May 1946	0730	0	Scheduled shutdown for pushing of metal; 2536 pieces with a MWD content of 2024 were discharged.
	2254	0	Unit starting to power
	2400	200	
15 May 1946	0015	250	Normal Operation resumed.
21 May 1946	0520	0	Scheduled shutdown for pushing of metal; 1725 pieces with a MWD content of 1501 were discharged. Two bismuth channels were discharged and recharged with bismuth material

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<u>DATE</u>	<u>TIME</u>	<u>POW</u>	<u>REMARKS</u>
21 May 1946	2252		Unit started to power.
	2359		
22 May 1946	0022		Normal Operation resumed.
22 May 1946	0253		No. 2 scram due to faulty brake on #34 vertical safety rod, which allowed rod to drop below limit switch; scrambling horizontal rods.
	0425	0	Unit started to power. Lost time 1 hour, 32 minutes.
	0432	~1	Power level at approximately 1 MW.
22 May 1946	0433	0	No. 1. scram due to power surge caused by an electrical storm.
	0442	0	Unit started to power. Lost time 9 minutes.
	0456	60	
	0457	0	No. 2 scram due to faulty brake on #34 vertical safety rod which allowed rod to drop below limit switch.
	0504	0	Unit started to power. Lost time 7 minutes.
	0525	250	Normal Operation resumed.
25 May 1946	2359	250	Normal operation continues.
		<u>100-F FILE</u>	
25 April 1946	2359	200	Normal Operation continues.
2 May 1946		0	Scheduled shutdown for pushing of metal; 1668 pieces with a MWD of 1356 were discharged. Four request numbers (9, 7, 16-I and 10-A) were charged into tube No. 1565.
		0	Unit starting to power.
		200	Normal operation resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POI</u>	<u>REMARKS</u>
9 May 1946	0440		Scheduled shutdown for pushing of metal; 1668 pieces with a MWD content of 1384 were discharged. Nine (9) channels were charged with special cast and extruded slugs
	2102	0	Unit started to power
	2210	200	Normal Operation resumed.
15 May 1946	0440	0	Scheduled shutdown for pushing of metal; 1668 pieces with a MWD content of 1358 were discharged.
	2021	0	Unit started to Power
	2132	200	Normal Operation resumed.
17 May 1946	0833	0	Scram caused by a short downward movement by No. 21 or No. 27 vertical safety rod at completion of vertical rod test. Number two (2) safety circuit scrambling unit.
	0855	0	Unit started to power. Lost time 22 minutes.
	0922	200	Normal Operation resumed.
21 May 1946	0442	0	Scheduled shutdown for pushing of metal; 1696 pieces with a MWD of 1395 were discharged. The unit was purged with 150 ppm super-cell for a duration of one hour.
	2327	0	Unit started to power.
	2359	90	
22 May 1946	0029	200	Normal Operation resumed.
22 May 1946	0432	0	No. 1 scram caused by an electrical power surge due to electrical storm.
	0507	0	Unit started to power. Lost time 25 minutes.

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(Continued)

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<u>DATE</u>	<u>TIME</u>	<u>POWER</u>	<u>REMARKS</u>
22 May 1946	0607	20	Normal Operation resumed.
	1221	(	Unit shutdown to place grooved steel dummies in charging end of tube #4674. Tube 4674 is empty to facilitate pile bowing studies and a beam was detected from it.
	1352	0	Unit started to power. Lost time 1 hour, 31 minutes.
	1452	200	Normal Operation resumed.
25 May 1946	2359	200	Normal Operation continues.

*Frank A. Valente*  
 FRANK A. VALENTE  
 Major, Corps of Engineers  
 Operations Officer  
 100 Areas

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100 Area MONTHLY REPORT

26 May 1946 to 25 June 1946

HEP  
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I. General

Comparison of Cast Metal Slugs vs Extruded Metal Slugs

Previous reports recorded the fact that a number of blistered, swollen, distorted slugs were found among those discharged from the piles during periodical shutdowns. Subsequent study indicated that a direct correlation existed between length of pile exposure and frequency of "defective" slugs.

During the early part of the current year, a test program was planned with the object in mind of discovering, if possible, the causes and remedies for the observed condition of the slugs under discussion. The test plan proposed was substantially as follows:

a. Seven channels were to be charged with class A slugs made from extruded X-metal. The slugs were to be hand-picked, so to speak, in order to obtain pieces of the highest quality.

b. Three channels were to be charged with slugs fabricated from metal. Cast metal was picked because preliminary tests indicated that slugs of such fabrication would be as good as, if not better than, high grade slugs fabricated from extruded metal. These slugs were to be charged in the region of the pile having the highest neutron flux density, and held in the pile until they had acquired an enrichment corresponding to 400 GT of product. After this enrichment was attained, a discharge schedule would be followed.

c. In addition, it was proposed to charge 32 to 37 tubes with slugs also fabricated from cast metal and purchased from three different manufacturers. The purpose was to study the properties of cast slugs, after being subjected to pile irradiation, and to compare them with those of extruded metal slugs subjected to the same working conditions. The slugs would be monitored periodically by discharging one or more tubes and making appropriate tests on the slugs obtained from such tubes.

Currently, the 100-D pile is charged with 13 channels of cast slugs and with three of extruded slugs. The 100-F pile contains 27 channels of cast slugs and four channels of extruded slugs. None of these channels have been discharged to date.

On 1 June 1945, the Columbia River obtained its crest of 395.8 feet above mean sea level as measured on the gauge at the 100-D river pump house. This level corresponds to the crest level of 393.3 feet as reported on 7 June 1945. The low point of the river level during the current year was measured as 379.9 feet on 1 April 1946, indicating a rise of 15.9 feet.

100-B

The entire 100-B area is now in a standby condition; and it is estimated that normal operations, if required, could be resumed in roughly thirty days.

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100 Area Monthly Report (Continued)

Additional leaks in the and sealed; the entire basin is no

sin have been located in.

HEAVY ASSECT

✓ The neoprene seals, stre pile structure, have been replaced

t of the expansion of the of greater width.

The work of decontaminat: al storage basin has been started. The cause of the contamination reported in the last monthly report.

On 22 June 1946, channel 2539 was discharged, and the slugs will be submitted to corrosion studies, the results of which will be reported later.

100-D

The corrosion study tubes, which were discharged on 21 May 1946, were analyzed and the following results noted.

<u>Tube #</u>	<u>Exposure</u>	<u>Corrosion (inches/month)</u>	
		<u>Ave.</u>	<u>Max.</u>
2375-D	285 days	.00003	.00006
2575-D	285 days	.00004	.00006

The rates of corrosion shown are well below the tolerance of 0.001 inch/month.

✓ The unit was shut down from 0252 on 17 June 1946 to 1659 on 20 June 1946 during which time maintenance and repair work was done:

a. No. 9 shim rod thimble was removed and replaced with a new thimble. The opening of the old thimble was examined through a boroscope and no apparent cause of the rod movement difficulty was observed.

b. Mattress plate extensions were examined and repaired or replaced as required.

All six refrigeration units have been in operation at times during the month. Currently, the refrigeration produced by four of the units in service is now approximately 5100 tons of ice.

On 25 June 1946, #2 horizontal shim rod thimble was examined through a boroscope and found in good condition.

The following work was carried out on Special Request Samples:

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100 Area Monthly Report (Continued)

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<u>Request No.</u>	<u>Channel and Date Charged</u>	<u>Channel and date discharged</u>	<u>Remarks</u>
9-1	--	3574 28 May 1946	Shipped via plane 12 June 1946
13	--	3574 28 May 1946	Shipped via plane 12 June 1946
9-2	3574 4 June 1946	--	8 slugs
25-2	3574 4 June 1946	--	1 slug
3	--	1474 11 June 1946	Now cooling
15-1	1579 25 June 1946	--	17 slugs.
25-3	2669 25 June 1946	--	1 slug.

100-F

During the shut down of 29 May 1946, 10 lbs of reactivity were lost and at this date have not been accounted for.

All four refrigeration machines are now in use and the refrigeration effect is approximately 7000 tons of ice.

During the shutdown of 12 June 1946, the top of the down comer was cut and a canvass "soft spot" installed.

During the shut down of 20 June 1946, the test stringers in the D test hole were removed and new stringers installed.

Special Requests now in pile 100-F are:

<u>Request Number</u>	<u>Tube</u>
6	3282
7, 9-3, 10-A and 16-I	1565
12-B-2, 16-2	3378

SHIPMENTS

On 12 June 1946, the following shipments were made to the indicated processing agencies via ATC.

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100 Area Monthly Report (Continued)

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<u>Description of Designation</u>	<u>Number of Pieces</u>	<u>Pieces of Material</u>	<u>Consignee</u>	<u>Product or Purpose</u>
✓ Soda Pulp	120	240	Dayton	722 Cases Postum
Request 9-1	8	--	Site C	Test
Request 13	8	--	Site C	C <sup>14</sup>
Request 17-1	1	16	Site C	Test
✓ Graphite Samples	17	--	Site C	Test

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COMPARISON OF B, D, AND F AREAS

AT 2359, 25 MAY 1946

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	✓ <u>B*</u>	<u>D</u>	<u>F</u>
Date of initial startup.	26 Sept. '44	17 Dec. '44	25 Feb. '45
1. Days since initial startup	638	556	486
2. Power Level (MW)	0	250	200
3. Accrued MWD	98107	127332	104281
4. Slugs pushed since startup.	97467	123394	92067
5. Product pushed (in MWD)	78027	101533	77448
6. Slugs in Pile	56001	64224	64490
7. No. Channels (Poison)	21	9	11
8. No. Channels (Dummy)	269	4	5
9. No. Channels (Soda Pulp)	0	4	4
10. Inlet Water Temp. (Ave) °C.	--	12.4	12.1
11. Outlet water Temp. (Ave.) °C.	--	42.0	35.3
12. Scrams	0	0	0

Note: \*Unit shutdown since 19 March 1946;  
held in standby condition.

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CHRONOLOGY OF OPERATIONS

26 MAY 1946 TO 25 JUNE 1946, INCLUSIVE

100-D FILE

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 May 1946	2359	250	Operation Normal.
28 May 1946	0315	0	Scheduled shutdown for pushing of metal; 2122 pieces with a MWD content of 1714 were discharged. The unit was purged with 100 ppm of solids for a duration of one hour. Special request No's 9-1 and 13 were discharged.
	2259	0	Unit started to power.
29 May 1946	0128	250	Nominal operating level attained.
	0310	240	Power level reduced due to excessive rate of graphite temperature rise and excessive temperature of tube #3887.
	0845	250	Normal operation resumed.
4 June 1946	0415	0	Scheduled shutdown for pushing of metal; 2110 pieces with a MWD content of 1723 were discharged. Request No. 9-2 and 25-2 were charged into tube 3574.
	2331	0	Unit started to power.
5 June 1946	0054	250	Normal operation resumed.
10 June 1946	0900	225	Level reduced in accordance with requirements of production test No. 105-50-P.
	1300	250	Normal Operations resumed.
11 June 1946	0600	0	Scheduled shutdown for pushing of metal; 1664 pieces with a MWD content of 1337 were discharged. Special request No. 3 was discharged from tube number 1474 and the tube was recharged with poison slugs.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
11 June 1946	2149	0	Unit started to power.
	2317	250	Normal Operating level attained.
12 June 1946	0245	240	Power level reduced due to excessive rate of graphite temperature rise.
	0830	245	
	1015	250	Normal operation resumed.
17 June 1946	0252	0	Scheduled shutdown planned for pushing of metal and for the replacement of horizontal shim rod thimble No. 9. 1664 pieces with a MW content of 1323 were discharged.
20 June 1946	1659	0	Unit started to power.
	1845	250	Normal operating level attained.
	1935	220	Level reduced account of high temperatures in 0.175 inch orifice zone.
	2315	230	Level increased.
21 June 1946	0100	240	
	0830	245	
	0945	0	Scheduled shutdown intended to push six (6) temporary poison columns and to recharge them with X-metal.
	1203	0	Unit started to power.
	1340	250	Nominal operating level attained.
	1645	240	Power level reduced due to excessive rate of graphite temperature rise.
	2100	250	Normal operation resumed.
25 June 1946	0520	0	Scheduled shutdown for pushing of metal; 1696 pieces with a MW content of 1365 were discharged. Poison tube No. 1579 was discharged and recharged with Request No. 15-1, consisting of 17 pieces; Request No. 25-3, consisting of 1 piece, was charged into tube No. 2669.

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100-D File (Continued)

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>	<b>DECLASSIFIED</b>
25 June 1946	2343	0	Unit started to power.	
	2359	Appx. 1	Returning to Normal operation.	

100-F FILE

25 May 1946	2359	200	Normal Operation.
27 May 1946	0900	175	Level lowered in accordance with requirements of production test.
	1330	200	Normal Operation resumed.
29 May 1946	0310	0	Scheduled shutdown for pushing of metal; 1674 pieces with a MWD content of 1351 were discharged. This includes one "over-age" (C material) tube No. 1369. Three tubes were charged with cast X-metal; and three, with dummies to facilitate future bowing studies; the remainder of 45 tubes were recharged with the regular X-metal.
30 May 1946	0042	0	Unit started to power.
	0130	200	Normal Operation resumed.
5 June 1946	0340	0	Scheduled shutdown for pushing of metal; 2515 pieces with a MWD content of 2042 were discharged. Poison channels 1569 and 3179 were rearranged to reduce the poison content by approximately 20 ihs.
	2322	0	Unit started to power.
6 June 1946	0046	200	Normal Operation resumed.
12 June 1946	0654	0	Scheduled shutdown for maintenance work. A "soft spot" ("soft spot" designation for canvas cover) on the down comer was installed.
	1903	0	Unit started to power.

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100-F File(Continued)

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
12 June 1946	2000	200	Normal Operation resumed.
20 June 1946	0530	0	Scheduled shutdown for pushing of metal: 1671 pieces with a MWD content of 1321 were discharged.
	2130	200	Normal operation resumed.
25 June 1946	2359	200	Normal operation continued.

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100 AREA MONTHLY REPORT

26 June 1946 thru 25 July 1946

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100-B AREA

Status of Contamination in 105B Storage Basin

During the month, the height of the water in the storage basin was lowered about two feet; but no scrubbing of the surface was done. Test of smears, taken at various points on the exposed surface, indicates contamination but at a reduced level. Further tests are required before more definite results can be expected and decisions of policy made.

100-D AREA

Slug Jam on Discharge Elevator

In the discharge of the Pile on 2 July, several falling metal slugs and dummy slugs were trapped by one of the I-beams of the rear elevator. By resorting to an ingenious procedure, in which a relay of fast-running supervisors pulled lead bricks by means of a cord along the I-Beam, the "hot" slugs were dislodged. A delay of roughly ten hours was caused by this unexpected slug jam.

Special Slugs

Twelve channels of the Pile contain a normal complement of cast metal slugs; namely 32 slugs per channel; and three channels contain slugs of extruded slugs which were selected with particular attention to highest quality.

Corrosion Studies

For the purpose of corrosion studies, a channel of normal metal slugs was discharged on 25 June 1946 after being subjected to pile irradiation for 333 days. A critical examination and underwater measurement of the slugs showed an average rate of corrosive penetration of 0.00004 inch per month with a maximum of 0.00006 inch per month. This condition is very satisfactory in light of the fact that the upper limit of tolerance is 0.001 inch per month.

One of the channels containing cast metals slugs was discharged on 9 July 1946 after an irradiation of about 91 days. An examination of, and measurements on, the slugs showed an average rate of corrosive penetration of 0.00004 inch per month and a maximum of 0.00006 inch per month. In

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general, the slugs were in excellent condition with the exception of one in the case of which blistering could be inferred but only with considerable doubt.

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Water Leak in B Test Hole

A leak in the B test hole of the pile was observed on about 18 July. An attempt was made to locate and repair the leak during the shutdown of 23 July. It is believed that there are several leaks but only one was found. No repair work was done at that time, but temporary measures were taken to provide for adequate water removal and to shield personnel during the interim.

100-F AREA

Currently there are 22 channels charged with slugs of cast metal, each channel containing 32 pieces. In addition there are three channels containing slugs of cast metal; these slugs were segregated from the others because they were selected with the maximum of care in order to obtain pieces of the highest quality. Four other channels are charged with slugs of extruded metal; these, too, were the pick of their particular lot and were so chosen in order to get the highest quality samples of this type of slug.

Corrosion

One channel of cast metal slugs was discharged after 92 days of exposure with an average corrosive penetration of 0.00004 inch per month and the maximum rate of 0.00007 inch per month. One of the slugs was definitely, although slightly, blistered.

COMPARATIVE TABLES

Reactivity Balance of the Operating Piles on 24 July 1946

<u>Absorbing Agent</u>	<u>IH Absorbed</u>	
	<u>F Pile</u>	<u>D Pile</u>
Control Rods	68	38.3
Xenon	438	497
Poison	293	248.4
Bismuth	16	16
Request Samples	<u>18</u>	<u>57.7</u>
Total	833	857.4

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File Tube Patterns at Close of 25 July 1946

<u>Material</u>	<u>No. of Tubes</u>		<u>No. Slugs per Tube</u>		<u>Total No. of Slugs</u>	
	<u>D</u>	<u>F</u>	<u>D</u>	<u>F</u>	<u>D</u>	<u>F</u>
Metal	1781	1650	32	32	56992	52800
Metal	201	331	35	35	7035	11585
Poison	8	8	--	--	--	--
Bismuth	4	4	--	--	--	--
Request	6	6	--	--	--	--
Dummy	4	5	--	--	--	--

RIVER ELEVATION

The river elevation at the 100-D river pump house on 25 July was 387.5 feet above mean sea level compared with the seasonal maximum of 395.8 feet on 1 June 1946.

STATUS OF REQUEST SAMPLES IN PILES AT CLOSE OF 25 JULY 1946

Currently, slug or slugs of Requests 3-1, 6, 7, 9-2, 9-3, 10-A, 12-B-2, 13-1, 15-2, 16-I, 16-II, 19, 25-1, 25-2, 25-3 are being irradiated in the Piles. A status report of these Request Samples appears fortnightly; the next summary is in preparation and due on 1 August 1946.

SHIPMENTS

Twelve boxes containing 120 slugs, or 240 pounds of irradiated soda pulp were shipped to the processing agency via ATC on 8 July 1946. The postum content on the day of shipment was equivalent to 594 cases.

On 8 July 1946, the third, irradiated graphite rod known as Request, 17-2 was shipped to Site C via ATC.

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COMPARISON OF B, D, AND F AREAS

AT 2359, 25 JULY 1946

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	<u>B*</u>	<u>D</u>	<u>F</u>
Date of initial startup. -	9/26/44	12/17/44	2/25/45
1. Days since initial startup	668	586	516
2. Power Level (MW)	0	250	200
3. Accrued MWD	98107	134009	109735
4. Slugs pushed since startup	97467	131846	98828
5. Product pushed (in MWD)	78027	108348	82870
6. Slugs in Pile	56001	64028	64385
7. No. Channels (Poison)	21	8	8
8. No. Channels (Dummy)	269	4	5
9. No. Channels (Soda Pulp)	0	4	4
10. Inlet water temp. (Ave.) °C.	--	14.6	14.3
11. Outlet water temp. (Ave.) °C.	--	43.0	37.5
12. Scrams	0	0	0

\*Unit has been shutdown since 19 March 1946 and has been held in standby condition.

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CHRONOLOGY OF PILE EVENTS

26 JUNE TO 25 JULY 1946, INCLUSIVE

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100-D AREA

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL MWD</u>	<u>REMARKS</u>
25 June	2359	1.0	Unit returning to power.
26 June	0128	250	Normal operations resumed.
2 July	0600	0	Scheduled shutdown for pushing of metal; 1182 pieces with a MWD content of 937 were discharged. Special request No. 19 was charged into tube No. 1666 (consisting of one piece) and special request No. 25-1 was charged into tube No. 2878 (also consisting of one piece) during this shutdown.
3 July	0612	0	Unit started to power.
	0730	250	Normal operating level attained.
	1100	240	Power level reduced due to excessive rate of Graphite temperature rise.
	1132	250	Normal operation resumed.
9 July	0525	0	Scheduled shutdown for pushing of metal; 3018 pieces with a MWD content of 2420 were discharged. Tube No. 2663 which contained special cast slugs was discharged and recharged with regular metal.
	2351	0	Unit started to power.
10 July	0122	250	Normal operations resumed.
16 July	0450	0	Scheduled shutdown for pushing of metal; 2528 pieces with a MWD content of 2015 were discharged. Special request No. 15-2 consisting of 36 pieces was charged into poison tube No. 2682.
17 July	0030	0	Unit started to power
	0203	250	Normal operations resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL MWD</u>	<u>REMARKS</u>
23 July	0400	0	Scheduled shutdown for pushing of metal; 1724 pieces with a MWD content of 1443 were discharged. Two tubes containing 6 papooses were discharged and the tubes were recharged as papoose tubes.
	2254	0	Unit started to power.
	2359	190	
24 July	0015	250	Normal operation resumed.
25 July	2359	250	Normal operation continues.

100-F Area

25 June	2359	200	Normal operation continues.
26 June	0720	0	Scheduled shutdown for pushing of metal; 856 pieces with a MWD content of 666 were discharged. Two tubes, Nos. 2685 and 3574, containing "B" material were discharged and recharged with "B" material.
	1935	0	Unit started to power.
	2052	200	Normal operation resumed.
3 July	0730	0	Scheduled shutdown for pushing of metal; 873 pieces with a MWD content of 676 were discharged.
	1903	0	Unit started to power.
	2013	200	Normal operation resumed.
10 July	0710	0	Scheduled shutdown for pushing of metal; 1672 pieces with a MWD content of 1331 were discharged.
	1827	0	Unit started to power.
	1920	200	Normal operation resumed.
17 July	0540	0	Scheduled shutdown for pushing of metal; 1696 pieces with a MWD content of 1400 were discharged.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL MWD</u>	<u>REMARKS</u>
17 July	1941	0	Unit started to power.
	2145	200	Normal operation resumed.
24 July	0540	0	Scheduled shutdown for pushing of metal; 1664 pieces with a MWD content of 1349 were discharged. Two tubes Nos. 1274 and 2085 were discharged of "B" material and recharged with "B" material. Poison tube No. 1474 was pushed and recharged with 35 pieces of Special Request No. 13-1. Poison tube No. 3274 was pushed and recharged with 34 pieces of Special Request No. 13-1. Poison tube No. 2082 was pushed and recharged with 43 pieces of Special Request No. 3-1.
	1941	0	Unit started to power.
	2115	200	Normal operation resumed.
25 July	2359	200	Normal operation continues.

100-B Area

25 June	2359	0	Unit in standby condition.
25 July	2359	0	Unit in standby condition.

*Frank R. Valente*  
FRANK A. VALENTE  
Major, Corps of Engineers  
Operations Officer  
100 Areas

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100 AREA MONTHLY REPORT

26 JULY TO 31 AUGUST 1946, INCLUSIVE

100-B AREA

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Storage Basin Contamination.

During the month, the 105-B storage basin was lowered until the water depth was about  $1\frac{1}{2}$  feet. Subsequently, measurements made on the columns and side walls, indicated the presence of a considerable amount of radioactivity. A preliminary scrubbing and flushing reduced the activity background on the working level by about 60%.

As explained in the May monthly report, the cause of this activity was the result of the contamination produced when the abrasive underwater cutting wheel, used to sever the paposes from their squaws on 13 May 1946, cut into the uranium metal, dispersing fine particles of this metal in the water and depositing "hot" material on the surfaces of the basin.

In order to avoid future occurrences of this nature, a procedure for radioautographing the slugs was adopted. By this method, the boundary between the uranium and aluminum is shown photographically. Severing of the capsule can then be accomplished in a manner to avoid cutting into the uranium.

This method was first tried on the paposes which were discharged from the 100-D pile on 23 July 1946, subsequently transferred to the 105-B storage basin for cutting. Observations made following the severing operation indicated that no further contamination to the storage basin resulted, proving the adequacy of the method for the purpose intended.

Corrosion of Standard Metal Slugs.

On 8 August 1946 the slugs of channel 2573B were discharged and critically examined for corrosion effects. The results show that, after 445 days of exposure, the average corrosion penetration rate was 0.00003 inch per month compared with a maximum of 0.00005. These values are well within the limit of 0.001 inch per month.

100-D AREA

Thimble Defect.

On 18 June 1946 the No. 9 horizontal rod thimble was removed

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from the pile because the movements of the rod during operation were impeded by some unknown cause.

Many attempts were made to find the cause. The latest, in which the graphite track of the thimble was removed, showed the presence of broken pieces of graphite, but these may have been produced in transporting the thimble from the pile building to the burial ground and by efforts to remove the graphite track from the thimble. The cause, therefore, remains unknown. The thimble itself was not found to be damaged in any way.

#### Corrosion of Cast Slugs.

On 6 August 1946, the cast metal slugs of channel 2163D were discharged and critically examined for corrosion effects. After an exposure of 19 days, the average corrosion penetration rate was 0.00004 inch per month compared with the maximum of 0.00005. Three of the slugs showed what might be classified as doubtful evidence of blistering.

#### The "B" Test Hole.

On 18 July 1946, water was found in the "B" Test Hole. Unsuccessful attempts were made during the shutdown of 30 July 1946 to repair the leak. After some deliberation, the decision was made to abandon it, and, in its stead to use the modified D Test Hole for the irradiation of special samples. On 6 August 1946, the hole was sealed; but one sample was left inside because it was irremovably jammed in place.

#### Storage Basin Contamination.

Evidence has been obtained from tongs and equipment indicating the presence of beta contamination of roughly 100 mr per hour in the 105-D Storage basin.

#### Personnel Count.

On 30 July 1946, there were 350 employees, inclusive of all shifts, 50 of whom were assigned to the P Department.

#### 100-F AREA

#### Outlet Pipes of the Retention Basin.

On 16 August 1946, an unusual surface "boiling" of the Columbia River was observed above the two, forty-two-inch steel pipes discharging water from the retention basin. An investigation showed that roughly 120 feet of one of the outlet pipes was lost, and that

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about 150 feet of the other had bent down-stream through approximately 80°. It seems that prolonged river action undermined the protective trenches, exposing the outlet pipes to the force of the current. The replacement of these pipes is under consideration.

The lost portion of the one pipe would be of no material concern if its radioactivity were within tolerance. In order to estimate the condition of the pipe in this respect, it is planned to make radioactivity measurements on the bent portion of the second pipe. If the estimate should indicate an over-tolerance, attempts will be made to locate and to recover the lost pipe for subsequent burial.

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The B Test Hole.

A small water leak, discovered during the shutdown of 31 July 1946, was successfully repaired.

Contamination of the Storage Basin.

Evidence obtained from tongs and equipment indicates the presence of beta contamination to the extent of roughly 100 mr per hour in the 105-F Storage Basin.

Personnel Count.

The approximate operating strength for the complete area is 400, about 55 of whom are working in the P. Department.

GENERAL

Graphite, Moderator

All of the piles have shown progressive changes in the physical properties of their respective graphite moderators. The changes of shape and dimensions of the graphite are of particular interest since they seem to indicate a limited pile life. Recently, however, there has been some small indications of the leveling-off of the progressive increases in this connection. While precise estimate of the life expectancy of each pile can not be given, a rough estimate indicates that no difficulty should be experienced from bowed pile channel in charging and discharging slugs during the next two years at the current operating levels. This item is considered to be a major factor in the life expectancy of a pile. This estimate seems reasonable at this time, but it is not to be taken as definite since other factors, both known and unknown, may influence decisively the actual length of pile life.

Semi-Automatic Charging Machines.

The semi-automatic machines of which there are four in use are

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continuing to perform satisfactorily. Two others are approximately 98% completed.

SHIPMENTS

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Twelve boxes, containing 120 slugs, or 240 pounds of irradiated soda pulp, were shipped to the processing agency via ATC on 5 August 1946. The postum content on the day of shipment was 703 cases.

On 5 August 1946, an empty lead cask, designed as a receptacle for Request 11, was sent to Site "C" via ATC.

On 20 August 1946, two pile irradiated slugs of Request 25, namely 25-1 and 25-2, were shipped via ATC to the University of California.

COMPARATIVE TABLES

TABLE I

Reactivity Balance of the Operating Piles on 31 August 1946

<u>Absorbing Agent</u>	<u>IH Absorbed</u>	
	<u>D Pile</u>	<u>F Pile</u>
Control Rods.	54	63
Xenon	497	435
Poison	210	198
Bismuth	16	16
Request Samples	94	129
Dummy	2	7
Total	873	848

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TABLE II

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File Tube Patterns as of 2359, 31 August 1946.

<u>Material</u>	<u>No. of Tubes</u>			<u>No. Slugs per Tube</u>			<u>Total No. of Slugs</u>		
	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>
Metal	1317	1806	1689	32	32	32	42144	57792	54048
Metal	395	177	291	35	35	35	13825	6195	10185
Poison	21	8	6	-	-	-	-	-	-
Bismuth	-	4	4	-	-	-	-	-	-
Request	-	5	9	-	-	-	-	-	-
Dummy	270	4	5	-	-	-	-	-	-

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TABLE III

COMPARISON OF B. D. AND F AREAS

AT 2359, 31 AUGUST 1946

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	<u>B*</u>	<u>D</u>	<u>F</u>
1. Date of initial startup.	26 Sept. '44	17 Dec. '44	25 Feb. '45
2. Days since initial startup	705	623	553
3. Power Level (MW)	0	250	200
4. Accrued MWD	98107	142239	116464
5. Slugs pushed since startup	97504	140302	107179
6. Product pushed (in MWD)	78073	115163	89627
7. Slugs in pile	55969	63988	64233
8. No. Channels (Poison)	21	8	6
9. No. Channels (Dummy)	270	4	5
10. No. Channels (Soda Pulp)	0	4	4
11. Inlet Water Temp. (Ave) °C.	-	16.3	17.4
12. Outlet Water Temp. (Ave) °C.	-	45.1	39.4
13. Scraps	0	0	0

Note: \*Unit has been shutdown since 19 March and is being held in standby condition.

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TABLE VI

CHRONOLOGY OF PILE EVENTS

26 JULY TO 31 AUGUST 1946, INCLUSIVE

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 July 1946	2359	0	Unit in standby condition.
31 August 1946	2359	0	Unit in standby condition.

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TABLE V

CHRONOLOGY OF PILE EVENTS

DECLASSIFIED

100 "F" AREA

26 JULY TO 31 AUGUST 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 July 1946	2359	200	Normal operations continue.
30 July 1946	0600	0	Scheduled shutdown for mock charging of special request No. 11 and for maintenance. The unit was purged with 100 ppm solids.
	2120	0	Unit started to power.
	2225	200	Normal operations resumed.
7 August 1946	0705	0	Scheduled shutdown for pushing of metal; 3360 pieces with a MWD content of 2697 were discharged. Special request No. 20 was charged into tube #2274, No. 13-2 into tube No. 2666 and No. 15-3 into tube No. 1569.
	2218	0	Unit started to power.
	2328	200	Normal operations resumed.
14 August 1946	0640	0	Scheduled shutdown for pushing corrosion tube No. 2382 and for maintenance work; 32 pieces with a MWD content of 54 were discharged. All the 4" screens in the "D" riser were replaced.
	2022	0	Unit started to power.
	2129	200	Normal operations resumed.
21 August 1946	0610	0	Scheduled shutdown for pushing of metal; 3368 pieces with a MWD content of 2704 were discharged. Tube No. 4374 was charged as a corrosion tube, also nine tubes were charged with selected material for production test No. 105-69-P.

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REMARKS  
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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
	2359	136	
22 August 1946	0050	200	Normal operations resumed.
25 August 1946	2359	200	Normal operations resumed.
28 August 1946	0610	0	Scheduled shutdown for pushing of metal, 1648 pieces with a MWD content of 1302 were discharged. One tube was charged as a papoose the balance with x-metal.
	2144	0	Unit started to power.
	2244	200	Normal operations resumed.

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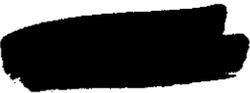


TABLE IV

CHRONOLOGY OF PILE EVENTS

100 "D" AREA

RECLASSIFIED

26 JULY TO 31 AUGUST 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 July 1946	2359	250	Normal Operation continuing.
30 July 1946	0330	0	Scheduled shutdown for pushing of metal; 3360 pieces with a MWD content of 2709 were discharged.
	2332	0	Unit started to power.
	2359	10	
31 July 1946	0102	250	Normal operations resumed.
6 August 1946	0345	0	Scheduled shutdown for pushing a tube of east material and special request No. 25-1 from tube, No. 2878; 9-2 & 25-2 from tube No. 3574. Charged special request Nos. 15-3 into tube No. 2082 and 13-2 into tube No. 3169. Two tubes were charged with regular metal.
7 August 1946	0032	0	Unit started to power.
	0146	250	Normal operating level attained.
	0443	240	Power level reduced due to excessive exit tube temp.
	0540	235	Power level reduced due to excessive exit tube temp.
	1020	250	Normal operation resumed.
13 August 1946	0352	0	Scheduled shutdown for pushing of metal; 1632 pieces with a MWD content of 1372 were discharged.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
	2132	0	Unit started to power.
	2255	250	Normal operations resumed.
20 August 1946	0350	0	Scheduled shutdown for pushing of metal; 3368 pieces with a MWD content of 2668 were discharged. Special request No. 15-1 was discharged from tube No. 1579.
	2104	0	Unit started to power.
	2222	250	Normal operations resumed.
25 August 1946	2359	250	Normal operations continues.
27 August 1946	0500	0	Scheduled shutdown to push two Bismuth tubes and two x-metal tubes were pushed for technical purposes. Sixty-four pieces with a MWD content of 48 were discharged
	1904	0	Unit started to power.
	2043	250	Normal operating level attained.
28 August 1946	0100	240	Reduced level due to excessive rate of packing temperature rise.
	0230	250	Normal operating level attained.
	0440	245	Reduced power level due to an excessive tube outlet temperature.
	0930	250	Normal operation resumed.

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20 August 1946

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100 AREA MONTHLY REPORT

1 SEPTEMBER TO 30 SEPTEMBER 1946, INCLUSIVE

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100 - B

Storage Basin

During the month, a basin was excavated in the area east of the 105 Building for the purpose of receiving the contaminated water remaining in the 105 Building Storage Basin. When the pumped-in water has seeped away, the excavated basin will be refilled; and the covering of earth is expected to form an adequate protective coating against the residuum of contaminated material.

The cleaning of the 105 Building Storage Basin is continuing; and tests to date show that progress is being made towards restoring the basin to its former uncontaminated state.

100 - F

Outlet Pipes

On 16 August 1946, a section of pipe extending into the river from the area effluent water sump (1904 Bldg.) was observed to be missing. This section of pipe was located on 6 September 20 feet downstream from the point of original installation.

Cost estimates of the various proposals for replacement are in preparation; but no work of any description has been done other than to locate the pipe.

CORROSION STUDIES.

The results of corrosion studies on extruded metal slugs are shown in the following table:

<u>Date Discharged</u>	<u>Channel &amp; Pils</u>	<u>Corrosive Penetration</u>		<u>Exposure Days</u>	<u>Remarks</u>
		<u>Average</u>	<u>In./mo. Maximum</u>		
13 Aug. 1946	2461-D	0.00004	0.00006	341	Slight blistering of 7 slugs
14 Aug. 1946	2382-F	0.00003	0.00005	384	Slight blistering on three slugs; one of these warped 1/8" over its entire length.
17 Sept. 1946	2382-D			63 MWD	One badly blistered; two medium blistered.

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The corrosive penetration shown by all slugs studied is well within the tolerance of 0.001 inch per month. A total of 137 slugs were examined in the 105-F Area during the month and 97 were found to be blistered. Of the total number examined, 105 were catalogued as belonging to metal with high product concentration and 32 to metal with normal product concentration.

### GRAPHITE MODERATOR

Results of tests, conducted on graphite and associated pile components, continue to indicate progressive changes in the physical properties and further increase in the dimensions of the graphite.

#### Stored Energy.

The latest papoose samples were discharged on 25 June 1946 and received an exposure corresponding to 1099 MWD/CT; no measurements in quantity of total stored energy have been made to date on these samples. These samples will predict the stored energy status of the average graphite in the 100-D Pile up to roughly the end of 1946, or about 30% advance of the date of discharge of the papoose samples.

#### Annealing.

Tests, more comprehensive than those made previously, will be run shortly on the effect of annealing graphite samples in different atmospheres, e.g. helium, CO<sub>2</sub>, in an attempt to determine recovery of samples which show expansion. A 16% recovery was observed on a 1077 MWD/CT-test-hole sample annealed in CO<sub>2</sub> at 425° C for 112 hours. In comparison, a duplicate sample annealed in air under corresponding conditions showed a 58% recovery.

#### Thermal Conductivity

Restoration of thermal conductivity of irradiated graphite is generally accomplished by high temperature annealing: the higher the temperature, the larger the annealing of a sample with a given exposure. However, as the exposure of the samples increases the annealing obtained increases less rapidly with increasing temperatures. This was observed in the cases of 200, 856, and 1007 MWD/CT samples, which were annealed for 5 days at 400° C. Experiments at higher annealing temperatures are planned for some time in the near future.

#### Bowing of Process Tubes

✓ Vertical Bowing. The status of the vertical bowing of process tubes for the D and F piles is shown in the following table:

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<u>Date</u>	<u>Tube and Pile</u>	<u>Maximum Bowing Inches</u>	<u>Rate of Increase</u>
17 Sept. 1946	4674-D	2 1/4	0.07 in./mo.
4 Sept. 1946	4674-F	29/16	-----

These two tubes are in the center of the topmost rows of their respective piles, and, therefore, give an indication of the maximum vertical displacement of the graphite to date. It is found that the total bowing of any tube is roughly proportional to the accumulated exposure of the tubes vertically beneath that particular tube. No difficulty is expected with regard to charging and discharging for some time. This is borne out by the fact that a test slug of 1.480 in. diameter will pass through the tubes. (The diameter of a regular heavy metal slug is 1.440 in.)

Horizontal Bowing. The status of horizontal bowing of the process tubes in both the D and F piles has shown a slight increase since previous measurements were made, and the present extent of the bowing is shown in the following table:

<u>Date</u>	<u>Tube and Pile</u>	<u>Maximum Bowing Inches (Approx.)</u>	<u>Previous Reading Inches (Approx.)</u>
6 August	2451-D	15/16	29/32
6 August	2496-D	21/16	20/16
18 September	2451-F	14/16	13/16
18 September	2496-F	19/16	33/32

At the position of maximum displacement for the two tubes on opposite sides of the piles, the sum of the total bowing for each pile is approximately 36/16 in. for 100-D and 33/16 in. for 100-F.

Monitoring of Van Stone Flanges.

Production Test, entitled, "Monitoring of Van Stone Flanges," was authorized recently and some preliminary studies have been made. The importance of this test is indicated by the fact that, if excessive pressure is exerted on the Van Stone flanges by expanding graphite, rupture of these flanges may eventuate.

Design specifications allow 5/8 inch clearance between the steel washer contacting the graphite packing and the inside ends of the steel gun-barrels, giving a sum or overall clearance of 10/8 in. As the graphite expands this clearance will diminish to zero, and possible rupturing of the Van Stone flanges, which are the weak parts of the tubes, may follow.

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During the month, several tubes in the 100-D Pile were scribed in accordance with the procedure for this test. Mock-up tests indicate that the amount of permanent stretch that the Van Stone flange can take without weakening is 0.05 inch.

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#### CORROSION OF ALUMINUM

In order to determine the cause of the white deposit on the horizontal control rods at 100-F, four aluminum samples were irradiated under different atmospheric conditions in the "B" Test Hole of 105-F. These samples were charged on 24 July 1946 and were removed from the pile on 11 September 1946, receiving an exposure corresponding to 110 MWD/CT. A preliminary examination of the samples indicated considerable corrosion for the two samples irradiated in building air and humidified building air respectively. The sample in the helium showed no corrosion; the fourth, in carbon dioxide, showed negligible corrosion but some discoloration.

#### SHIPMENTS

Twelve boxes containing 120 slugs, or 240 pounds, of irradiated soda pulp were shipped to the processing agency via ATC on 6 September 1946. The postum content on the day of shipment was 766 cases. The gross weight of the shipment was about 5000 pounds.

On 6 September 1946, the following special request samples were shipped to Site C via ATC:

<u>Request No.</u>	<u>No. of Slugs</u>	<u>Weight of Shipment (lbs.)</u>
9-2	8	5277
15-1	17	1501
18-1	1	1120

On 6 September 1946, thirty-three irradiated slugs of myrnalloy (Request No. 3) were shipped from Hanford to Clinton Laboratories via Site C. The weight of this shipment was 4679 pounds.

On 25 September 1946, one slug of Request No. 16-I was shipped to California via ATC. The gross weight of the package was roughly 1460 pounds.

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TABLE I

Reactivity Balance of the Operating Piles on 30 September 1946

<u>Absorbing Agent</u>	<u>IH Absorbed</u>	
	<u>D PILE</u>	<u>F PILE</u>
Control Rods	53	70
Xenon	497	435
Poison	165	161
Bismuth	20	16
Request Samples	138	165
Dummy	2	7
Total	- 875	854

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TABLE II

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Pile Tube Patterns as of 2359, 30 September 1946.

<u>Material</u>	<u>No. of Tubes</u>			<u>No. Slugs per Tube</u>			<u>Total No. of Slugs</u>		
	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>
Metal	1317	1828	1693	32	32	32	42,144	58,496	54,176
Metal	395	154	288	35	35	35	13,825	5,390	10,080
Poison	21	6	5	-	-	-	-	-	-
Bismuth	-	5	4	-	-	-	-	-	-
Request	-	7	9	-	-	-	-	-	-
Dummy	270	4	5	-	-	-	-	-	-
Instrument	1	-	-	-	-	-	-	-	-

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TABLE III

COMPARISON OF B, D, AND F AREAS

AT 2359, 30 SEPTEMBER 1946

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	<u>B*</u>	<u>D</u>	<u>F</u>
1. Date of initial startup	26 Sept. 1944	17 Dec. 1944	25 Feb. 1945
2. Days since initial startup	735	653	583
3. Power Level (MW)	0	250	200
4. Accrued MWD	98107	148809	121863
5. Slugs pushed since startup	97504	148691	113140
6. Product pushed (in MWD)	78073	121784	94557
7. Slugs in pile	55969	63887	64256
8. No. Channels (Poison)	21	6	5
9. No. Channels (Dummy)	270	4	5
10. No. Channels (Soda Pulp)	0	5	4
11. No. Channels (Special Request)	0	7	9
12. Inlet Water Temp. (Ave) °C.	-	14.6	14.7
13. Outlet Water Temp. (Ave) °C.	-	43.6	37.7
14. Scrums	0	0	0

Note: \*Unit has been shutdown since 19 March 1946 and is being held in standby condition.

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TABLE IV  
CHRONOLOGY OF PILE EVENTS

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100 "B" AREA

1 SEPTEMBER TO 30 SEPTEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
31 August 1946	2359	0	Unit in standby condition.
30 September 1946	2359	0	Unit in standby condition.

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TABLE V

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CHRONOLOGY OF PILE EVENTS

100 "D" AREA

1 SEPTEMBER TO 30 SEPTEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
30 August 1946	1044	0	Unit shut down due to critical "Y" power condition caused by pile fire in 151 F Sub-Station.
	1056	0	Unit started to power.
	1156	118	Unit reached this maximum but failed to recover level.
	1214	0	Unit shut down.
	2350	0	Unit started to power.
31 August 1946	0140	250	Normal operation resumed.
3 September 1946	0345	0	Scheduled shut down for pushing of metal; 3296 pieces with a MWD content of 2577 were discharged. Special Request No. 15-4 was charged into tubes No. 3276 (12 pieces 51-62) and No. 1579 (23 pieces 63-85). Tube No. 3574 (poison) was discharged and re-charged with regular metal.
	2143	0	Unit started to power.
	2300	250	Normal level reached.
4 September 1946	0145	235)	Level lowered on account of excessive temperature use of tube No. 3887.
	0210	230)	
	0735	250	Normal operation resumed.
10 September 1946	0350	0	Scheduled shut down for pushing of metal; 2496 pieces with a MWD content of 1953 were discharged.
	2042	0	Unit started to power.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
	2202	250	Normal operating level attained.
11 September 1946	0050 0110	245 ) 240 )	Power level reduced due to excessive tube temperature.
	0434	245	Power level increased from 240 to 245 MW.
	0535	250	Normal operation resumed.
17 September 1946	0320	0	Scheduled shutdown for pushing of metal and technical measurements; 96 pieces with a MWD content of 112 were discharged. Special Request No. 15-2 was discharged from tube No. 2682 and Special Request Nos. 15-4 (14 pieces) and 15-5 (22 pieces) were charged into tube No. 2682. "B" material was charged into regular tube No. 1976.
	2017	0	Unit started to power.
	2144	250	Normal operating level attained.
18 September 1946	0015	240	Power level reduced due to high tube temperature and excessive rate of graphite temperature rise.
	0705	250	Normal operation resumed.
24 September 1946	0420	0	Scheduled shutdown for pushing of metal; 2501 pieces with a MWD content of 1979 were discharged.
	2333	0	Unit started to power.
25 September 1946	0108	250	Normal operating level attained.
	0230	240	Power level reduced due to excessive tube temperature.
	0240	235	Power level reduced due to excessive tube temperature.
	0405	230	Power level reduced due to excessive tube temperature.
	0535	225	Power level reduced due to excessive tube temperature.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
	0550	230	Power level raised from 225 to 230.
	0730	220	Power level reduced due to excessive tube temperature.
	0815	210	Power level reduced due to excessive tube temperature.
	0915	220	Power level raised 10 MW.
	0930	230	Power level raised 10 MW.
	0950	240	Power level raised 10 MW.
	1005	250	Normal operation resumed.
30 September 1946	2359	250	Normal operation continues.

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TABLE VI

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CHRONOLOGY OF PILE EVENTS

100°F AREA

1 SEPTEMBER TO 30 SEPTEMBER, 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
30 August 1946	1049	0	Unit shut down due to critical "Y" power condition caused by pole fire in 151 F Sub Station.
	2015	0	Unit started to power.
	2116	200	Normal operation resumed.
4 September 1946	0706	0	Scheduled shut down for maintenance and technical work. Tube No. 2374 (poison) was discharged and recharged with Special Request No. 15-4 (50 pieces).
	2113	0	Unit started to power.
	2218	200	Normal operation resumed.
11 September 1946	0700	0	Scheduled shut down for pushing of metal; 2496 pieces with a MWD content of 1978 were discharged.
	2005	0	Unit started to power.
	2114	200	Normal operation resumed.
18 September 1946	0600	0	Scheduled shut down for maintenance and technical work. One corrosion and one over-age tube were discharged consisting of 70 pieces with a MWD content of 142. Horizontal bowing measurements were made on tubes 2451 and 2496.
	2153	0	Unit started to power.
	2316	200	Normal operation resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MWD</u>	<u>REMARKS</u>
25 September 1946	0400	0	Scheduled shutdown for pushing of metal; 3395 pieces with a MWD content of 2810 were discharged. Special Request Nos. 7, 9-3, 10-A and 16-I were discharged from tube No. 1565. An over-age corrosion tube (2491) was also discharged. All tubes discharged were recharged with regular metal.
	1952	0	Unit started to power.
	2058	200	Normal operation resumed.
30 September 1946	2359	200	Normal operation continues.

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100 AREA MONTHLY REPORT

1 OCTOBER THROUGH 31 OCTOBER 1946

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100 - B

Storage Basin

During the month, the cleaning of the 105 Building Storage Basin continued. The washing of the walls, pillars and floors has reduced contamination by a considerable amount; but, in order to meet tolerance requirements, further work is necessary.

General

The normal work consists of that required in maintaining buildings, equipment and grounds in standby condition. At this time the application of protective painting is in progress throughout the area.

100 - D

Exposure of 4-Inch Slugs (Production Test 105-75-P)

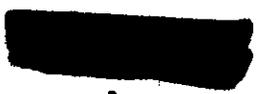
Much thought has been given to proposals aiming towards the extension of the operating life of the Hanford piles. In particular, a test entitled, "Exposure of Four-inch Slugs," was begun during the month. On 8 October 1946 three channels were charged with two sets of uranium slugs, the slugs differing only in length. Each of the channels contained 26 four-inch slugs, centered in their respective tubes, and 19 eight-inch slugs. These slugs will be discharged according to a schedule designed to give information correlating slug length with production factors; such as product concentration and pile reactivity. If successful, this test would show that tube-bowing tolerances could be increased above those now possible with the standard eight-inch slugs, thereby substantially extending the operating life of the piles providing no counter-acting factors occur.

Extended Shutdown

An extended shutdown was carried out on 21-24 October 1946 as scheduled, during which maintenance work, long over-due, was accomplished.

The thimble and assembly of the "B" Test Hole were removed from the pile because the leak, discovered on 18 July 1946, could not be repaired during normal shutdown. After the removal, the hole was boroscoped, and a new thimble installed. This installation places an additional test facility at the disposal of the contractor.

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The neoprene seal on the top of the pile, adjacent to the control room, and the seal on the rear side were replaced during the extended shutdown. These seals had stretched to hazardous limits as a direct result of expansion of the graphite moderator.

In addition, the following maintenance jobs were performed: (1) repair of discharge chutes, and mattress plate extensions; (2) installation of screens in the pipe lines between the far-side emergency water high-tank and the pile; and (3) removal of the cork layer between the top of the pile and the rod room because it had been compressed to about half of its original thickness as a result of graphite expansion. (A neoprene seal was installed in place of the cork.)

Two refrigeration units are still in operation in this area as of 31 October 1946.

Bowing

Traverses of tubes 2451-D and 2496-D on 22 October 1946 showed that the horizontal bowing of these tubes is now approximately 1 inch and 1 15/32 inches, amounting to an increase of 1/16 inch and 5/32 inch for the respective tubes. The previous data were taken on 6 August 1946.

Status of Request Samples

Request Samples currently in the pile are as follows:

<u>Request No.</u>	<u>Charged</u>	<u>Tube No.</u>	<u>Pieces</u>
13-2	6 Aug. 1946	3169-D	30
15-4	3 Sept. 1946	3276-D	12
15-4	3 Sept. 1946	1579-D	23
15-4	(17 Sept. 1946	2682-D )	14
15-5	(17 Sept. 1946	2682-D )	22
15-5	1 Oct. 1946	2374-D	34
15-5	1 Oct. 1946	2666-D	31
15-6	8 Oct. 1946	2082-D	24
15-6	15 Oct. 1946	1569-D	26
15-7	15 Oct. 1946	3179-D	32
15-8	24 Oct. 1946	2066-D	27
15-7	24 Oct. 1946	1474-D	18

100 - F

Special Request No. 11

After considerable difficulty, Request No. 11, consisting of 1 gram of radium, was charged in the "B" Test Hole on 2 October 1946. The foresightedness and skill of contractor personnel, charged with the responsibility of loading this sample in the "B" Test Hole, forestalled



a future emergency. Circumstances were such that a hazardous condition would have resulted from an improper insertion of the capsule. In view of the fact that the capsule was improperly loaded in the shipping container by personnel at site C, there was a grave possibility of placing this request sample backwards in the test hole. Had this error occurred, removal of the sample after the period of irradiation would have presented problems of serious proportions.

Exposure of 4-Inch Slugs (Production Test 105-75-P)

Each of three tubes were charged with 27 special four-inch slugs and 18 regular pieces on 9 October 1946 in accordance with Production Test 105-75-P. For details, see paragraph on this same subject under 100-D on page 1.

General

The 20-inch water-line, supplying emergency export water from the 105 group of buildings, broke on 2 October 1946. Some damage occurred to walkways and roads. Water ran into some electrical manholes. And, although the refrigeration units were shut down at this time as a safety measure, they will not be restarted until warm weather requires their operation. The damaged section of pipe was replaced and service restored.

Difficulty was experienced in discharging channel 2284-F on 23 October 1946, and a boroscope examination showed that the tube was badly gouged. Since the operations necessary in replacing this channel require more time than is available during a normal shutdown, this tube was charged as a dummy and the orifice was changed to 0.175 inches to facilitate continued operation until the extended shutdown on or about 4 November 1946.

Status of Request Samples

Request samples currently in the pile are as follows:

<u>Request No.</u>	<u>Charged</u>	<u>Tube No.</u>	<u>Pieces</u>
6	2 April 1946	3282-F	1
12-B-2	( 18 April 1946	3378-F )	1
16-II	( 18 April 1946	3378-F )	1
13-1	24 July 1946	3274-F	34
13-2	7 Aug. 1946	2666-F	30
15-4	4 Sept. 1946	2374-F	50
15-5	2 Oct. 1946	1474-F	19
15-5	2 Oct. 1946	1569-F	35
15-5	2 Oct. 1946	2082-F	35
15-5	( 2 Oct. 1946	2682-F )	21
15-6	( 2 Oct. 1946	2682-F )	14
15-6	16 Oct. 1946	1579-F	36
15-7	16 Oct. 1946	3179-F	35
20	7 Aug. 1946	2271-F	1
11	2 Oct. 1946	"B" Test Hole	1

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SODA PULP

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100-D

At the present time there are eight soda-pulp columns in 105-D, four charged with 60 slugs each and the remainder containing 40 pieces each. According to present plans, ten columns of 50 pieces each will constitute the loading pattern for the soda pulp in the D-pile--a pattern which will be an actuality on or about 2 January 1947. The exposure period for the increased production schedule will be 120 days.

100-F

There are four channels charged with soda pulp in the F-pile at present. It is planned to discharge two of these on 4 November 1946, and to recharge six instead of two channels with soda pulp. On 4 December 1946 the remaining two channels of the soda pulp of the original four will be discharged, and replaced with six, making a total of twelve (12) channels in the F-pile. Each of the twelve tubes will be loaded with 45 slugs, and the exposure period will also be 120 days.

CORROSION STUDIES

The results of corrosion studies on extruded metal slugs are shown in the following table:

Tabulation of Results on Blistering & Corrosion of Slugs Recently Discharged

Tube No.	Date Discharged	App. Exp. MWD/Tube	Corrosion Rate Inches/mo.		Number Blistered	Remarks
			Ave.	Max.		
2382-D	17 Sept. 1946	63	0.00004	0.00008	35	Corrosion Tube
2083-D	17 Sept. 1946	25	0.00003	0.00005	20	Cast Material
0674-F	18 Sept. 1946	69	0.00004	0.00007	35	Corrosion Tube
1286-F	18 Sept. 1946	74	0.00003	0.00005	27	Corrosion Tube
2491-F	25 Sept. 1946	69			35	Regular Tube
1074-F	25 Sept. 1946	25			16	Regular Tube
0169-D	24 Sept. 1946	25			20	Regular Tube
2465-D	8 Oct. 1946	50			25	Pressure Drop Tube
2469-D	8 Oct. 1946	50			26	" " "
2479-D	8 Oct. 1946	50			26	" " "
2483-D	8 Oct. 1946	50			26	" " "
1462-D	15 Oct. 1946	25			20	Regular Tube

Note: 25 MWD/tube corresponds roughly to 200 MW/Ton.

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SHIPMENTS

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Twelve boxes containing 120 slugs, or 240 pounds, of irradiated soda pulp were shipped to the processing agency via ATC on 11 October 1946 from Pasco. The postum content on the day of shipment was 798 cases. The gross weight of the shipment was about 5000 pounds.

On 11 October 1946, the following special request samples were shipped to Site C via ATC from Pasco:

<u>Request No.</u>	<u>No. of Slugs</u>	<u>Weight of Shipment (lbs.)</u>
9-3	8	5777
7	1	2100
10-A	1	
13-1	35	3629
15-2	36	3197
15-3	24	1750
<hr/>		
Total	105	16,453

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TABLE I

Reactivity Balance of the Operating Piles on 31 October 1946

<u>Absorbing Agent</u>	<u>Ih Absorbed</u>	
	<u>D PILE</u>	<u>F PILE</u>
Control Rods	48	48
Xenon	497	427
Poison	0	54
Bismuth	34	16
Request Samples	308	276
Dummy	2	12
Total	889	833



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TABLE II

Pile Tube Patterns as of 2359, 31 October 1946

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<u>Material</u>	<u>No. of Tubes</u>			<u>No. Slugs per Tube</u>			<u>Total No. of Slugs</u>		
	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>
Metal	1317	1849	1733	32	32	32	42,144	59,168	55,456
Metal	395	129	244	35	35	35	13,825	4,515	8,540
Metal (Tubes with 4" & regular pieces	0	3	3	0	32	31½	0	96	94½
Poison	21	0	2	-	-	-	-	-	-
Request	0	11	12	-	-	-	-	-	-
Dummy	270	4	6	-	-	-	-	-	-
Bismuth	0	8	4	-	-	-	-	-	-
Instrument	1	-	-	-	-	-	-	-	-

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TABLE III

COMPARISON OF B, D, AND F AREAS

AT 2359, 31 OCTOBER 1946

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	<u>B *</u>	<u>D</u>	<u>F</u>
1. Date of initial startup	26 Sept. 1944	17 Dec. 1944	25 Feb. 1945
2. Days since initial startup	766	684	614
3. Power Level (MW)	0	250	200
4. Accrued MWD	98107	154644	127512
5. Slugs pushed since startup	97504	157246	120664
6. Product pushed (in MWD)	78073	128622	100634
7. Slugs in pile	55969	63780	64090 $\frac{1}{2}$
8. No. of Channels (Poison)	21	0	2
9. No. of Channels (Dummy)	270	4	6
10. No. of Channels (Soda Pulp)	0	8	4
11. No. of Channels (Special Request)	0	11	12
12. Inlet Water Temp. (Ave.) °C.	-	11.3	12.5
13. Outlet Water Temp. (Ave.) °C.	-	41.4	36.4
14. Scrams	0	1	1

\*Note: - \* Unit has been shut down since 19 March 1946 and is being held in standby condition.

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TABLE IV  
CHRONOLOGY OF PILE EVENTS

100 "B" AREA

1 OCTOBER TO 31 OCTOBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 October 1946	0001	0	Unit in standby condition.
31 October 1946	2359	0	Unit in standby condition.



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TABLE V

CHRONOLOGY OF PILE EVENTS

100 "D" AREA

**DECLASSIFIED**

1 OCTOBER TO 31 OCTOBER, 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 October 1946	0001	250	Normal operation.
1 October 1946	0145	0	Scheduled shutdown for pushing of metal; 3363 pieces with a MWD content of 2630 were discharged. Tubes No. 0980 and No. 3880 were discharged of "B" material and re-charged with "B" material. Tube No. 1971 was charged with 40 pieces of "B" material. Special Request 15-5 (34 pieces) was charged in tube No. 2374. Special Request 15-5 (31 pieces) was charged in tube No. 2666.
	2032	0	Unit started to power.
	2346	250	Nominal operating level attained.
2 October 1946	0130	230	Power level reduced due to excessive tube temperature.
	0935	250	Normal operation resumed.
8 October 1946	0350	0	Scheduled shutdown for pushing and maintenance; 288 pieces with a MWD content of 277 were discharged. Special Requests 15-3 and 25-3 were discharged. Special Request 15-6 (24 pieces) was charged into tube No. 2082-D. "B" material (40 pieces each) was re-charged into tubes No. 3385-D and 1485-D. Tubes No. 3569-D, 3570-D and 3571-D were each charged with 26 special 4-inch pieces and 19 regular pieces.
	2258	0	Unit started to power.

(Continued)

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
9 October 1946	0024	250	Normal operating level attained.
	0228	240	Power level reduced due to excessive tube temperature.
	0436	235	Power level reduced due to excessive tube temperature.
	0546	240	Power level raised from 235 to 240 MW.
	0730	245	Power level raised from 240 to 245 MW.
	0945	250	Normal operation resumed.
14 October 1946	1631	0	Unit scrambled by No. 22 Vertical Safety Rod dropping into unit. Cause unknown.
15 October 1946	0000	0	Scheduled discharge of 3144 pieces with a MWD content of 2508. Special Request 15-6 (26 pieces) was charged into tube No. 1569. Special Request 15-7 (32 pieces) was charged into tube No. 3179.
	1506	0	Unit started to power.
	1657	250	Normal operating level attained.
	1840	235	Power level reduced due to excessive tube temperature.
	1920	225	Power level reduced due to excessive tube temperature.
	1945	230	Power level raised.
	2050	235	Power level raised.
	2245	240	Power level raised.
16 October 1946	0210	250	Normal operation resumed.
17 October 1946	1206	0	Unit shut down due to trouble with operating mechanism on No. 32 Vertical Safety Rod. Rod tied out of service.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
17 October 1946	1215	0	Unit started to power.
	1232	250	Normal operation resumed.
21 October 1946	0400	0	Scheduled shutdown for maintenance work. Six regular metal tubes were discharged, 192 pieces with a MWD content of 132, and recharged with temporary poison pieces. The "B" test hole was removed and a new 3 1/2 inch thimble inserted. During the shutdown a total of 1760 pieces of metal were discharged with a MWD content of 1423, which total includes the above-mentioned 192 pieces. Special Request 15-8 (27 pieces) was charged into tube No. 2066 and Special Request 15-7 (18 pieces) was charged into tube No. 1474.
24 October 1946	2240	0	Unit started to power. The Technical Department made period and coefficient tests.
	2359	33.5	Technical tests performed.
25 October 1946	0436	3.0	Technical tests performed.
	1637	229.0	Tests completed. Power raised to design level.
	1729	220	Level reduced due to excessive tube temperature.
	1930	197	Level reduced due to excessive tube temperature.
	2210	200	Power level raised.
	2359	217	Power level raised gradually.
	26 October 1946	0330	250
0700		235	Power level reduced due to excessive tube temperature.
0745		250	Normal operating level attained.
0925		0	Scheduled shutdown for pushing of six temporary "P" tubes.

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<u>DATE</u>	<u>TIME</u>	<u>POWER</u>	<u>REMARKS</u>
26 October 1946	1220		Unit started to power.
	1334	250	Normal operating level attained.
	1526	240	Level reduced from 250 to 240 due to excessive tube temperature.
	1625	235	Level reduced due to excessive tube temperature.
	1705	228	Level reduced due to excessive tube temperature.
	1845	235	Power level raised.
	2045	245	Power level raised.
	2100	250	Normal operation resumed.
31 October 1946	2359	250	Normal operation continues.



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TABLE VI

CHRONOLOGY OF PILE EVENTS

100 "F" AREA

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1 OCTOBER TO 31 OCTOBER, 1946, INCLUSIVE.

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 October 1946	0001	200	Normal operation.
2 October 1946	0340	0	Scheduled shutdown for pushing of metal. 2528 pieces with a MWD content of 2057 were discharged. Special Requests 13-1, 15-3 and 3-1 were discharged. Special Requests 11, 15-5 and 15-6 were charged.
	2243	0	Unit started to power.
	2340	200	Normal operation resumed.
9 October 1946	0600	0	Scheduled shutdown for pushing of metal; 2504 pieces with a MWD content of 2016 were discharged. Three tubes were charged for P.T.--80; each tube having 27 special 4-inch pieces and 18 regular metal pieces.
	2035	0	Unit started to power.
	2140	200	Normal operation resumed.
16 October 1946	0625	0	Scheduled shutdown for maintenance. Special Request 15-6 (36 pieces) was charged in tube No. 1579. Special Request 15-7 (35 pieces) was charged in tube No. 3179.
	1932	0	Unit started to power.
	2050	200	Normal operation resumed.
22 October 1946	1255	0	No. 1 scram, due to momentarily low water pressure at 190 Bldg.
	1309	0	Unit started to power.
	1317	200	Normal operation resumed.

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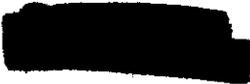
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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
23 October 1946	0640	0	Scheduled shutdown for pushing of metal; 2492 pieces with a MWD content of 2004 were discharged.
	2143	0	Unit started to power.
	2300	200	Normal operation resumed.
31 October 1946	2359	200	Normal operation continues.

*F.A. Valente  
maj. C.E.*



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100 AREA MONTHLY REPORT

1 NOVEMBER THROUGH 30 NOVEMBER 1946

*Mr. Hageman*  
*Maj. Travis*

100 - B

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Storage Basin

Cleaning of the 105 Building storage basin has been completed and the basin was filled with water on 15 November 1946. Very good results were obtained on tests made to determine the amount of contamination and the basin is now considered to be in good condition. The excavation, which was used as a settling basin in the cleaning process, has been back filled with the earth removed in the digging of the basin.

100 - D

On 7 November 1946 the process water refrigeration units were shut down for the season.

During the month it was discovered that what was thought to be tube 3276 was in reality tube 3274, the intended uppermost column of the regular poison pattern. Tube 3274 had been chosen as the correct poison column, and it was thought that 3276 had been loaded by accident. Actually, tube 3274 was being used as the poison column, the confusion being caused by switching of the thermocouple leads which measure the temperature of the effluent water.

Corrosion Studies

The following table lists the data on corrosion studies on the 100-D pile hitherto unreported:

Tube No.	Date Discharged	App. Exp.		Corrosion Rate		No. Blistered	Remarks
		MWD/Tube	Days	Ave. Inches/mo.	Max.		
2084-D	23 Oct. 1946	30	197	0.00004	0.00005	27	Cast material
2487-D	23 Oct. 1946	65	418	0.00004	0.00008	29	Corrosion Tube
1776-D	23 Oct. 1946	66	411	0.00004	0.00008	32	Corrosion Tube
3276-D	5 Nov. 1946	9	50	-	-	12	Discharged prematurely
0989-D	26 Nov. 1946						Corrosion Tube
2184-D	26 Nov. 1946						Cast Metal
1762-D	26 Nov. 1946						Cast Metal

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Status of Request Samples

Request Samples currently in the 100-D pile are as follows:

<u>Request No.:</u>	<u>Charged:</u>	<u>Tube No.:</u>	<u>Pieces:</u>
13-2	6 August 1946	3169-D	30
15-6	8 October 1946	2082-D	24
15-6	15 October 1946	1569-D	26
15-7	15 October 1946	3179-D	32
15-7	24 October 1946	1474-D	18
15-8	24 October 1946	2066-D	27
15-8	5 November 1946	1579-D	23
15-9	5 November 1946	3274-D	12
15-9	26 November 1946	2666-D	31
15-9	26 November 1946	2682-D	36
15-9	( 26 November 1946	2374-D	21 )
15-10	( 26 November 1946	2374-D	13 )

100 - F

During the period 4 to 7 November 1946 there was an extended shutdown in the 100-F Area similar to that held in 100-D last month. This shutdown was for the purpose of maintenance. This maintenance included the installation of new valves (pneumatically operated) on the third safety device; the installation of screens in the lines between the emergency high-water tanks and the pile; removal of the cork layer in the wall between the top of the pile and the rod-room and replacement of this cork layer by a neoprene seal; the replacement of the neoprene seal on the top of the control-room side shield of the pile; the replacement of two dummy tubes, 2174 and 2284; and repair of mattress plates in the discharge area.

Corrosion and Blistering

Studies on corrosion and blistering of slugs discharged from the 100-F pile are as follows:

Tube No.	Exposure		Number Blistered					
			A Material * UNBLISTERED			C Material * UNBLISTERED		
			Slight	Moderate	Severe	Slight	Moderate	Severe
2375-F	45	348	9	1	2	15	5	-
2473-F	44	348	10	-	2	15	4	1
2475-F	46	348	8	-	3	14	4	3
2575-F	46	348	9	-	2	15	6	-

\* A Material - Normal concentration material.  
 C Material - High concentration material.

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Status of Request Samples

Request samples currently in the 100-F pile are as follows:

<u>Request No.</u>	<u>Charged</u>	<u>Tube No.</u>	<u>Pieces</u>
6	2 April 1946	3282-F	1
12-B-2	(18 April 1946	3378-F )	1
16-II	(18 April 1946	3378-F )	1
13-1	24 July 1946	3274-F	34
13-2	7 August 1946	2666-F	30
15-6	16 October 1946	1579-F	38
15-7	16 October 1946	3179-F	35
15-7	( 5 November 1946	3169-F )	13
15-8	( 5 November 1946	3169-F )	10
15-8	5 November 1946	2374-F	39
15-9	27 November 1946	1474-F	19
15-9	27 November 1946	1569-F	23
15-9	27 November 1946	2082-F	25
15-9	27 November 1946	2682-F	25
20	7 August 1946	2271-F	1
11	2 October 1946	"B" Test Hole	1

GRAPHITE EFFECTS

Two graphite samples were removed from the "B" Test Hole of the 100-F pile during the extended shutdown of 4 to 7 November 1946. These samples had received a total exposure corresponding to 355 and 1215 megawatt days per central ton, respectively, having received previous exposures corresponding to 39 and 899 MWD/CT, respectively, in the "B" Test Hole of the 100-B pile before being transferred to 105-F. To compare the properties of irradiated graphite with those of unirradiated graphite, the following list is presented showing ratios of values of thermal conductivity (K), electrical resistivity (R), cross-breaking strength (B), and crushing strength (C). The stored energy content (cal./gm.) and the percent expansion for these irradiations are also given.

<u>MWD/CT</u>	<u>K<sub>o</sub>/K</u>	<u>R/R<sub>o</sub></u>	<u>B/B<sub>o</sub></u>	<u>C/C<sub>o</sub></u>	<u>Cal./gm.</u>	<u>Dim. Change (%)</u>
355	18.8	4.1	-	-	-	0.30
1215	39.4	4.9	1.7	2.3	90	(parallel)
1045 *	19.6	3.7	-	-	36	0.28

\*This sample was taken from the No. 9 horizontal rod thimble, which was removed from 100-D pile on 18 June 1946.

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The  $K_0/K$  value for the 1215 MWD/CT sample is in line with previous measurements on other samples and fits the empirical equation developed from previous data: E is the exposure in MWD/CT.

$$K/K_0 = 1 + 12.7 \left[ 1 - e^{(-0.0118E)} \right] + .0217E.$$

The ratios,  $B/B_0$  and  $C/C_0$ , continue to show decreases from the maximum values of 3.6 and 2.9, respectively, which values were attained at an exposure corresponding to 120 MWD/CT.

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### File Power Coefficients

Following the extended shutdown of 100-F from 4 to 7 November 1946, coefficient tests were run on the xenon-free pile. These values (averages) are tabulated below:

Total integrated exposure of unit:	128150 MWD.
Metal coefficient:	-0.38 ih/MW.
Graphite coefficient:	+1.40 ih/MW.
Overall coefficient:	1.02 ih/MW.
Period:	62 minutes.

The graphite coefficient of 1.40 ih/MW is considerably higher than the value of .5 to .6 ih/MW found when measurements are made with the piles near their rated operating level. Data from this test also furnish the most accurate information available to date on the percentage of xenon formed directly in fission. This value is 6.5%.

Analysis of the coefficient test run at 100-D on 1 November 1946 under normal operating conditions gave the following results:

Total integrated exposure:	154888 MWD.
Metal coefficient:	-0.32 ih/MW.
Graphite coefficient:	0.69 ih/MW.
Overall coefficient:	0.37 ih/MW.
Period:	54 minutes.

As was indicated in last month's report, coefficient tests were made at 100-D during the shutdown of 21 to 24 October 1946 on the xenon-free pile. However, due to complications arising from these tests, a complete analysis has not been made to date. Results will be reported in a future report.

### PILE MOTION

#### 100-B

Push-pull tests with the 1500-pound pneumatic jack have been made on fifty (50) tubes at the B Pile. A total of eight (8) tubes has been shown to be subject to binding. These tubes are all located

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in the upper third of the pile. The gunbarrel sum-clearance for this unit has a value of  $9/32$  in. minimum and  $16/32$  in. average. These values have been corrected to  $5^{\circ}$  C.

100-D

A transit survey of the far-side shield indicates that the shield has moved outward at a rate of between 0.06 to 0.08 in. per month for the past six months. Bowing of tube 4674, which on 21 October 1946 had reached a value of 2 and  $5/16$  in., and the readings of levels on the roof of the pile, indicate that the roof has continued to rise at a steady rate of about 0.06 in. per month for the past three months.

In an attempt to determine the effect of bowing on charging and discharging of tubes, probe tests are being run on representative tubes in the different areas. These tests consist of inserting into the tubes over-size test slugs of different dimensions and noting any binding effects. During the 5 November 1946 shutdown of the D pile there were found to be five (5) tubes for which a 1.490 inch diameter slug could be inserted into the rear end but not into the front end. One tube could accommodate this size slug only from the front end, while there was one tube (4477) into which the probe could not be inserted from either end. A 1.485 inch slug could be inserted in all cases. During the shutdown of 26 November 1946, ten (10) tubes were probed. In this test, the nozzles of the tubes were left on and the probe inserted through the nozzle. It was found impossible to insert the probe through the nozzles of three of the tubes due, probably, to the design of gaskets rather than that of the nozzles. Of the remaining seven (7) tubes, it was found that a 1.490 inch diameter test slug would pass completely through six of them. This size test slug stuck 8 feet 7 inches from the inlet end of the seventh tube, but a 1.485 inch diameter slug could be pushed through the tube. The diameter of the standard heavy metal slug is 1.440 inch.

100-F

Unexpectedly large roof displacements were recorded for the 100-F pile. The average value was .30 inch during the month, 15 October to 15 November. Transit surveys of the central and top portions of the far side shield of the 100-F pile indicate an outward movement of 0.04 and 0.06 inch per month for the past six months. The face to face graphite length at 100-F was measured while two of the tubes (2174 and 2284) were out of the pile. These values were checked by measuring the sum clearance of the tubes.

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<u>Tube No.</u>	<u>Expansion</u>	<u>Check Value</u>
2174-F	28/32 in.	25/32 in.
2284-F	23/32 in.	24/32 in.

In comparison, previously reported expansion at 100-B was 20/32 inch at tube 3671.

Probe tests on six (6) channels of the F pile on 20 November 1946 indicated binding in several tubes with the 1.490 inch diameter test slug; no binding was indicated with the 1.485 inch probe. In four of these tubes, the 1.490 inch test probe stuck at a distance of approximately 7 feet 4 inches from the inlet end. Only one tube showed any binding when the test slug was inserted from the rear end.

SODA PULP PROGRAM

As of 30 November 1946, the accelerated soda pulp program had the following status:

<u>PILE:</u>	<u>ORIGINAL LOADING:</u>		<u>PRESENT LOADING:</u>		<u>PROPOSED FINAL LOADING:</u>	
	<u>Channels</u>	<u>Slugs/channel</u>	<u>Channels</u>	<u>Slugs/channel</u>	<u>Channels</u>	<u>Slugs/Ch.</u>
100-D	4	60	(4 4)	60 40	10	50
100-F	4	60	(2 6)	60 45	12	45

SHIPMENTS

Twelve boxes containing 120 slugs, or 240 pounds, of irradiated soda pulp were shipped to the processing agency via ATC on 15 November 1946 from Hanford. The postum content on the day of shipment was 693 cases. The gross weight of the shipment was about 5000 pounds.

On 12 November 1946 one slug of Request 25-3 was shipped by truck to the University of California. The approximate weight of this shipment was 1100 pounds.

On 15 and 19 November the following Special Request samples were shipped to Site C and Clinton via ATC from Hanford:

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<u>Request No.</u>	<u>Date of Shipment</u>	<u>No. of Slugs</u>	<u>Weight (lbs.)</u>
(15-3	15 November 1946	24 )	2101
(15-4	15 November 1946	14)	
15-4	15 November 1946	36	2100
15-4	19 November 1946	35	2085
19	19 November 1946	1	1070
Iodine	15 November 1946	5 gal.	316
Cold Soda Pulp	19 November 1946	3	10
<hr/>			
Total			7682

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TABLE I

Reactivity Balance of the Operating Piles on 30 November 1946

<u>Absorbing Agent</u>	<u>lb Absorbed</u>	
	<u>D PILE</u>	<u>F PILE</u>
Control Rods	64	52
Xenon	497	427
Poison	0	17
Bismuth	34	41
Request Samples	302	275
Dummy	2	2
Totals -	899	814

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TABLE II

File Tube Patterns as of 2359, 30 November 1946

<u>Material</u>	<u>No. of Tubes</u>			<u>No. Slugs per Tube</u>			<u>Total No. of Slugs</u>		
	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>
Metal	1317	1849	1755	32	32	32	42,144	59,168	56,160
Metal	395	129	220	35	35	35	13,825	4,515	7,700
Metal (Tubes with 4 <sup>th</sup> and regular pieces)	0	3	3	0	32	31 $\frac{1}{2}$	0	96	94 $\frac{1}{2}$
Poison	21	0	1	-	-	-	-	-	-
Request	0	11	13	-	-	-	-	-	-
Dummy	270	4	4	-	-	-	-	-	-
Bismuth	0	8	8	-	-	-	-	-	-
Instrument	1	-	-	-	-	-	-	-	-

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TABLE III

COMPARISON OF B, D, AND F AREAS

AT 2359, 30 NOVEMBER 1946

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	<u>B *</u>	<u>D</u>	<u>F</u>
1. Date of initial startup	26 Sept. 1944	17 Dec. 1944	25 Feb. 1945
2. Days since initial startup	796	714	644
3. Power level (MW)	0	250	200
4. Accrued MWD	98107	161639	132241
5. Slugs pushed since startup	97504	164030	129152
6. Product pushed (in MWD)	78073	133965	107388
7. Slugs in pile	55969	63780	63954 $\frac{1}{2}$
8. No. of Channels (Poison)	21	0	1
9. No. of Channels (Dummy)	270	4	4
10. No. of Channels (Soda Pulp)	0	8	8
11. No. of Channels ( Special Request)	0	11	13
12. Inlet Water Temp. (Ave.) °C.	-	9.8	9.9
13. Outlet Water Temp. (Ave.) °C.	-	39.9	33.9
14. Scrams	0	2	0

\* Note: - Unit has been shut down since 19 March 1946 and is being held in standby condition.

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TABLE IV  
CHRONOLOGY OF PILE EVENTS

100 "B" Area

1 NOVEMBER TO 30 NOVEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 November 1946	0001	0	Unit in standby condition.
30 November 1946	2359	0	Unit in standby condition.



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CHRONO LOG

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1 NOVEMBER TO 30 NOVEMBER 1946, INCLUSIVE

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 November 1946	0001	250	Normal operations.
1 November 1946	0900	221	The pile level was reduced to make co-efficient tests.
	1400	248	Power level being raised to design capacity.
	1800	250	Normal operation resumed.
4 November 1946	1202	0	The unit scrambled due to a power interruption on the B.P.A. system.
	1228	250	Normal operation resumed.
5 November 1946	0350	0	Scheduled shutdown for pushing of metal; 3360 pieces with a M.W.D. content of 2585 were discharged. Discharged 23 pieces of Special Request No. 15-4 from tube No. 1579 and 12 pieces from tube No. 3274. Charged 23 pieces of Special Request No. 15-8 in tube No. 1579 and 12 pieces of Special Request No. 15-9 in tube No. 3274.
6 November 1946	0204	0	Unit started to power.
	0320	250	Normal operating level attained.
	0455	245	Power level reduced due to excessive tube temperature.
	0542	240	Power level reduced due to excessive tube temperature.
	1020	245	Power level raised.
	1200	250	Normal operation resumed.
26 November 1946	0145	0	Scheduled shutdown for pushing of metal; 3424 pieces with a M.W.D. content of 2758 were discharged. Tube No. 2374 was discharged of Special Request 15-5 (34 pieces) Tube No. 2686 was discharged of Special Request 15-5 (31 pieces). Tube No. 2682 (Con't on next page)

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
			was discharged of Special Request 15-4 (14 pieces) and 15-5 (22 pieces). Tube No. 2374 was charged with Special Request No. 15-9 (21 pieces) and 15-10 (13 pieces). Tube No. 2666 was charged with Special Request No. 15-9 (31 pieces). Tube No. 2682 was charged with Special Request 15-9 (36 pieces).
27 November 1946	0004	0	Unit started to power.
	0145	250	Normal operating level attained.
	0330	230	Power level reduced on account of high temperature in tube No. 3887.
	0615	250	Normal power level resumed.
29 November 1946	1527	0	A No. 1 scram was caused by a faulty switch on the Emergency Alternator while the system was being tested.
	1532	0	Unit started to power.
	1606	250	Normal operation resumed.
30 November 1946	2359	250	Normal operation continues.

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CHRONOLOGICAL EVENTS

LOG AREA

1 NOVEMBER TO 30 NOVEMBER, 1946, INCLUSIVE

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 November 1946	0001	200	Normal operation.
4 November 1946	0400	0	Scheduled shutdown for pushing of metal and maintenance work; 3488 pieces with a MWD content of 2858 were discharged. Two bismuth tubes were discharged and six tubes of 45 pieces each were recharged with bismuth. Special request 15-4 consisting of 50 pieces was discharged from tube No. 2374. Special requests 15-7 (13 pieces) and 15-8 (10 pieces) were charged in tube No. 3169. Special request No. 15-8 (39 pieces) was charged in tube No. 2374.
7 November 1946	1438	0	Unit started to power. Technical Department to make production tests.
	1751	~36	Approximate power level of 36 attained.
	2251	0.4	Power level reduced for technical production tests.
	2359	0.4	Tests continue.
8 November 1946	1355	0	Production test completed.
	1425	0	Unit started to power.
	1507	175	Power level of 175 MW attained.
	1507	0	No. 4 Beckman tripped shutting unit down.
	1515	0	Unit started to power.
	1630	200	Operating power level attained.
	2020	190	Power level reduced due to excessive graphite temperature rise.
	2330	200	Normal operation resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
9 November 1946	1000	0	Scheduled shutdown to replace six temporary poison tubes with x-metal.
	1419	0	Unit started to power.
	1530	200	Operating power level attained.
	1730	190	Level reduced due to excessive graphite temperature rise.
	1820	180	Level reduced due to excessive graphite temperature rise.
	2145	190	Power level raised from 180 to 190 MW.
	2215	200	Normal operation resumed.
20 November 1946	0440	0	Scheduled shutdown for pushing of metal; 2504 pieces with a MWD content of 1951 were discharged.
21 November 1946	0210	0	Unit started to power.
	0320	200	Normal operation resumed.
27 November 1946	0440	0	Scheduled shutdown for pushing of metal; 2496 pieces with a MWD content of 1945 were discharged. Tube No. 1474 was discharged of Special Request 15-5 (19 pieces). Tube No. 1569 was discharged of Special Request 15-5 (35 pieces). Tube No. 2082 was discharged of Special Request 15-5 (35 pieces). Tube No. 2682 was discharged of Special Request 15-5 (21 pieces) and 15-6 (14 pieces). Tube No. 1474 was charged with Special Request 15-9 (19 pieces). Tube No. 1569 was charged with Special Request 15-9 (23 pieces). Tube No. 2082 was charged with Special Request 15-9 (25 pieces). Tube No. 2682 was charged with Special Request 15-9 (25 pieces).
	2010	0	Unit started to power.
	2212	200	Normal level attained.
28 November 1946	0145	194	Power level reduced on account of excessive rise in graphite temperature.
	0645	200	Normal operation resumed.
30 November 1946	2359	200	Normal operation continues.

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100 AREA REPORT

1 DECEMBER THROUGH 31 DECEMBER 1946

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100 - B

General.

*Explain that it is short about 36 tons of metal.*

A foil test of the activity of the 100-B pile on 17 December 1946 indicates an average of 105 neutrons per square centimeter per second. This figure is very close to the value obtained during last month's count of 107 neutrons per square centimeter per second, corresponding to a reactivity 1.42% below critical.

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100 - D

Graphite Samples.

Two process tubes (2074-D and 2369-D), containing capsule samples, are scheduled for discharge during the 2 January 1946 shutdown. The exposures of samples from these tubes are expected to correspond roughly to 1400 MWD/CT. These tubes will be reloaded with papooses. To date, only three samples have been charged in any one tube; however, six samples will be charged in each of the above-mentioned tubes. As of 31 December 1946 there were five tubes in this pile containing papoose samples.

General.

The extra slug, the location of which has been uncertain and which has been reported on tables of pile tube patterns for 100-D, has finally been accounted for; 3360 pieces were charged on 17 December 1946, whereas 3361 pieces were discharged.

Status of Request Samples.

Request Samples currently in the 100-D pile are as follows:

(Next page for table.)

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<u>Request No.:</u>	<u>Charged:</u>	<u>Tube No.:</u>	<u>Pieces:</u>
13-2	6 August 1946	3169-D	30
15-9	26 November 1946	2666-D	31
15-9	26 November 1946	2682-D	36
15-9	(26 November 1946	2374-D	21 )
15-10	(26 November 1946	2374-D	13 )
15-10	17 December 1946	2082-D	24
15-10	17 December 1946	1569-D	26
15-10	17 December 1946	3179-D	32
15-10	17 December 1946	2066-D	27
15-10	17 December 1946	1474-D	27
15-10	17 December 1946	1579-D	23
15-10	17 December 1946	3274-D	27

100 - F

Graphite Samples.

During the shutdown of 11 December 1946, three tubes, containing regular metal, were discharged and charged with papoose samples. Each of these tubes were charged with six papooses instead of the usual three charged in other tubes up to the present time. As of 31 December 1946, there were five tubes containing papoose samples in this pile, giving a total of 24 papooses for the unit. The new papooses contain samples whose previous exposures range from 0 to 1215 MWD/CT. These 1215 MWD/CT samples were made up of test graphite removed from the "B" Test Hole of the 100-F pile during the early part of November.

Special Thermocouple Slugs.

Special uranium slugs containing thermocouples have been tested in the 100-F Flow Laboratory. These slugs have been subjected to full water pressure and have been found to operate very satisfactorily. It is expected that the first slug of this type will be charged in the 100-F pile during the shutdown of 9 January 1947.

*Explain purpose of these slugs.*

No. 2 Shim Rod.

The No. 2 shim rod was tied out of service on 26 December 1946 as a result of a small water leak in the cooling system of the rod.

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River Survey.

(spud of the Current)

A survey to determine the flow of the Columbia River, opposite the 100-F Area, was made by a representative of the Portland District, U. S. Engineer Office, on 3 to 6 December 1946. This survey was conducted as part of the project for replacement of the discharge pipes from the area effluent sump. These pipes were found to be broken on 16 August 1946.

Status of Request Samples.

Request Samples currently in the 100-F pile are as follows:

<u>Request No.:</u>	<u>Charged:</u>	<u>Tube No.:</u>	<u>Pieces:</u>
6	2 April 1946	3282-F	1
12-B-2	( 18 April 1946	3378-F	1 )
16-II	( 18 April 1946	3378-F	1 )
13-1	24 July 1946	3274-F	34
13-2	7 August 1946	2666-F	30
15-7	( 5 November 1946	3169-F	13 )
15-8	( 5 November 1946	3169-F	10 )
15-8	5 November 1946	2374-F	39
15-9	27 November 1946	1474-F	19
15-9	27 November 1946	1569-F	23
15-9	27 November 1946	2082-F	25
15-9	27 November 1946	2682-F	25
15-9	( 4 December 1946	1579-F	6 )
15-10	( 4 December 1946	1579-F	19 )
15-10	26 December 1946	2066-F	23
15-10	26 December 1946	3179-F	25
11	2 October 1946	"B" Test Hole	1
26	4 December 1946	"B" Test Hole	1

CORROSION AND BLISTERING

Corrosion and blistering data for the report period ending 31 December 1946 are summarized in the following table:

<u>Tube No.</u>	<u>Date Discharged</u>	<u>App. Exp. MWD/tube</u>	<u>Days</u>	<u>No. Blistered</u>			<u>Penetration Inches/mo.</u>		<u>Remarks</u>
				<u>Sli.</u>	<u>Mod.</u>	<u>Ext.</u>	<u>Ave.</u>	<u>Max.</u>	
1762-D	11-26-46	27	182	18	12	-	0.00003	0.00005	Cast
2658-D	11-26-46	25	196	12	14	2	-	-	Regular
2665-F	-	25	209	22	1	-	-	-	Regular
3161-D	-	-	-	23	3	-	-	-	Randomly selected tube.

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Slug Diameters.

Nine extensively blistered slugs were found amongst those discharged recently from tube 2491-F. A survey of the diameters of the blistered slugs was made using the underwater calipers. Ten readings taken at random on each slug indicated that there is no significant difference between the diameters of slightly blistered and extensively blistered slugs. However, some of the readings were as low as 1.430 inches indicating that even the slightly blistered slugs were far from being round at certain positions along their lengths.

Plaster Casts of Slugs.

In an attempt to record in permanent form the extensiveness and severity of blistering of slugs, plaster casts of three or four severely blistered slugs have been made. The procedure used in making these casts consists merely of making a negative of the slug in the storage basin of the 105 Building, and splitting the negative lengthwise into two halves for making the positives. The positives show very plainly every swelling and depression. Several of these slugs give the appearance of a gnarled tree trunk. Since there is no radioactivity associated with the finished positive, examination at close range is possible.

GRAPHITE EFFECTS

Pile Power Coefficients.

Two production tests to determine reactivity coefficients of the 100-F pile were made during the month on 3 and 18 December. To allow for more complete xenon decay and increased values of the graphite relaxation period, there was an elapsed period of approximately ten hours between the time of lowering of the pile power level and the time of rise to operating level. Previous tests that have been run made use of a five-hour interval. Data (averages) from these tests are given below:

	<u>3 December</u>	<u>18 December</u>
Integrated Exposure of Unit:	132,837 MWD	135,523 MWD
Metal Coefficient:	-0.21 ih/MW	-0.25 ih/MW
Graphite Coefficient:	0.51 ih/MW	0.64 ih/MW
Overall Coefficient:	0.30 ih/MW	0.39 ih/MW
Period:	(66 mins. *	(65 mins.**
	(54 mins.**	(68 mins.**

\* Values at time of lowering of power.  
\*\* Values at return to operating level.

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Bowing of Process Tubes.

✓  
a. Traverses

The most recent data (3 December 1946) on the vertical bowing of the top centermost tube of 100-D (4674) indicates that the extent of the bowing is now  $2\frac{1}{2}$  inches. This corresponds to an increase of  $\frac{3}{16}$  inch since previous measurements were made on 21 October 1946.

✓  
b. Probe Tests

Two series of probe tests were made on representative tubes of the 100-D pile during the month; one on 3 December and the other on 17 December. In both of these tests the probe was inserted into the tubes, where possible, without removing the Van Stone flanges. Data from the 3 December test indicate that, out of 14 top central tubes tested, a 1.490-inch probe could be inserted through only seven of the Van Stone joints. Two of these seven tubes passed the 1.490-inch probe beyond the inner end of the gun barrel; the other five passed the 1.485-inch probe. In the tests made on 17 December, five tubes were probed. Three of these tubes passed a 1.485-inch test probe but could not pass a 1.490-inch probe. In the other two, the probe could not be inserted beyond the Van Stone flange.

*give dia. of tubes & slug.*

It appears from probe test data taken up to the present time that the Van Stone flanges of tubes in the top three rows of the unit are more likely to prevent the passing of test probes. Therefore, probe tests will be confined in the future to tubes in the top three rows of the unit.

Graphite Papooses.

In the near future, a production test covering further graphite irradiation in process tubes will be set up. It is proposed to load three or four tubes with all-graphite papooses which will hold the special graphite for irradiation. These graphite papooses are approximately eight inches long and have a diameter equal to the inside diameter of a process tube (1.526 inches), with grooves cut lengthwise to accommodate the ribs of aluminum tubes. There will be no cooling. A slot, about six inches in length, one-half inch wide and about one inch deep is cut in the top part of the papoose, in which the sample will rest. It is planned to charge four such papooses into each tube. The papooses will be centered in the empty tube; the ends of the tubes will be blocked by means of steel dummy slugs to cut off radiation from the inside.

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SODA PULP PROGRAM

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✓ As of 31 December 1946, the accelerated soda pulp program had the following status:

File	Original Loading		Present Loading		Proposed Final Loading	
	Channels	Slugs/channel	Channels	Slugs/channel	Channels	Slugs/channel
100-D	4	60	(4 4)	(60 40)	10	50
100-F	4	60	12	45	12	45

New containers are under construction for use in future shipments of soda pulp. These containers are designed to carry 57 pieces and it is expected that the gross weight of the ultimate package will be roughly 900 pounds. As a consequence of this new design and in view of increasing shipments of soda pulp starting in February 1947, the number of casks and the total weight of the shipment will not be increased. It is expected that at least one of these new containers will be used in the January shipment.

STATUS OF REQUESTS 13 & 15

✓ The following table presents the status of Requests 13 and 15 as of 31 December 1946:

Req. No.	No. Received To Date	No. To Be Charged	No. In Pile	No. Discharged (Cooling)	No. Shipped (Complete)	Defective
<i>Req. No. 13</i>	423	285	94	0	43	1
<i>Req. No. 15</i>	1312	133	514	197	452	16

SHIPMENTS

✓ Twelve boxes containing 120 slugs, or 240 pounds, of irradiated soda pulp were shipped to the processing agency via ATC on 17 December 1946 from Pasco. The postum content on the day of shipment was 689 cases. The gross weight of the shipment was about 5000 pounds.

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On 17 December 1946 the following Special Request samples were shipped to Site C and Clinton via ATC from Pasco:

<u>Request No.:</u>	<u>Destination:</u>	<u>No. of Slugs:</u>	<u>Weight (lbs.):</u>
(15-4 15-5)	Site C	14) 24)	2101
15-5	Site C	38	2101
15-5	Site C	38	1670
15-5	Site C	38	1741
15-5	Site C	35	2101
(15-5 15-6)	Site C	24) 14	1751
(15-6 15-7)	Site C	36) 2)	1546
20	Site C	1	1527
3-1	Clinton	43	4365
15-10	Site C	1 (leaker)	10

Total

*Total Slugs* ✓ 18,913 ✓  
307



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TABIE I

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REACTIVITY BALANCE OF THE OPERATING PILES ON 31 DECEMBER 1946.

<u>Absorbing Agent</u>	<u>Th Absorbed</u>	
	<u>D PILE</u>	<u>F PILE</u>
Control Rods	64	51
Xenon	492	427
Poison	0	0
Bismuth	34	62
Request Samples	320	278
Dummy	2	2
	<hr/>	<hr/>
Totals	912	820

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TABLE II

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PILE TUBE PATTERNS AS OF 2359, 31 DECEMBER 1946

<u>Material:</u>	<u>No. of Tubes:</u>			<u>No. Slugs per Tube:</u>			<u>Total No. of Slugs:</u>		
	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>	<u>B</u>	<u>D</u>	<u>F</u>
Metal	1317	1873	1772	32	32	32	42,144	59,936	56,704
Metal	395	105	200	35	35	35	13,825	3,675	7,000
Metal (Tubes with 4" and regular pcs.)	0	3	3	0	32	31 $\frac{1}{2}$	0	96	94 $\frac{1}{2}$
Poison	21	0	0	-	-	-	-	-	-
Request	0	11	13	-	-	-	-	-	-
Dummy	270	4	4	-	-	-	-	-	-
Bismuth	0	8	12	-	-	-	-	-	-
Instrument	1	-	-	-	-	-	-	-	-

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TABLE III

COMPARISON OF B, D, AND F AREAS

AT 2359, 31 DECEMBER 1946.

*List items that have been included in previous reports*

	<u>B *</u>	<u>D</u>	<u>F</u>
1. Date of initial startup	26 Sept. 1944	17 Dec. 1944	25 Feb. 1945
2. Days since initial startup	827	745	675
3. Power level (MW)	0	250	200
4. Accrued MWD	98107	168895	137974
5. Slugs pushed since startup	97504	170759	135900
6. Product pushed (in MWD)	78073	139257	112742
7. Slugs in pile	55969	63707	63798 <sup>1</sup> / <sub>2</sub>
8. No. of Channels (Poison)	21	0	0
9. No. of Channels (Dummy)	270	4	4
10. No. of Channels (Soda Pulp)	0	8	12
11. No. of Channels (Special Requests)	0	11	13
12. Inlet Water Temp. (Ave.) °C.	-	7.0	7.1
13. Outlet Water Temp. (Ave.) °C.	-	37.1	31.8
14. Scrams	0	1	0

\* Note: - Unit has been shut down since 19 March 1946 and is being held in stand-by condition.



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TABLE IV  
CHRONOLOGY OF PILE EVENTS

100 "B" AREA

1 DECEMBER TO 31 DECEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 December 1946	0001	0	Unit in standby condition.
31 December 1946	2359	0	Unit in standby condition.

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TABLE V

CHRONOLOGY OF PILE EVENTS

100 "D" AREA

DECLASSIFIED

1 DECEMBER TO 31 DECEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 December 1946	0001	250	Normal operation continues.
3 December 1946	0550	0	Scheduled shutdown for pushing of metal; 3368 pieces with a M.W.D. content of 2613 were discharged.
4 December 1946	0313	0	Unit started to power.
	0413	250	Normal operating level attained.
	0655	235	Power level reduced due to excessive tube temperature.
	0720	225	Power level reduced due to excessive tube temperature.
	1201	240	Level raised to 240 M.W.
	1240	250	Normal operation resumed.
10 December 1946	1252	0	No. 1 scram, due to power disturbance.
	1325	0	Unit started to power. Lost time 33 minutes.
	1345	250	Normal operation resumed.
17 December 1946	0245	0	Scheduled shutdown for pushing of metal; 3361 pieces with a M.W.D. content of 2679 were discharged. The unit was purged with 100 p.p.m. solids at a pressure of 370 p.s.i. for a duration of one hour. The following changes in the Special Request program were made: Tube: Discharged:                      Charged:
	1474	15-7 (18 pcs)	15-10 (27 pcs)
	1569	15-6 (26 pcs)	15-10 (26 pcs)
	1579	15-8 (23 pcs)	15-10 (23 pcs)
	2082	15-6 (24 pcs)	15-10 (24 pcs)
	2066	15-8 (27 pcs)	15-10 (27 pcs)
	3179	15-7 (32 pcs)	15-10 (32 pcs)
	3274	15-9 (12 pcs)	15-10 (27 pcs)

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
	2339	0	Unit started to power.
	2359	50	A power level of 50 M.W. attained.
18 December 1946	0050	250	Normal operation resumed.
27 December 1946	0900	203.7	Power level lowered for a 10-hour period for a coefficient test.
	1900	250	Normal operation resumed.
21 December 1946	2359	250	Normal operation continues.



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TABLE VI

CHRONOLOGY OF PILE EVENTS

100 "F" AREA

**DECLASSIFIED**

1 DECEMBER TO 31 DECEMBER 1946, INCLUSIVE

<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
1 December 1946	0001	200	Normal operation continues.
3 December 1946	0900	175	Production test by Technical Dept.
	1400	204	Normal operation resumed.
4 December 1946	0410	0	Scheduled shutdown to charge four (4) additional "B" tubes. Four tubes of metal were discharged consisting of 128 pieces with a M.W.D. content of 73. Tube No. 2271 was discharged of Special Request No. 20. Tube No. 1579 was discharged of Special Requests 15-6 (36 pcs) and 15-7 (2 pcs), and recharged with Special Requests 15-9 (6 pcs) and 15-10 (19 pcs).
	2019	0	Unit started to power.
	2121	200	Normal operation resumed.
11 December 1946	0410	0	Scheduled shutdown for pushing of metal; 3232 pieces with a M.W.D. content of 2563 were discharged. The unit was purged for a duration of one hour with 100 p.p.m. of solids.
	2313	0	Unit started to power.
	2355	150	Unit at 150 M.W.
12 December 1946	0020	200	Normal operation resumed.
18 December 1946	1015	171	Making coefficient test as outlined in production test 105-74-P.
	2015	200	Normal operation resumed.

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<u>DATE</u>	<u>TIME</u>	<u>POWER LEVEL, MW</u>	<u>REMARKS</u>
26 December 1946	0340	0	Scheduled shutdown for pushing of metal; 3388 pieces with a M.W.D. content of 2718 were discharged. One poison tube (2066) and one tube of Special Request 15-7 (3179) were discharged. Two tubes were charged with Special Request 15-10 (2066 with 23 pcs and 3179 with 25 pcs). The No. 2 shim rod was tied out of the unit due to a small water leak.
	2018	0	Unit started to power.
	2059	200	Nominal level attained.
27 December 1946	0055	190	Power level reduced due to excessive tube temperature.
	0115	180	Power level reduced due to excessive tube temperature.
	0415	190	Power level raised.
	0545	200	Normal operation resumed.
31 December 1946	2359	200	Normal operation continues.

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