DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

**Cover Sheet for a Hanford
Historical Document
Released for Public Availability**

Released 1994

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DT

DISCLAIMER

Portions of this document may be illegible in electronic image products. Images are produced from the best available original document.

HBC-2385

DATE _____

11-14-51

RECORD CENTER FILE, DECLASSIFIED
GENERAL RECORD CENTER FILE

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

100

REF ID: A66444

THIS DOCUMENT CONTAINS RESTRICTED INFORMATION AS
DEFINED BY THE ATOMIC ENERGY ACT OF 1954.
TRANSMISSION OR DISCLOSURE OF ITS
CONTENTS IN ANY MANNER TO AN UNAUTHORIZED
PERSON IS PROHIBITED.

TITLE

Tentative Design Basis New 100 Area Water
Plant Embodying A Close Cooling Water Circuit

1

OTHER OFFICIAL CLASSIFIED INFORMATION

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECS. 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

AUTHOR

ISSUING FILE

CIRCULATING COPY
RECEIVED 700 AREA

12/10/17 118 7900

THIS DOCUMENT IS NOT TO BE LEFT UNATTENDED OR WHERE AN UNAUTHORIZED PERSON MAY HAVE ACCESS TO IT. WHEN NOT IN USE, IT MUST BE STORED IN AN APPROVED LOCKED STORAGE WITHIN AN APPROPRIATE AREA. WHILE IT IS IN YOUR POSSESSION AND UNDER YOUR CONTROL, YOU HAVE OBTAINED IT FROM CLASSIFIED FILES, IT IS YOUR RESPONSIBILITY TO PROTECT IT AND ITS CONTENTS FROM THE RESULTS OF THIS PROJECT AND TO PREVENT ANY UNAUTHORIZED DISCLOSURE. ITS TRANSMITTAL TO, AND STORAGE AT YOUR PLACE OF RESIDENCE IS PROHIBITED. IT IS NOT TO BE DUPLICATED. IF ADDITIONAL COPIES ARE REQUIRED, OBTAIN THEM FROM THE RELATIONSHIP FILE. ALL PERSONS READING THIS DOCUMENT ARE REQUESTED TO SIGN IN THE SPACE PROVIDED BELOW.

[illegible]

54-3000-052 (7-59)

A.E.C.-G.E.-RICHLAND, WASH.

(CLASSIFICATION)

DECLASSIFIED

DECLASSIFIED

RECORD CENTER FILE

HDC-2385

-1-

RECEIVED

JUL 30 1956

300 AREA
CLASSIFIED FILES

Classification Canceled and Changed To

DECLASSIFIED

By Authority of R M Otten

CG-NMP-1 7-7-94

By J E Savely 7-26-94

Verified By Jerrie Mally,
7-28-94.

cc: 1. RM Fryar
2. JR Kelly
3. JP Langan
4. VD Nixon
5. JS Parker
6. KT Perkins
7. OH Pilkey
8. MH Russ
9. JR Wolcott
10. D & C File

Yellow

November 14, 1951

RDA NO. DC-6

TENTATIVE DESIGN BASIS
NEW 100 AREA WATER PLANT
EMBODYING A CLOSE COOLING WATER CIRCUIT

This document consists of
19 pages, [REDACTED]

*#54420501
SK-1-20500-014 may be
obtained from Eng. File*

The attached document includes a plot plan, flow diagram and delineation of basic assumptions upon which the report was developed. It summarizes the work which has been accomplished to date under RDA No. DC-6 in developing a recirculating water system to serve a new reactor. In order to proceed with the work under RDA No. DC-6 it has been necessary to make certain basic assumptions relative to the primary circuit requirements of RDA No. DC-3. These assumptions are explained in the report and are presented by the exhibits contained therein.

They are presented here for the purpose of obtaining either the approval of or corrections to them. Work cannot effectively proceed on this study until the contents of this report are either approved or corrected.

Subsequent to the compilation of the basic report certain additional considerations have come to our attention and are included in the addendum.

MASTER

DECLASSIFIED

RDA NO. DC-6

TENTATIVE DESIGN BASIS

NEW 100 AREA WATER PLANT
EMBODYING A CLOSED COOLING WATER CIRCUIT

INTRODUCTION

The purpose of this report is to briefly explain the development of the tentative flow diagram, SK-20,500 and to define the work being carried out under RDA No. DC-6.

ASSUMPTIONS

The following basic assumptions have been made:

1. The water plant would support a reactor whose power level would be 1300 MW.
2. The water plant, and the reactor which it serves, would be located in a geographical area as yet undetermined.
3. The surface water source in the hypothetical area would be sufficient to supply the plant with a 100 cfs at all times.
4. The surface water supply in the hypothetical area is assumed to be a river containing a large amount of sediment. For the purpose of this study, an average of approximately 10,000 parts per million of sediment was assumed, as was a typical raw water analysis of a Southwestern river.
5. The basic reactor cooling system would employ a recirculating primary cooling system which would pass through the pile and through a heat exchanger plus a recirculating secondary cooling system which would pass through the primary heat exchanger and through an evaporative cooler.
6. The development of the portions of the system integral to the pile and of the primary cooling system, including the heat exchanger, is to be carried under RDA No. DC-3.
7. The development of the water plant, power house, and appurtenances not defined by No. 5 above is to be carried out under RDA No. DC-6.
8. The topography of the hypothetical site is arbitrarily assumed to be that of the "Coyote Rapids" site on Hanford Project.

DECLASSIFIED

TENTATIVE RESULTS

The integration of the basic assumptions and data is presented in the following exhibits:

1. SK-20,500 - Flow Diagram
2. SK-20,501 - Plot Plan
3. Fig. 1. Process Circuit - Normal Operating Condition.
4. Fig. 2. Process Circuit - Condition Coincident with Electrical Power Failure.
5. Fig. 3. Process Circuit - Condition at Steady State Following Shutdown.
6. Fig. 4. Hypothetical Pressure Decay Curve.
7. Fig. 5. Tabulation of Required Flows and Storage Capacities.
8. Fig. 6. Primary Storage Requirement.

DEVELOPMENT OF FLOWS, STORAGE, COOLING AND PUMPING CAPACITY

The values of the following components will be developed under RDA No. DC-3. However, for the purpose of formulating a plan for attacking the problem this office has developed tentative values, which are in some cases broad assumptions.

1. Rate of circulation and pressure of water in primary cooling circuit.
2. Temperatures of water entering and leaving the pile.
3. Quality of primary coolant.
4. Amount of primary coolant make-up required.
5. Volume of primary coolant storage required.
6. Quantity, quality, and pressure of secondary cooling water required through the heat exchanger.
7. Amount of steam required for pumps in the primary cooling circuit.
8. Amount of condenser cooling water, if any, required by the primary circuit.
9. Minimum pressure decay relative to time after power failure.

DECLASSIFIED

Tentative values for the above enumerated factors are enumerated below:

Primary circuit cooling water is assumed to circulate at the rate of 126,000 gpm at a pressure of 525 psi measured at the top of the front face riser. This data was received verbally from Mr. J. S. Parker and is subject to modification by RDA No. DC-3.

Primary cooling circuit temperatures are assumed at 88° F. (31° C.) and 150° F. (65° C.) entering and leaving the pile respectively. This data was received verbally from Mr. J. S. Parker and is subject to modification by RDA No. DC-3.

Primary cooling circuit make-up is assumed to require 1500 gpm to compensate for evaporation and waste from the system under normal operating conditions and to recharge the system after shutdown. This is an arbitrary assumption of approximately one per cent of the normal process flow which would fill the empty system sufficiently to operate in a period of 70 hours.

Primary cooling circuit storage capacity of 10,000,000 gallons is predicated upon provision for the occurrence of the one of the following two contingencies having the greater demand:

1. Execution of the proposed shutdown scheme, (see Figs. 2 and 3) through the following cycle:
 - a. Shutdown with pressure decay as shown on Fig. 4, followed immediately by
 - b. Flushing for three minutes @ 126,000 gpm followed immediately by
 - c. Another shutdown with postulated pressure decay.

For graphic interpretation see Fig. 6.

2. Contamination of one of the 5,000,000 gallon retention basins.

Primary coolant quality

Two methods have been proposed for supplying cooling water of the required quality: (1) Use condensate from prime movers in the system as make-up, (2) Use a demineralization plant to demineralize the water as completely as possible with electric driven prime movers, and (3) Use a combination of demineralization and evaporation to attain satisfactory quality.

We are proceeding on the second proposition assuming that the water thus obtained will be satisfactory for use in the primary circuit. The reasons for proceeding on the basis are as follows:

1. Initial cost of obtaining the make-up and operating the plant is less for proposition number two by a ratio of about 1 to 4.

DECLASSIFIED

2. Simplicity of plant operation favors proposition No. 2.
3. Condenser water flow is less for proposition No. 2 by a ratio of about 1 to 3. Since the foregoing analysis is predicated upon the assumption that surface water will be available in very limited supply this factor assumes significant proportions.
4. Possible contamination of the condensate in proposition No. 1 from turbine oils, metal pick-up, foreign materials, etc. is not present in proposition No. 2.
5. If considered desirable, the condensate from the area could be returned as boiler feed water thereby salvaging most of the heat contained in condensate.
6. Proposition No. 1 might require some after treatment to the condensate before injection into the primary circuit. Thus adding another step not required in proposition No. 2.
7. Proposition No. 3 has not been considered since no definite criteria has been established to fix the water quality required in the system.

Process water requirements during shutdown and transition from operating to shutdown condition are based upon the following assumptions:

1. The pressure decay curve for the reactor would require a pressure of 100 psig at top of front face riser at the end of three minutes after electrical power failure.

This estimate is based upon the arbitrary assumption that the pressure for the reactor under consideration would be 33 per cent higher than that for 105-C measured at the same place at the same time interval after power failure.

2. The required steady state demand, after shutdown, would be 10,000 gpm at the end of one hour after power failure.

These figures are derived by arbitrarily doubling the steady state requirement for 105-C and arbitrarily assuming the period between power failure and steady state to be one hour. An assumed graphical representation of this relationship is shown on Fig. 6.

The portion of the system for which this office is responsible is tentatively developed upon the bases of the above fundamental data and upon other considerations independent of them as described hereinafter.

The secondary cooling system would consist of three components:

1. A pump house (analagous to the existing 190 buildings) which would house pumps for the secondary cooling system, the heat exchangers and primary circuit pumps.

DECLASSIFIED

2. Evaporative coolers.
3. A cooling water reservoir.

The heat exchanger and pumps in the primary cooling system are included in the work to be performed under RDA No. DC-3; however, it is necessary that cognizance of the heat exchanger, in particular, be taken jointly under the two RDA's in order to provide a workable system.

The function of the secondary system would be to remove heat from the primary cooling system by means of heat exchangers and to dissipate it to the atmosphere by means of the evaporative coolers.

The development of the secondary cooling system is predicated upon the following basic assumptions:

1. Make-up water to the secondary system would be furnished at a temperature of 78° F.
2. The temperature rise across the pile would be 62° F. (88° to 150°)
3. Circulation of primary coolant through the heat exchanger would be at the rate of 126,000 gpm.
4. The rate of evaporation would be based on the following atmospheric conditions:
 - a. Temperature: Wet bulb, 70° F. - Dry bulb, 97°F.
 - b. Average summer wind velocity, 10 mph.
 - c. Dew point 65° F.
 - *d. Wet bulb temperature readings will equal or exceed 70° for 190 hours during the period June-September inclusive.

Rationalization of the above data and considerations results in a rate of circulation in the secondary system of 283,000 gpm with a rate of make-up of 20,000 gpm. The make-up rate provides 10,000 gpm for evaporative cooling and 10,000 gpm for a continuous blow down.

Pump House

For the purposes of this analysis the rate of circulation of 283,000 gpm through the secondary circuit would be effected by means of sixteen, 20,000 gpm pumps including one operating plus one maintenance spare, operating at a discharge pressure of 110 psi.

Cooling Towers

Water would be delivered from the heat exchanger to top of the cooling tower distribution piping at a pressure of five to ten feet.

* Commercial practice permits 200-300 hours per season.

DECLASSIFIED

The mechanical induced draft tower is tentatively selected in preference to atmospheric type towers or cooling ponds for the following reasons:

1. A close control of the cold water temperature can be maintained by varying the quantity of the air passing through the tower.
2. The spray water loss is less resulting in less make-up water. The location of an atmospheric tower must in general be restricted to the leeward side of the plant.
3. A lower pumping head is required in the distribution piping than is encountered in the heavy spray type nozzles used in spray ponds and atmospheric towers.
4. A smaller ground area is required. It should be noted that with the use of the mechanical draft towers, the water load per unit tower area will approximate 2-1/2 gallons per square inch; with cooling ponds it will approximate 3/4 gallons per square inch; and with atmospheric towers the ratio will approximate 1.2 gallons per square inch.
5. The initial cost of the mechanical induced draft and the atmospheric towers are generally comparable. However, under the assumed design weather conditions one of the tower vendors indicates that the mechanical draft tower will be some 30 per cent less expensive.
6. Chimney type cooling towers were not considered because of their high initial cost and because of their limited performance during periods of hot weather. The chimney type tower requires a cooling approach temperature of 15° F. The above condition is also characteristic for the spray ponds.

The primary disadvantage of a mechanical draft tower is the power requirement and higher maintenance costs.

The cooling tower would cool 283,000 gpm of water from 110° F. to 78° F. by evaporating 9500 gpm. Provision for entrained moisture, spray, blow-down, etc. would fix the required make-up at approximately 20,000 gpm. These towers would require a maximum of 27,000,000 cfm powered by electrical motor totaling 6000 HP.

Reservoir

A reservoir of 2,800,000 gallons capacity would be provided. This storage capacity is based upon the assumption that the system must be able to maintain full operational demand for a period of two hours without replenishment from the filter plant.

Export to Separations Plant of 16,000 gpm @ 205 psi is based upon the assumption that separations facilities to support the contemplated reactor would require water in an amount equal to that required by the existing 200-W plant. It is further assumed that the line losses for the new installation would be the same as those between 100-D and 200-W. It is tentatively

DECLASSIFIED

assumed that the high sediment content of the surface water would require filtration and/or flocculation to render it usable in heat exchange equipment. Consequently, it is deemed advantageous to perform all filtration at the 100 Area site.

Fire and sanitary water peak requirements are based upon a discharge of 1500 gpm for eight hours which is the capacity desired by the operating divisions. The average consumption is 300 gpm based upon past operating experience.

Miscellaneous Filtered Water

The requirement of 9500 gpm of filtered water, designated "Miscellaneous" on the flow diagram is derived as follows:

1. Filtered water to the reactor for purposes other than process cooling. The demand of 3000 gpm for "100-CW" is doubled for a total of 6000 gpm.
2. Filtered water for equipment cooling. The demand of 1500 gpm for 100-C is doubled for a total of 3000 gpm. This assumes that the same types of pumps, generally, would be used as were installed in the 100-C project.
3. Other miscellaneous filtered water, chemical mixing, etc.; the demand is assumed to equal that of 100-C, 1500 gpm.

Boiler Feed Water. Upon the basis of steam driven pumping capacity, as shown on SK-1-20500, and upon the operating schemes as shown on Figures 1, 2, and 3, the steam requirements would amount to approximately 88,000 lbs./hour during normal operation and about 300,000 lbs./hour during the first phase of a shutdown due to electrical power failure. On this basis of steam consumption about 600 gpm of boiler feed water would be required at peak condition and would extend through the progressive stages of shutdown.

Condenser Cooling Water. On the basis of the turbines' in the process pump house exhausting into the atmosphere and of all other turbines' exhausting to barometric type condensers the nominal condenser cooling requirement would be approximately 5000 gpm during emergency conditions of flow.

Backwash

The rate of filtration to compensate for backwash is arbitrarily assumed at 6 per cent of the rate of filtration of water for all purposes or 3000 gpm. The derivation of pumping capacity for backwashing is described under "Filter Plant" following hereinafter. The conservative figure of 6 per cent is selected due to the assumed high sediment of the surface water.

Filter Plant

For the purpose of establishing tentative values for fixing the filter backwash requirements the following criteria as assumed.

1. Rate of filtration = 2 gpm per square foot of filter area.

DECLASSIFIED

2. Rate of backwash - 15 gpm per square foot of filter area.

If each filter bed is considered to be composed of two halves each 20' x 40' the capacity per bed would be 3,200 gpm. Considering the rate of filtration as the sum of the component filtered water requirements enumerated hereinbefore, the required rate of filtration would be 51,200 gpm and the required number of filters would be sixteen.

If one half filter bed is backwashed at any one time the required backwash pumping capacity, at 15 gpm per square foot would be 12,000 gpm.

A clearwell of 5,800,000 gallons capacity would be integral with the filter plant. It would serve the purpose of providing storage to compensate for peak demands of backwash and fire protection and to provide sufficient storage to permit operation of the plant in the emergency condition for a period of five hours without the addition of water from the filter plant.

River Pump House capacity would not exceed the filter plant capacity, again based upon the assumption that water containing suspended solids in the amount of 10,000 parts per million would not be fit for any of the required purposes without some degree of treatment.

LAYOUT

Generally, the following three factors have been considered in arriving at the tentative layout shown on SK-1-20501.

1. Low cost and convenience of operation.
2. Proper layout with respect to prevailing wind.
3. Dispersal of plant as a protective measure in the event a catastrophe occurs in one part.

None of the above factors are satisfied completely. Numbers 1. and 3. are opposed and a compromise has been made between them. In Number 2. the wind blows in a direction to carry the discharge from the evaporative coolers, reactor, power house, ash storage, and coal storage away from the plant 75 per cent of the time. The remaining 25 per cent of the time the above discharge will travel partially across the plant.

Following is an item by item discussion with reasons why the layout was made as it is shown.

Space for Administration Buildings

This space would be provided to the windward of the plant and in an area where it would least affect the layout of plant utilities.

River Pump House

The river pump house would be located at the river's edge upstream from any discharges of the plant into the river. It would also be isolated from other plant units so that it might be protected as much as possible from damage.

REF ASSIFIED

This would be necessary since the building would furnish the only water supply to the plant.

Filter Plant

The filter plant would consist of a head house, flocculation chambers, sedimentation basins, filtration units, a clear well, and a filtered water pump house. These units would be combined into one building from the viewpoint of economy of construction and of operation. The filter plant would be located approximately equidistant from the river pump house, the process pump house, and the evaporative coolers since it would receive or deliver water to all of these units. It would be located so that a convenient rail connection could be made to the head house. Since the reactor would be cooled by water directly from the filters in the shutdown condition, the filters would be located so that a direct run of pipe could be laid between it and the reactor. It would also be isolated from any part of the primary and secondary cooling systems so that anything damaging these systems would not be likely to damage the filter plant.

Process Pump House, Heat Exchangers and Storage Basin

The process pump house would house the following components:

1. Primary pumps
2. Booster pumps
3. Heat exchangers
4. Primary water storage basin
5. Secondary pumps

The above items would be contained in one building because they would operate as a unit and it would be economically desirable from a construction and operation point of view. The building would be located between the reactor and the evaporative coolers because water to both of these units would be pumped by pumps in this building. It would also be located between the power house and the substation because in this building would be used most of the steam and electric power consumed by the plant. Orientation of the building would be so as to allow the simplest piping layouts between it, the reactor, and the evaporative coolers, and also between the reactor and the filter plant.

Primary Retention Tanks

The primary retention tanks would be located adjacent to the primary cooling system pumps located in the process pump house so that in addition to acting as retention basins they would also act as suction wells for the pumps.

Evaporative Coolers and Secondary Storage

The evaporative coolers would be located to the leeward side of the plant

DECLASSIFIED

in order that the moisture they discharge will be blown away from the plant. They would be oriented in reference to the direction of the prevailing winds so as to reduce to a minimum the amount of moisture laden discharge air which would be recirculated. Because of the large flow of water between the secondary pumps located in the process pump house and the evaporative coolers the latter would be located contiguous to the former.

Power House, Coal Storage and Ash Storage

The power house, coal storage, and ash storage would be located to the leeward side of the plant in a centralized location at a point easily accessible by railroad. The power house would be located close to the process pump house because this building uses the major part of the steam used on the plant. The coal and ash storage would be located close to the power house to secure economical operation.

Demineralization Building

The demineralization building would be located on a convenient railroad siding close to the process pump house since it would supply make-up water to the primary cooling system.

Electrical Substation

The substation would be located approximately equidistant from the river pump house, filter plant, process pump house, and reactor, the sites where most of the power in the plant is used. It would be located to be readily accessible to railroad and power line connections and in an area which would not interfere with the location of water lines. It would be located on the opposite side of the process pump house from the power house at a sufficient distance from the power house to make it improbable that a single cause could damage both sources of power.

Reactor

The reactor would be located at the downstream end of the plant for the following reasons:

1. Locates the reactor to the leeward of the plant allowing discharge from the reactor to be blown away from the plant.
2. Locates the reactor adjacent to the process pump house.
3. Allows an economical and convenient process sewer from the reactor to the river downstream from the river pump house.
4. Allows an economical and convenient railroad connection.

DECLASSIFIED

DECLASSIFIED

FIG. 1
PROCESS CIRCUIT
NORMAL OPERATING
CONDITION

**GENERAL ELECTRIC CO.
HANFORD WORKS**

100 AREA PRODUCTION FACILITY
COOLING WATER SYSTEM
WATER FLOW
NORMAL OPERATING CONDITION

SCALE
APPROVED

PRELIMINARY
Not Approved for Construction

DATE 11/15/51 DRAWN BY B. Williams
CHECKED PROJ. NO. RDA-DCG
E. R. NO. 100-4864 BLDG. NO. 100
DWG. SK-1-20505
NO.

13

DECLASSIFIED

FIG. 2

PROCESS CIRCUIT
CONDITION COINCIDENT WITH
ELECTRICAL POWER FAILURE

GENERAL ELECTRIC CO.
HANFORD WORKS

100 AREA PRODUCTION FACILITY
COOLING WATER SYSTEM
WATER FLOW

SCALE
APPROVED
PRELIMINARY Not Approved For Construction

DATE 11/15/51	DRAWN BY B. Williams
CHECKED	PROJ. NO. RDA DCG
E. R. NO. 100-4864	BLDG. NO. 100/K
DWG. SK-1-20506	

15

Q THOUSANDS OF G.P.M.

DECLASSIFIED

FIG 4

HYPOTHETICAL PRESSURE DECAY CURVE

GENERAL ELECTRIC CO.
HANFORD WORKS

SCALE
APPROVED

100 AREA PRODUCTION FACILITY
COOLING WATER SYSTEM

PRELIMINARY
NOT APPROVED FOR CONSTRUCTION

DATE 11-15-51
CHECKED
E. R. NO. 7-11-4-4
DRAWN BY [Signature]
PROJ. NO. 100-40-
BLDG. NO. 100

HYPOTHETICAL PRESSURE
DECAY CURVE

BWG. SK 1-25503
NO.

	NORMAL OPERATION GPM	NORMAL SHUTDOWN GPM	PEAK REQD. GPM	EMERG. FLEG. LOSS GPM	CLEARWATER CAPACITY GALS	SECONDARY STORAGE GALS
SECONDARY SYSTEM MAKE-UP	20,000		20,000			5,400,000
PROCESS SHUTDOWN		10,000	10,000	0,000	2,000,000	24HR STORAGE
PROCESS WASTE	500	3500 LPH 2500	12,000	3500 LPH 2500	360,000	
BOILER	100	100	600	600	180,000	
PRIMARY MAKE-UP	1800	1800 Not REQD. FOR DROUING	1800	1800	540,000	
CONDENSER WATER	500	500	5000	5000	1,500,000	
EXPORT	16,000	16,000	16,000	6000		
FIRE & SANITARY	300	300	1500 FOR 8 HRS	300	720,000	
FILTER BACKWASH	3,000	3,000	12000 REQD. 15 MIN/HR	Not REQD. FOR PROLONGED SHUTDOWN		
TOTALS	52,100	42,200		33,200	6,300,000	
RECOVERY RETURN TO HEADHOUSE	12,000	2,000				
	40,200	40,200		33,200		
WASTAGE 2 1/2%	800	800		700		
SUPPLY FROM RIVER PUMP HOUSE	41,000	41,000		33,200		

PRELIMINARY

FIG 5

DECLASSIFIED

REQD. FILTER PLANT
& STORAGE CAPACITYGENERAL ELECTRIC CO.
HANFORD WORKSSCALE
APPROVED

100 AREA PRODUCTION FACILITY

COOLING WATER SYSTEM

REQD. FILTER PLANT & STORAGE CAPACITY

DATE 11/18/51 DRAWN BY LK

CHECKED PROJ. NO. KDA-DC6

E. R. NO. BLDG. NO. 100

DWG. NO. 616-1-00500

CUMULATIVE THOUSANDS OF GPM

126

66

10

0

DEMINERALIZED
STORAGE

DEMINERALIZED
STORAGE

FILTERED
WATER

3 MIN.

57 MIN.

DETERMINATE

3 MIN.

57 MIN.

1st Issue 11-20-51

Fig 6

PRIMARY STORAGE REQUIREMENT

DECLASSIFIED

GENERAL ELECTRIC CO.
HANFORD WORKS

SCALE
APPROVED

100 AREA PRODUCTION FACILITY
COOLING WATER SYSTEM
PRIMARY STORAGE REQUIREMENT

PRELIMINARY
Not Approved For Construction

DATE 11/18/51	DRAWN BY RW
CHECKED	PROJ. NO ZDA-DC 6
E. R. NO.	BLDG. NO. 100
DWG. NO. SK-1-20507	

-18-

ADDENDUM TO
TENTATIVE DESIGN BASIS
NEW 100 AREA WATER PLANT
EMBODYING A CLOSE COOLING WATER CIRCUIT

The criteria established in the foregoing report are qualified and are subject to modification on the basis of the recently acquired data described hereinafter:

DEVELOPMENT OF FLOWS, STORAGE, COOLING, AND PUMPING CAPACITY

Basic data which would be formulated under RDA-DC-3 and which would define the flow, storage, and pressure requirements of the primary cooling circuit were requested of J. R. Wolcott on October 16, 1951. Preliminary values of these data were supplied on November 6, 1951, in a letter from E. L. Reed dated November 2, 1951.

In order to proceed with the work assigned under RDA-DC-6 during the interim period, it was necessary for this office to assume values for elements of the system properly under the cognizance of RDA-DC-3, and to arbitrarily formulate a philosophy of plant operation. All of these assumptions are described in the basic report.

The data assumed by this office is at some slight variance with that contained in Mr. Reed's letter of November 2. The variation is due mainly to differences in philosophy of plant operation.

Raw Water. Provisions for the supply of raw water to the pile in the event of a complete disability of the filter plant has not been touched upon in the foregoing basic report. However, this office is cognizant of the problem and is taking the matter under advisement.

PHILOSOPHY OF PLANT OPERATION

The system of plant operation during normal operating conditions and during the shutdown and transition to shutdown conditions as formulated by this office are shown on Drawing SK-1-20500 and Figures 1, 2, and 3 of the basic report. From the design and operating point of view, this philosophy is advantageous since it would be economical of steam pump capacity.

However, the Pile Technology Unit states that, based upon their present knowledge, it would be inadvisable to ever run filtered water through the pile, as shown in the above mentioned exhibits, due to its forming film which cannot be subsequently removed by practical means. This statement was voiced by the Pile Technology representative, R. M. Fryar, at a Working Committee meeting on November 7. Consequently, unless further information

DECLASSIFIED

-19-

is developed in the very near future, it seems advisable that future work by this office be based upon the premise that demineralized or distilled water, rather than filtered water, must be circulated through the pile during shutdown. This necessitates additional steam pumps in the primary circuit, steam pumps in the secondary circuit, steam driven fans for cooling towers, and added boiler capacity to supply steam to the above.

MISCELLANEOUS CONSIDERATIONS

This office takes cognizance of the possible necessity for the following items that have not been previously mentioned. They will be investigated as development of the study proceeds.

- a. Provision for re-demineralization of water in the primary cooling circuit.
- b. Provision for removal of carbonates from all non-demineralized water passing through heat exchangers.
- c. Provision for removal of part of the suspended solids by including a settling basin or lagoon ahead of the filter plant.

DECLASSIFIED