WATER BALANCE REPORT
FOR THE OAK RIDGE Y-12 PLANT

JULY 1994

Prepared for
MARTIN MARIETTA ENERGY SYSTEMS, INC.
Oak Ridge, Tennessee

MASTER

Prepared by
CDM FEDERAL PROGRAMS CORPORATION
Oak Ridge, Tennessee
and
ENVIROSOFT-ENGINEERING & SCIENCE INC.

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ACRONYMS

CDM Federal	CDM Federal Programs Corporation
CPCF	Central Pollution Control Facility
DOE	Department of Energy
EFPC	East Fork Poplar Creek
Energy Systems	Martin Marietta Energy Systems, Inc.
GWTF	Groundwater Treatment Facility
NPDES	National Pollutant Discharge Elimination System
ORNL	Oak Ridge National Laboratory
PRTF	Plating Rinsewater Treatment Facility
SPWTF	Steam Plant Wastewater Treatment Facility
TDS	total dissolved solids
WETF	West End Treatment Facility

1.0 INTRODUCTION

1.1 BACKGROUND

Martin Marietta Energy Systems, Inc. (Energy Systems) contracted CDM Federal Programs Corporation (CDM Federal) to perform an updated water balance for the Y-12 Plant located in Oak Ridge, Tennessee. The Y-12 Plant, which occupies approximately 800 acres, was built for the U.S. Army Corps of Engineers in 1943 as part of the Manhattan Project. The Y-12 Plant serves as a key manufacturing technology center for the development and demonstration of unique materials, components, and important services to the Department of Energy (DOE) and the nation. This is accomplished through the reclamation and storage of nuclear materials, manufacture of nuclear materials, manufacture of components for the nation's defense capabilities, support to national security programs, and services provided to other customers as approved by DOE.

Since 1986, CDM Federal has assisted Energy Systems on numerous projects, primarily dealing with the National Pollutant Discharge Elimination System (NPDES) permitting process and facility discharge, and water quality-related issues. Throughout these projects, there has been a need to develop a better understanding of water consumption and its losses within the Y-12 Plant. More recently, Energy Systems has been concerned with the effects of groundwater at the site and its ability to act as a source of water seepage into East Fork Poplar Creek (EFPC) or as a source of infiltration into subsurface strata. This has prompted the need to perform a water balance on the facility.

1.2 GENERAL DESCRIPTION OF THE WATER SUPPLY SYSTEM

The Y-12 Plant consumes 4 to 5 million gallons per day of potable water. As shown on Figure 1-1, water is metered at three locations as it enters the Y-12 Plant water distribution network. This water is used by various activities which can be generally categorized as follows:

POTABLE WATER NETWORK PIPING
FOR LINES 8" AND GREATER

MARTIN MARIETTA ENERGY SYSTEMS Y-12 PLANT
OAK RIDGE, TENNESSEE

FIGURE No.

1-1

- Once through cooling
- Steam plant makeup
- Cooling tower makeup
- Plant personnel consumption in sanitary facilities, cafeteria, water fountains, etc.
- Process use and building maintenance

With the exception of the steam plant and cooling tower makeup, water consumption is not metered for each individual activity. In addition, the Y-12 Plant water network connects to the pipe that supplies the Oak Ridge National Laboratory (ORNL) complex. Recently, a water meter was installed at the pipe connecting these two systems (known as the Valve Pit "G" meter) to determine if water enters or leaves the Y-12 water network system at the junction with the X-10 pipe (see Figure 1-1).

As in most water supply systems, a fraction of the water circulating in the distribution system is lost due to system leaks. Typically, water losses range from 5 to 25 %.

Water consumed by the different activities are either:

- discharged to the sanitary sewer for treatment at the City of Oak Ridge Wastewater Treatment Plant,
- lost due to evaporation,
- or discharged to EFPC.

A schematic diagram of interactions of the water supply system with the EFPC drainage system is shown in Figure 1-2.

1.3 GENERAL DESCRIPTION OF THE EAST FORK POPLAR CREEK DRAINAGE SYSTEM

EFPC receives drainage from the Y-12 Plant and conveys it to Lake Reality. The initial water flow of EFPC is generated at the Y-12 Plant primarily from groundwater and drainage sources.

1-4

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Figure 1-2 Schematic Diagram of the Water Supply and Drainage System Interactions

The base flow (during dry weather) increases as it reaches Lake Reality prior to exiting the Plant. Storm water drainage from more than 90% of the Y-12 Plant area flows to EFPC; the remaining 10% flows to Bear Creek. EFPC also receives a small portion of treated wastewater effluents and water used in once through cooling activities (which is essentially potable water). Other water flow sources in EFPC include:

- groundwater infiltration in the storm sewer system,
- groundwater seepage, from natural systems,
- condensate from steam and HVAC systems, and
- cooling tower blowdown.

1.4 PURPOSE OF THE WATER BALANCE

The primary purpose of the water balance is to estimate potential water sources to EFPC and to determine if groundwater acts as a source of water supply or loss from the system. To accomplish this objective, Energy Systems collected appropriate flow and process data from December 1993 through February 1994. The total water sources and losses across the entire Y-12 system. Data were not collected two weeks during the Christmas holiday, because this period was not considered representative of normal operating conditions. The mathematical difference between the water sources and losses will determine if groundwater is acting as a source of water supply or a sink of water loss. It is impossible to accurately measure many of the flow sources; therefore, a few key flow measurements will be made to allow a reasonable estimate of groundwater flow.

1.5 PROJECT TASKS

To complete the water balance study, the following project tasks were implemented: development of flow monitoring plan, data collection and data compilation, data reduction and analysis, development of a computer model, execution of model runs, conduction of a sensitivity analysis using the model, and preparation of a water balance report. Each task is described briefly below:

Monitoring Plan

The Monitoring Plan identified data collection objectives and outlined the flow data collection procedures used to generate the water balance database.

Data Collection and Compilation

Data identified in the monitoring plan were collected by Energy Systems' staff during December 1993, and January and February 1994.

Data Reduction and Analysis

This task consisted of keying the data for use in an electronic spreadsheet for use in the computer model. The data were analyzed, sorted, and summarized into tabular and/or graphical outputs. Appendix A presents the data used in the model.

Computer Model Development

This task involved developing a mathematical model using a multi-dimensional electronic spreadsheet. This model uses the data inputs and performs the calculations needed for the water balance analysis. In addition, this model produces the tabular and graphical outputs of the model.

Model Execution

Once the model was set up with all the data, the model was used to analyze three cases, or model runs. In addition, five sensitivity case analyses were performed to determine the effect of changing certain model parameters or assumptions.

Prepare Water Balance Report

Following all data acquisition and evaluation, the computer model was used to estimate quantities for all water sources and losses. This report has been prepared documenting the procedures used and summarizing the results of the water balance study.

2.0 METHODS AND GENERAL ASSUMPTIONS

The objective of the water balance study is to estimate the overall flow contributions of water sources and losses at the Y-12 Plant, and in turn determine whether groundwater acts as a water source or contributes to water loss. According to the flow schematic shown in Figure 2-1, the two principal components of flow to EFPC are plant storm sewer discharges and groundwater infiltration or exfiltration. Figure 2-2 shows the uses and distribution of potable water received at the Oak Ridge Y-12 Plant. The interaction and water balance of potable water uses and related discharges to EFPC were described in the previous chapter and illustrated on Figure 1-2. As previously discussed, the major water sources to EFPC (assuming no precipitation effects from rainfall events) include potable water used for once through cooling units supplied from the water treatment plant, groundwater infiltration into the storm sewer network and seepage into EFPC, condensate derived from plant machinery and steam system, and seepage of groundwater into facility buildings from active artesian springs. Losses from the system include: flow to ORNL, piping leaks to the groundwater system, sanitary sewer discharge, evaporation to the atmosphere, losses from outfalls into EFPC, and surface water infiltration along EFPC.

This water balance task involved monitoring flow from the various sources and losses during a 10-week period from December 1, 1993, through February 6, 1994. However, because groundwater seepage into EFPC (source), piping losses, and condensate discharge to French drains cannot be monitored, the difference between groundwater sources and losses, or the tendency for groundwater to act as a source or loss to the system, can only be approximated by the following equations:

1. $\text{Purchased Water} = \text{Sanitary Sewer Discharge} + \text{Evaporation} + \text{Storm Sewer Discharges} + \text{Leakage Losses} + \text{Other Losses}$
2. $\text{EFPC Flow (Station 17)} = \text{Storm Sewer Discharges} + (\text{or } -) \text{Groundwater Infiltration / Exfiltration.}$

SEE FIGURE 2-2

SOURCES:

COOLING TOWERS
ONCE THROUGH COOLING
TREATMENT PLANTS
CONDENSATE
BUILDING BASEMENT PUMPING

LOSSES

EVAPORATION
SANITARY SEWER
WATER TO X-10
PIPE LEAKS

NEW SOURCES:

CONDENSATE
BUILDING BASEMENT PUMPING

FIGURE 2-1

**SCHEMATIC DIAGRAM OF THE WATER
BALANCE MODEL COMPONENTS**

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In planning for the water balance project, the following assumptions were made:

- Only the components listed above and shown on Figures 1-2 and 2-2 will be monitored to determine the sources and sinks within the system. Any other components are assumed negligible.
- The data used for EFPC Station 17 is only from dry monitoring events. Rainfall data were collected and evaluated assessing the validity of this assumption.
- During the study period, neither a filling of emergency water storage tanks or a discharge from these tanks occurred; therefore, no emergency water was used.
- The water balance estimation was based on data collected over the study period under "normal plant operating conditions." It is assumed, based on information provided by Energy Systems, that major manufacturing and process operations did not start up or shut down during the study period, as this would have significantly affected water use at the Y-12 Plant.
- The monitoring period coincided with a quarterly cooling tower monitoring study to provide data on cooling tower evaporation. Also, the study was conducted during winter months to reduce condensate inputs from air conditioning units.
- The only water supply source used by the Y-12 Plant during the study period was the Water Treatment Plant.
- The groundwater contribution to EFPC is greater during December-January (the wet season) than during other periods of the year.

3.0 MONITORING REQUIREMENTS

A monitoring plan was prepared outlining the monitoring requirements necessary to collect the appropriate data and to fulfill the overall project objective of estimating the potential for groundwater to act as a water source or sink to the system.

To accomplish this objective, flow data and other useful information were collected and/or estimated based on design specifications or operational observations from the following areas:

- Meteorological Data
- Potable Water Supply
- Sanitary Sewer Discharges
- Wastewater Treatment Plant Discharges
- Cooling Towers Evaporation
- Steam Plant Water Use
- Steam Plant Waste Treatment Facility
- Refrigeration Units Use
- Open Channel Flows at EFPC Station 17

Data for each of these categories are presented in Appendix A.

4.0 WATER BALANCE MODEL AND RESULTS

The data reduction and water balance calculations were performed using a computer model developed in a multi-dimensional electronic spreadsheet. This model uses the data inputs and performs the calculations of the water balance equations presented in Section 2. In addition, this model produced the tabular and graphical outputs.

Model Results

Once the model was set up with all the data, it was used to perform three case analyses, or model runs. The results of the model runs are presented on Figure 4-1. This figure shows each water source contributing to EFPC flow in terms of percent of total water monitored at Station 17. Run 1 used the average values for all data collected during the 10-week period. Runs 2 and 3 used the average values from a four consecutive day period occurring December 16-19, 1993, and February 1-4, 1994, respectively. Figure 4-2 presents a comparison of the three runs. More detailed model parameters, assumptions, and results for these model runs are presented in Appendix B.

As shown on Figure 4-1, the two most significant components of the EFPC flow are once through cooling water and groundwater, accounting for about 84% of the total flow (in both runs). For all runs the range in values of the groundwater contribution is 29.6% to 33.5%.

A similar water balance was developed for the Y-12 Plant by CDM Federal in 1988 based on operations at that time and without the benefit of data from the new valve pit G flow meter. The results of this analysis indicated that groundwater contributed approximately 22% of the flow in EFPC. Details of this analysis are described in a memorandum included as Appendix C in this report.

Figure 4-1 Results for Runs 1,2 and 3

Run 1 - Average Conditions for Dec 93 -Feb 94.

* Excludes SPWTF

Run 2 - December 16, 17, 18, & 19, 1993

* Excludes SPWTF

Run 3 - February 1, 2, 3 & 4, 1994

* Excludes SPWTF

FIGURE 4-2 COMPARISON OF RUNS 1, 2 AND 3 **WATER BALANCE MODEL** **OAK RIDGE Y-12 PLANT**

1,000 GALLONS PER DAY

	Cooling towers	Groundwater	Treatment plants	Once through cooling	Untreated process	SPWTF effluent	Condensate
RUN 1 ■	200.2	1,029.1	13.5	1,922.0	0.0	172.9	141.0
RUN 2 □	200.2	1,129.5	29	1,719.8	0.0	174.2	140.8
RUN 3 ▨	200.2	1,297.9	27.0	2,324.4	0.0	133.0	145.0

RUN 1 - BEST AVAILABLE DATA FOR DEC 93 AND FEB 94

RUN 2 - DATA FOR DEC 16, 17, 18, 19, 1993

RUN 3 - DATA FOR FEB 1, 2, 3 & 4, 1994

5.0 SENSITIVITY ANALYSIS

The water balance model used several assumptions for estimating the contribution of various sources of dry-weather flow at EFPC Station 17. Since there is uncertainty associated with every assumption, the purpose of the sensitivity analysis is to replace the assumed values by others which are higher or lower to determine the impact such a change has on the estimate results.

To analyze the impact that changing the magnitude of assumed values has on the results, several preliminary runs were performed using Run 1 as the base and changing the value of one of the assumed parameters at a time.

Based on this preliminary evaluation, the parameters which had the most significant impact on the model results were:

- Percent of water leaks from the water supply network
- Volume of condensate generated by a 1-ton HVAC machine
- Percent of water infiltrating into the sanitary sewers

The values of the above parameters were changed in model Runs 4,5,6,7 and 8. The results of these runs and the previous model runs are summarized in Table 5-1. Likewise, Figure 5-1 illustrates the sensitivity analysis results and presents the maximum, average, and minimum values estimated for each component contributing to the flow at EFPC Station 17.

Based on the scenarios evaluated, the groundwater contribution ranged from 29.58% to 45.07% (using Run 1 data). The average value was 35.37%, which represents a realistic estimate of the dry weather groundwater condition to EFPC. Under wet weather conditions, the groundwater contribution to EFPC flow is expected to increase. Apparently, no conditions exist where groundwater flow reverses, resulting in groundwater recharge from EFPC. See Appendix D for the data resulting from the Sensitivity Analysis.

Table 5-1 Results of the Sensitivity Analysis

ITEM	Average Data Dec. - Feb. Run 1	Dec 16, 17, 18 & 19 Run 2	Feb 1, 2 3 & 4 Run 3	SENSITIVITY ANALYSIS					Population Average	+ OR - Standard Deviation
				Run 4	Run 5	Run 6	Run 7	Run 8		
Variable Parameters										
% of Potable Water Leaks	8.0	8.0	8.0	15.0	20.0	15.0	8.0	15.0	12.1	4.1
Condensate, GPD/ton	10.0	10.0	10.0	10.0	10.0	20.0	10.0	10.0	11.3	3.1
Sewer Infiltration, % of total flow	20.0	20.0	20.0	20.0	20.0	20.0	15.0	25.0	20.0	2.4
Results										
Groundwater, 1,000 gal/day	1,029.1	1,129.5	1,297.9	1,343.3	1,567.7	1,269.7	1,074.2	1,298.3	1,251.2	152.3
Groundwater, % of total	29.58%	33.54%	31.45%	38.62%	45.07%	36.50%	30.88%	37.32%	35.37%	4.50%
Once Through Cooling, 1,000 gal/day	1,922.0	1,719.8	2,324.4	1,608.8	1,383.3	1,607.8	1,876.9	1,652.8	1,762.0	249.3
Once Through Cooling, % of total	55.25%	51.07%	56.32%	46.25%	39.77%	46.22%	53.96%	47.51%	49.54%	4.97%
Condensate, 1,000 gal/day	141.0	140.8	145.0	141.0	141.0	214.5	141.0	141.0	150.7	22.8
Condensate, % of total	4.05%	4.18%	3.51%	4.05%	4.05%	6.17%	4.05%	4.05%	4.27%	0.70%
Total EFPC flow, 1,000 gal/day	3,478.6	3,367.4	4,127.4	3,478.6	3,478.6	3,478.6	3,478.6	3,478.6	3,545.8	210.1

Figure 5-1 Results of the Sensitivity Analysis

Water Balance Model
Oak Ridge, Y-12 Plant

	Once Through Cooling	Groundwater	Cooling Towers	Condensate	Treatment Plants	SPWTF effluent
High ■	55.25	45.00	5.90	6.17	0.70	5.20
Average □	49.54	35.37	5.65	4.27	0.41	4.51
Low □	39.77	29.58	4.90	4.05	0.10	3.20

All values are express in percent of total flow at EFPC

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APPENDIX A
MONITORING DATA

MONITORING DATA

This section presents the data collected by Energy Systems that were used in the water balance model for the Y-12 Plant. The model estimates the principal water uses and losses and gives an indication of the effect that groundwater has on the East Fork Poplar Creek flow. Groundwater could either act as a water source or sink to water loss from the system.

To accomplish this objective, flow data and other useful information were collected and/or estimated based on design specifications or operational observations from the following areas:

- ▶ Meteorological Data
- ▶ Potable Water Supply
- ▶ Sanitary Sewer Discharges
- ▶ Wastewater Treatment Plant Discharges
- ▶ Cooling Towers Evaporation
- ▶ Steam Plant Water Use
- ▶ Steam Plant Waste Treatment Facility
- ▶ Refrigeration Units Use
- ▶ Open Channel Flows at EFPC Station 17

CLIMATOLOGICAL DATA

The water balance model is designed to estimate the water uses, discharges, and losses for the Y-12 Plant. One key parameter of this model is the data from Station 17 that measures the flow at EFPC contributed by the plant. This flow has three main components: storm sewer discharges during dry weather, groundwater infiltration, and storm runoff during wet weather. Since the model used for calculating the water balance is strictly designed for dry weather conditions, the climatological data verified the presence or absence of rainfall, thereby eliminating storm-related flows from the analysis. In addition, snow accumulation was monitored to determine if snow melt could influence the EFPC flow. The attached graph presents the summary of rainfall and snow accumulation data.

METEREOLOGICAL DATA FOR THE Y-12 PLANT

DECEMBER 1, 1993 TO FEBRUARY 4, 1994

METEREOLOGICAL DATA

Date	Rain, in.	Snow, in.	Date	Rain, in.	Snow, in.
01-Dec-93	0		03-Jan-94	0.64	
02-Dec-93	0		04-Jan-94	0.12	0.01
03-Dec-93	0.18		05-Jan-94	0	
04-Dec-93	4.89		06-Jan-94	0	
05-Dec-93	0.04		07-Jan-94	1	
06-Dec-93	0		08-Jan-94	0	
07-Dec-93	0		09-Jan-94	0	
08-Dec-93	0		10-Jan-94	0	
09-Dec-93	0.2		11-Jan-94	0.77	
10-Dec-93	0.9		12-Jan-94	0.38	
11-Dec-93	0.01	0.01	13-Jan-94	0	
12-Dec-93	0		14-Jan-94	0.01	0.01
13-Dec-93	0		15-Jan-94	0	
14-Dec-93	0.22		16-Jan-94	0	
15-Dec-93	0.1		17-Jan-94	0.81	0.9
16-Dec-93	0		18-Jan-94	0	
17-Dec-93	0		19-Jan-94	0	
18-Dec-93	0.03		20-Jan-94	0	
19-Dec-93	0		21-Jan-94	0.01	0.01
20-Dec-93	0.64	0.01	22-Jan-94	0	
21-Dec-93	0.03	0.01	23-Jan-94	0	
22-Dec-93	0.01	0.01	24-Jan-94	0.02	
23-Dec-93	0.05	0.5	25-Jan-94	0.88	
24-Dec-93	0		26-Jan-94	0.06	
25-Dec-93	0.01	0.01	27-Jan-94	0.83	
26-Dec-93	0		28-Jan-94	0.4	
27-Dec-93	0		29-Jan-94	0	
28-Dec-93	0.99		30-Jan-94	0	
29-Dec-93	0.01	0.01	31-Jan-94	0	
30-Dec-93	0		01-Feb-94	0.01	0.01
31-Dec-93	0		02-Feb-94	0	
01-Jan-94	0.13	0.01	03-Feb-94	0	
02-Jan-94	0.08		04-Feb-94	0.02	0.01

POTABLE WATER SUPPLY

Potable water is monitored daily by the City of Oak Ridge Water Treatment Plant along three pipelines feeding the Y-12 Plant: two 16-in. lines which feed the eastern and central portions of the Y-12 Plant, and one 24-in. line feeding the western portion. Each of these lines is metered as it leaves the water treatment plant. In addition, the 24-in. line is metered west of the storage tanks between valve pit "G" (VP-G) and VP-F. All piping within the Y-12 Plant is interconnected, and based on discussions with Energy Systems' personnel, all potable water lines are below ground. Other than seven valve pits (VP-A through VP-G), potable water lines cannot be accessed and monitored for flow. Therefore, flow data from the City of Oak Ridge Water Treatment Plant was used as a source to monitor water supply.

Based on discussions with Energy Systems' personnel, it was unknown if flow in the 16-in. line located west of the Y-12 Plant through VP-G flows into the 24-in. line feeding ORNL (loss from the system) or removes flow from the 24-in. line into the Y-12 Plant (source to the system). As part of this study, a permanent flowmeter was placed in VP-G to monitor flow rates in either direction. This flowmeter helped estimate the total flow into or out of the Y-12 Plant. Since this flowmeter can detect the direction of flow, it was determined that water flows out of the Y-12 Plant almost all the time. The following graph and data sheets summarize the water supply data collected during the study.

WATER SUPPLIED TO THE Y-12 PLANT OAK RIDGE, TN

9-V

24" Meter 16" Meter E 16" Meter W Valve Pit 'G'

POTABLE WATER SUPPLY TO THE DOE Y-12 PLANT

All flows are in gallons x 1,000

DATE	24" Meter	16" Meter E East	16" Meter W West	Valve Pit "G" to X-10	Valve Pit "G" to Y-12	Valve Pit "G" Net Y-12	Total Flow to Y-12
30-Nov-93	2,598.0	867.0	1,700.0				
01-Dec-93	2,553.0	847.0	1,710.0				
02-Dec-93	2,640.0	878.0	1,772.0				
03-Dec-93	2,520.0	849.0	1,729.0				
04-Dec-93	2,504.0	829.0	1,665.0				
05-Dec-93	2,372.0	765.0	1,588.0				
06-Dec-93	2,436.0	764.0	1,568.0				
07-Dec-93	2,422.0	817.0	1,628.0	648.0	0.0	(648.0)	4,219.0
08-Dec-93	2,496.0	815.0	1,372.0	671.0	0.0	(671.0)	4,012.0
09-Dec-93	2,471.0	831.0	1,686.0	639.0	0.0	(639.0)	4,349.0
10-Dec-93	2,438.0	838.0	1,698.0	585.0	0.0	(585.0)	4,389.0
11-Dec-93	2,509.0	829.0	1,696.0	585.0	0.0	(585.0)	4,449.0
12-Dec-93	2,331.0	747.0	1,562.0	585.0	0.0	(585.0)	4,055.0
13-Dec-93	2,459.0	763.0	1,598.0	583.0	0.0	(583.0)	4,237.0
14-Dec-93	2,563.0	823.0	1,733.0	538.0	0.0	(538.0)	4,581.0
15-Dec-93	2,624.0	851.0	1,702.0	505.0	0.0	(505.0)	4,672.0
16-Dec-93	2,610.0	854.0	1,677.0	646.0	0.0	(646.0)	4,495.0
17-Dec-93	2,423.0	841.0	1,682.0	752.0	0.0	(752.0)	4,194.0
18-Dec-93	2,455.0	865.0	1,798.0	752.0	0.0	(752.0)	4,366.0
19-Dec-93	2,392.0	816.0	1,732.0	752.0	0.0	(752.0)	4,188.0
20-Dec-93	2,362.0	833.0	1,762.0	761.0	0.0	(761.0)	4,196.0
21-Dec-93	1,588.0	876.0	1,824.0	759.0	0.0	(759.0)	3,529.0
22-Dec-93	2,451.0	893.0	1,845.0	783.0	0.0	(783.0)	4,406.0
23-Dec-93	2,516.0	893.0	1,881.0	783.0	0.0	(783.0)	4,507.0
24-Dec-93	2,384.0	829.0	1,740.0	783.0	0.0	(783.0)	4,170.0
25-Dec-93	2,428.0	808.0	1,729.0	783.0	0.0	(783.0)	4,182.0
26-Dec-93	2,493.0	839.0	1,789.0	783.0	0.0	(783.0)	4,338.0
27-Dec-93	2,421.0	837.0	1,777.0	783.0	0.0	(783.0)	4,252.0
28-Dec-93	2,527.0	889.0	1,909.0	783.0	0.0	(783.0)	4,542.0
29-Dec-93	2,381.0	925.0	1,841.0	783.0	0.0	(783.0)	4,364.0
30-Dec-93	2,553.0	900.0	1,910.0	783.0	0.0	(783.0)	4,580.0
31-Dec-93	2,573.0	889.0	1,923.0	783.0	0.0	(783.0)	4,602.0
01-Jan-94	2,341.0	808.0	1,728.0	783.0	0.0	(783.0)	4,094.0
02-Jan-94	2,475.0	823.0	1,779.0	783.0	0.0	(783.0)	4,294.0
03-Jan-94	2,331.0	806.0	1,713.0	783.0	0.0	(783.0)	4,067.0
04-Jan-94	2,520.0	1,020.0	1,905.0	864.0	0.0	(864.0)	4,581.0
05-Jan-94	2,475.0	887.0	1,856.0	751.0	0.0	(751.0)	4,467.0
06-Jan-94	2,660.0	910.0	1,932.0	795.0	0.0	(795.0)	4,707.0
07-Jan-94	2,469.0	885.0	1,873.0	790.0	0.0	(790.0)	4,437.0
08-Jan-94	2,433.0	848.0	1,720.0	578.0	0.0	(578.0)	4,423.0
09-Jan-94	2,732.0	791.0	1,685.0	578.0	0.0	(578.0)	4,630.0
10-Jan-94	2,598.0	733.0	1,630.0	578.0	0.0	(578.0)	4,383.0
11-Jan-94	2,676.0	846.0	1,731.0	572.0	0.0	(572.0)	4,681.0
12-Jan-94	2,580.0	867.0	1,718.0	614.0	0.0	(614.0)	4,551.0
13-Jan-94	2,851.0	879.0	1,847.0	602.0	0.0	(602.0)	4,975.0
14-Jan-94	2,674.0	846.0	1,703.0	560.0	0.0	(560.0)	4,663.0
15-Jan-94	2,605.0	828.0	1,685.0	649.0	0.0	(649.0)	4,469.0
16-Jan-94	2,801.0	919.0	1,737.0	649.0	0.0	(649.0)	4,808.0

POTABLE WATER SUPPLY TO THE DOE Y-12 PLANT (Continued)

All flows are in gallons x 1,000

DATE	24" Meter	16" Meter E East	16" Meter W West	Valve Pit "G" to X-10	Valve Pit "G" to Y-12	Valve Pit "G" Net Y-12	Total Flow to Y-12
17-Jan-94	2,815.0	938.0	1,738.0	649.0	0.0	(649.0)	4,842.0
18-Jan-94	2,760.0	930.0	1,831.0	649.0	0.0	(649.0)	4,872.0
19-Jan-94	2,727.0	1,000.0	1,933.0	649.0	0.0	(649.0)	5,011.0
20-Jan-94	2,727.0	909.0	1,762.0	743.0	0.0	(743.0)	4,655.0
21-Jan-94	2,728.0	887.0	1,721.0	541.0	0.0	(541.0)	4,795.0
22-Jan-94	2,732.0	870.0	1,752.0	672.0	0.0	(672.0)	4,682.0
23-Jan-94	2,659.0	743.0	1,698.0	672.0	0.0	(672.0)	4,428.0
24-Jan-94	2,788.0	892.0	1,880.0	672.0	0.0	(672.0)	4,888.0
25-Jan-94	2,873.0	977.0	2,007.0	824.0	0.0	(824.0)	5,033.0
26-Jan-94	2,693.0	1,021.0	1,999.0	938.0	0.0	(938.0)	4,775.0
27-Jan-94	2,529.0	947.0	1,894.0	770.0	0.0	(770.0)	4,600.0
28-Jan-94	2,559.0	923.0	1,872.0	807.0	0.0	(807.0)	4,547.0
29-Jan-94	2,419.0	907.0	1,874.0	837.0	0.0	(837.0)	4,363.0
30-Jan-94	2,465.0	847.0	1,782.0	837.0	0.0	(837.0)	4,257.0
31-Jan-94	2,440.0	844.0	1,766.0	837.0	0.0	(837.0)	4,213.0
01-Feb-94	2,576.0	903.0	1,887.0	775.0	0.0	(775.0)	4,591.0
02-Feb-94	2,529.0	955.0	1,973.0	813.0	0.0	(813.0)	4,644.0
03-Feb-94	2,972.0	964.0	2,024.0	730.0	0.0	(730.0)	5,230.0
04-Feb-94	2,672.0	930.0	1,932.0	760.0	0.0	(760.0)	4,774.0
AVERAGE	2,545.9	869.7	1,784.4	711.6	0.0	(711.6)	4,488.4

SANITARY SEWER FLOWS

The City of Oak Ridge monitors the sewer discharge from the Y-12 Plant using an 8-in. Parshall Flume located near Scarboro Road. The sewer flow at this station includes the flow from the Union Valley Industrial Park; therefore, the flow at this station must be adjusted to exclude the industrial park contribution. The sewer flow data for the two stations are summarized in the attached data sheets. A correction of the data was made by subtracting flows of the Union Valley station from the ones monitored at the City of Oak Ridge station. A graph presenting the net sewer flow from the Y-12 Plant is attached.

SEWER DISCHARGE DATA FOR THE Y-12 PLANT*

Y-12 Plant Sanitary Sewer Flow

DATE	Union Valley SS5 gpm	City Line SS4 gpm	Union Valley SS5 1000 GPD	City Line SS4 1000 GPD	Y-12 Contribution City-Union 1000 GPD
07-Dec-93	122.7		176.7		
08-Dec-93	122.4		176.3		
09-Dec-93	119.7	953.1	172.4	1,372.5	1,200.1
10-Dec-93	215.0	1,538.9	309.6	2,216.0	1,906.4
11-Dec-93	132.7	1,052.7	191.1	1,515.9	1,324.8
12-Dec-93	103.0	917.2	148.3	1,320.7	1,172.4
13-Dec-93	124.1		178.7		
14-Dec-93	158.8		228.7		
15-Dec-93	205.7		296.2		
16-Dec-93	189.7	1,040.6	273.2	1,498.5	1,225.3
17-Dec-93	154.2	821.1	222.1	1,182.4	960.4
18-Dec-93	127.9	691.0	184.2	995.1	810.8
19-Dec-93	116.5	649.0	167.8	934.6	766.8
20-Dec-93			237.5	655.0	417.5
21-Dec-93			285.4	915.0	629.6
22-Dec-93			225.3	785.5	560.2
23-Dec-93			182.6	658.4	475.8
24-Dec-93			150.9	501.0	350.1
25-Dec-93			158.4	573.0	414.6
26-Dec-93			160.2	544.9	384.7
27-Dec-93			178.5	647.5	469.0
28-Dec-93			248.3	1,024.2	775.9
29-Dec-93			301.4	1,133.3	831.9
30-Dec-93			212.7	861.1	648.4
31-Dec-93			173.5	690.7	517.2
01-Jan-94					
02-Jan-94					
03-Jan-94	211.5	752.1	304.6	1,083.0	778.5
04-Jan-94	211.8	818.1	305.0	1,178.1	873.1
05-Jan-94	132.2	640.3	190.4	922.0	731.7
06-Jan-94	112.1	607.8	161.4	875.2	713.8
07-Jan-94	201.0	963.1	289.4	1,386.9	1,097.4
08-Jan-94	185.3	784.4	266.8	1,129.5	862.7
09-Jan-94	119.6	699.1	172.2	1,006.7	834.5
10-Jan-94	133.7	752.1	192.5	1,083.0	890.5
11-Jan-94	129.7	752.1	186.8	1,083.0	896.3
12-Jan-94	228.3	1,047.5	328.8	1,508.4	1,179.6
13-Jan-94	148.4	696.7	213.7	1,003.2	789.6
14-Jan-94	148.4	611.5	213.7	880.6	666.9

Y-12 Plant Sanitary Sewer Flow (Continued)

DATE	Union Valley SS5 gpm	City Line SS4 gpm	Union Valley SS5 1000 GPD	City Line SS4 1000 GPD	Y-12 Contribution City-Union 1000 GPD
15-Jan-94	130.1	483.1	187.3	695.7	508.3
16-Jan-94	136.7	462.4	196.8	665.8	469.0
17-Jan-94	233.6	727.4	336.4	1,047.5	711.1
18-Jan-94	260.2	659.2	374.7	949.2	574.6
19-Jan-94		572.1		823.8	
20-Jan-94		561.8		809.0	
21-Jan-94	199.7	561.8	287.6	809.0	521.4
22-Jan-94	163.2	476.8	235.0	686.6	451.6
23-Jan-94	68.0	459.0	97.9	661.0	563.1
24-Jan-94	87.0	539.6	125.3	777.1	651.7
25-Jan-94	154.5	830.3	222.5	1,195.6	973.1
26-Jan-94	256.2	834.4	368.9	1,201.5	832.7
27-Jan-94	475.2	883.8	684.3	1,272.7	588.4
28-Jan-94	751.0	1,212.1	1,081.4	1,745.4	664.0
29-Jan-94	544.6	624.1			
30-Jan-94	456.5	500.4			
31-Jan-94	320.8	571.5			
01-Feb-94			51.6	919.7	868.1
02-Feb-94			51.1	799.3	748.2
03-Feb-94			41.8	773.7	731.9
04-Feb-94			41.8	774.2	732.4
AVERAGE					765.5

Note: Data for January 28, 29, 30 and 31 were not used due to possible malfunction of the Union Valley flow meter.

WASTEWATER TREATMENT PLANT DISCHARGES

Facilities that discharge treated effluent to the plant storm sewer system, which drains into EFPC, include:

- CPCF - The Central Pollution Control Facility (Bldg. 9623)
- WETF - The West End Treatment Facility (Bldg. 9616-7)
- SPWTF - The Steam Plant Wastewater Treatment Facility (Bldg. 9616-C)
- PRTF - The Plating Rinsewater Treatment Facility (Bldg. 9623)
- GWTF - Groundwater Treatment Facility (Bldg. 9616-7)

The following graph and data sheets summarize the wastewater treatment plant data collected during the study.

WWTP DISCHARGES **OAK RIDGE Y-12 PLANT**

WASTEWATER TREATMENT PLANT DATA

DATE	GWTF	CPCF/PRTF	WETF	SPWTF	TOTAL
30-Nov-93	17.3	8.3		222.4	248.0
01-Dec-93	3.0	0.0		96.3	99.3
02-Dec-93	16.3	0.0		186.1	202.4
03-Dec-93	0.0	7.8		105.1	112.9
04-Dec-93	0.0	0.0		339.4	339.4
05-Dec-93	0.0	0.0		216.1	216.1
06-Dec-93	14.9	0.0		269.2	284.1
07-Dec-93	9.7	9.4		155.0	174.1
08-Dec-93	14.5	0.0		211.4	225.9
09-Dec-93	0.0	0.0		161.6	161.6
10-Dec-93	0.0	0.0		111.6	111.6
11-Dec-93	0.0	0.0		165.1	165.1
12-Dec-93	0.0	0.0	0.0	235.3	235.3
13-Dec-93	20.8	0.0		167.3	188.1
14-Dec-93	2.8	9.7		149.7	162.3
15-Dec-93	18.1	0.0		170.8	188.9
16-Dec-93	2.0	0.0		115.8	117.8
17-Dec-93	0.0	9.5		179.8	189.3
18-Dec-93	0.0	0.0		194.0	194.0
19-Dec-93	0.0	0.0		207.2	207.2
20-Dec-93	19.7	0.0		179.7	199.4
21-Dec-93	12.3	0.0		249.2	261.5
22-Dec-93	0.0	7.5		237.5	245.0
23-Dec-93	0.0	0.0		190.5	190.5
24-Dec-93	0.0	0.0		136.3	136.3
25-Dec-93	0.0	0.0		31.0	31.0
26-Dec-93		0.0		167.9	167.9
27-Dec-93	0.0	0.0		152.1	152.1
28-Dec-93	16.7	0.0		204.9	221.6
29-Dec-93	25.5	0.0		97.9	123.4
30-Dec-93	28.3	0.0		78.2	106.5
31-Dec-93	0.0	0.0		151.5	151.5
01-Jan-94	0.0	0.0		189.1	189.1
02-Jan-94	0.0	0.0		79.9	79.9
03-Jan-94	21.7	0.0		122.4	144.1
04-Jan-94	31.9	8.4		253.5	293.8
05-Jan-94	23.8	0.0		278.4	302.2
06-Jan-94	24.9	0.0		133.2	158.1
07-Jan-94	29.7	0.0		109.0	138.7
08-Jan-94	0.0	0.0		218.8	218.8
09-Jan-94	0.0	0.0		193.8	193.8
10-Jan-94	13.1	0.0		121.7	134.8

WASTEWATER TREATMENT PLANT DATA (Continued)

DATE	GWTF	CPCF/PRTF	WETF	SPWTF	TOTAL
11-Jan-94	29.4	0.0		165.8	195.2
12-Jan-94	22.6	0.0		187.9	210.5
13-Jan-94	17.1	10.5		137.4	165.0
14-Jan-94	7.4	0.0		88.6	96.0
15-Jan-94	0.0	0.0		129.9	129.9
16-Jan-94	0.0	0.0		183.5	183.5
17-Jan-94	0.0	0.0		3.0	3.0
18-Jan-94	0.0	0.0		185.0	185.0
19-Jan-94	2.3	0.0		215.9	218.2
20-Jan-94	23.0	0.0		258.3	281.3
21-Jan-94	20.3	10.2		61.7	92.3
22-Jan-94	15.9	0.0		249.2	265.1
23-Jan-94	24.3	0.0		189.5	213.8
24-Jan-94	24.9	9.8		124.6	159.3
25-Jan-94	31.7	13.4		269.7	314.8
26-Jan-94	26.2	0.0		251.5	277.7
27-Jan-94	28.9	0.0		167.0	195.9
28-Jan-94	22.6	9.5		250.5	282.6
29-Jan-94	0.0	0.0		261.0	261.0
30-Jan-94	0.0	0.0		227.7	227.7
31-Jan-94	31.1	0.0		210.1	241.2
01-Feb-94	23.5	0.0		137.9	161.4
02-Feb-94	24.2	0.0		17.0	41.2
03-Feb-94	26.2	7.0		246.8	280.1
04-Feb-94	26.8	0.0		130.1	156.9
05-Feb-94	0.0	0.0		224.2	224.2
06-Feb-94	0.0			119.0	119.0
AVERAGE	11.7	1.8	0.0	172.9	186.2

COOLING TOWERS

Cooling towers recirculate water and maintain a certain concentration of total dissolved solids (TDS). In this process as return water cascades through the tower, part of the water evaporates and another fraction discharges to the plant sewer system. A certain water volume is discharged (known as blowdown) to maintain the TDS concentration in the tower. Evaporation from plant cooling towers was estimated based on quarterly averages calculated by Energy Systems' personnel during the last month of each quarter (March, June, September, and December). Cooling tower evaporation rates were estimated by Energy Systems' personnel as part of the quarterly monitoring of this parameter. The attached data sheet summarizes the available data.

STEAM PLANT

The steam plant uses process potable water through ion exchange columns to generate demineralized water for use as make-up water in the boilers for steam generation at the Y-12 Plant. Steam is used for space heating and for process. In addition, the steam plant discharges its blowdown water to the SPWTF and the treated water is discharged to the plant's storm sewer system (which discharges to EFPC).

The attached graph and data sheets summarize the available data for the study period.

STEAM PLANT WATER USE OAK RIDGE Y-12 PLANT

STEAM PLANT DATA

DATE	Steam Plant WATER USE 1,000 Gal.	Steam Plant WATER USE mgd
30-Nov-93	785.0	0.79
01-Dec-93	798.0	0.80
02-Dec-93	0.0	0.00
03-Dec-93	1,451.0	1.45
04-Dec-93	748.0	0.75
05-Dec-93	681.0	0.68
06-Dec-93	0.0	0.00
07-Dec-93	1,462.0	1.46
08-Dec-93	805.0	0.81
09-Dec-93	688.0	0.69
10-Dec-93	816.0	0.82
11-Dec-93	644.0	0.64
12-Dec-93	767.0	0.77
13-Dec-93	738.0	0.74
14-Dec-93	777.0	0.78
15-Dec-93	774.0	0.77
16-Dec-93	710.0	0.71
17-Dec-93	760.0	0.76
18-Dec-93	699.0	0.70
19-Dec-93	756.0	0.76
20-Dec-93	767.0	0.77
21-Dec-93	776.0	0.78
22-Dec-93	810.0	0.81
23-Dec-93	802.0	0.80
24-Dec-93	828.0	0.83
25-Dec-93	0.0	0.00
26-Dec-93	0.0	0.00
27-Dec-93	0.0	0.00
28-Dec-93	3,313.0	3.31
29-Dec-93	781.0	0.78
30-Dec-93	0.0	0.00
31-Dec-93	1,709.0	1.71
01-Jan-94	783.0	0.78
02-Jan-94	836.0	0.84
03-Jan-94	815.0	0.82
04-Jan-94	780.0	0.78
05-Jan-94	0.0	0.00
06-Jan-94	1,671.0	1.67
07-Jan-94	842.0	0.84
08-Jan-94	847.0	0.85
09-Jan-94	0.0	0.00
10-Jan-94	1,923.0	1.92
11-Jan-94	859.0	0.86
12-Jan-94	849.0	0.85
13-Jan-94	807.0	0.81
14-Jan-94	1,057.0	1.06
15-Jan-94	755.0	0.76

COOLING TOWER DATA

DATE	Evaporation Cooling Towers 1,000 gpd	Blowdown Cooling Towers 1,000 gpd	COC-1
June 91	362.4	196.3	1.8
Sept 91	356.7	169.5	2.1
Dec 91	292.7	114.7	2.6
Mar 92	420.4	199.7	2.1
Jun 92	468.5	217.7	2.2
Sep 92	553.1	257.0	2.2
Dec 93	530.3	246.4	2.2
Average	426.3	200.2	2.2

STEAM PLANT DATA (Continued)

DATE	Steam Plant WATER USE	Steam Plant WATER USE
	1,000 Gal.	mgd
16-Jan-94	1,023.0	1.02
17-Jan-94	1,116.0	1.12
18-Jan-94	916.0	0.92
19-Jan-94	1,450.0	1.45
20-Jan-94	0.0	0.00
21-Jan-94	1,758.0	1.76
22-Jan-94	1,086.0	1.09
23-Jan-94	0.0	0.00
24-Jan-94	1,984.0	1.98
25-Jan-94	905.0	0.91
26-Jan-94	907.0	0.91
27-Jan-94	825.0	0.83
28-Jan-94	802.0	0.80
29-Jan-94	873.0	0.87
30-Jan-94	881.0	0.88
31-Jan-94	887.0	0.89
01-Feb-94	918.0	0.92
02-Feb-94	925.0	0.93
03-Feb-94	1,046.0	1.05
04-Feb-94	0.0	0.00
05-Feb-94	1,781.0	1.78
06-Feb-94	885.0	0.89
AVERAGE	846.9	

REFRIGERATION MACHINES

Condensate from refrigeration machines is produced for the surrounding atmosphere by humidity condensing on air conditioners and chillers. This condensate is disposed into French drains where it eventually seeps into the ground, or flows through process sewer lines to EFPC. Energy Systems does not estimate or measure condensate production, nor do they have an updated list of refrigeration machines and chillers for the plant. However, according to Energy Systems' staff, the Y-12 Plant has an estimated 41,000 tons of refrigeration for the entire facility. During the summer months (assumed to be June through September), they are operating at an estimated 65 % capacity, and during other times of the year at 30 to 35 %. Based on these estimates, and a knowledge of air temperature, humidity, and cooling medium temperature, condensate production was approximated using standard theoretical equations for heat transfer. The attached graph and data sheet summarize the available data.

REFRIGERATION UNITS USED AT THE OAK RIDGE Y-12 PLANT

ALL DATA IS BASED ON WEEKLY AVERAGES

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc

Tons of Refrigeration Usage at Y-12

Day	West	East	Total
29-Nov-93	7,035.0	1,755.0	8,790.0
30-Nov-93	7,035.0	1,755.0	8,790.0
01-Dec-93	7,035.0	1,755.0	8,790.0
02-Dec-93	7,035.0	1,755.0	8,790.0
03-Dec-93	7,035.0	1,755.0	8,790.0
04-Dec-93	7,035.0	1,755.0	8,790.0
05-Dec-93	7,035.0	1,755.0	8,790.0
06-Dec-93	7,430.0	1,824.0	9,254.0
07-Dec-93	7,430.0	1,824.0	9,254.0
08-Dec-93	7,430.0	1,824.0	9,254.0
09-Dec-93	7,430.0	1,824.0	9,254.0
10-Dec-93	7,430.0	1,824.0	9,254.0
11-Dec-93	7,430.0	1,824.0	9,254.0
12-Dec-93	7,430.0	1,824.0	9,254.0
13-Dec-93	5,630.0	1,751.0	7,381.0
14-Dec-93	5,630.0	1,751.0	7,381.0
15-Dec-93	5,630.0	1,751.0	7,381.0
16-Dec-93	5,630.0	1,751.0	7,381.0
17-Dec-93	5,630.0	1,751.0	7,381.0
18-Dec-93	5,630.0	1,751.0	7,381.0
19-Dec-93	5,630.0	1,751.0	7,381.0
20-Dec-93	5,630.0	1,660.0	7,290.0
21-Dec-93	5,630.0	1,660.0	7,290.0
22-Dec-93	5,630.0	1,660.0	7,290.0
23-Dec-93	5,630.0	1,660.0	7,290.0
24-Dec-93	5,630.0	1,660.0	7,290.0
25-Dec-93	5,630.0	1,660.0	7,290.0
26-Dec-93	5,630.0	1,660.0	7,290.0
27-Dec-93			
28-Dec-93			
29-Dec-93			
30-Dec-93			
31-Dec-93			
01-Jan-94			
02-Jan-94			
03-Jan-94	5,430.0	1,580.0	7,010.0
04-Jan-94	5,430.0	1,580.0	7,010.0
05-Jan-94	5,430.0	1,580.0	7,010.0
06-Jan-94	5,430.0	1,580.0	7,010.0
07-Jan-94	5,430.0	1,580.0	7,010.0
08-Jan-94	5,430.0	1,580.0	7,010.0
09-Jan-94	5,430.0	1,580.0	7,010.0
10-Jan-94	4,996.0	1,585.0	6,581.0

Tons of Refrigeration Usage at Y-12 (Continued)

Day	West	East	Total
11-Jan-94	4,996.0	1,585.0	6,581.0
12-Jan-94	4,996.0	1,585.0	6,581.0
13-Jan-94	4,996.0	1,585.0	6,581.0
14-Jan-94	4,996.0	1,585.0	6,581.0
15-Jan-94	4,996.0	1,585.0	6,581.0
16-Jan-94	4,996.0	1,585.0	6,581.0
17-Jan-94	4,460.0	1,589.0	6,049.0
18-Jan-94	4,460.0	1,589.0	6,049.0
19-Jan-94	4,460.0	1,589.0	6,049.0
20-Jan-94	4,460.0	1,589.0	6,049.0
21-Jan-94	4,460.0	1,589.0	6,049.0
22-Jan-94	4,460.0	1,589.0	6,049.0
23-Jan-94	4,460.0	1,589.0	6,049.0
24-Jan-94	4,933.0	1,691.0	6,624.0
25-Jan-94	4,933.0	1,691.0	6,624.0
26-Jan-94	4,933.0	1,691.0	6,624.0
27-Jan-94	4,933.0	1,691.0	6,624.0
28-Jan-94	4,933.0	1,691.0	6,624.0
29-Jan-94	4,933.0	1,691.0	6,624.0
30-Jan-94	4,933.0	1,691.0	6,624.0
31-Jan-94	5,373.0	1,861.0	7,234.0
01-Feb-94	5,373.0	1,861.0	7,234.0
02-Feb-94	5,373.0	1,861.0	7,234.0
03-Feb-94	5,373.0	1,861.0	7,234.0
04-Feb-94	5,373.0	1,861.0	7,234.0
05-Feb-94	5,373.0	1,861.0	7,234.0
06-Feb-94	5,373.0	1,861.0	7,234.0
AVERAGE			7,357.0

EFPC Station 17 - EFPC Flow Data

This monitoring station is located near the point where EFPC exits the Y-12 Plant. This station is equipped with permanent flow measuring devices and is one of the principal flow monitoring stations in EFPC. The following graph and data sheets summarize the flow data collected during the study for Station 17.

FLOW AT EFPC STATION 17

METEOREOLOGICAL DATA FOR THE Y-12 PLANT DECEMBER 1, 1993 TO FEBRUARY 4, 1994

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
29-Nov-93	0:00	3.2	3,200.0
29-Nov-93	1:00	3.2	3,200.0
29-Nov-93	2:00	3.2	3,200.0
29-Nov-93	3:00	3.2	3,200.0
29-Nov-93	4:00	3.2	3,200.0
29-Nov-93	5:00	3.2	3,200.0
29-Nov-93	6:00	3.2	3,200.0
29-Nov-93	7:00	3.1	3,100.0
29-Nov-93	8:00	3.1	3,100.0
29-Nov-93	9:00	3.1	3,100.0
29-Nov-93	10:00	3.2	3,200.0
29-Nov-93	11:00	3.2	3,200.0
29-Nov-93	12:00	3.2	3,200.0
29-Nov-93	13:00	3.3	3,300.0
29-Nov-93	14:00	3.3	3,300.0
29-Nov-93	15:00	3.3	3,300.0
29-Nov-93	16:00	3.2	3,200.0
29-Nov-93	17:00	3.2	3,200.0
29-Nov-93	18:00	3.2	3,200.0
29-Nov-93	19:00	3.2	3,200.0
29-Nov-93	20:00	3.2	3,200.0
29-Nov-93	21:00	3.2	3,200.0
29-Nov-93	22:00	3.2	3,200.0
29-Nov-93	23:00	3.2	3,200.0
30-Nov-93	0:00	3.2	3,200.0
30-Nov-93	1:00	3.1	3,100.0
30-Nov-93	2:00	3.1	3,100.0
30-Nov-93	3:00	3	3,000.0
30-Nov-93	4:00	3	3,000.0
30-Nov-93	5:00	3	3,000.0
30-Nov-93	6:00	3	3,000.0
30-Nov-93	7:00	3	3,000.0
30-Nov-93	8:00	3	3,000.0
30-Nov-93	9:00	3	3,000.0
30-Nov-93	10:00	3.1	3,100.0
30-Nov-93	11:00	3.1	3,100.0
30-Nov-93	12:00	3.1	3,100.0
30-Nov-93	13:00	3.2	3,200.0
30-Nov-93	14:00	3.3	3,300.0
30-Nov-93	15:00	3.3	3,300.0
30-Nov-93	16:00	3.2	3,200.0
30-Nov-93	17:00	3.2	3,200.0
30-Nov-93	18:00	3.2	3,200.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
30-Nov-93	19:00	3.2	3,200.0
30-Nov-93	20:00	3.2	3,200.0
30-Nov-93	21:00	3.1	3,100.0
30-Nov-93	22:00	3.2	3,200.0
30-Nov-93	23:00	3.2	3,200.0
01-Dec-93	0:00	3.1	3,100.0
01-Dec-93	1:00	3.1	3,100.0
01-Dec-93	2:00	3.1	3,100.0
01-Dec-93	3:00	3.1	3,100.0
01-Dec-93	4:00	3.1	3,100.0
01-Dec-93	5:00	3.1	3,100.0
01-Dec-93	6:00	3.1	3,100.0
01-Dec-93	7:00	3.1	3,100.0
01-Dec-93	8:00	3	3,000.0
01-Dec-93	9:00	3	3,000.0
01-Dec-93	10:00	2.9	2,900.0
01-Dec-93	11:00	2.9	2,900.0
01-Dec-93	12:00	2.9	2,900.0
01-Dec-93	13:00	2.9	2,900.0
01-Dec-93	14:00	2.9	2,900.0
01-Dec-93	15:00	2.9	2,900.0
01-Dec-93	16:00	3	3,000.0
01-Dec-93	17:00	2.9	2,900.0
01-Dec-93	18:00	2.9	2,900.0
01-Dec-93	19:00	2.9	2,900.0
01-Dec-93	20:00	2.8	2,800.0
01-Dec-93	21:00	2.8	2,800.0
01-Dec-93	22:00	2.8	2,800.0
01-Dec-93	23:00	2.8	2,800.0
02-Dec-93	0:00	2.8	2,800.0
02-Dec-93	1:00	2.8	2,800.0
02-Dec-93	2:00	2.8	2,800.0
02-Dec-93	3:00	2.8	2,800.0
02-Dec-93	4:00	2.8	2,800.0
02-Dec-93	5:00	2.9	2,900.0
02-Dec-93	6:00	3	3,000.0
02-Dec-93	7:00	3	3,000.0
02-Dec-93	8:00	3	3,000.0
02-Dec-93	9:00	3	3,000.0
02-Dec-93	10:00	3	3,000.0
02-Dec-93	11:00	3.1	3,100.0
02-Dec-93	12:00	3.1	3,100.0
02-Dec-93	13:00	3.1	3,100.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
02-Dec-93	14:00	3.1	3,100.0
02-Dec-93	15:00	3.1	3,100.0
02-Dec-93	16:00	3	3,000.0
02-Dec-93	17:00	3	3,000.0
02-Dec-93	18:00	2.8	2,800.0
02-Dec-93	19:00	2.8	2,800.0
02-Dec-93	20:00	2.8	2,800.0
02-Dec-93	21:00	2.9	2,900.0
02-Dec-93	22:00	2.9	2,900.0
02-Dec-93	23:00	2.9	2,900.0
03-Dec-93	0:00	2.9	2,900.0
03-Dec-93	1:00	2.9	2,900.0
03-Dec-93	2:00	2.9	2,900.0
03-Dec-93	3:00	2.9	2,900.0
03-Dec-93	4:00	2.9	2,900.0
03-Dec-93	5:00	3	3,000.0
03-Dec-93	6:00	3	3,000.0
03-Dec-93	7:00	3	3,000.0
03-Dec-93	8:00	3	3,000.0
03-Dec-93	9:00	2.8	2,800.0
03-Dec-93	10:00	2.8	2,800.0
03-Dec-93	11:00	2.8	2,800.0
03-Dec-93	12:00	2.8	2,800.0
03-Dec-93	13:00	2.8	2,800.0
03-Dec-93	14:00	2.8	2,800.0
03-Dec-93	15:00	2.8	2,800.0
03-Dec-93	16:00	2.8	2,800.0
03-Dec-93	17:00	2.7	2,700.0
03-Dec-93	18:00	2.7	2,700.0
03-Dec-93	19:00	2.7	2,700.0
03-Dec-93	20:00	2.7	2,700.0
03-Dec-93	21:00	2.8	2,800.0
03-Dec-93	22:00	3	3,000.0
03-Dec-93	23:00	3.7	3,700.0
04-Dec-93	0:00	5.6	5,600.0
04-Dec-93	1:00	9	9,000.0
04-Dec-93	2:00	12.6	12,600.0
04-Dec-93	3:00	16.5	16,500.0
04-Dec-93	4:00	22.5	22,500.0
04-Dec-93	5:00	35.2	35,200.0
04-Dec-93	6:00	42.1	42,100.0
04-Dec-93	7:00	44.5	44,500.0
04-Dec-93	8:00	67	67,000.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
04-Dec-93	9:00	60	60,000.0
04-Dec-93	10:00		
04-Dec-93	11:00		
04-Dec-93	12:00		
04-Dec-93	13:00		
04-Dec-93	14:00		
04-Dec-93	15:00		
04-Dec-93	16:00		
04-Dec-93	17:00	90.3	90,300.0
04-Dec-93	18:00	67.7	67,700.0
04-Dec-93	19:00	41	41,000.0
04-Dec-93	20:00	33.5	33,500.0
04-Dec-93	21:00	56.3	56,300.0
04-Dec-93	22:00	51.2	51,200.0
04-Dec-93	23:00	35	35,000.0
05-Dec-93	0:00	32.7	32,700.0
05-Dec-93	1:00	27.2	27,200.0
05-Dec-93	2:00	24.7	24,700.0
05-Dec-93	3:00	22	22,000.0
05-Dec-93	4:00	19.5	19,500.0
05-Dec-93	5:00	17.1	17,100.0
05-Dec-93	6:00	14.9	14,900.0
05-Dec-93	7:00	13.1	13,100.0
05-Dec-93	8:00	11.8	11,800.0
05-Dec-93	9:00	10.9	10,900.0
05-Dec-93	10:00	10.1	10,100.0
05-Dec-93	11:00	9.4	9,400.0
05-Dec-93	12:00	8.9	8,900.0
05-Dec-93	13:00	8.5	8,500.0
05-Dec-93	14:00	8.1	8,100.0
05-Dec-93	15:00	7.8	7,800.0
05-Dec-93	16:00	7.4	7,400.0
05-Dec-93	17:00	7.2	7,200.0
05-Dec-93	18:00	7	7,000.0
05-Dec-93	19:00	6.7	6,700.0
05-Dec-93	20:00	6.5	6,500.0
05-Dec-93	21:00	6.3	6,300.0
05-Dec-93	22:00	6.2	6,200.0
05-Dec-93	23:00	6	6,000.0
06-Dec-93	0:00	6	6,000.0
06-Dec-93	1:00	5.9	5,900.0
06-Dec-93	2:00	5.8	5,800.0
06-Dec-93	3:00	5.7	5,700.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
06-Dec-93	4:00	5.7	5,700.0
06-Dec-93	5:00	5.6	5,600.0
06-Dec-93	6:00	5.5	5,500.0
06-Dec-93	7:00	5.3	5,300.0
06-Dec-93	8:00	5.4	5,400.0
06-Dec-93	9:00	5.6	5,600.0
06-Dec-93	10:00	5.4	5,400.0
06-Dec-93	11:00	5.3	5,300.0
06-Dec-93	12:00	5.3	5,300.0
06-Dec-93	13:00	5.3	5,300.0
06-Dec-93	14:00	5.2	5,200.0
06-Dec-93	15:00	5.1	5,100.0
06-Dec-93	16:00	5	5,000.0
06-Dec-93	17:00	4.9	4,900.0
06-Dec-93	18:00	4.9	4,900.0
06-Dec-93	19:00	4.8	4,800.0
06-Dec-93	20:00	4.8	4,800.0
06-Dec-93	21:00	4.7	4,700.0
06-Dec-93	22:00	4.6	4,600.0
06-Dec-93	23:00	4.6	4,600.0
07-Dec-93	0:00	4.5	4,500.0
07-Dec-93	1:00	4.5	4,500.0
07-Dec-93	2:00	4.4	4,400.0
07-Dec-93	3:00	4.4	4,400.0
07-Dec-93	4:00	4.4	4,400.0
07-Dec-93	5:00	4.3	4,300.0
07-Dec-93	6:00	4.2	4,200.0
07-Dec-93	7:00	4.2	4,200.0
07-Dec-93	8:00	4.1	4,100.0
07-Dec-93	9:00	4.1	4,100.0
07-Dec-93	10:00	4.3	4,300.0
07-Dec-93	11:00	4.3	4,300.0
07-Dec-93	12:00	4.3	4,300.0
07-Dec-93	13:00	4.2	4,200.0
07-Dec-93	14:00	4.2	4,200.0
07-Dec-93	15:00	4.2	4,200.0
07-Dec-93	16:00	4.2	4,200.0
07-Dec-93	17:00	4.1	4,100.0
07-Dec-93	18:00	4.1	4,100.0
07-Dec-93	19:00	4.1	4,100.0
07-Dec-93	20:00	4	4,000.0
07-Dec-93	21:00	4	4,000.0
07-Dec-93	22:00	4	4,000.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
07-Dec-93	23:00	4	4,000.0
08-Dec-93	0:00	3.9	3,900.0
08-Dec-93	1:00	3.9	3,900.0
08-Dec-93	2:00	3.9	3,900.0
08-Dec-93	3:00	3.9	3,900.0
08-Dec-93	4:00	3.8	3,800.0
08-Dec-93	5:00	3.8	3,800.0
08-Dec-93	6:00	3.8	3,800.0
08-Dec-93	7:00	3.8	3,800.0
08-Dec-93	8:00	3.8	3,800.0
08-Dec-93	9:00	3.8	3,800.0
08-Dec-93	10:00	3.7	3,700.0
08-Dec-93	11:00		
08-Dec-93	12:00		
08-Dec-93	13:00		
08-Dec-93	14:00		
08-Dec-93	15:00	3.9	3,900.0
08-Dec-93	16:00	3.9	3,900.0
08-Dec-93	17:00	3.9	3,900.0
08-Dec-93	18:00	3.8	3,800.0
08-Dec-93	19:00	3.8	3,800.0
08-Dec-93	20:00	3.7	3,700.0
08-Dec-93	21:00	3.7	3,700.0
08-Dec-93	22:00	3.7	3,700.0
08-Dec-93	23:00	3.7	3,700.0
09-Dec-93	0:00	3.6	3,600.0
09-Dec-93	1:00	3.6	3,600.0
09-Dec-93	2:00	3.5	3,500.0
09-Dec-93	3:00	3.5	3,500.0
09-Dec-93	4:00	3.5	3,500.0
09-Dec-93	5:00	3.5	3,500.0
09-Dec-93	6:00	3.5	3,500.0
09-Dec-93	7:00	3.5	3,500.0
09-Dec-93	8:00	3.5	3,500.0
09-Dec-93	9:00	3.5	3,500.0
09-Dec-93	10:00	3.5	3,500.0
09-Dec-93	11:00	3.6	3,600.0
09-Dec-93	12:00	3.6	3,600.0
09-Dec-93	13:00	3.6	3,600.0
09-Dec-93	14:00	3.6	3,600.0
09-Dec-93	15:00	3.7	3,700.0
09-Dec-93	16:00	3.6	3,600.0
09-Dec-93	17:00	3.5	3,500.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
09-Dec-93	18:00	3.5	3,500.0
09-Dec-93	19:00	3.5	3,500.0
09-Dec-93	20:00	3.5	3,500.0
09-Dec-93	21:00	3.5	3,500.0
09-Dec-93	22:00	3.5	3,500.0
09-Dec-93	23:00	4	4,000.0
10-Dec-93	0:00	6.3	6,300.0
10-Dec-93	1:00	11.8	11,800.0
10-Dec-93	2:00	15.9	15,900.0
10-Dec-93	3:00	16.6	16,600.0
10-Dec-93	4:00	20.1	20,100.0
10-Dec-93	5:00	35.7	35,700.0
10-Dec-93	6:00	33.4	33,400.0
10-Dec-93	7:00	23.7	23,700.0
10-Dec-93	8:00	17	17,000.0
10-Dec-93	9:00	14	14,000.0
10-Dec-93	10:00	12.3	12,300.0
10-Dec-93	11:00	10.5	10,500.0
10-Dec-93	12:00	9.3	9,300.0
10-Dec-93	13:00	8.5	8,500.0
10-Dec-93	14:00	8.5	8,500.0
10-Dec-93	15:00	8.6	8,600.0
10-Dec-93	16:00	8.1	8,100.0
10-Dec-93	17:00	7.5	7,500.0
10-Dec-93	18:00	7.1	7,100.0
10-Dec-93	19:00	6.7	6,700.0
10-Dec-93	20:00	6.3	6,300.0
10-Dec-93	21:00	6.1	6,100.0
10-Dec-93	22:00	5.9	5,900.0
10-Dec-93	23:00	5.7	5,700.0
11-Dec-93	0:00	5.6	5,600.0
11-Dec-93	1:00	5.5	5,500.0
11-Dec-93	2:00	5.4	5,400.0
11-Dec-93	3:00	5.4	5,400.0
11-Dec-93	4:00	5.4	5,400.0
11-Dec-93	5:00	5.4	5,400.0
11-Dec-93	6:00	5.3	5,300.0
11-Dec-93	7:00	5.3	5,300.0
11-Dec-93	8:00	5.4	5,400.0
11-Dec-93	9:00	5	5,000.0
11-Dec-93	10:00	4.8	4,800.0
11-Dec-93	11:00	4.7	4,700.0
11-Dec-93	12:00	4.7	4,700.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
11-Dec-93	13:00	4.6	4,600.0
11-Dec-93	14:00	4.6	4,600.0
11-Dec-93	15:00	4.5	4,500.0
11-Dec-93	16:00	4.5	4,500.0
11-Dec-93	17:00	4.4	4,400.0
11-Dec-93	18:00	4.4	4,400.0
11-Dec-93	19:00	4.4	4,400.0
11-Dec-93	20:00	4.3	4,300.0
11-Dec-93	21:00	4.2	4,200.0
11-Dec-93	22:00	4.1	4,100.0
11-Dec-93	23:00	4	4,000.0
12-Dec-93	0:00	4	4,000.0
12-Dec-93	1:00	4	4,000.0
12-Dec-93	2:00	4	4,000.0
12-Dec-93	3:00	4	4,000.0
12-Dec-93	4:00	4	4,000.0
12-Dec-93	5:00	4	4,000.0
12-Dec-93	6:00	4	4,000.0
12-Dec-93	7:00	4	4,000.0
12-Dec-93	8:00	3.9	3,900.0
12-Dec-93	9:00	3.9	3,900.0
12-Dec-93	10:00	3.9	3,900.0
12-Dec-93	11:00	3.9	3,900.0
12-Dec-93	12:00	3.9	3,900.0
12-Dec-93	13:00	3.8	3,800.0
12-Dec-93	14:00	3.8	3,800.0
12-Dec-93	15:00	3.7	3,700.0
12-Dec-93	16:00	3.8	3,800.0
12-Dec-93	17:00	3.8	3,800.0
12-Dec-93	18:00	3.7	3,700.0
12-Dec-93	19:00	3.7	3,700.0
12-Dec-93	20:00	3.7	3,700.0
12-Dec-93	21:00	3.6	3,600.0
12-Dec-93	22:00	3.6	3,600.0
12-Dec-93	23:00	3.6	3,600.0
13-Dec-93	0:00	3.7	3,700.0
13-Dec-93	1:00	3.7	3,700.0
13-Dec-93	2:00	3.7	3,700.0
13-Dec-93	3:00	3.7	3,700.0
13-Dec-93	4:00	3.7	3,700.0
13-Dec-93	5:00	3.7	3,700.0
13-Dec-93	6:00	3.7	3,700.0
13-Dec-93	7:00	3.6	3,600.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
13-Dec-93	8:00	3.6	3,600.0
13-Dec-93	9:00		
13-Dec-93	10:00	3.8	3,800.0
13-Dec-93	11:00	3.7	3,700.0
13-Dec-93	12:00	3.7	3,700.0
13-Dec-93	13:00		
13-Dec-93	14:00	3.7	3,700.0
13-Dec-93	15:00	3.8	3,800.0
13-Dec-93	16:00	3.8	3,800.0
13-Dec-93	17:00	3.7	3,700.0
13-Dec-93	18:00	3.7	3,700.0
13-Dec-93	19:00	3.7	3,700.0
13-Dec-93	20:00	3.6	3,600.0
13-Dec-93	21:00	3.6	3,600.0
13-Dec-93	22:00	3.6	3,600.0
13-Dec-93	23:00	3.6	3,600.0
14-Dec-93	0:00	3.6	3,600.0
14-Dec-93	1:00	3.6	3,600.0
14-Dec-93	2:00	3.6	3,600.0
14-Dec-93	3:00	3.6	3,600.0
14-Dec-93	4:00	3.6	3,600.0
14-Dec-93	5:00	3.5	3,500.0
14-Dec-93	6:00	3.5	3,500.0
14-Dec-93	7:00	3.5	3,500.0
14-Dec-93	8:00	3.5	3,500.0
14-Dec-93	9:00	3.5	3,500.0
14-Dec-93	10:00	3.6	3,600.0
14-Dec-93	11:00	3.6	3,600.0
14-Dec-93	12:00	3.7	3,700.0
14-Dec-93	13:00	4	4,000.0
14-Dec-93	14:00	4.5	4,500.0
14-Dec-93	15:00	5	5,000.0
14-Dec-93	16:00	5.1	5,100.0
14-Dec-93	17:00	5.3	5,300.0
14-Dec-93	18:00	5.4	5,400.0
14-Dec-93	19:00	5.9	5,900.0
14-Dec-93	20:00	6.2	6,200.0
14-Dec-93	21:00	5.8	5,800.0
14-Dec-93	22:00	5.4	5,400.0
14-Dec-93	23:00	5	5,000.0
15-Dec-93	0:00	4.9	4,900.0
15-Dec-93	1:00	5	5,000.0
15-Dec-93	2:00	5.2	5,200.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
15-Dec-93	3:00	5.3	5,300.0
15-Dec-93	4:00	5.4	5,400.0
15-Dec-93	5:00	5.3	5,300.0
15-Dec-93	6:00	5.1	5,100.0
15-Dec-93	7:00	5	5,000.0
15-Dec-93	8:00	4.7	4,700.0
15-Dec-93	9:00		
15-Dec-93	10:00	4.5	4,500.0
15-Dec-93	11:00	4.4	4,400.0
15-Dec-93	12:00	4.3	4,300.0
15-Dec-93	13:00		
15-Dec-93	14:00		
15-Dec-93	15:00	4.1	4,100.0
15-Dec-93	16:00	4	4,000.0
15-Dec-93	17:00	4	4,000.0
15-Dec-93	18:00	3.9	3,900.0
15-Dec-93	19:00	3.9	3,900.0
15-Dec-93	20:00	3.9	3,900.0
15-Dec-93	21:00	3.8	3,800.0
15-Dec-93	22:00	3.7	3,700.0
15-Dec-93	23:00	3.7	3,700.0
16-Dec-93	0:00	3.7	3,700.0
16-Dec-93	1:00	3.7	3,700.0
16-Dec-93	2:00	3.6	3,600.0
16-Dec-93	3:00	3.6	3,600.0
16-Dec-93	4:00	3.6	3,600.0
16-Dec-93	5:00	3.6	3,600.0
16-Dec-93	6:00	3.6	3,600.0
16-Dec-93	7:00	3.6	3,600.0
16-Dec-93	8:00	3.6	3,600.0
16-Dec-93	9:00		
16-Dec-93	10:00	3.6	3,600.0
16-Dec-93	11:00	3.6	3,600.0
16-Dec-93	12:00	3.5	3,500.0
16-Dec-93	13:00	3.5	3,500.0
16-Dec-93	14:00	3.5	3,500.0
16-Dec-93	15:00	3.5	3,500.0
16-Dec-93	16:00	3.5	3,500.0
16-Dec-93	17:00	3.5	3,500.0
16-Dec-93	18:00	3.5	3,500.0
16-Dec-93	19:00	3.5	3,500.0
16-Dec-93	20:00	3.5	3,500.0
16-Dec-93	21:00	3.5	3,500.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
16-Dec-93	22:00	3.5	3,500.0
16-Dec-93	23:00	3.6	3,600.0
17-Dec-93	0:00	3.6	3,600.0
17-Dec-93	1:00	3.5	3,500.0
17-Dec-93	2:00	3.5	3,500.0
17-Dec-93	3:00	3.5	3,500.0
17-Dec-93	4:00	3.5	3,500.0
17-Dec-93	5:00	3.5	3,500.0
17-Dec-93	6:00	3.5	3,500.0
17-Dec-93	7:00	3.5	3,500.0
17-Dec-93	8:00	3.5	3,500.0
17-Dec-93	9:00	3.5	3,500.0
17-Dec-93	10:00	3.4	3,400.0
17-Dec-93	11:00	3.4	3,400.0
17-Dec-93	12:00	3.4	3,400.0
17-Dec-93	13:00	3.4	3,400.0
17-Dec-93	14:00	3.4	3,400.0
17-Dec-93	15:00	3.4	3,400.0
17-Dec-93	16:00	3.4	3,400.0
17-Dec-93	17:00	3.4	3,400.0
17-Dec-93	18:00	3.4	3,400.0
17-Dec-93	19:00	3.4	3,400.0
17-Dec-93	20:00	3.3	3,300.0
17-Dec-93	21:00	3.3	3,300.0
17-Dec-93	22:00	3.3	3,300.0
17-Dec-93	23:00	3.3	3,300.0
18-Dec-93	0:00	3.3	3,300.0
18-Dec-93	1:00	3.2	3,200.0
18-Dec-93	2:00	3.3	3,300.0
18-Dec-93	3:00	3.3	3,300.0
18-Dec-93	4:00	3.3	3,300.0
18-Dec-93	5:00	3.3	3,300.0
18-Dec-93	6:00	3.3	3,300.0
18-Dec-93	7:00	3.3	3,300.0
18-Dec-93	8:00	3.3	3,300.0
18-Dec-93	9:00	3.3	3,300.0
18-Dec-93	10:00	3.4	3,400.0
18-Dec-93	11:00	3.3	3,300.0
18-Dec-93	12:00	3.2	3,200.0
18-Dec-93	13:00	3.3	3,300.0
18-Dec-93	14:00	3.4	3,400.0
18-Dec-93	15:00	3.4	3,400.0
18-Dec-93	16:00	3.4	3,400.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
18-Dec-93	17:00	3.4	3,400.0
18-Dec-93	18:00	3.4	3,400.0
18-Dec-93	19:00	3.3	3,300.0
18-Dec-93	20:00	3.2	3,200.0
18-Dec-93	21:00	3.2	3,200.0
18-Dec-93	22:00	3.2	3,200.0
18-Dec-93	23:00	3.2	3,200.0
19-Dec-93	0:00	3.2	3,200.0
19-Dec-93	1:00	3.2	3,200.0
19-Dec-93	2:00	3.2	3,200.0
19-Dec-93	3:00	3.2	3,200.0
19-Dec-93	4:00	3.2	3,200.0
19-Dec-93	5:00	3.2	3,200.0
19-Dec-93	6:00	3.2	3,200.0
19-Dec-93	7:00	3.2	3,200.0
19-Dec-93	8:00	3.2	3,200.0
19-Dec-93	9:00	3.2	3,200.0
19-Dec-93	10:00	3.2	3,200.0
19-Dec-93	11:00	3.1	3,100.0
19-Dec-93	12:00	3.1	3,100.0
19-Dec-93	13:00	3.1	3,100.0
19-Dec-93	14:00	3.2	3,200.0
19-Dec-93	15:00	3.2	3,200.0
19-Dec-93	16:00	3.2	3,200.0
19-Dec-93	17:00	3.2	3,200.0
19-Dec-93	18:00	3.2	3,200.0
19-Dec-93	19:00	3.2	3,200.0
19-Dec-93	20:00	3.2	3,200.0
19-Dec-93	21:00	3.2	3,200.0
19-Dec-93	22:00	3.2	3,200.0
19-Dec-93	23:00	3.2	3,200.0
03-Jan-94	0:00	3.5	3,500.0
03-Jan-94	1:00	3.5	3,500.0
03-Jan-94	2:00	3.5	3,500.0
03-Jan-94	3:00	3.5	3,500.0
03-Jan-94	4:00	3.5	3,500.0
03-Jan-94	5:00	3.5	3,500.0
03-Jan-94	6:00	3.5	3,500.0
03-Jan-94	7:00	3.5	3,500.0
03-Jan-94	8:00	3.5	3,500.0
03-Jan-94	9:00		
03-Jan-94	10:00	8.2	8,200.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
03-Jan-94	11:00	14	14,000.0
03-Jan-94	12:00	17.5	17,500.0
03-Jan-94	13:00		
03-Jan-94	14:00	22.6	22,600.0
03-Jan-94	15:00	21.4	21,400.0
03-Jan-94	16:00	16.6	16,600.0
03-Jan-94	17:00	13.9	13,900.0
03-Jan-94	18:00	11.8	11,800.0
03-Jan-94	19:00	9.9	9,900.0
03-Jan-94	20:00	8.5	8,500.0
03-Jan-94	21:00	7.6	7,600.0
03-Jan-94	22:00	7.1	7,100.0
03-Jan-94	23:00	6.9	6,900.0
04-Jan-94	0:00	7.6	7,600.0
04-Jan-94	1:00	10.6	10,600.0
04-Jan-94	2:00	13.1	13,100.0
04-Jan-94	3:00	12.2	12,200.0
04-Jan-94	4:00	10.4	10,400.0
04-Jan-94	5:00	8.9	8,900.0
04-Jan-94	6:00	8	8,000.0
04-Jan-94	7:00	7.3	7,300.0
04-Jan-94	8:00	6.9	6,900.0
04-Jan-94	9:00	6.5	6,500.0
04-Jan-94	10:00	6.2	6,200.0
04-Jan-94	11:00	6	6,000.0
04-Jan-94	12:00	5.9	5,900.0
04-Jan-94	13:00	5.8	5,800.0
04-Jan-94	14:00	5.7	5,700.0
04-Jan-94	15:00	5.6	5,600.0
04-Jan-94	16:00	5.4	5,400.0
04-Jan-94	17:00	5.3	5,300.0
04-Jan-94	18:00	5.3	5,300.0
04-Jan-94	19:00	5.1	5,100.0
04-Jan-94	20:00	5	5,000.0
04-Jan-94	21:00	4.9	4,900.0
04-Jan-94	22:00	4.9	4,900.0
04-Jan-94	23:00	4.8	4,800.0
05-Jan-94	0:00	4.7	4,700.0
05-Jan-94	1:00	4.6	4,600.0
05-Jan-94	2:00	4.6	4,600.0
05-Jan-94	3:00	4.6	4,600.0
05-Jan-94	4:00	4.6	4,600.0
05-Jan-94	5:00	4.5	4,500.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
05-Jan-94	6:00	4.5	4,500.0
05-Jan-94	7:00	4.5	4,500.0
05-Jan-94	8:00	4.4	4,400.0
05-Jan-94	9:00		
05-Jan-94	10:00	4.4	4,400.0
05-Jan-94	11:00	4.5	4,500.0
05-Jan-94	12:00	4.4	4,400.0
05-Jan-94	13:00	4.4	4,400.0
05-Jan-94	14:00	4.4	4,400.0
05-Jan-94	15:00	4.4	4,400.0
05-Jan-94	16:00	4.4	4,400.0
05-Jan-94	17:00	4.4	4,400.0
05-Jan-94	18:00	4.3	4,300.0
05-Jan-94	19:00	4.3	4,300.0
05-Jan-94	20:00	4.3	4,300.0
05-Jan-94	21:00	4.3	4,300.0
05-Jan-94	22:00	4.3	4,300.0
05-Jan-94	23:00	4.2	4,200.0
06-Jan-94	0:00	4.2	4,200.0
06-Jan-94	1:00	4.1	4,100.0
06-Jan-94	2:00	4.1	4,100.0
06-Jan-94	3:00	4.1	4,100.0
06-Jan-94	4:00	4.1	4,100.0
06-Jan-94	5:00	4.1	4,100.0
06-Jan-94	6:00	4.1	4,100.0
06-Jan-94	7:00	4.1	4,100.0
06-Jan-94	8:00	4	4,000.0
06-Jan-94	9:00	4	4,000.0
06-Jan-94	10:00	3.9	3,900.0
06-Jan-94	11:00	3.9	3,900.0
06-Jan-94	12:00	3.9	3,900.0
06-Jan-94	13:00	3.9	3,900.0
06-Jan-94	14:00	3.9	3,900.0
06-Jan-94	15:00	3.9	3,900.0
06-Jan-94	16:00	3.9	3,900.0
06-Jan-94	17:00	3.8	3,800.0
06-Jan-94	18:00	3.8	3,800.0
06-Jan-94	19:00	3.9	3,900.0
06-Jan-94	20:00	3.9	3,900.0
06-Jan-94	21:00	3.9	3,900.0
06-Jan-94	22:00	3.9	3,900.0
06-Jan-94	23:00	3.9	3,900.0
07-Jan-94	0:00	3.8	3,800.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
07-Jan-94	1:00	3.7	3,700.0
07-Jan-94	2:00	3.7	3,700.0
07-Jan-94	3:00	3.7	3,700.0
07-Jan-94	4:00	3.6	3,600.0
07-Jan-94	5:00	3.6	3,600.0
07-Jan-94	6:00	3.7	3,700.0
07-Jan-94	7:00	3.7	3,700.0
07-Jan-94	8:00	4.9	4,900.0
07-Jan-94	9:00	27.7	27,700.0
07-Jan-94	10:00	31.8	31,800.0
07-Jan-94	11:00	27.7	27,700.0
07-Jan-94	12:00	22.1	22,100.0
07-Jan-94	13:00	19.1	19,100.0
07-Jan-94	14:00	19.7	19,700.0
07-Jan-94	15:00	22.6	22,600.0
07-Jan-94	16:00	23.9	23,900.0
07-Jan-94	17:00	23.4	23,400.0
07-Jan-94	18:00	21.2	21,200.0
07-Jan-94	19:00	17.2	17,200.0
07-Jan-94	20:00	14.2	14,200.0
07-Jan-94	21:00	12.4	12,400.0
07-Jan-94	22:00	10.9	10,900.0
07-Jan-94	23:00	9.7	9,700.0
08-Jan-94	0:00	8.8	8,800.0
08-Jan-94	1:00	8.2	8,200.0
08-Jan-94	2:00	7.8	7,800.0
08-Jan-94	3:00	7.4	7,400.0
08-Jan-94	4:00	7	7,000.0
08-Jan-94	5:00	6.7	6,700.0
08-Jan-94	6:00	6.4	6,400.0
08-Jan-94	7:00	6.2	6,200.0
08-Jan-94	8:00	6	6,000.0
08-Jan-94	9:00	5.9	5,900.0
08-Jan-94	10:00	5.8	5,800.0
08-Jan-94	11:00	5.7	5,700.0
08-Jan-94	12:00	5.7	5,700.0
08-Jan-94	13:00	5.7	5,700.0
08-Jan-94	14:00	5.6	5,600.0
08-Jan-94	15:00	5.6	5,600.0
08-Jan-94	16:00	5.5	5,500.0
08-Jan-94	17:00	5.4	5,400.0
08-Jan-94	18:00	5.4	5,400.0
08-Jan-94	19:00	5.3	5,300.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
08-Jan-94	20:00	5.2	5,200.0
08-Jan-94	21:00	5.1	5,100.0
08-Jan-94	22:00	5	5,000.0
08-Jan-94	23:00	4.9	4,900.0
09-Jan-94	0:00	4.9	4,900.0
09-Jan-94	1:00	4.9	4,900.0
09-Jan-94	2:00	4.8	4,800.0
09-Jan-94	3:00	4.8	4,800.0
09-Jan-94	4:00	4.7	4,700.0
09-Jan-94	5:00	4.7	4,700.0
09-Jan-94	6:00	4.7	4,700.0
09-Jan-94	7:00	4.6	4,600.0
09-Jan-94	8:00	4.5	4,500.0
09-Jan-94	9:00	4.5	4,500.0
09-Jan-94	10:00	4.5	4,500.0
09-Jan-94	11:00	4.5	4,500.0
09-Jan-94	12:00	4.5	4,500.0
09-Jan-94	13:00	4.5	4,500.0
09-Jan-94	14:00	4.5	4,500.0
09-Jan-94	15:00	4.5	4,500.0
09-Jan-94	16:00	4.4	4,400.0
09-Jan-94	17:00	4.4	4,400.0
09-Jan-94	18:00	4.4	4,400.0
09-Jan-94	19:00	4.4	4,400.0
09-Jan-94	20:00	4.4	4,400.0
09-Jan-94	21:00	4.4	4,400.0
09-Jan-94	22:00	4.4	4,400.0
09-Jan-94	23:00	4.3	4,300.0
10-Jan-94	0:00	4.2	4,200.0
10-Jan-94	1:00	4.2	4,200.0
10-Jan-94	2:00	4.2	4,200.0
10-Jan-94	3:00	4.3	4,300.0
10-Jan-94	4:00	4.3	4,300.0
10-Jan-94	5:00	4.4	4,400.0
10-Jan-94	6:00	4.3	4,300.0
10-Jan-94	7:00	4.2	4,200.0
10-Jan-94	8:00	4.2	4,200.0
10-Jan-94	9:00	4.1	4,100.0
10-Jan-94	10:00		
10-Jan-94	11:00		
10-Jan-94	12:00		
10-Jan-94	13:00		
10-Jan-94	14:00		

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
10-Jan-94	15:00		
10-Jan-94	16:00		
10-Jan-94	17:00		
10-Jan-94	18:00		
10-Jan-94	19:00		
10-Jan-94	20:00		
10-Jan-94	21:00		
10-Jan-94	22:00		
10-Jan-94	23:00		
11-Jan-94	0:00		
11-Jan-94	1:00		
11-Jan-94	2:00		
11-Jan-94	3:00		
11-Jan-94	4:00		
11-Jan-94	5:00		
11-Jan-94	6:00		
11-Jan-94	7:00		
11-Jan-94	8:00		
11-Jan-94	9:00	3.9	3,900.0
11-Jan-94	10:00	4	4,000.0
11-Jan-94	11:00	4	4,000.0
11-Jan-94	12:00	4.1	4,100.0
11-Jan-94	13:00		
11-Jan-94	14:00	4.1	4,100.0
11-Jan-94	15:00	4.2	4,200.0
11-Jan-94	16:00	4.4	4,400.0
11-Jan-94	17:00	5.1	5,100.0
11-Jan-94	18:00	7.6	7,600.0
11-Jan-94	19:00	12.8	12,800.0
11-Jan-94	20:00	17.7	17,700.0
11-Jan-94	21:00	21.6	21,600.0
11-Jan-94	22:00	26	26,000.0
11-Jan-94	23:00	29.6	29,600.0
12-Jan-94	0:00	27.4	27,400.0
12-Jan-94	1:00	26.9	26,900.0
12-Jan-94	2:00	33.7	33,700.0
12-Jan-94	3:00	34.6	34,600.0
12-Jan-94	4:00	27	27,000.0
12-Jan-94	5:00	19.6	19,600.0
12-Jan-94	6:00	15.2	15,200.0
12-Jan-94	7:00	12.7	12,700.0
12-Jan-94	8:00	11.2	11,200.0
12-Jan-94	9:00	10.1	10,100.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
12-Jan-94	10:00	9.4	9,400.0
12-Jan-94	11:00		
12-Jan-94	12:00		
12-Jan-94	13:00	8.1	8,100.0
12-Jan-94	14:00	7.9	7,900.0
12-Jan-94	15:00	7.6	7,600.0
12-Jan-94	16:00	7.3	7,300.0
12-Jan-94	17:00	7.1	7,100.0
12-Jan-94	18:00	6.9	6,900.0
12-Jan-94	19:00	6.7	6,700.0
12-Jan-94	20:00	6.6	6,600.0
12-Jan-94	21:00	6.5	6,500.0
12-Jan-94	22:00	6.3	6,300.0
12-Jan-94	23:00	6.2	6,200.0
13-Jan-94	0:00	6	6,000.0
13-Jan-94	1:00	5.9	5,900.0
13-Jan-94	2:00	5.8	5,800.0
13-Jan-94	3:00	5.7	5,700.0
13-Jan-94	4:00	5.7	5,700.0
13-Jan-94	5:00	5.6	5,600.0
13-Jan-94	6:00	5.5	5,500.0
13-Jan-94	7:00	5.6	5,600.0
13-Jan-94	8:00	5.4	5,400.0
13-Jan-94	9:00	5.4	5,400.0
13-Jan-94	10:00	5.4	5,400.0
13-Jan-94	11:00	5.5	5,500.0
13-Jan-94	12:00	5.5	5,500.0
13-Jan-94	13:00	5.4	5,400.0
13-Jan-94	14:00	5.4	5,400.0
13-Jan-94	15:00	5.4	5,400.0
13-Jan-94	16:00	5.3	5,300.0
13-Jan-94	17:00	5.3	5,300.0
13-Jan-94	18:00	5.2	5,200.0
13-Jan-94	19:00	5.2	5,200.0
13-Jan-94	20:00	5.2	5,200.0
13-Jan-94	21:00	5.2	5,200.0
13-Jan-94	22:00	5.1	5,100.0
13-Jan-94	23:00	5	5,000.0
14-Jan-94	0:00	4.9	4,900.0
14-Jan-94	1:00	4.9	4,900.0
14-Jan-94	2:00	4.9	4,900.0
14-Jan-94	3:00	4.9	4,900.0
14-Jan-94	4:00	4.9	4,900.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
14-Jan-94	5:00	4.8	4,800.0
14-Jan-94	6:00	4.8	4,800.0
14-Jan-94	7:00	4.8	4,800.0
14-Jan-94	8:00	4.7	4,700.0
14-Jan-94	9:00	4.7	4,700.0
14-Jan-94	10:00		
14-Jan-94	11:00	4.8	4,800.0
14-Jan-94	12:00	4.8	4,800.0
14-Jan-94	13:00	4.7	4,700.0
14-Jan-94	14:00	4.7	4,700.0
14-Jan-94	15:00	4.7	4,700.0
14-Jan-94	16:00	4.6	4,600.0
14-Jan-94	17:00	4.5	4,500.0
14-Jan-94	18:00	4.5	4,500.0
14-Jan-94	19:00	4.5	4,500.0
14-Jan-94	20:00	4.5	4,500.0
14-Jan-94	21:00	4.5	4,500.0
14-Jan-94	22:00	4.4	4,400.0
14-Jan-94	23:00	4.4	4,400.0
15-Jan-94	0:00	4.3	4,300.0
15-Jan-94	1:00	4.3	4,300.0
15-Jan-94	2:00	4.3	4,300.0
15-Jan-94	3:00	4.3	4,300.0
15-Jan-94	4:00	4.3	4,300.0
15-Jan-94	5:00	4.3	4,300.0
15-Jan-94	6:00	4.2	4,200.0
15-Jan-94	7:00	4.1	4,100.0
15-Jan-94	8:00	4.1	4,100.0
15-Jan-94	9:00	4.1	4,100.0
15-Jan-94	10:00	4.1	4,100.0
15-Jan-94	11:00	4.1	4,100.0
15-Jan-94	12:00	4.2	4,200.0
15-Jan-94	13:00	4.2	4,200.0
15-Jan-94	14:00	4.2	4,200.0
15-Jan-94	15:00	4.2	4,200.0
15-Jan-94	16:00	4.2	4,200.0
15-Jan-94	17:00	4.1	4,100.0
15-Jan-94	18:00	4.1	4,100.0
15-Jan-94	19:00	4.1	4,100.0
15-Jan-94	20:00	4	4,000.0
15-Jan-94	21:00	4	4,000.0
15-Jan-94	22:00	4	4,000.0
15-Jan-94	23:00	3.9	3,900.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
16-Jan-94	0:00	3.9	3,900.0
16-Jan-94	1:00	3.9	3,900.0
16-Jan-94	2:00	3.9	3,900.0
16-Jan-94	3:00	4	4,000.0
16-Jan-94	4:00	4	4,000.0
16-Jan-94	5:00	4	4,000.0
16-Jan-94	6:00	4	4,000.0
16-Jan-94	7:00	4	4,000.0
16-Jan-94	8:00	3.9	3,900.0
16-Jan-94	9:00	3.9	3,900.0
16-Jan-94	10:00	3.9	3,900.0
16-Jan-94	11:00	3.9	3,900.0
16-Jan-94	12:00	4.7	4,700.0
16-Jan-94	13:00	5.1	5,100.0
16-Jan-94	14:00	4.7	4,700.0
16-Jan-94	15:00	4.4	4,400.0
16-Jan-94	16:00	4.2	4,200.0
16-Jan-94	17:00	4.1	4,100.0
16-Jan-94	18:00	4	4,000.0
16-Jan-94	19:00	4.1	4,100.0
16-Jan-94	20:00	4	4,000.0
16-Jan-94	21:00	4	4,000.0
16-Jan-94	22:00	4	4,000.0
16-Jan-94	23:00	4	4,000.0
17-Jan-94	0:00	3.9	3,900.0
17-Jan-94	1:00	3.9	3,900.0
17-Jan-94	2:00	3.8	3,800.0
17-Jan-94	3:00	3.8	3,800.0
17-Jan-94	4:00	3.8	3,800.0
17-Jan-94	5:00	3.7	3,700.0
17-Jan-94	6:00	3.7	3,700.0
17-Jan-94	7:00	3.8	3,800.0
17-Jan-94	8:00	4.3	4,300.0
17-Jan-94	9:00	6.4	6,400.0
17-Jan-94	10:00	12.3	12,300.0
17-Jan-94	11:00	16	16,000.0
17-Jan-94	12:00	19.9	19,900.0
17-Jan-94	13:00	30.2	30,200.0
17-Jan-94	14:00	29.1	29,100.0
17-Jan-94	15:00	23.2	23,200.0
17-Jan-94	16:00	18.2	18,200.0
17-Jan-94	17:00	14.5	14,500.0
17-Jan-94	18:00	12.3	12,300.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
17-Jan-94	19:00	10.8	10,800.0
17-Jan-94	20:00	9.6	9,600.0
17-Jan-94	21:00	8.6	8,600.0
17-Jan-94	22:00	7.9	7,900.0
17-Jan-94	23:00	7.3	7,300.0
18-Jan-94	0:00	6.8	6,800.0
18-Jan-94	1:00	6.4	6,400.0
18-Jan-94	2:00	6	6,000.0
18-Jan-94	3:00	5.8	5,800.0
18-Jan-94	4:00	5.6	5,600.0
18-Jan-94	5:00	5.4	5,400.0
18-Jan-94	6:00	5.2	5,200.0
18-Jan-94	7:00	5.2	5,200.0
18-Jan-94	8:00	5.2	5,200.0
18-Jan-94	9:00	5.1	5,100.0
18-Jan-94	10:00	5.1	5,100.0
18-Jan-94	11:00	5	5,000.0
18-Jan-94	12:00	5.1	5,100.0
18-Jan-94	13:00	5.2	5,200.0
18-Jan-94	14:00	5.5	5,500.0
18-Jan-94	15:00	5.6	5,600.0
18-Jan-94	16:00	5.5	5,500.0
18-Jan-94	17:00	5.3	5,300.0
18-Jan-94	18:00	5.1	5,100.0
18-Jan-94	19:00	4.9	4,900.0
18-Jan-94	20:00	4.7	4,700.0
18-Jan-94	21:00	4.7	4,700.0
18-Jan-94	22:00	4.6	4,600.0
18-Jan-94	23:00	4.5	4,500.0
19-Jan-94	0:00	4.5	4,500.0
19-Jan-94	1:00	4.5	4,500.0
19-Jan-94	2:00	4.4	4,400.0
19-Jan-94	3:00	4.4	4,400.0
19-Jan-94	4:00	4.4	4,400.0
19-Jan-94	5:00	4.4	4,400.0
19-Jan-94	6:00	4.4	4,400.0
19-Jan-94	7:00	4.4	4,400.0
19-Jan-94	8:00	4.4	4,400.0
19-Jan-94	9:00	4.4	4,400.0
19-Jan-94	10:00	4.4	4,400.0
19-Jan-94	11:00	4.4	4,400.0
19-Jan-94	12:00	4.3	4,300.0
19-Jan-94	13:00		

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
19-Jan-94	14:00	4.2	4,200.0
19-Jan-94	15:00	4.2	4,200.0
19-Jan-94	16:00	4.2	4,200.0
19-Jan-94	17:00	4.2	4,200.0
19-Jan-94	18:00	4.2	4,200.0
19-Jan-94	19:00	4.2	4,200.0
19-Jan-94	20:00	4.2	4,200.0
19-Jan-94	21:00	4.1	4,100.0
19-Jan-94	22:00	4.1	4,100.0
19-Jan-94	23:00	4.1	4,100.0
20-Jan-94	0:00	4.1	4,100.0
20-Jan-94	1:00	4.1	4,100.0
20-Jan-94	2:00	4.1	4,100.0
20-Jan-94	3:00	4.1	4,100.0
20-Jan-94	4:00	4.1	4,100.0
20-Jan-94	5:00	4.1	4,100.0
20-Jan-94	6:00	4.1	4,100.0
20-Jan-94	7:00	4.1	4,100.0
20-Jan-94	8:00	4	4,000.0
20-Jan-94	9:00	4	4,000.0
20-Jan-94	10:00		
20-Jan-94	11:00	4	4,000.0
20-Jan-94	12:00		
20-Jan-94	13:00	4	4,000.0
20-Jan-94	14:00	4	4,000.0
20-Jan-94	15:00		
20-Jan-94	16:00	3.9	3,900.0
20-Jan-94	17:00	3.9	3,900.0
20-Jan-94	18:00	3.9	3,900.0
20-Jan-94	19:00	3.9	3,900.0
20-Jan-94	20:00	3.9	3,900.0
20-Jan-94	21:00	3.9	3,900.0
20-Jan-94	22:00	3.8	3,800.0
20-Jan-94	23:00	3.7	3,700.0
21-Jan-94	0:00	3.7	3,700.0
21-Jan-94	1:00	3.7	3,700.0
21-Jan-94	2:00	3.7	3,700.0
21-Jan-94	3:00	3.7	3,700.0
21-Jan-94	4:00	3.7	3,700.0
21-Jan-94	5:00	3.7	3,700.0
21-Jan-94	6:00	3.7	3,700.0
21-Jan-94	7:00	3.7	3,700.0
21-Jan-94	8:00	3.7	3,700.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
21-Jan-94	9:00	3.8	3,800.0
21-Jan-94	10:00	3.7	3,700.0
21-Jan-94	11:00	3.7	3,700.0
21-Jan-94	12:00	3.7	3,700.0
21-Jan-94	13:00	3.7	3,700.0
21-Jan-94	14:00	3.8	3,800.0
21-Jan-94	15:00	4	4,000.0
21-Jan-94	16:00	4	4,000.0
21-Jan-94	17:00	4	4,000.0
21-Jan-94	18:00	4	4,000.0
21-Jan-94	19:00	4	4,000.0
21-Jan-94	20:00	3.9	3,900.0
21-Jan-94	21:00	3.9	3,900.0
21-Jan-94	22:00	3.9	3,900.0
21-Jan-94	23:00	3.9	3,900.0
22-Jan-94	0:00	3.8	3,800.0
22-Jan-94	1:00	3.7	3,700.0
22-Jan-94	2:00	3.7	3,700.0
22-Jan-94	3:00	3.7	3,700.0
22-Jan-94	4:00	3.7	3,700.0
22-Jan-94	5:00	3.7	3,700.0
22-Jan-94	6:00	3.7	3,700.0
22-Jan-94	7:00	3.7	3,700.0
22-Jan-94	8:00	3.7	3,700.0
22-Jan-94	9:00	3.6	3,600.0
22-Jan-94	10:00	3.6	3,600.0
22-Jan-94	11:00	3.6	3,600.0
22-Jan-94	12:00	3.6	3,600.0
22-Jan-94	13:00	3.7	3,700.0
22-Jan-94	14:00	3.7	3,700.0
22-Jan-94	15:00	3.8	3,800.0
22-Jan-94	16:00	4	4,000.0
22-Jan-94	17:00	4.1	4,100.0
22-Jan-94	18:00	4.1	4,100.0
22-Jan-94	19:00	4	4,000.0
22-Jan-94	20:00	4	4,000.0
22-Jan-94	21:00	3.9	3,900.0
22-Jan-94	22:00	3.9	3,900.0
22-Jan-94	23:00	3.9	3,900.0
23-Jan-94	0:00	3.8	3,800.0
23-Jan-94	1:00	3.7	3,700.0
23-Jan-94	2:00	3.6	3,600.0
23-Jan-94	3:00	3.6	3,600.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
23-Jan-94	4:00	3.6	3,600.0
23-Jan-94	5:00	3.5	3,500.0
23-Jan-94	6:00	3.5	3,500.0
23-Jan-94	7:00	3.5	3,500.0
23-Jan-94	8:00	3.5	3,500.0
23-Jan-94	9:00	3.5	3,500.0
23-Jan-94	10:00	3.6	3,600.0
23-Jan-94	11:00	3.6	3,600.0
23-Jan-94	12:00	3.7	3,700.0
23-Jan-94	13:00	3.7	3,700.0
23-Jan-94	14:00	3.7	3,700.0
23-Jan-94	15:00	3.8	3,800.0
23-Jan-94	16:00	3.8	3,800.0
23-Jan-94	17:00	3.9	3,900.0
23-Jan-94	18:00	3.9	3,900.0
23-Jan-94	19:00	3.8	3,800.0
23-Jan-94	20:00	3.7	3,700.0
23-Jan-94	21:00	3.7	3,700.0
23-Jan-94	22:00	3.8	3,800.0
23-Jan-94	23:00	3.8	3,800.0
24-Jan-94	0:00	3.7	3,700.0
24-Jan-94	1:00	3.7	3,700.0
24-Jan-94	2:00	3.7	3,700.0
24-Jan-94	3:00	3.6	3,600.0
24-Jan-94	4:00	3.6	3,600.0
24-Jan-94	5:00	3.6	3,600.0
24-Jan-94	6:00	3.6	3,600.0
24-Jan-94	7:00	3.6	3,600.0
24-Jan-94	8:00	3.6	3,600.0
24-Jan-94	9:00	3.6	3,600.0
24-Jan-94	10:00	3.7	3,700.0
24-Jan-94	11:00	3.7	3,700.0
24-Jan-94	12:00	3.8	3,800.0
24-Jan-94	13:00	3.9	3,900.0
24-Jan-94	14:00	4.1	4,100.0
24-Jan-94	15:00	4.2	4,200.0
24-Jan-94	16:00	4.2	4,200.0
24-Jan-94	17:00	4.2	4,200.0
24-Jan-94	18:00	4.1	4,100.0
24-Jan-94	19:00	4.1	4,100.0
24-Jan-94	20:00	4	4,000.0
24-Jan-94	21:00	4	4,000.0
24-Jan-94	22:00	3.9	3,900.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
24-Jan-94	23:00	3.9	3,900.0
25-Jan-94	0:00	3.9	3,900.0
25-Jan-94	1:00	3.9	3,900.0
25-Jan-94	2:00	3.9	3,900.0
25-Jan-94	3:00	3.9	3,900.0
25-Jan-94	4:00	3.9	3,900.0
25-Jan-94	5:00	3.9	3,900.0
25-Jan-94	6:00	3.9	3,900.0
25-Jan-94	7:00	4	4,000.0
25-Jan-94	8:00	4.2	4,200.0
25-Jan-94	9:00	4.8	4,800.0
25-Jan-94	10:00	5.2	5,200.0
25-Jan-94	11:00	5.3	5,300.0
25-Jan-94	12:00	5.7	5,700.0
25-Jan-94	13:00	10.1	10,100.0
25-Jan-94	14:00	15.2	15,200.0
25-Jan-94	15:00	22.7	22,700.0
25-Jan-94	16:00	31.8	31,800.0
25-Jan-94	17:00	31.6	31,600.0
25-Jan-94	18:00	31.3	31,300.0
25-Jan-94	19:00	25.5	25,500.0
25-Jan-94	20:00	18.4	18,400.0
25-Jan-94	21:00	14.1	14,100.0
25-Jan-94	22:00	11.9	11,900.0
25-Jan-94	23:00	10.4	10,400.0
26-Jan-94	0:00	9.5	9,500.0
26-Jan-94	1:00	8.8	8,800.0
26-Jan-94	2:00	8.3	8,300.0
26-Jan-94	3:00	7.8	7,800.0
26-Jan-94	4:00	7.4	7,400.0
26-Jan-94	5:00	7.1	7,100.0
26-Jan-94	6:00	6.8	6,800.0
26-Jan-94	7:00	6.6	6,600.0
26-Jan-94	8:00	6.3	6,300.0
26-Jan-94	9:00	6.2	6,200.0
26-Jan-94	10:00	6.1	6,100.0
26-Jan-94	11:00	6	6,000.0
26-Jan-94	12:00	6	6,000.0
26-Jan-94	13:00	6	6,000.0
26-Jan-94	14:00	5.9	5,900.0
26-Jan-94	15:00	5.8	5,800.0
26-Jan-94	16:00	5.9	5,900.0
26-Jan-94	17:00	6.6	6,600.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
26-Jan-94	18:00	7.6	7,600.0
26-Jan-94	19:00	7.7	7,700.0
26-Jan-94	20:00	7.3	7,300.0
26-Jan-94	21:00	7	7,000.0
26-Jan-94	22:00	6.7	6,700.0
26-Jan-94	23:00	6.4	6,400.0
27-Jan-94	0:00	6.1	6,100.0
27-Jan-94	1:00	6	6,000.0
27-Jan-94	2:00	5.9	5,900.0
27-Jan-94	3:00	5.8	5,800.0
27-Jan-94	4:00	5.7	5,700.0
27-Jan-94	5:00	5.6	5,600.0
27-Jan-94	6:00	5.5	5,500.0
27-Jan-94	7:00	5.4	5,400.0
27-Jan-94	8:00	5.3	5,300.0
27-Jan-94	9:00	5.2	5,200.0
27-Jan-94	10:00	5.2	5,200.0
27-Jan-94	11:00	5.1	5,100.0
27-Jan-94	12:00	5.1	5,100.0
27-Jan-94	13:00	5.1	5,100.0
27-Jan-94	14:00	5.1	5,100.0
27-Jan-94	15:00	5.1	5,100.0
27-Jan-94	16:00	5.2	5,200.0
27-Jan-94	17:00	10	10,000.0
27-Jan-94	18:00	24.3	24,300.0
27-Jan-94	19:00	25.8	25,800.0
27-Jan-94	20:00	24.6	24,600.0
27-Jan-94	21:00	23.5	23,500.0
27-Jan-94	22:00	25.2	25,200.0
27-Jan-94	23:00	26.7	26,700.0
28-Jan-94	0:00	31.7	31,700.0
28-Jan-94	1:00	38.4	38,400.0
28-Jan-94	2:00	40.5	40,500.0
28-Jan-94	3:00	35.6	35,600.0
28-Jan-94	4:00	27.5	27,500.0
28-Jan-94	5:00	21.4	21,400.0
28-Jan-94	6:00	17.8	17,800.0
28-Jan-94	7:00	15.3	15,300.0
28-Jan-94	8:00	13.6	13,600.0
28-Jan-94	9:00		
28-Jan-94	10:00	11.7	11,700.0
28-Jan-94	11:00	11	11,000.0
28-Jan-94	12:00	10.4	10,400.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
28-Jan-94	13:00	10	10,000.0
28-Jan-94	14:00	9.6	9,600.0
28-Jan-94	15:00	9.1	9,100.0
28-Jan-94	16:00	8.6	8,600.0
28-Jan-94	17:00	8.3	8,300.0
28-Jan-94	18:00	8	8,000.0
28-Jan-94	19:00	7.7	7,700.0
28-Jan-94	20:00	7.5	7,500.0
28-Jan-94	21:00	7.3	7,300.0
28-Jan-94	22:00	7.2	7,200.0
28-Jan-94	23:00	7	7,000.0
29-Jan-94	0:00	6.9	6,900.0
29-Jan-94	1:00	6.7	6,700.0
29-Jan-94	2:00	6.6	6,600.0
29-Jan-94	3:00	6.5	6,500.0
29-Jan-94	4:00	6.4	6,400.0
29-Jan-94	5:00	6.3	6,300.0
29-Jan-94	6:00	6.3	6,300.0
29-Jan-94	7:00	6.2	6,200.0
29-Jan-94	8:00	6.1	6,100.0
29-Jan-94	9:00	6	6,000.0
29-Jan-94	10:00	6	6,000.0
29-Jan-94	11:00	5.9	5,900.0
29-Jan-94	12:00	5.8	5,800.0
29-Jan-94	13:00	5.8	5,800.0
29-Jan-94	14:00	5.7	5,700.0
29-Jan-94	15:00	5.7	5,700.0
29-Jan-94	16:00	5.7	5,700.0
29-Jan-94	17:00	5.6	5,600.0
29-Jan-94	18:00	5.6	5,600.0
29-Jan-94	19:00	5.5	5,500.0
29-Jan-94	20:00	5.4	5,400.0
29-Jan-94	21:00	5.4	5,400.0
29-Jan-94	22:00	5.4	5,400.0
29-Jan-94	23:00	5.4	5,400.0
30-Jan-94	0:00	5.3	5,300.0
30-Jan-94	1:00	5.3	5,300.0
30-Jan-94	2:00	5.3	5,300.0
30-Jan-94	3:00	5.3	5,300.0
30-Jan-94	4:00	5.3	5,300.0
30-Jan-94	5:00	5.2	5,200.0
30-Jan-94	6:00	5.2	5,200.0
30-Jan-94	7:00	5.2	5,200.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
30-Jan-94	8:00	5.1	5,100.0
30-Jan-94	9:00	5.1	5,100.0
30-Jan-94	10:00	5	5,000.0
30-Jan-94	11:00	5	5,000.0
30-Jan-94	12:00	5	5,000.0
30-Jan-94	13:00	4.9	4,900.0
30-Jan-94	14:00	4.8	4,800.0
30-Jan-94	15:00	4.8	4,800.0
30-Jan-94	16:00	4.8	4,800.0
30-Jan-94	17:00	4.8	4,800.0
30-Jan-94	18:00	4.8	4,800.0
30-Jan-94	19:00	4.7	4,700.0
30-Jan-94	20:00	4.7	4,700.0
30-Jan-94	21:00	4.7	4,700.0
30-Jan-94	22:00	4.7	4,700.0
30-Jan-94	23:00	4.7	4,700.0
31-Jan-94	0:00		
31-Jan-94	1:00		
31-Jan-94	2:00		
31-Jan-94	3:00		
31-Jan-94	4:00		
31-Jan-94	5:00		
31-Jan-94	6:00		
31-Jan-94	7:00		
31-Jan-94	8:00		
31-Jan-94	9:00		
31-Jan-94	10:00		
31-Jan-94	11:00		
31-Jan-94	12:00		
31-Jan-94	13:00		
31-Jan-94	14:00		
31-Jan-94	15:00		
31-Jan-94	16:00		
31-Jan-94	17:00		
31-Jan-94	18:00		
31-Jan-94	19:00		
31-Jan-94	20:00		
31-Jan-94	21:00		
31-Jan-94	22:00		
31-Jan-94	23:00		
01-Feb-94	0:00	4.6	4,600.0
01-Feb-94	1:00	4.5	4,500.0
01-Feb-94	2:00	4.5	4,500.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
01-Feb-94	3:00	4.4	4,400.0
01-Feb-94	4:00	4.4	4,400.0
01-Feb-94	5:00	4.4	4,400.0
01-Feb-94	6:00	4.4	4,400.0
01-Feb-94	7:00	4.4	4,400.0
01-Feb-94	8:00	4.4	4,400.0
01-Feb-94	9:00	4.3	4,300.0
01-Feb-94	10:00	4.4	4,400.0
01-Feb-94	11:00	4.4	4,400.0
01-Feb-94	12:00	4.4	4,400.0
01-Feb-94	13:00	4.5	4,500.0
01-Feb-94	14:00	4.5	4,500.0
01-Feb-94	15:00	4.5	4,500.0
01-Feb-94	16:00	4.4	4,400.0
01-Feb-94	17:00	4.4	4,400.0
01-Feb-94	18:00	4.4	4,400.0
01-Feb-94	19:00	4.4	4,400.0
01-Feb-94	20:00	4.4	4,400.0
01-Feb-94	21:00	4.4	4,400.0
01-Feb-94	22:00	4.4	4,400.0
01-Feb-94	23:00	4.4	4,400.0
02-Feb-94	0:00	4.2	4,200.0
02-Feb-94	1:00	4.2	4,200.0
02-Feb-94	2:00	4.2	4,200.0
02-Feb-94	3:00	4.2	4,200.0
02-Feb-94	4:00	4.1	4,100.0
02-Feb-94	5:00	4.1	4,100.0
02-Feb-94	6:00	4.1	4,100.0
02-Feb-94	7:00	4.1	4,100.0
02-Feb-94	8:00	4.1	4,100.0
02-Feb-94	9:00	4.1	4,100.0
02-Feb-94	10:00	4.1	4,100.0
02-Feb-94	11:00	4.1	4,100.0
02-Feb-94	12:00	4	4,000.0
02-Feb-94	13:00	4.1	4,100.0
02-Feb-94	14:00	4.1	4,100.0
02-Feb-94	15:00	4.1	4,100.0
02-Feb-94	16:00	4.1	4,100.0
02-Feb-94	17:00	4.1	4,100.0
02-Feb-94	18:00	4	4,000.0
02-Feb-94	19:00	4	4,000.0
02-Feb-94	20:00	4	4,000.0
02-Feb-94	21:00	4	4,000.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
02-Feb-94	22:00	4	4,000.0
02-Feb-94	23:00	4.1	4,100.0
03-Feb-94	0:00	4.1	4,100.0
03-Feb-94	1:00	4.1	4,100.0
03-Feb-94	2:00	4.1	4,100.0
03-Feb-94	3:00	4.1	4,100.0
03-Feb-94	4:00	4.2	4,200.0
03-Feb-94	5:00	4.2	4,200.0
03-Feb-94	6:00	4.1	4,100.0
03-Feb-94	7:00	4.1	4,100.0
03-Feb-94	8:00	4.1	4,100.0
03-Feb-94	9:00	4.1	4,100.0
03-Feb-94	10:00	4.1	4,100.0
03-Feb-94	11:00	4.1	4,100.0
03-Feb-94	12:00	4.1	4,100.0
03-Feb-94	13:00		
03-Feb-94	14:00	4.1	4,100.0
03-Feb-94	15:00	4.1	4,100.0
03-Feb-94	16:00	4.1	4,100.0
03-Feb-94	17:00	4	4,000.0
03-Feb-94	18:00	4	4,000.0
03-Feb-94	19:00	4	4,000.0
03-Feb-94	20:00	4	4,000.0
03-Feb-94	21:00	4	4,000.0
03-Feb-94	22:00	4	4,000.0
03-Feb-94	23:00	4	4,000.0
04-Feb-94	0:00	4	4,000.0
04-Feb-94	1:00	3.9	3,900.0
04-Feb-94	2:00	3.9	3,900.0
04-Feb-94	3:00	3.9	3,900.0
04-Feb-94	4:00	3.9	3,900.0
04-Feb-94	5:00	3.9	3,900.0
04-Feb-94	6:00	3.9	3,900.0
04-Feb-94	7:00	3.9	3,900.0
04-Feb-94	8:00	3.9	3,900.0
04-Feb-94	9:00	3.9	3,900.0
04-Feb-94	10:00	3.9	3,900.0
04-Feb-94	11:00	3.8	3,800.0
04-Feb-94	12:00	3.7	3,700.0
04-Feb-94	13:00	3.7	3,700.0
04-Feb-94	14:00	3.7	3,700.0
04-Feb-94	15:00	3.8	3,800.0
04-Feb-94	16:00	3.9	3,900.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
04-Feb-94	17:00	3.9	3,900.0
04-Feb-94	18:00	3.9	3,900.0
04-Feb-94	19:00	3.9	3,900.0
04-Feb-94	20:00	3.9	3,900.0
04-Feb-94	21:00	4.1	4,100.0
04-Feb-94	22:00	4.3	4,300.0
04-Feb-94	23:00	4.3	4,300.0
05-Feb-94	0:00	4.2	4,200.0
05-Feb-94	1:00	4.1	4,100.0
05-Feb-94	2:00	4.2	4,200.0
05-Feb-94	3:00	4.3	4,300.0
05-Feb-94	4:00	4.5	4,500.0
05-Feb-94	5:00	4.7	4,700.0
05-Feb-94	6:00	4.9	4,900.0
05-Feb-94	7:00	4.9	4,900.0
05-Feb-94	8:00	4.8	4,800.0
05-Feb-94	9:00	4.7	4,700.0
05-Feb-94	10:00	4.7	4,700.0
05-Feb-94	11:00	4.7	4,700.0
05-Feb-94	12:00	4.7	4,700.0
05-Feb-94	13:00	4.9	4,900.0
05-Feb-94	14:00	4.8	4,800.0
05-Feb-94	15:00	4.8	4,800.0
05-Feb-94	16:00	4.6	4,600.0
05-Feb-94	17:00	4.5	4,500.0
05-Feb-94	18:00	4.4	4,400.0
05-Feb-94	19:00	4.4	4,400.0
05-Feb-94	20:00	4.3	4,300.0
05-Feb-94	21:00	4.2	4,200.0
05-Feb-94	22:00	4.1	4,100.0
05-Feb-94	23:00	4.1	4,100.0
06-Feb-94	0:00	4	4,000.0
06-Feb-94	1:00	3.9	3,900.0
06-Feb-94	2:00	3.9	3,900.0
06-Feb-94	3:00	3.9	3,900.0
06-Feb-94	4:00	3.9	3,900.0
06-Feb-94	5:00	3.8	3,800.0
06-Feb-94	6:00	3.7	3,700.0
06-Feb-94	7:00	3.7	3,700.0
06-Feb-94	8:00	3.7	3,700.0
06-Feb-94	9:00	3.7	3,700.0
06-Feb-94	10:00	3.7	3,700.0
06-Feb-94	11:00	3.7	3,700.0

STATION 17 DATA

DATE	TIME	MGD	1,000 GPD
06-Feb-94	12:00	3.6	3,600.0
06-Feb-94	13:00	3.7	3,700.0
06-Feb-94	14:00	3.7	3,700.0
06-Feb-94	15:00	3.7	3,700.0
06-Feb-94	16:00	3.7	3,700.0
06-Feb-94	17:00	3.7	3,700.0
06-Feb-94	18:00	3.7	3,700.0
06-Feb-94	19:00	3.7	3,700.0
06-Feb-94	20:00	3.7	3,700.0
06-Feb-94	21:00	3.7	3,700.0
06-Feb-94	22:00	3.7	3,700.0
06-Feb-94	23:00	3.7	3,700.0

APPENDIX B
MODEL RUNS

FIGURE 1 - SCHEMATIC DIAGRAM OF THE Y-12 WATER BALANCE

29-Mar-94

RUN

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BEST AVAILABLE DATA FOR THE MONITORING PERIOD DEC 1 1993 - FEBRUARY 8 1994

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 2 - EFPC Sources

Run 1 - Best Available Data

Dec. 1, 1993 - Feb. 6, 1994

* Excludes SPWTF

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

TABLE 1

SUMMARY OF WATER BALANCE PARAMETERS AND CALCULATIONS

29-Mar-94

RUN 1

BEST AVAILABLE DATA FOR THE MONITORING PERIOD DEC. 1, 1993 - FEBRUARY 6, 1994

Water Balance Components	Water 1000 gal/d	Comments
Meter 24"	2,545.9	Measured during the study
Meter 16" E	869.7	Measured during the study
Meter 16" W	1,784.4	Measured during the study
Valve Pit G (net flow to Y-12)	(711.6)	Measured during the study
Total potable water supplied to Y-12	4,488.4	Sum of all meters with positive and negative reading
Water to X-10 accounted to Y-12	711.6	Measured by flow meter at Valve Pit G
Water to Y-12 previously accounted to ORNL	0.0	Measured by flow meter at Valve Pit G
Leakage loss @ Y-12	359.1	Estimated according to Table 2
Leakage loss to groundwater	341.1	Estimated according to Table 2
Leakage loss to groundwater that returns to EFPC	307.0	Estimated according to Table 2
Leakage loss to groundwater not returning to EFPC	52.1	Calculated by difference
Groundwater from building basements	432.0	Estimated according to flow rate shown in Table 2
Cooling tower water use	626.5	Estimated to be equal to evaporation
Cooling tower evaporation	426.3	Estimated based on Dec 93 blowdown data and historical evaporation records
Cooling tower blowdown	200.2	Estimated based on Dec 93 blowdown data
Once through cooling use	1,922.0	Solved based on total water supply minus other water uses
Process water use	13.5	Estimated based on wastewater treatment plant discharge volumes
Process treatment	13.5	Obtained from daily treatment plant records
Untreated process water	0.0	Total process use less treated wastewater
Process water storage	0.0	Treated water storage of sludges and batch treatment
Process treatment discharge	13.5	Based on daily reports from treatment plants
Process evaporation	0.0	No data available, assumed zero
Process discharge to sanitary sewer	0.0	Based on existing operations
Process untreated discharge to the storm sewer	0.0	Based on existing operations
Plant Personnel Use	720.5	Estimated according to Table 2 and sewer flows less infiltration
Sanitary sewer flow from Y-12	765.5	Based on measurements at City Sta. minus Union Valley Sta.
Sanitary sewer flow less infiltration	612.4	Calculated by difference
Sanitary sewer infiltration	153.1	Estimated according to Table 2
Steam plant water use	846.9	Estimated by steam plant personnel
Steam plant blowdown	172.9	Estimated based on SPWTF effluent discharge records
Steam plant evaporation	674.0	Estimated based on water used and blowdown
Steam plant condensate	67.4	Estimated according to Table 2
Steam plant condensate to groundwater	33.7	Estimated according to Table 2
Steam plant condensate to storm sewer	33.7	Estimated according to Table 2
Condensate from refrigeration units	73.6	Estimated according to Table 2
Condensate from refrigeration units to storm sewer	36.8	Estimated according to Table 2
Condensate from refrigeration units to groundwater	36.8	Estimated according to Table 2
Measured flow at Station 17 EFPC (Dry weather)	3,478.6	Measured continuously during the study
Groundwater from quantifiable sources	739.0	Sum of basement discharge + leakage
Groundwater from non-quantifiable sources	233.0	Calculated using total groundwater contribution minus quantifiable groundwater sources
Dry weather flow from Union Valley	57.1	Measured by volumetric method by Y-12 Personnel
Total groundwater contribution	1,029.1	Obtained by calculation of total flow measured at Station 17 minus the quantifiable sources

TABLE 2
WATER BALANCE ASSUMPTIONS

29-Mar-94

RUN 1

BEST AVAILABLE DATA FOR THE MONITORING PERIOD DEC. 1, 1993 - FEBRUARY 6, 1994

Item	Value	Comments
Estimated Leakage loss from potable water distribution	8.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

TABLE 3

MODEL RESULTS

29-Mar-94 RUN 1
 BEST AVAILABLE DATA FOR THE MONITORING PERIOD DEC. 1, 1993 - FEBRUARY 6, 1994

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	359.1
Process water use	13.5
Once through cooling use	1,922.0
Cooling tower water use	626.5
Plant Personnel Use	720.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	52.1
Plant Personnel Use	720.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,805.5

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,029.1
Treatment plants*	13.5
Once through cooling	1,922.0
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	141.0
Total	3,478.6

* Excludes SPWTF Effluent

FIGURE 1 - SCHEMATIC DIAGRAM OF THE Y-12 WATER BALANCE

30-Mar-94

RUN

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DATA FOR DECEMBER 18 17, 18 & 19 1993

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 2 - EFPC Sources

Run 2 - December 16, 17, 18 & 19, 1993

* Excludes SPWTF

TABLE 1

SUMMARY OF WATER BALANCE PARAMETERS AND CALCULATIONS

30-Mar-94

RUN 2

DATA FOR DECEMBER 16, 17, 18 & 19, 1993

Water Balance Components	Water 1000 gal/d	Comments
Meter 24"	2,470.0	Measured during the study
Meter 16" E	844.0	Measured during the study
Meter 16" W	1,722.3	Measured during the study
Valve Pit G (net flow to Y-12)	(725.5)	Measured during the study
Total potable water supplied to Y-12	4,310.8	Sum of all meters with positive and negative reading
Water to X-10 accounted to Y-12	725.5	Measured by flow meter at Valve Pit G
Water to Y-12 previously accounted to ORNL	0.0	Measured by flow meter at Valve Pit G
Leakage loss @ Y-12	344.9	Estimated according to Table 2
Leakage loss to groundwater	327.6	Estimated according to Table 2
Leakage loss to groundwater that returns to EFPC	294.9	Estimated according to Table 2
Leakage loss to groundwater not returning to EFPC	50.0	Calculated by difference
Groundwater from building basements	432.0	Estimated according to flow rate shown in Table 2
Cooling tower water use	626.5	Estimated to be equal to evaporation
Cooling tower evaporation	426.3	Estimated based on Dec 93 blowdown data and historical evaporation records
Cooling tower blowdown	200.2	Estimated based on Dec 93 blowdown data
Once through cooling use	1,719.8	Solved based on total water supply minus other water uses
Process water use	2.9	Estimated based on wastewater treatment plant discharge volumes
Process treatment	2.9	Obtained from daily treatment plant records
Untreated process water	0.0	Total process use less treated wastewater
Process water storage	0.0	Treated water storage of sludges and batch treatment
Process treatment discharge	2.9	Based on daily reports from treatment plants
Process evaporation	0.0	No data available, assumed zero
Process discharge to sanitary sewer	0.0	Based on existing operations
Process untreated discharge to the storm sewer	0.0	Based on existing operations
Plant Personnel Use	885.5	Estimated according to Table 2 and sewer flows less infiltration
Sanitary sewer flow from Y-12	940.8	Based on measurements at City Sta. minus Union Valley Sta.
Sanitary sewer flow less infiltration	752.7	Calculated by difference
Sanitary sewer infiltration	188.2	Estimated according to Table 2
Steam plant water use	846.9	Estimated by steam plant personnel
Steam plant blowdown	174.2	Estimated based on SPWTF effluent discharge records
Steam plant evaporation	672.7	Estimated based on water used and blowdown
Steam plant condensate	67.3	Estimated according to Table 2
Steam plant condensate to groundwater	33.6	Estimated according to Table 2
Steam plant condensate to storm sewer	33.6	Estimated according to Table 2
Condensate from refrigeration units	73.6	Estimated according to Table 2
Condensate from refrigeration units to storm sewer	36.8	Estimated according to Table 2
Condensate from refrigeration units to groundwater	36.8	Estimated according to Table 2
Measured flow at Station 17 EFPC (Dry weather)	3,367.4	Measured continuously during the study
Groundwater from quantifiable sources	726.9	Sum of basement discharge + leakage
Groundwater from non-quantifiable sources	345.5	Calculated using total groundwater contribution minus quantifiable groundwater sources
Dry weather flow from Union Valley	57.1	Measured by volumetric method by Y-12 Personnel
Total groundwater contribution	1,129.5	Obtained by calculation of total flow measured at Station 17 minus the quantifiable sources

TABLE 2

WATER BALANCE ASSUMPTIONS

30-Mar-94

RUN 2

DATA FOR DECEMBER 16, 17, 18 & 19, 1993

Item	Value	Comments
Estimated Leakage loss from potable water distribution	8.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

TABLE 3
MODEL RESULTS

30-Mar-94

DATA FOR DECEMBER 16, 17, 18, & 19, 1993

RUN 2

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,470.0
Meter 16" E	844.0
Meter 16" W	1,722.3
Valve Pit G	(725.5)
Total	4,310.8

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(725.5)
Leakage loss @ Y-12	344.9
Process water use	2.9
Once through cooling use	1,719.8
Cooling tower water use	626.5
Plant Personnel Use	885.5
Steam Plant Water Use	731.3
Total water distribution	4,310.8

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	50.0
Plant Personnel Use	885.5
Untreated Process	0.0
Steam plant evaporation	605.4
Total	1,967.2

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,129.5
Treatment plants*	2.9
Once through cooling	1,719.8
Untreated Process	0.0
SPWTF effluent	174.2
Condensate	140.8
Total	3,367.4

* Excludes SPWTF Effluent

30-Mar-94 RUN 30 DATA FOR FEBRUARY 1, 2, 3, & 4, 1994

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

Figure 2 - EFPC Sources

Run 3 - February 1, 2, 3 & 4, 1994

* Excludes SPWTF

CDM FEDERAL PROGRAMS CORPORATION
a subsidiary of Camp Dresser & McKee Inc.

TABLE 1

SUMMARY OF WATER BALANCE PARAMETERS AND CALCULATIONS

30-Mar-94

RUN 3

DATA FOR FEBRUARY 1, 2, 3, & 4, 1994

Water Balance Components	Water 1000 gal/d	Comments
Meter 24"	2,687.3	Measured during the study
Meter 16" E	938.0	Measured during the study
Meter 16" W	1,954.0	Measured during the study
Valve Pit G (net flow to Y-12)	(769.5)	Measured during the study
Total potable water supplied to Y-12	4,809.8	Sum of all meters with positive and negative reading
Water to X-10 accounted to Y-12	769.5	Measured by flow meter at Valve Pit G
Water to Y-12 previously accounted to ORNL	0.0	Measured by flow meter at Valve Pit G
Leakage loss @ Y-12	384.8	Estimated according to Table 2
Leakage loss to groundwater	365.5	Estimated according to Table 2
Leakage loss to groundwater that returns to EFPC	329.0	Estimated according to Table 2
Leakage loss to groundwater not returning to EFPC	55.8	Calculated by difference
Groundwater from building basements	432.0	Estimated according to flow rate shown in Table 2
Cooling tower water use	626.5	Estimated to be equal to evaporation
Cooling tower evaporation	426.3	Estimated based on Dec 93 blowdown data and historical evaporation records
Cooling tower blowdown	200.2	Estimated based on Dec 93 blowdown data
Once through cooling use	2,324.4	Solved based on total water supply minus other water uses
Process water use	27.0	Estimated based on wastewater treatment plant discharge volumes
Process treatment	27.0	Obtained from daily treatment plant records
Untreated process water	0.0	Total process use less treated wastewater
Process water storage	0.0	Treated water storage of sludges and batch treatment
Process treatment discharge	27.0	Based on daily reports from treatment plants
Process evaporation	0.0	No data available, assumed zero
Process discharge to sanitary sewer	0.0	Based on existing operations
Process untreated discharge to the storm sewer	0.0	Based on existing operations
Plant Personnel Use	724.8	Estimated according to Table 2 and sewer flows less infiltration
Sanitary sewer flow from Y-12	770.2	Based on measurements at City Sta. minus Union Valley Sta.
Sanitary sewer flow less infiltration	616.1	Calculated by difference
Sanitary sewer infiltration	154.0	Estimated according to Table 2
Steam plant water use	846.9	Estimated by steam plant personnel
Steam plant blowdown	133.0	Estimated based on SPWTF effluent discharge records
Steam plant evaporation	714.0	Estimated based on water used and blowdown
Steam plant condensate	71.4	Estimated according to Table 2
Steam plant condensate to groundwater	35.7	Estimated according to Table 2
Steam plant condensate to storm sewer	35.7	Estimated according to Table 2
Condensate from refrigeration units	73.6	Estimated according to Table 2
Condensate from refrigeration units to storm sewer	36.8	Estimated according to Table 2
Condensate from refrigeration units to groundwater	36.8	Estimated according to Table 2
Measured flow at Station 17 EFPC (Dry weather)	4,127.4	Measured continuously during the study
Groundwater from quantifiable sources	761.0	Sum of basement discharge + leakage
Groundwater from non-quantifiable sources	479.8	Calculated using total groundwater contribution minus quantifiable groundwater sources
Dry weather flow from Union Valley	57.1	Measured by volumetric method by Y-12 Personnel
Total groundwater contribution	1,297.9	Obtained by calculation of total flow measured at Station 17 minus the quantifiable sources

TABLE 2

WATER BALANCE ASSUMPTIONS

30-Mar-94

RUN 3

DATA FOR FEBRUARY 1, 2, 3, & 4, 1994

Item	Value	Comments
Estimated Leakage loss from potable water distribution	8.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

TABLE 3

MODEL RESULTS

30-Mar-94

DATA FOR FEBRUARY 1, 2, 3, & 4, 1994

RUN 3

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,687.3
Meter 16" E	938.0
Meter 16" W	1,954.0
Valve Pit G	(769.5)
Total	4,809.8

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(769.5)
Leakage loss @ Y-12	384.8
Process water use	27.0
Once through cooling use	2,324.4
Cooling tower water use	626.5
Plant Personnel Use	724.8
Steam Plant Water Use	722.3
Total water distribution	4,809.8

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	55.8
Plant Personnel Use	724.8
Untreated Process	0.0
Steam plant evaporation	642.6
Total	1,849.5

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,297.9
Treatment plants*	27.0
Once through cooling	2,324.4
Untreated Process	0.0
SPWTF effluent	133.0
Condensate	145.0
Total	4,127.4

* Excludes SPWTF Effluent

APPENDIX C

1988 WATER BALANCE RESULTS

MEMORANDUM

TO: Lori Muhs, Martin Marietta Energy Systems
FROM: Elio F. Arniella, Camp Dresser & McKee Inc. *EOH*
DATE: January 20, 1989
SUBJECT: Y-12 Plant Water Balance

To estimate the quantity of groundwater infiltration to East Fork Poplar Creek (EFPC), various data were collected over a three day period (from 10 a.m. 10/25/88 to 10 a.m. 10/28/88). A water balance of the Y-12 Plant was then conducted to determine daily discharge to EFPC. Using the calculated discharge and measured creek flow, groundwater infiltration was estimated for the second day. Rain occurred on the first and third days; the runoff generated introduced an additional variable, and consequently, estimates are provided for Day 2 (10 a.m. 10/26/88 to 10 a.m. 10/27/88) only. During the monitoring period, several clarifications were made in delineating the distribution system configuration and in defining current process operations. Clarifications which changed calculation procedures outlined in the memoranda of October 15 and 17, 1988 are provided in the description below.

To conduct the water balance, water consumption for the Y-12 Plant (Q_2) was measured through five meters (M3, M4, M5, M6 and M7). Flow into the plant is given by:

$$Q_2 = M3 + M4 + M5 - M6 - M7$$

where: M3, M4 and M5 = Total flow from the water treatment plant
M6 = Flow to other plants (X-10, K-25)
M7 = Flow to the industrial park via the 12-inch pipe
Subscript 2 = Flow on day 2

This configuration and pipe dimensions are shown in Figure 1. The 8-inch line going to the industrial plant has been closed, and, therefore, it is not included in the flow equation. The measured flow into the plant on Day 2 was 7,401,000 gallons. ($Q_2 = 1,469,000 + 2,766,000 + 6,706,000 - 3,452,000 - 88,000$.)

Within the Y-12 Plant, water is used and discharged (i.e. to EFPC or the sanitary sewer), lost, or stored. Some process contaminated waters are treated and discharged. This schematic is also shown in Figure 1 along with the various components.

Losses include evaporation from cooling towers and the steam plant, sanitary sewer discharges, and distribution system leakage. Cooling tower evaporation was calculated based on measured temperature (incoming and outgoing), maximum rated recirculation rate, and the operating fraction of circulation rate as described in the previous memo of October 17, 1988.

C.W. Kimbrough
M.C. Wiest
L.L. McCauley
C.C. Hill
H.L. Fellers
L.O. Vaughan

548/45

**Figure 1. WATER BALANCE SCHEMATIC
FOR THE OAKRIDGE Y-12 PLANT**

January 13, 1989
Memorandum to Lori Muhs,
Martin Marietta Energy Systems
Page 3

This evaporation was 145,996 gpd on Day 2. Steam plant evaporation, derived from the monitored makeup and discharge quantities, was 278,772 gpd on Day 2. Total flow for the sanitary sewer system was measured using a Parshall flume; the quantity for Day 2 was 1,383,022 gpd. The measurement includes infiltration which was assumed to be 15% of total sewage flow or 207,453 gpd. Sanitary sewer discharge for plant personnel was based on 55 liters/person/day, which is typical of office buildings, and 9,200 employees. The remaining sewage flow is attributed to process discharge of 1,041,985 gpd on Day 2. Since a leak detection survey or detailed system audit have not been conducted for the Y-12 plant, leakage was assumed to be 15 percent of total flow and equaled 1,110,150 gpd for Day 2. Leakage observed in municipal distribution systems has varied from 5 to 25 percent, and a value of 15 percent is not deemed excessive based on existing system knowledge (e.g. pipe age, pipe material, corrosivity, lack of general monitoring, and the limited number of meters). Some of this leakage enters EFPC with groundwater infiltration. No other major losses were identified. The sum of evaporation, plant sewer discharge (i.e. without infiltration), and leakage represents a total loss of 2,710,487 gpd on Day 2.

Onsite storage occurs primarily in the West Tank Farm and totaled 10,000 gallons over the 3 day period or an average of 3,333 gpd. The cyanide treatment facility is no longer in use and other treatment plants discharge effluent directly to EFPC. The reservoir and other sources were assigned zero values for the storage category.

Discharges to EFPC result from once through cooling (blowdown from approximately 300 units) and process water, both of which are unmetered and, therefore, unknown quantities. In addition, blowdown from approximately twenty major cooling towers is discharged, and this quantity was calculated to be 202,319 gpd for Day 2, based on evaporation and cycles of concentration (as per the 10/17/88 memo), and 12 units operating during the monitoring period. Lastly, discharge for the following treatment plants was measured during the three day period.

- o Aluminum Nitrate and Nitric Acid Recovery (563 gpd)
- o Plating Rinsewater Treatment Facility (PRTF, 5,175 gpd)
- o Steam Plant Wastewater Treatment Facility (201,900 gpd)
- o West End (25,256 gpd).

* Metcalf and Eddy Inc., Wastewater Engineering: Treatment/Disposal/Reuse, 2nd ed., McGraw-Hill Book Co., New York, 1979.

January 13, 1989
Memorandum to Lori Muhs,
Martin Marietta Energy Systems
Page 4

This total treatment plant effluent discharge for the three day period was 698,682 gallons or an average of 232,894 gpd.

The PRTF discharge includes effluent from the Central Pollution Control Facility-I (CPCF-I). The ORNL building 9204-3 Sump Pump Oil/Water Separator contributes a negligible quantity (50 to 100 gpd). Other treatment facilities originally identified (e.g. Central Pollution Control Facility-II, Decant Treatment Facility, and Mobile Wastewater Treatment Facility) are no longer operating. The Waste Coolant Facility diverts its effluent to CPCF-I. No other discharge sources were identified. Condensate originally thought to be 7 to 12 percent of EFPC flow was zero during the monitoring period.

Given these measured data, total plant discharge to EFPC was computed to be 4,687,180 gpd on Day 2. A summary of the water balance analysis and major components is shown in Figure 2.

To derive the flow in EFPC (which originates at the Y-12 Plant), 11 stations (A, B, C, D, E, F, G, H, I, J, and K) were continuously monitored with readouts every 30 minutes. Because station K is the last monitor location in EFPC before leaving the plant site, measurements from this station were used to estimate flow. These flows were converted from percent depth to flow in cubic feet per second (cfs) using a regression curve equation obtained from three measured depths and flows. The three sampling points were used to determine the constants of the following function which best fit the data:

$$\text{FLOW} = A(\text{depth}^N)$$

where, A = constant
N = constant

'A' was found to be 1.0143 and "N" was found to be 4.7168. Figure 3 shows the relationship of flow versus depth at Station K for the measured values and for the obtained regression curve with flow in cfs and depth in feet.

Using the regression curve equation to obtain flow measurements at station K, a total daily quantity of 5,987,481 gpd was estimated for Day 2. It should be noted that no rainfall occurred on Day 2 and that no data exists for miscellaneous releases to the storm sewer system.

To increase the degree of confidence and correspondingly decrease the margin of error resulting from limited data in fitting the regression curve, an attempt was made to derive a theoretical flow equation using the trapezoidal weir at station K. However, uncertainties exist with the measured data (e.g., weir dimensions and point of measurement).

LEGEND

202 FLOW IN THOUSAND
● GALLONS PER DAY

**Figure 2. WATER BALANCE ANALYSIS
FOR THE OAKRIDGE Y-12 PLANT**
DAY 2 (10 am 10/26/88 – 10/27/88)

Figure 3

Flow vs. Depth in EFP
at Oakridge Y-12 Plant

January 13, 1989
Memorandum to Lori Muhs,
Martin Marietta Energy Systems
Page 7

Consequently, groundwater infiltration is based on the regression curve flow estimates.

By subtracting Y-12 Plant discharge from the EFPC flow at station K, groundwater infiltration 1,300,301 gpd was derived for Day 2. The percentage of each discharge component to EFPC flow is shown in Figure 4. Supporting data used in deriving the water balance and flow components are provided in Appendix A.

EFA/bc

cc: Leslie Blythe
Tatiana Gianella
Grady Maraman

File: 1386-03-CG

Figure 4. ESTIMATED DRY WEATHER DISCHARGE TO EFPC
Day 2 (10 am 10/26/88 - 10 am 10/27/88)

APPENDIX A

DATA

DAY 1

	Initial	Meter Reading (10/25/88) (10:00 am)	Time (10:00 am)	Meter Reading (10/26/88) (10:00 am)	Time (10:00 am)	Difference (gpd) ± 1,000
M3	2,233,623			2,235,207		1,584
M4	11,775,846			11,778,620		2,774
M5	32,842,264			32,849,006		6,742
M6	21,151,115			21,154,646		3,531
M7	2,795			3,012		217

WATER USAGE

$$Q = (M3 + M4 + M5 - M6 - M7) \pm 1,000 = 7,352,000$$

DAY 2

	Initial	Meter Reading (10/26/88) (10:00 am)	Time (10:00 am)	Meter Reading (10/27/88) (10:00 am)	Time (10:00 am)	Difference (gpd) ± 1,000
		2,235,207		2,236,676		1,469
		11,778,620		11,781,386		2,766
		32,849,006		32,855,712		6,706
		21,154,646		21,158,098		3,452
		3,012		3,100		88

WATER USAGE

$$Q = (M3 + M4 + M5 - M6 - M7) \pm 1,000 = 7,401,000$$

DAY 3

	Initial	Meter Reading (10/27/88) (10:00 am)	Time (10:00 am)	Meter Reading (10/28/88) (10:00 am)	Time (10:00 am)	Difference (gpd) ± 1,000
M3	2,236,676			2,238,148		1,472
M4	11,781,386			11,784,157		2,771
M5	32,855,712			32,862,336		6,624
M6	21,158,098			21,161,547		3,449
M7	3,100			3,187		87

WATER USAGE

$$Q = (M3 + M4 + M5 - M6 - M7) \pm 1,000 = 7,331,000$$

FACILITY.WR1

Days 1-3

	Start		End		Waste Storage	Effluent Discharge (gallons)	Average Daily Effluent Discharge (gallons)	DATA SOURCE		
	Date	Time	Date	Time				Name	Department	Extension
Aluminum Nitrate and Nitric Acid Recovery	10/25/88	10:00 am	10/28/88	10:00 am	None	1,689	563	J. Dillon	2,637	615-574-0327
Central Pollution Control Facility I (CPCF-I)	10/25/88	10:00 am	10/28/88	10:00 am	None	w/PRTF		J. Russel	2,366	615-574-6831
Central Pollution Control Facility II (CPCF-II)	No longer operating.							M. Shelton		615-576-1815
Decant Treatment Facility	No longer operating.							M. Shelton		615-576-1815
Plating Rinsewater Treatment Facility (PRTF)	10/25/88	10:00 am	10/28/88	10:00 am	None	15,526	5,175	J. Russel	2,366	615-574-6831
Waste Coolant Treatment Facility	Effluent goes to CPCF-I							M. Shelton		615-576-1815
Steam Plant Wastewater Treatment Facility (SPWTF)	10/25/88	10:00 am	10/28/88	10:00 am	None	605,700	201,900	J. Russel	2,366	615-574-6831
Mobile Wastewater Treatment Facility	No longer operating.							M. Shelton		615-576-1815
ORNL Building 9204-3 Sump Pump Oil Separator	Negligible Daily Discharge						50 - 100	Bannik		615-574-0434
West End	10/25/88	10:00 am	10/28/88	10:00 am	None	75,767	25,256	J. Russel	2,366	615-574-6831
OTHER										
West Tank Farm	10/25/88	10:00 am	10/28/88	10:00 am	10,000	XXXXXXXXXX	3,333	J. Russel	XXXXXXXXXX	615-576-1815
Steam Plant	Start		End		Water Used (gallons)					
	Date	Time	Date	Time						
	TOTAL	10/25/88 10:00 am	10/27/88 10:00 am		951,771			R. Wilson	Steam Plant	615-574-1417
	Day 1	10/25/88 10:00 am	10/26/88 10:00 am		471,099					
	Day 2	10/26/88 10:00 am	10/27/88 10:00 am		480,672					

COOLING TOWER

DAY 2			R	T		D		E	C	BD	BD + E		
TOWER #	I.D.	DATE	Circulation Rate (R), gpm	In Out		Delta T	Pumps Operating	Total Pumps	Fraction of Circulation Rate	Evaporation GPD	Cycles of Concentrations	Blow Down GPD	Water Consumption GPD
				Degrees F	Degrees F								
1	-2	10/26/88	6,000	74	67	7	2	5	0.400000	19,353.600	2	19,353.600	38,707.200
2	-4	10/26/88	15,500	62	51	11	1	7	0.142857	28,059.429	1.3	93,531.429	121,590.857
3	-6	10/26/88	2,600			0			0.000000	0.000	DOWN	0.000	0.000
4	-10	10/26/88	9,000	77	70	7	2	10	0.200000	14,515.200	2.5	9,676.800	24,192.000
5	-12	10/26/88	11,700	68	66	2	1	4	0.250000	6,739.200	2.1	6,126.545	12,865.745
6	-13	10/26/88	24,000	75	72	3	2	8	0.250000	20,736.000	2.7	12,197.647	32,933.647
7	-15	10/26/88	3,000	80	76	4	2	3	0.666667	9,216.000	2.7	5,421.176	14,637.176
8	-17	10/26/88	5,400	70	67	3	4	6	0.666667	12,441.600	2.6	7,776.000	20,217.600
9	-18/31	10/26/88	9,500	74	70	4	3	7	0.428571	18,761.143	1.5	37,522.286	56,283.429
10	-19	10/26/88	7,200	70	68	2	3	5	0.600000	9,933.280	2.8	5,529.600	15,482.880
11	-20	10/26/88	5,400	60	58	2	1	2	0.500000	6,220.800	2.2	5,184.000	11,404.800
12	-22	10/26/88	8,000	78	75	3	6	14	0.428571	0.000	DOWN	0.000	0.000
13	-23	10/26/88	7,600			0			0.000000	0.000	1.5	0.000	0.000
14	-24	10/26/88	9,000	68	64	4	1	6	0.166667	0.000	DOWN	0.000	0.000
15	-26	10/26/88	9,000			0			0.000000	0.000	DOWN	0.000	0.000
16	-28/29	10/26/88	3,000			0			0.000000	0.000	DOWN	0.000	0.000
17	-30	10/26/88	1,200			0			0.000000	0.000	DOWN	0.000	0.000
18	-32	10/26/88				0			0.000000	0.000	DOWN	0.000	0.000
19		10/26/88				0			0.000000	0.000	DOWN	0.000	0.000
20		10/26/88				0			0.000000	0.000	DOWN	0.000	0.000
TOTAL							28	77		145,996		202,319	348,315

* All cooling tower IDs preceded by 9,409--.
 DOWN indicates unit not operating.
 E = (0.01 * R * T * D * 1,440)/12.5
 BD = E/(-1)

STEAM PLANT DATA

DATE	TIME	STEAM PRODUCED (lb/hr)		
		BOILER NUMBER		
		1	2	3
10/26/88	11:00 a.m.	0	170,000	120,000
	12:00	0	165,000	120,000
	1:00	0	170,000	120,000
	2:00	0	165,000	120,000
	3:00	0	165,000	120,000
	4:00	0	180,000	120,000
	5:00	0	180,000	120,000
	6:00	0	175,000	120,000
	7:00	0	170,000	120,000
	8:00	0	145,000	180,000
	9:00	0	155,000	120,000
	10:00	0	155,000	120,000
	11:00	0	160,000	145,000
	12:00 a.m.	0	160,000	145,000
10/27/88	1:00	0	160,000	150,000
	2:00	0	160,000	155,000
	3:00	0	165,000	155,000
	4:00	0	165,000	160,000
	5:00	0	160,000	155,000
	6:00	0	165,000	165,000
	7:00	0	170,000	180,000
	8:00	0	170,000	175,000
	9:00	50,000	180,000	0
	10:00 a.m.	155,000	180,000	0
SUBTOTAL DAY 2:		205,000	3,990,000	3,085,000

TOTAL DAY 2: 7,280,000 lb steam produced

$$7,280,000 \text{ lb steam} \times \frac{1 \text{ gallon H}_2\text{O}}{8.33 \text{ lb}} = 873,950 \text{ gallon H}_2\text{O}$$

with 45% condensate return, water use is

$$873,950(1-.45) = 480,673 \text{ gallons}$$

APPENDIX D

SENSITIVITY ANALYSIS RESULTS

SENSITIVITY ANALYSIS MODEL RESULTS

30-Mar-94

SENSITIVITY ANALYSIS-CASE 1

RUN 4

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	673.3
Process water use	13.5
Once through cooling use	1,607.8
Cooling tower water use	626.5
Plant Personnel Use	720.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	97.6
Plant Personnel Use	720.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,851.1

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,343.3
Treatment plants*	13.5
Once through cooling	1,607.8
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	141.0
Total	3,478.6

* Excludes SPWTF Effluent

WATER BALANCE ASSUMPTIONS

31-Mar-94

RUN 4

SENSITIVITY ANALYSIS - CASE 1

Item	Value	Comments
Estimated Leakage loss from potable water distribution	15.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

SENSITIVITY ANALYSIS MODEL RESULTS

31-Mar-94

SENSITIVITY ANALYSIS-CASE 2

RUN 5

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	897.7
Process water use	13.5
Once through cooling use	1,383.3
Cooling tower water use	626.5
Plant Personnel Use	720.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	130.2
Plant Personnel Use	720.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,883.6

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,567.7
Treatment plants*	13.5
Once through cooling	1,383.3
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	141.0
Total	3,478.6

* Excludes SPWTF Effluent

WATER BALANCE ASSUMPTIONS

31-Mar-94

RUN 5

SENSITIVITY ANALYSIS - CASE 2

Item	Value	Comments
Estimated Leakage loss from potable water distribution	20.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

SENSITIVITY ANALYSIS MODEL RESULTS

31-Mar-94

RUN 6

SENSITIVITY ANALYSIS-CASE 3

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	673.3
Process water use	13.5
Once through cooling use	1,607.8
Cooling tower water use	626.5
Plant Personnel Use	720.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	97.6
Plant Personnel Use	720.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,851.1

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,269.7
Treatment plants*	13.5
Once through cooling	1,607.8
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	214.5
Total	3,478.6

* Excludes SPWTF Effluent

WATER BALANCE ASSUMPTIONS

31-Mar-94

RUN 6

SENSITIVITY ANALYSIS - CASE 3

Item	Value	Comments
Estimated Leakage loss from potable water distribution	15.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	20.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	20	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

SENSITIVITY ANALYSIS MODEL RESULTS

31-Mar-94

SENSITIVITY ANALYSIS-CASE 4

RUN 7

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	359.1
Process water use	13.5
Once through cooling use	1,876.9
Cooling tower water use	626.5
Plant Personnel Use	765.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	52.1
Plant Personnel Use	765.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,850.5

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,074.2
Treatment plants*	13.5
Once through cooling	1,876.9
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	141.0
Total	3,478.6

* Excludes SPWTF Effluent

WATER BALANCE ASSUMPTIONS

31-Mar-94

RUN 7

SENSITIVITY ANALYSIS - CASE 4

Item	Value	Comments
Estimated Leakage loss from potable water distribution	8.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	15.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd

SENSITIVITY ANALYSIS MODEL RESULTS

31-Mar-94

SENSITIVITY ANALYSIS-CASE 5

RUN 8

a. TOTAL POTABLE WATER TO Y-12

	1000 gal/d
Meter 24"	2,545.9
Meter 16" E	869.7
Meter 16" W	1,784.4
Valve Pit G	(711.6)
Total	4,488.4

b. POTABLE WATER USES AND DISTRIBUTION

	Water uses 1000 gal/d
Water to X-10 accounted to Y-12	(711.6)
Leakage loss @ Y-12	673.3
Process water use	13.5
Once through cooling use	1,652.8
Cooling tower water use	626.5
Plant Personnel Use	675.5
Steam Plant Water Use	846.9
Total water distribution	4,488.4

c. POTABLE WATER LOSSES

	Water 1000 gal/d
Cooling towers evaporation	426.3
Once through cooling	0.0
Treatment plants	0.0
Leakage not returning to EFPC	97.6
Plant Personnel Use	675.5
Untreated Process	0.0
Steam plant evaporation	606.6
Total	1,806.0

d. EFPC SOURCES

	Water 1000 gal/d
Cooling towers	200.2
Groundwater	1,298.3
Treatment plants*	13.5
Once through cooling	1,652.8
Untreated Process	0.0
SPWTF effluent	172.9
Condensate	141.0
Total	3,478.6

* Excludes SPWTF Effluent

WATER BALANCE ASSUMPTIONS

31-Mar-94

RUN 8

SENSITIVITY ANALYSIS - CASE 5

Item	Value	Comments
Estimated Leakage loss from potable water distribution	15.00%	of total water supplied to Y-12
Sanitary Sewer Infiltration	25.00%	of addition to discharge
Leakage loss that goes to the groundwater	95.00%	from the potable water leaks
Leakage loss to groundwater that returns to EFPC	90.00%	from the potable water leaks
Volume of process water for treatment	100.00%	
Estimated Pumping Rate in Basements	300	gpm
Fraction of Water Consumed by Personnel not going to the sewer	15.00%	
Steam Plant Condensate	10.00%	of evaporation volume (Guess)
Steam Plant Condensate to groundwater	50.00%	of condensate volume (Guess)
Steam Plant Condensate to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units	10	gpd per ton of refrigeration unit
Condensate from refrigeration units to storm sewer	50.00%	of condensate volume (Guess)
Condensate from refrigeration units to groundwater	50.00%	of condensate volume (Guess)
Dry Weather Flow to EFPC from Union Valley	57,100	gpd