Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352

13-ESQ-0050

JUL 3 2013

Ms. S. L. Dahl-Crumpler
Nuclear Waste Program
State of Washington
Department of Ecology
3100 Port of Benton Boulevard
Richland, Washington 99354

Dear Ms. Dahl-Crumpler:

CLASS 1 MODIFICATIONS TO THE HANFORD FACILITY RESOURCE CONSERVATION AND RECOVERY ACT PERMIT (PERMIT), QUARTER ENDING JUNE 30, 2013

In accordance with Permit Condition I.C.3, enclosed for your notification are the Class 1 modifications for the quarter ending June 30, 2013. Included within the enclosure is permit equivalency notification documentation associated with the Waste Treatment and Immobilization Plant.

These modifications and the permit equivalency notification documentation update information in Part III of Permit Revision 8C. The modifications pertain to the Liquid Effluent Retention Facility and 200 Area Effluent Treatment Facility, the 242-A Evaporator, the Integrated Disposal Facility, the 400 Area Waste Management Unit, and the Waste Treatment and Immobilization Plant. The Class 1 modifications are being made to ensure that activities are conducted in compliance with the Permit. A record of the enclosed documentation is maintained in the Hanford Facility Operating Record.

If you have any questions, please contact me, or your staff may contact Ray J. Corey, Assistant Manager for Safety and Environment on (509) 376-0108.

Sincerely,

Matt McCormick
Manager

ESQ:ACM

Enclosure

cc: See page 2

cc w/encl:
P. G. Harrington, ORP (CD ROM)
Ecology NWP Library (Hardcopy)
Environmental Portal, LMSI, A3-95 (CD ROM)
Administrative Record, TSD: H-0-1, H-0-8, T-3-4, H6-08 (CD ROM)
HF Operating Record (J. K. Perry, MSA, H7-28) (CD ROM)

cc w/o encl:
F. W. Bond, Ecology
D. M. Busche, BNI
A. S. Carlson, Ecology
B. L. Curn, URS
S. L. Dahl, Ecology
L. L. Fritz, MSA
J. A. Hedges, Ecology
A. L. Hummer, WRPS
D. L. McDonald, Ecology
A. G. Miskho, WRPS
A. L. Prignano, Ecology
J. R. Seaver, CHPRC

ENCLOSURE

CLASS 1 MODIFICATIONS FOR QUARTER ENDING June 30, 2013
Ms. S. L. Dahl-Crumpler, Ecology

Consisting of 426 pages,
including this cover page

Hanford Facility RCRA Permit Modification Notification Forms

Part III, Operating Unit 3

Liquid Effluent Treatment Facility & 200 Area Effluent Treatment Facility

Index

Page 2 of 2 Hanford Facility RCRA Permit III.3 Conditions

Submitted by Co-Operator: 6/26/13 Date

Reviewed by RL Program Office: FOR J. DAVEY 6/26/13 Date

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
LERF and 200 Area ETF	**Part III, Operating Unit 3**

Description of Modification:
Hanford Facility RCRA Permit III.3:

PART III, OPERATING UNIT GROUP 3 PERMIT CONDITIONS
Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility

Unit Description:

The Liquid Effluent Retention Facility (LERF) and 200 Area Effluent Treatment Facility(200 Area ETF) consists of an aqueous waste treatment system that provides treatment, storage integral to the treatment process, and storage of secondary wastes from the treatment process for a variety of aqueous mixed waste. The 200 Area ETF is located in the 200 East Area. Aqueous wastes managed by the 200 Area ETF include process condensate from the LERF and 200 Area ETF and other aqueous waste generated from onsite remediation and waste management activities.

The LERF consists of .....

List of Addenda Specific to Operating Unit Group 3

Addendum A	Part A Form, dated June 20, 2013~~30, 2011~~
Addendum B	Waste Analysis Plan, dated March 31, 2012
Addendum C	Process Information, dated June 20, 2013~~December 31, 2011~~
Chapter 5.0	Groundwater Monitoring (PNNL-11620 & WHC-SD-EN-AP-024), dated June 30, 2008
Addendum E	Security Requirements, dated, June 30, 2011
Addendum F	Preparedness and Prevention, dated June 20, 2013 ~~30, 2011~~
Addendum G	Personnel Training, dated June 30, 2011
Addendum H	Closure Plan, dated June 30, 2011
Addendum I	Inspection Requirements, dated June 30, 2011
Addendum J	Contingency Plan, dated March 31, 2012

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. The date changes for Addenda A, C, and F, are associated with a recently approved Class 2 permit modification.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
Suzanne Dahl 6/25/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Remove and Replace the Following Sections:

Remove Part III.3 Permit Conditions, dated March 31, 2013 and replace with Permit Conditions, dated June 30, 2013.

PART III, OPERATING UNIT GROUP 3 PERMIT CONDITIONS

Liquid Effluent Retention Facility & 200 Area Effluent Treatment Facility

Unit Description:

The Liquid Effluent Retention Facility (LERF) and 200 Area Effluent Treatment Facility(200 Area ETF) consists of an aqueous waste treatment system that provides treatment, storage integral to the treatment process, and storage of secondary wastes from the treatment process for a variety of aqueous mixed waste. The 200 Area ETF is located in the 200 East Area. Aqueous wastes managed by the 200 Area ETF include process condensate from the LERF and 200 Area ETF and other aqueous waste generated from onsite remediation and waste management activities.

The LERF consists of three lined surface impoundments, or basins. Aqueous waste from LERF is pumped to the 200 Area ETF for treatment in a series of process units, or systems, that remove or destroy essentially all of the dangerous waste constituents. The treated effluent is discharged to a State-Approved Land Disposal Site (SALDS) north of the 200 West Area, under the authority of a Washington State Waste Discharge Permit (Ecology 2000) and 200 Area ETF Delisting (40 CFR 261, Appendix IX, Table 2). Construction of the LERF began in 1990. Waste management operations began at LERF in April 1994. Construction of the 200 Area ETF began in 1992. Waste management operations began at 200 Area ETF in November of 1995.

This Chapter provides unit-specific Permit conditions applicable to the dangerous waste management units for LERF and 200 Area ETF.

List of Addenda Specific to Operating Unit Group 3

Addendum A	Part A Form, dated June 20, 2013
Addendum B	Waste Analysis Plan, dated March 31, 2013
Addendum C	Process Information, dated June 20, 2013
Chapter 5.0	Groundwater Monitoring (PNNL-11620 & WHC-SD-EN-AP-024), dated June 30, 2008
Addendum E	Security Requirements, dated, June 30, 2011
Addendum F	Preparedness and Prevention, dated June 20, 2013
Addendum G	Personnel Training, dated June 30, 2012
Addendum H	Closure Plan, dated June 30, 2011
Addendum I	Inspection Requirements, dated June 30, 2011
Addendum J	Contingency Plan, dated March 31, 2012

Definitions

State and federal delisting actions: The state delisting action pursuant to WAC 173-303-910(3), August 8, 2005, and the federal delisting action appearing in 40 CFR 261, Appendix IX, Table 2 applicable to the United States, Department of Energy, Richland, Washington.

Acronyms

LERF and 200 Area ETF 200-Area Liquids Processing Facility

III.3.A COMPLIANCE WITH UNIT-SPECIFIC PERMIT CONDITIONS

III.3.A.1 The Permittees will comply with all Permit Conditions in this Chapter and its Addendums and Chapters with respect to dangerous waste management and dangerous waste management units in LERF and 200 Area ETF, in addition to requirements in Permit Part I and Part II.

III.3.B GENERAL WASTE MANAGEMENT

III.3.B.1 The Permittees are authorized to accept dangerous and/or mixed waste for treatment in dangerous waste management units that satisfies the waste acceptance criteria in Permit Addendum B according to the waste acceptance procedures in Permit Addendum B. [WAC 173-303-300]

III.3.B.2 The Permittees are authorized to manage dangerous and/or mixed wastes physically present in the dangerous waste management units in LERF and 200 Area ETF as of the effective date of this Permit according to the requirements of Permit Condition III.15.B.1.

III.3.B.3 The Permittees are authorized to treat and/or store dangerous/mixed waste in the dangerous waste management units in LERF and 200 Area ETF according to the following requirements:

III.3.B.3.a The Permittees are authorized to treat, and store as necessary in support of treatment, dangerous waste in the 200 Area ETF tank systems identified in Permit Addendum C, Section C.2, and Section C.4 according to the Permit Conditions of this Chapter.

III.3.B.3.b The Permittees are authorized to store and treat those dangerous and/or mixed waste identified in Permit Addendum C, Section C.3, in containers according to the requirements of this Chapter. All container management activities pursuant to this Permit Condition will take place within the container storage area or within the 200 Area ETF process area identified in Permit Addendum C, Figure C.3.

III.3.B.3.c Treatment in containers authorized by Permit Condition III.3.B.3.b is limited to decanting of free liquids, and addition of sorbents to free liquids. The Permittees will ensure that sorbents are compatible with wastes and the containers. Sorbents will be compliant with the requirements of WAC 173-303-140(4)(b)(iv), incorporated by reference.

III.3.B.3.d The Permittees are authorized to treat aqueous waste in LERF Basins (Basins 42, 43 and 44) subject to the following requirements:

III.3.B.3.d.1 Following treatment in a LERF basin, aqueous wastes must be treated in 200 Area ETF according to Permit Conditions III.3.B.3.a through c.; [40 CFR 268.4(2)(iii), incorporated by reference by WAC 173-303-140]

III.3.B.3.d.2 The Permittees must ensure that for each basin, either supernatant is removed on a flow-through basis, to meet the requirement of 40 CFR 268.4(a)(2)(ii) incorporated by reference by WAC 173-303-140, or incoming waste is shown to not contain solids by either: (1) sampling results showing the waste does not contain detectable solids, or (2) filtering through a 10 micron filter;[WAC 173-303-815(2)(b)(ii)]

III.3.B.4 The Permittees will maintain the physical structure of the LERF and 200 Area ETF as documented in the applicable sections of Permit Addendum C, Section C.2. [WAC 173-303-630(7), WAC 173-303-640(3), WAC 173-303-640(4)]

III.3.B.5 The Permittees are authorized to use treated effluent for recycle/makeup water purposes at the 200 Area ETF as outlined in Permit Addendum C, Section C.2.5.5, and the letters dated August 19, 2005, EPA Region 10 to Keith A. Klein; and August 8, 2005, Department of Ecology to Keith A. Klein. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.6 The Permittees will maintain and operate systems for the 200 Area ETF documented in Permit Addendum C, Section C.2.5 as necessary for proper operation of the 200 Area ETF, compliance with the conditions of this Permit, and protection of human health and the environment. For purposes of this Permit Condition, the Monitor and Control System documented in Permit Addendum C, Section C.2.5.1, is considered to include all indicators, sensors, transducers, actuators and other control devices connected to but remote from the centralized monitor and control system (MCS) computer.

III.3.B.7 The Permittees must complete the following requirements prior to acceptance for treatment in 200 Area ETF aqueous waste streams with listed waste numbers subject to the requirements of the State and Federal delisting: [WAC 173-303-815(2)(b)(ii)]

III.3.B.7.a The Permittees will prepare a written waste processing strategy according to the requirements of the State and Federal Delisting Actions Conditions (1)(a)(ii) and (1)(b), incorporated by reference, and Permit Addendum B, Section B.2.2.2.

III.3.B.7.b The waste processing strategy required by Permit Condition III.3.B.7.a, must document the proposed processing configuration for the 200 Area ETF, operating conditions for each processing unit, and the expected treated effluent characteristics based on the process model and treatability envelope data required by State and Federal Delisting Conditions (1)(a)(ii) and (1)(b).

III.3.B.7.c The written waste processing strategy required by Permit Condition III.3.B.7.a must demonstrate that the projected treated effluent characteristics satisfy the delisting exclusion limits in State and Federal Delisting Condition (5) of the state and federal delisting actions, and the discharge limits of the State Discharge Permit ST-4500.

III.3.B.7.d The Permittees will place a copy of the written waste processing strategy required by Permit Condition III.3.B.7.a in the Hanford Facility Operating Record, LERF and 200 Area ETF file as part of the documentation of waste streams accepted for management at the 200 Area ETF.

III.3.B.8 Treatment of aqueous waste streams in the 200 Area ETF with listed waste numbers that are subject to the requirements of the state and federal delisting actions must comply with the requirements of State and Federal Delisting Condition (1)(c), incorporated by reference. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.9 The Permittees will manage treated effluent in the final verification tanks according to the requirements of the State and Federal Delisting Conditions (3) and (5), incorporated by reference. [WAC 173-303-815 (2)(b)(ii)]

III.3.B.10 The Permittees will manage treated effluent from the 200 Area ETF according to the requirements of the State Waste Discharge Permit ST 4500 and State and Federal Delisting Condition (7). [WAC 173-303-815(2)(b)(ii)]

III.3.B.11 The Permittees will ensure compliance with treatment standards (40 CFR 268, incorporated by reference by WAC 173-303-140) applicable to treated effluent prior to discharge to the State Authorized Land Disposal Site (SALDS), the delisting criteria at 40 CFR 261, Appendix IX, Table 2, and the corresponding state-approved delisting (dated August 8, 2005, all incorporated by reference). Sampling and analysis necessary for these demonstrations must meet the corresponding requirements in Permit Addendum B. [WAC 173-303-140, WAC 173-303-815 (2)(b)(ii)]

III.3.C WASTE ANALYSIS

III.3.C.1 The Permittees will comply with requirements in Permit Addendum B for sampling and analysis of all dangerous and/or mixed waste required by conditions in this Chapter. [WAC 173-303-300]

III.3.C.2 The Permittees will have an accurate and complete waste profile as described in Permit Addendum B, Section B.2.1.2, for every waste stream accepted for management in LERF and 200 Area ETF dangerous waste management units. [WAC 173-303-380 (1)(a), (b)]

III.3.C.3 The Permittees will place a copy of each waste profile required by Permit Condition III.15.C.2 in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-380 (1)(a), (b)]

III.3.C.4		The Permittees will make a copy of the waste profile required by Permit Condition III.15.C.2 available upon request. [WAC 173-303-380 (1)(a), (b)]
III.3.C.5		Records and results of waste analysis described in this Permit will be maintained in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-380 (1)(a), (b)]
III.3.D	**RECORDKEEPING AND REPORTING**	
III.3.D.1		The Permittees will place the following into the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2:
III.3.D.1.a		Records required by WAC 173-303-380 (1)(k), and -(o) incorporated by reference.
III.3.D.1.b		Records and results of waste analysis, waste determinations (as required by Subpart CC) and trial tests required by WAC 173-303-300, General waste analysis, and by 40 CFR §264.1034,§264.1063, §264.1083, §265.1034, §265.1063, §265.1084, §268.4(a), and §268.7; [WAC 173-303-310(2)]
III.3.D.1.c		An inspection log, summarizing inspections conducted pursuant to Permit Condition III.3.H.1; [WAC 173-303-380(1)(e)]
III.3.D.1.d		Records required by the State and Federal Delisting Condition (6), incorporated by reference; [WAC 173-303-815 (2)(b)(ii)]
III.3.E	**SECURITY**	
III.3.E.1		The Permittees comply with the Security requirements specific to the LERF and 200 Area ETF in Addendum E and Permit Attachment 3 as required by Permit Condition II.L. [WAC 173-303-310(2)]
III.3.F	**PREPAREDNESS AND PREVENTION**	
III.3.F.1		The Permittees will comply with the Preparedness and Prevention requirements specific to LERF and 200 Area ETF in Addendum F. [WAC 173-303-340]
III.3.G	**CONTINGENCY PLAN**	
III.3.G.1		The Permittees will comply with Addendum J, Contingency Plan, in addition to the requirements of Permit Condition II.A when applicable. [WAC 173-303-350]
III.3.H	**INSPECTIONS**	
III.3.H.1		The Permittees will comply with Addendum I in addition to the requirements of Permit Condition II.X. [WAC 173-303-320]
III.3.I	**TRAINING PLAN**	
III.3.I.1		The Permittees will include the training requirements described in Addendum G of this Chapter specific to the dangerous waste management units and waste management activities at LERF and 200 Area ETF into the written training plan required by Permit Condition II.C.
III.3.J	**GENERAL REQUIREMENTS**	
III.3.J.1		The Permittees will comply with the requirements of WAC 173-303-395(1), incorporated by reference, for prevention of reaction of ignitable, reactive, or incompatible wastes.
III.3.K	CLOSURE	
III.3.K.1		The Permittees will close dangerous waste management units in the LERF and 200 Area ETF in accordance with Addendum H, Closure Plan, and Permit Condition II.J. [WAC 173-303-610(3)(a)]

III.3.L POST CLOSURE – RESERVED

III.3.M CRITICAL SYSTEMS – RESERVED

III.3.N RESERVED

III.3.O CONTAINERS

III.3.O.1 Container Storage and Treatment Unit Standards

III.3.O.1.a As part of or in addition to the requirements of Permit Condition III.3.B.2, the Permittees will ensure the integrity of container storage secondary containment and the chemically resistant coating described in Addendum C, Section C.3.4.1 as necessary to ensure any spills or releases to secondary containment do not migrate to the underlying concrete or soils.

III.3.O.1.a.1 Include documentation of any damage and subsequent repairs in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2.

III.3.O.2 Container Management Standards

III.3.O.2.a The Permittees will maintain and manage wastes in accordance with the requirements of Addendum C, Section 4.3.2, and Section 4.3.2. [WAC 173-303-630(2)]

III.3.O.2.b The Permittees will label containers in accordance with the requirements of Addendum C, Section C.3.2, and Section C.3.3. [WAC 173-303-630(3)]

III.3.O.2.c The Permittees will comply with the requirements for managing wastes in containers in WAC 173-303-630(5), incorporated by reference.

III.3.O.2.d The Permittees will ensure wastes are compatible with containers and with other wastes stored or treated in containers within the 200 Area ETF according to the requirements of Addendum C, Section C.3.4.3. [WAC 173-303-630(4), WAC 173-303-630(9)]

III.3.O.2.e The Permittees may treat wastes in containers via decanting of free liquids and addition of sorbents. The Permittees may not use addition of sorbents for purposes of changing the treatability group of a waste with respect to the land disposal restriction standards of 40 CFR 268, incorporated by reference by WAC 173-303-140.

III.3.O.2.f The Permittees will remove any accumulated liquids from container storage areas in 200 Area ETF according to the requirements of Addendum C, Section C.3.4.2, to ensure containers are not in contact with free liquids and to prevent overflow of the container storage area secondary containment.

III.3.O.2.g The Permittees will comply with the requirements for air emissions from containers in Addendum C, Section C.6.3.2. [WAC 173-303-692]

III.3.P TANK SYSTEMS

III.3.P.1 Tank System Requirements

III.3.P.1.a The Permittees will develop a schedule for conducting integrity assessments (IA). The schedule will meet the requirements of Addendum C, Section C.4.2, and consideration of the factors in WAC 173-303-640(2)(e) or WAC 173-303-640(3)(b) as applicable:

III.3.P.1.b The Permittees will maintain a copy of the schedule required by Permit Condition III.3.P.1.a, in the Hanford Facility Operating Record, LERF and 200 Area ETF file, and conduct periodic integrity assessments according to the schedule. The Permittees will document results of integrity assessments conducted according to the IA in the Hanford Facility Operating Record, LERF and 200 Area ETF file.

III.3.P.1.c	For existing tank systems, if a tank system is found to be leaking, or is unfit for use, the Permittees must follow the requirements of WAC 173-303-640(7), incorporated by reference. [WAC 173-303-640(3)(b)]
III.3.P.2	Tank System Operating Requirements
III.3.P.2.a	The Permittees will comply with the requirements of WAC 173-303-640(5)(a), incorporated by reference.
III.3.P.2.b	The Permittees will comply with the requirements of Addendum C, Section C.4.5.2. [WAC 173-303-640(5)(b)]
III.3.P.2.c	The Permittees will comply with the requirements of Addendum C, Section C.4.6. [WAC 173-303-640(5)(d)]
III.3.P.2.d	The Permittees will comply with the requirements of WAC 173-303-640(7), incorporated by reference, in response to spills or leaks from tanks systems at 200 Area ETF. [WAC 173-303-640(5)(c)]
III.3.P.2.e	The Permittees will ensure that the Waste Processing Strategy required by Permit Condition III.3.B.7.a, provides for the immediate treatment or blending of waste accepted for management at the 200 Area ETF such that the resulting waste or mixture is no longer reactive or ignitable when further managed in 200 Area ETF tank systems. [WAC 173-303-640(9)]
III.3.P.2.f	The Permittees will comply with the requirements of WAC 173-303-640(10), incorporated by reference.
III.3.Q	**SURFACE IMPOUNDMENTS**
III.3.Q.1	The Permittees will maintain the three LERF basins according to the requirements of WAC 173-303-650 (2)(f), incorporated by reference.
III.3.Q.2	The Permittees will operate the LERF basins according to the requirements of Addendum C, Section C.5.3, and Addendum I, Section I.2.2.3.1 to prevent over-topping. [WAC 173-303-650 (2)(c)]
III.3.Q.3	The Permittees will develop and maintain, and operate the LERF basins to ensure that any flow of waste into the impoundment can be immediately shut off in the event of overtopping or liner failure. [WAC 173-303-650 (2)(d)]
III.3.Q.4	The Permittees will comply with the requirements of WAC 173-303-650 (2)(g), incorporated by reference.
III.3.Q.5	The Permittees will comply with the requirements of WAC 173-303-650 (4)(b), incorporated by reference.
III.3.Q.6	The Permittees will comply with the requirements of WAC 173-303-650 (4)(c), incorporated by reference. The certification required by this Permit Condition must be provided to Ecology no later than seven calendar days after the date of the certification. A copy of the certification will be placed in the Hanford Facility Operating Record, LERF and 200 Area ETF file required by Permit Condition II.I.2. [WAC 173-303-650 (4)(c)]
III.3.Q.7	The Permittees will comply with the requirements of WAC 173-303-650(5)(b), incorporated by reference, in response to events in WAC 173-303-650(5)(a), incorporated by reference.
III.3.Q.8	The Permittees will comply with the requirements of WAC 173-303-650(5)(d) for any LERF basin that has been removed from service in accordance with Permit Condition III.3.Q.7 that the Permittees will restore to service. [WAC 173-303-650(5)(d)]

III.3.Q.9	The Permittees will close any LERF basin removed from service in accordance with the requirements of Permit Condition III.3.Q.7 or a basin that cannot be repaired or that the Permittees will not to return to service. [WAC 173-303-650(5)(e)]
III.3.Q.10	The Permittees will comply with the requirements of Addendum C, Section C.5.10 with respect to management of ignitable or reactive wastes in the LERF basins. [WAC 173-303-650(7)]
III.3.Q.11	The Permittees can place incompatible wastes and materials in the same LERF basin only if in compliance with the requirements of WAC 173-303-395(1)(b), (c). [WAC 173-303-650(8)]
III.3.Q.12	The Permittees will use the action leakage rate in Addendum C, Section C.5.8, for operation of LERF basins, and comply with the requirements of WAC 173-303-650(10)(b). [WAC 173-303-650(10)]
III.3.Q.13	The Permittees will comply with the requirements of WAC 173-303-650(11), incorporated by reference.
III.3.Q.14	The Permittees will comply with the requirements of 40 CFR 264, Subpart CC, incorporated by reference by WAC 173-303-692.
III.3.Q.15	Groundwater Monitoring
III.3.Q.15.a	The Permittees will comply with the requirements of Chapter 5.0. [WAC 173-303-645]

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Hanford Facility RCRA Permit Modification Notification Forms

Part III, Operating Unit 4

242-A Evaporator

Index

Page 2 of 5 Hanford Facility RCRA Permit III.4 Conditions

Page 3 of 5 Chapter 4.0, Section 4.1.3

Page 4 of 5 Chapter 4.0, Figure 4.2

Page 5 of 5 Chapter 11.0, Section 11.2.3

Submitted by Co-Operator: 6/27/13 Date

Reviewed by ORP Program Office: 6/27/13 Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **242-A Evaporator**	Permit Part **Part III, Operating Unit 4**

Description of Modification:
Hanford Facility RCRA Permit III.4:

PART III, OPERATING UNIT 4 UNIT-SPECIFIC CONDITIONS
242-A Evaporator

UNIT DESCRIPTION

The 242-A Evaporator is a mixed waste treatment and storage unit consisting of a conventional forced-circulation, vacuum evaporation system to concentrate mixed-waste solutions located in the 200 East Area.

This document sets forth the operating conditions for the 242-A Evaporator.

III.4.A COMPLIANCE WITH UNIT SPECIFIC PERMIT CONDITIONS

The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment 93, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit-specific Permit Conditions are enforceable in their entirety.

In the event that the Part III-Unit-Specific Conditions for Operating Unit 4, 242-A Evaporator conflict with the Part I-Standard Conditions and/or Part II-General Facility Conditions of the Permit, the unit-specific conditions for Operating Unit 4, 242-A Evaporator prevail.

CHAPTERS SPECIFIC TO OPERATING UNIT GROUP 4:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 2.0	Unit Description, dated August 2004
Chapter 3.0	Waste Analysis Plan, dated September 30, 2007
Chapter 4.0	Process Information, dated June 30, 2013~~June 30, 2010~~
Appendix 4B	Tank Integrity Assessment, dated December 31, 2002
Chapter 5.0	Groundwater Monitoring, dated (not applicable)
Chapter 6.0	Procedures to Prevent Hazards, dated June 30, 2010~~(also refer to Permit Attachment 33, §6.1, Security)~~
Chapter 7.0	Contingency Plan, dated June 30, 2010
Chapter 8.0	Personnel Training, dated June 30, 2010
Chapter 11.0	Closure and Post Closure Requirements, dated June 30, 2013~~December 31, 2005~~
~~Chapter 12.0~~	~~Reporting and Recordkeeping (refer to Permit Attachment 33, Table 12.1, Reports and Records)~~

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class '1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation: Administrative and informational changes. Changes reflect new modification dates for Chapters 4 and 11. Changes are needed to correct references to portions of permit that were revised in prior modifications (i.e., Attachment number for the Applicability Matrix and removal of Attachment 33 from the permit as part of the 9/30/2010 quarterly modifications). Chapter 12 language is deleted because there is no need to mention Attachments. There is no Chapter 12 for 242-A. Attachment 6 is the Reports and Records Attachment.

Modification Approved: ☑ Yes ☐ No (state reason for denial)

Reason for denial:

Reviewed by Ecology:

S. L. Dahl-Crumpler 6/26/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class '1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **242-A Evaporator**	Permit Part **Part III, Operating Unit 4**

Description of Modification:
Chapter 4.0, Section 4.1.3:

4.1.3 Vapor-Liquid Separator (C-A-1) and Ancillary Equipment

The following sections describe the vapor-liquid separator (C-A-1) and ancillary equipment.

Waste Feed System. Feed to the 242-A Evaporator is supplied via a pump located in the 241-AW-102 feed tank. The feed pump transfers the waste to the 242-A Evaporator through a 3-inch diameter carbon steel transfer pipeline encased in a 6-inch diameter carbon steel pipe to provide secondary containment. The feed pipeline is equipped with a leak detection system.

~~Samples can be taken from the waste feed when needed.~~Waste feed will be sampled from 241-AW-102 or identified candidate feed tanks as described in the Waste Analysis Plan. The feed sampler (SAMP-F-1) ~~is~~ located in a sample enclosure located in the hot equipment storage room has been isolated and blanked, and will be closed in accordance with the approved Closure Plan.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A
Requesting downgrade from Class 3 to Class 1, per WAC 173-303-830(4)(d). This modification does not change the sampling process or requirements of the permit described in the waste analysis plan or the treatment process of the 242-A Evaporator. The sampler/jumper configuration does not meet ASME B31.3 standards and cannot be used. In an effort to isolate the feed sampler from the system, piping connecting nozzle 13 to nozzle K and piping connecting nozzle J to nozzle D will be removed, including the 13A connector. Nozzles J and K will be blanked, isolating the feed sampler from the entire system. A new jumper will run from nozzle 13 to a new connection where 13A existed to nozzle D. This modification does not affect the ability of the 242-A Evaporator to protect human health and the environment.

Modification Approved: ☑ Yes ☐ No (state reason for denial) Reason for denial:	Reviewed by Ecology: S. L. Dahl-Crumpler 6/26/13 Date

[1] Class 1 modifications requiring prior Agency approval.

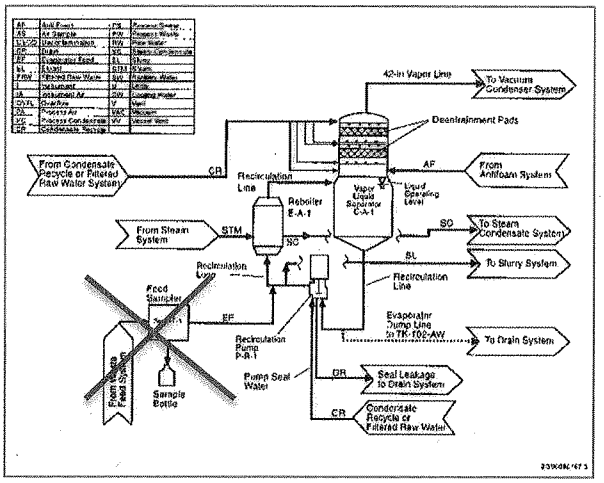
[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

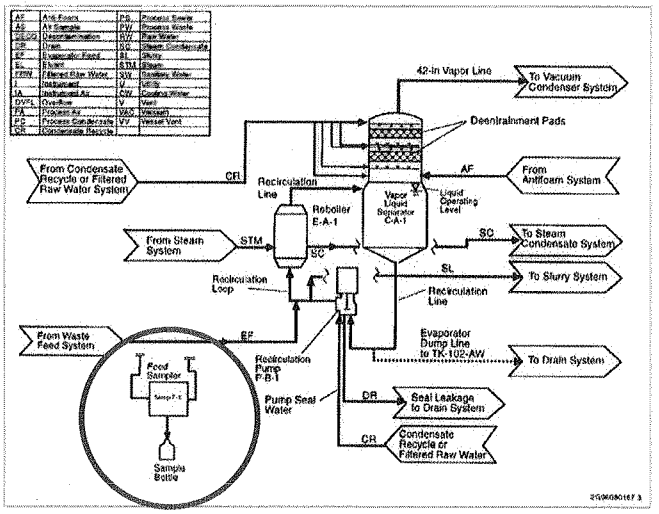
Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
242-A Evaporator	**Part III, Operating Unit 4**

Description of Modification:
Chapter 4.0, Figure 4.2:

Figure 4.2. 242-A Evaporator Process Loop





WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A

Requesting downgrade from Class 3 to Class 1, per WAC 173-303-830(4)(d). Figure 4.2 has been revised regarding the Feed sampler, SAMP-F-1. The figure modification reflects the configuration after the feed sampler has been isolated and blanked.

Modification Approved: ☑ Yes ☐ No (state reason for denial)

Reason for denial:

Reviewed by Ecology:

S. L. Dahl-Crumpler 6/26/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **242-A Evaporator**	Permit Part **Part III, Operating Unit 4**

Description of Modification:
Chapter 11.0, Section 11.2.3:

11.2.3 Closure Standards for Internal and/or External Piping

The internal and/or external piping of 242-A Evaporator will be flushed and drained as part of closure. For piping where the contaminated surfaces can be inspected, an inspection will be performed to see if the piping meets the clean debris surface standard in 40 CFR 268.45 incorporated by reference and can be declared non-dangerous in accordance with WAC 173-303-071(3)(qq). If it is not possible to inspect the contaminated surfaces or meet the clean debris surface performance standard, the particular piping of concern will be removed, designated, and disposed of accordingly.

The feed sampler (SAMP-F-1) located in a sample enclosure in the Hot Equipment Storage room has been isolated and blanked and will be closed during closure of the 242-A Evaporator. The feed sampler line was designed so that the piping does not contain any level/flat segments and thus facilitates active gravity drainage of liquids. The remaining portion of the feed sampler line that exists between Nozzles J and K is sloped 1° from Nozzle J to a 180° bend and sloped 1° from the 180° bend to Nozzle K.

Dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A

Requesting downgrade from Class 3 to Class 1, per WAC 173-303-830(4)(d). This request completes the permit modification to isolate the current sampler and jumpers described for the process information section of the 242-A Evaporator permit chapter. As noted for that request, "this modification does not change the sampling process or requirements of the permit described in the waste analysis plan or the treatment process of the 242-A Evaporator. The sampler/jumper configuration does not meet ASME B31.3 standards and cannot be used. This modification does not affect the ability of the 242-A Evaporator to protect human health and the environment." This modification to the closure chapter is to ensure that the isolated equipment will be appropriately accounted for during closure activities for the unit.

Modification Approved: ☑ Yes ☐ No (state reason for denial) Reason for denial:	Reviewed by Ecology: S. L. Dahl-Crumpler 6/26/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Remove and Replace the Following Sections:

Remove Part III Permit Conditions, dated June 30, 2010, and replace with Permit Conditions, dated June 30, 2013.

Remove Chapter 4.0, dated June 30, 2010, and replace with Chapter 4.0, dated June 30, 2013.

Remove Chapter 11.0 dated December 31, 2005, and replace with Chapter 11.0 dated June 30, 2013.

PART III, OPERATING UNIT 4 UNIT-SPECIFIC CONDITIONS

242-A Evaporator

UNIT DESCRIPTION

The 242-A Evaporator is a mixed waste treatment and storage unit consisting of a conventional forced-circulation, vacuum evaporation system to concentrate mixed-waste solutions located in the 200 East Area.

This document sets forth the operating conditions for the 242-A Evaporator.

III.4.A COMPLIANCE WITH UNIT SPECIFIC PERMIT CONDITIONS

The Permittees shall comply with all requirements set forth in the Hanford Facility RCRA Permit (Permit) as specified in Permit Attachment 9, Permit Applicability Matrix, including all approved modifications. All chapters, subsections, figures, tables, and appendices included in the following unit-specific Permit Conditions are enforceable in their entirety.

In the event that the Part III-Unit-Specific Conditions for Operating Unit 4, 242-A Evaporator conflict with the Part I-Standard Conditions and/or Part II-General Facility Conditions of the Permit, the unit-specific conditions for Operating Unit 4, 242-A Evaporator prevail.

CHAPTERS SPECIFIC TO OPERATING UNIT GROUP 4:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 2.0	Unit Description, dated August 2004
Chapter 3.0	Waste Analysis Plan, dated September 30, 2007
Chapter 4.0	Process Information, dated June 30, 2013
Appendix 4B	Tank Integrity Assessment, dated December 31, 2002
Chapter 5.0	Groundwater Monitoring, dated (not applicable)
Chapter 6.0	Procedures to Prevent Hazards, dated June 30, 2010
Chapter 7.0	Contingency Plan, dated June 30, 2010
Chapter 8.0	Personnel Training, dated June 30, 2010
Chapter 11.0	Closure and Post Closure Requirements, dated June 30, 2013

III.4.B COMPLIANCE WITH UNIT-SPECIFIC PERMIT CONDITIONS

III.4.B.1 Portions of Permit Attachment 4 (DOE/RL-94-02) that are not made enforceable by inclusion in the applicability matrix for that document are not made enforceable by reference in this document.

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Chapter 4.0 Process Information

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4.0 PROCESS INFORMATION

Where information regarding treatment, management, and disposal of the radioactive source byproduct material and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954 as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or chapter 70.105 RCW and its implementing regulations but is provided for information purposes only.

The 242-A Evaporator receives mixed waste from the DST System that contains inorganic and organic constituents and radionuclides. A 242-A Evaporator simplified process flow diagram is given in Figure 4.1. The 242-A Evaporator separates the mixed waste received from the DST System, generating the following waste streams:

- A concentrated aqueous waste stream (slurry) containing the nonvolatile components, including most of the radionuclides, inorganic constituents, and nonvolatile organics such as tri-butyl phosphate
- A dilute aqueous waste stream (process condensate) containing the volatile components, primarily water with low concentrations of radionuclides, inorganic constituents, and volatile constituents such as ammonia and acetone.

The slurry is routed back to the DST System pending further treatment. The process condensate is transferred to the LERF for storage until processed through the ETF.

The 242-A Evaporator process employs a conventional forced circulation, vacuum evaporation system to concentrate the DST System waste solution. The major components of this system include the reboiler, vapor-liquid separator, recirculation pump and pipe loop, slurry product pump, condenser, jet vacuum system, and condensate collection tank

The vapor-liquid separator, C-A-1, also called the evaporator vessel, and the condensate collection tank, C-100, meet the definition of a tank in WAC 173-303-040. Other process equipment associated with these tank systems is considered ancillary equipment. Drawings that aid in understanding the systems are provided in Section 4.3.

The 242-A Evaporator receives waste from a DST System tank, 241-AW-102 that serves as the 242-A Evaporator feed tank. The feed enters the recirculation line and blends with the main process slurry stream, which is pumped to the reboiler.

In the reboiler, the mixture is heated to the specified operating temperature, normally 38 to 77EC, using 21 to 69 kilopascals gauge pressure steam. The low-pressure steam provides adequate heat input, and the resulting low-temperature differential across the reboiler minimizes scale formation on the heat transfer surfaces. The static pressure of the waste in the reboiler is sufficient to suppress the boiling point so the waste does not boil in the reboiler tubes. Boiling occurs only near or at the liquid surface in the vapor liquid separator.

The heated slurry stream is discharged from the reboiler to the vapor-liquid separator (C-A-1) that typically is maintained at an absolute pressure of 5.3 to 10.7 kilopascals. Under this reduced pressure, a fraction of the water in the heated slurry flashes to steam and the steam is drawn through two, wire mesh deentrainer pads into a 42-inch diameter vapor line that leads to the primary condenser, leaving behind a more concentrated slurry solution in the vapor-liquid separator.

After a brief residence time in the vapor-liquid separator, the slurry exits from the bottom through the lower portion of the recirculation line and is recirculated by the recirculation pump (P-B-1). The pump discharges the slurry back to the reboiler via the upper portion of the recirculation line, thus completing the recirculation loop.

The specific gravity of the waste liquid is monitored closely to ensure that the target density, established before the beginning of the campaign, is not exceeded. A portion of the slurry is removed from the upper

portion of the recirculation line using the slurry pump (P-B-2) and transferred through an encased underground pipeline (pipe-within-a-pipe) to a designated slurry receiver tank in the DST System.

The vapors are drawn from the vapor-liquid separator, through a 42-inch diameter vapor line and enter a series of three condensers, where the vapors are condensed using raw water. The condensed vapors, called process condensate, are collected in tank C-100. Steam jets are used to create a vacuum on the vapor liquid separator drawing the process vapors into and through the condensers. Noncondensable vapors are drawn from the condensers, then through a series of particulate filters and vented to the atmosphere. The air discharges are monitored continuously when the 242-A Evaporator is operating to verify that standards for radionuclide and ammonia emissions standards are met.

Process condensate contains the volatile constituents of the waste and trace quantities of inorganic materials and radionuclides. The process condensate is pumped from tank C-100 through an encased underground pipeline (pipe-within-a-pipe) to the LERF.

During a campaign, the evaporation process is continuous with typical feed flow rates of 260 to 450 liters per minute, process condensate flow rates of 150 to 230 liters per minute, and slurry flow rates of 110 to 230 liters per minute. The evaporator process is shutdown when the desired endpoint concentration of the slurry is met. Endpoints are established at the beginning of the campaign, based on the target specific gravity of the waste, or allowable waste volume reduction (WVR) and defined operating limits. If the evaporation rate cannot achieve the desired endpoint, slurry in the DST System serving as the slurry receiver is transferred to the feed tank for one or more passes through the 242-A Evaporator. At the end of each campaign, the 242-A Evaporator process equipment is shutdown, emptied, flushed with raw water, and placed in a safe standby mode.

Other discharges during 242-A Evaporator processing include condensate from the steam used to heat the waste and cooling water used to condense the vapors. The 242-A Evaporator is designed to prevent contamination of these streams. The fluids on the uncontaminated side of the heat exchangers are maintained at a higher pressure than the waste stream so that uncontaminated fluid migrates toward the contaminated waste if a leak were to occur. The steam condensate and the cooling water are monitored continuously for radiation, pH, conductivity, and discharged to TEDF as long as none of the discharge limits are exceeded. The steam condensate and cooling water streams were assessed in the stream specific reports (WHC 1990a and WHC 1990b) and are not dangerous waste in accordance with WAC 173-303.

The 242-A Evaporator process is controlled by the MCS. The MCS computer monitors process parameters and controls the parameters where required. Once the configuration parameters and other process control inputs are set, the MCS maintains the process parameters within specified ranges by sending output signals that operate specific pieces of equipment (e.g., control valves).

4.1 TANK SYSTEMS

This section discusses information associated with design requirements, integrity assessments, and any additional requirements for tanks used to treat and store mixed waste in the 242-A Evaporator.

4.1.1 Design Requirements

The following design requirements were addressed in the 242-A Evaporator/Crystallizer Tank System Integrity Assessment Report (IAR) (Appendix 4B):

- Minimum design wall thicknesses and measured wall thicknesses at various points throughout the tank systems
- Design standards used in construction, including references
- Waste characteristics
- Materials of construction and compatibility of materials with the waste being processed
- Corrosion protection

- Seismic design basis evaluation

The conclusion of the integrity assessment report is that the 242-A Evaporator system is not leaking and is fit for use. The inspections, tests, and analyses performed provide assurance that the tank system has adequate design, sufficient structural strength, and sufficient compatibility with the waste to not collapse, rupture, or fail during operation. The report also states that a review of construction files indicates that the building structure was designed and constructed to withstand a design-basis earthquake.

4.1.2 PC-5000 Transfer line

Process condensate from the 242-A Evaporator is transferred to the LERF using a pump located in the 242-A Evaporator and approximately 1,500 meters of pipe, consisting of a 3-inch carrier pipe within a 6-inch outer containment pipeline. Flow through the pump is controlled through a valve at flow rates from 150 to 300 liters per minute.

The encased fiberglass transfer line (PC-5000) exits the 242-A Evaporator below grade and remains below grade at a minimum 1.2-meter depth for freeze protection, until the pipeline emerges at the LERF catch basin, at the corner of each basin. All piping at the catch basin that is less than 1.2 meters below grade is wrapped with electric heat tracing tape and insulated for protection from freezing. Additional detail including information on secondary containment, leak detection and integrity assessment for this line is provided in § 4.1.6.3.3 and §4.1.4.1.

4.1.3 Vapor-Liquid Separator (C-A-1) and Ancillary Equipment

The following sections describe the vapor-liquid separator (C-A-1) and ancillary equipment.

Waste Feed System. Feed to the 242-A Evaporator is supplied via a pump located in the 241-AW-102 feed tank. The feed pump transfers the waste to the 242-A Evaporator through a 3-inch diameter carbon steel transfer pipeline encased in a 6-inch diameter carbon steel pipe to provide secondary containment. The feed pipeline is equipped with a leak detection system.

Waste feed will be sampled from 241-AW-102 or identified candidate feed tanks as described in the Waste Analysis Plan. The feed sampler (SAMP-F-1) located in a sample enclosure located in the hot equipment storage room has been isolated and blanked, and will be closed in accordance with the approved Closure Plan.

The feed sampler (SAMP-F-1) is located in a sample enclosure located in the hot equipment storage room.

Evaporator Process Loop. The 242-A Evaporator process loop equipment components are as follows:

- Reboiler (E-A-1)
- Vapor-liquid separator (C-A-1)
- Recirculation pump (P-B-1)
- Recirculation loop

Figure 4.2 is a simplified process flow diagram showing the major components of the process loop.

Reboiler (E-A-1). Waste is heated as the waste passes through the reboiler before entering the vapor-liquid separator. The reboiler is a vertical tube unit with steam on the shell-side and process solution on the tube-side. The 364 tubes in the reboiler are enclosed in a 1.03-meter outside diameter, 4.6-meter-long stainless steel shell. Both the reboiler shell and tubes are constructed of 304L stainless steel. The shell is 0.64 centimeter thick and the tubes are 14-gauge steel. The reboiler is designed to distribute steam evenly and to prevent tube damage from water droplets that may be present in the steam.

Vapor-Liquid Separator (C-A-1). Process solution from the reboiler enters the vapor-liquid separator via the upper recirculation line. Some of the solution flashes into vapor, which exits through a vapor line at the top of the vapor-liquid separator. The remaining solution (slurry) exits through the recirculation line at the bottom.

The separator consists of a lower and upper section. The lower (liquid) section is a stainless steel shell 4.3 meters in diameter having an 85,200 to 94,600 liter normal operating capacity (including recirculation loop and reboiler). The maximum design capacity is 103,000 liters. The upper (vapor) section is a stainless steel shell 3.5 meters in diameter containing two deentrainment pads. These wire mesh pads remove liquids and solids that entrain into the vapor section of the vessel. Spray nozzles, using recycled process condensate or filtered raw water, wash collected solids from the deentrainment pads and vessel walls. Both sections of the vapor-liquid separator are constructed of 0.95-centimeter-thick stainless steel.

Operating parameters in the vapor-liquid separator are monitored to provide an indication of process problems such as slurry foaming, deentrainer flooding, or excessive vapor temperatures. Instrumentation also is available to monitor the liquid levels in the vapor-liquid separator. Interlocks are activated when high pressures or high- or low-liquid levels are detected, shutting down the evaporation process and placing the facility in a safe configuration.

The vapor-liquid separator and recirculation loop can be flushed to remove any residual solids from the system and/or to reduce radiation levels. The most common flush solution is water, but dilute nitric or citric acid solutions could be used. All acidic flush solutions are chemically adjusted to meet DST acceptance criteria before transfer to the DST System. Antifoam solution is added (at very low flow rates - approximately 0.04 to 0.4 liters per minute) to the vessel to prevent foaming. The antifoam solution is a noncorrosive, nonregulated silicone-based solution that is compatible with the evaporator components.

Recirculation Pump. The stainless steel recirculation pump (P-B-1), is constructed as part of the recirculation loop to the reboiler. The 28-inch diameter axial flow pump has 60,900 liters per minute output. The recirculation pump is designed to handle slurry up to 30 percent undissolved solids by volume at specific gravities up to 1.8. The recirculation pump moves waste at high velocities through the reboiler to improve heat transfer, keep solids in suspension, and reduce fouling of the heat transfer surfaces.

The recirculation pump is equipped with shaft seals with high-pressure recycled process condensate (or water) introduced between the seals to prevent the waste solution from leaking out of the system. Seal water pressure and flow are monitored and controlled to shut down the recirculation pump if conditions are not adequate to prevent waste liquid from migrating into the seal water. The used seal water is routed to the feed tank.

Recirculation Loop. The recirculation loop consists of a 28-inch diameter stainless steel pipe that connects the vapor-liquid separator to the recirculation pump and reboiler. The lower loop runs from the bottom of the vapor-liquid separator to the recirculation pump inlet. The upper loop connects the pump discharge to the reboiler and the reboiler to the vapor-liquid separator. The feed line from the feed tank and the slurry line to underground storage tanks are connected to the upper recirculation line.

Slurry System. The slurry system draws a portion of the concentrated waste from the upper recirculation loop and transfers it to the DST System. The major components of the slurry system are the slurry pump and the slurry transfer pipelines. Figure 4.3 shows a simplified flow diagram of the slurry system. These components are described in the following paragraphs.

The slurry pump (P-B-2) is used to transfer slurry from the recirculation loop to the underground storage tanks. The pump is driven by a variable speed motor and is constructed of 304L stainless steel. The slurry pump is designed to generate high pressures to alleviate the possibility of a transfer line plugging.

Interlocks control the operation of the slurry pump. The slurry pump (P-B-2) is shutdown if any of the following occur:

- Excessive pressure is detected in the slurry lines to 241-AW Tank Farm
- A leak is detected in the slurry transfer lines secondary containment
- A leak is detected in the 241-AW Tank Farm process pits where the transfer lines enter the DST System.

The slurry pump uses a shaft seal with recycled process condensate (or water) and pressure and flow controls similar to the system described above for the recirculation pump.

Transfer pipelines are 2-inch diameter, carbon steel encased lines which route slurry to a designated underground DST within the 200 East Area. All transfer pipelines are encased in a secondary containment pipe and equipped with leak detectors between the primary and encasement piping. The pipelines are sloped to drain to the valve pit. The detection of any leak by the automated leak detection system shuts off the slurry pump. In lieu of the MCS automated shutdown, the slurry pump (P-B-2) can be manually shutdown at the direction of the Shift manager or 242-A Evaporator Control Room operator if a leak occurs.

The flow rate of the slurry transfer to the DST System is monitored and a decrease in flow below a specified value automatically will shut down the slurry pump (P-B-2) and initiate a line flush with water. The objective of flushing the transfer line is to prevent settling of solids, which precludes plugging the slurry transfer lines.

Samples can be taken from the slurry line when needed via a sampler (SAMP-F-2) that is located near the feed sampler in the load out and hot equipment storage room.

4.1.3.1 Condensate Collection Tank (C-100) and Ancillary Equipment

The following section discusses the condensate collection tank (C-100) and ancillary equipment. This equipment collects process condensate via the condensers in the vacuum condenser system, filters the condensate, and pumps the process condensate to LERF. Figure 4.4 provides a simplified process flow diagram showing the major components of the process condensate system. The following major components make up the process condensate system:

- Vacuum condenser system
- Condensate collection tank (C-100)
- Process condensate pump (P-C-100)
- Condensate filters (F-C-1, F-C-2, and F-C-3)
- Process condensate radiation monitoring, sampling system and diversion system (RC3)
- Seal pot
- Process condensate recycle system
- Vessel Vent System

Vacuum Condenser System. Vapors removed from the vapor-liquid separator flow to a series of three condensers where the vapors are condensed using raw water. Condensate drains to the condensate collection tank (C-100). The vacuum condenser system consists of the following major components:

- Primary condenser (E-C-1)
- Intercondenser (E-C-2)
- Aftercondenser (E-C-3)
- Steam jet ejectors (J-EC1-1 and J-EC2-2)

Figure 4.5 provides a simplified process flow diagram showing the major components of the vacuum condenser system. These system components are discussed in the following sections.

Primary Condenser (E-C-1). Vapors drawn from the vapor-liquid separator flow through the 42-inch (3.5 feet) vapor line, into the E-C-1 condenser where the majority of the condensation takes place. Noncondensed vapors exit to the intercondenser (E-C-2) while the condensed vapors (process condensate) drain to the condensate collection tank (C-100). Cooling water passes through the cooling tubes and exits to TEDF.

The carbon steel condenser shell measures approximately 5.3 meters (17.4 feet) long and has a 2.2-meter (7.2 feet) inside diameter. The condenser consists of 2,950 equally spaced carbon steel tubes that are 3.6 meters (11.8 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

Intercondenser (E-C-2). Noncondensed vapors from E-C-1 enter the intercondenser. The vapor stream contacts the cooling tubes in the condenser where cooling water provides additional condensation. The condensate drains to the condensate collection tank (C-100). Noncondensed vapors and used cooling water are routed to the after condenser.

The carbon steel intercondenser measures 2.2 meters (7.2 feet) long with a 0.39 meter (1.3 feet) inside diameter. This heat exchanger contains 144 tubes that are 1.7 meters (5.6 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

After condenser (E-C-3). Vapor discharged from the intercondenser enters the after condenser. Cooling is supplied to the after condenser by the cooling water from the intercondenser. Condensate is routed to the condensate collection tank (C-100), while the noncondensed vapors are filtered, monitored, and discharged to the atmosphere through the vessel ventilation system. The cooling water is discharged to TEDF.

The carbon steel after condenser measures 2.3 meters (7.5 feet) long and has a 0.20-meter (0.66 feet) inside diameter. This heat exchanger contains 45 tubes that are 1.8 meters (5.9 feet) long with a 1.9-centimeter (0.75 inches) outside diameter.

Steam Jet Ejectors. The vacuum that draws the vapors from C-A-1 into the condensers is created by a two-stage steam jet ejector system. The first-stage jet ejector (J-EC1-1) maintains a vacuum on the primary condenser, which in turn creates a vacuum on the vapor-liquid separator. The ejector consists of a steam jet, pressure controller, and air bleed-in valve. Steam and noncondensed vapors from the primary condenser are ejected from J-EC1-1 into the intercondenser. The desired vacuum is obtained by controlling steam pressure and bleeding ambient air as necessary into the vapor header through an air intake filter. The second-stage jet ejector (J-EC2-1) creates the vacuum that moves vapors from the intercondenser through the after condenser.

Condensate Collection Tank (C-100). Process condensate from the primary condenser, intercondenser, after condenser, and the vessel ventilation system drain to the condensate collection tank (C-100). The tank is 4.3 meters in diameter, 5.8 meters high, and is constructed of 0.79-centimeter (0.31 inches)-thick stainless steel. The tank has a maximum design capacity of 67,400 liters (17,805 gallons). Normal operating volume is approximately 50 percent of the tank capacity. A carbon steel base supports the tank. An agitator is installed but not used.

In the event of a tank overflow, the solution is routed through an overflow line to the drain system, which returns waste to the feed tank (241-AW-102). Overflow occurs when the volume exceeds about 60,600 liters. The overflow line is equipped with a liquid filled trap to isolate the drain system from the tank.

Process feed samples are evaluated for the presence of a separate organic layer and process controls are used to reduce the risk of the condensate collection tank to receive small amounts of immiscible organics with the condensed waste. If detected, the organic layer is removed by overflowing tank C-100 back to the feed tank 241-AW-102. The liquid level in the tank is controlled well above the discharge pump intake point and a controlled overflow is conducted upon completion of each processing cycle (campaign) to ensure that an organic layer does not accumulate and cannot be pumped to LERF.

Process Condensate Pump. A pump (P-C-100) moves the process condensate from tank C-100 through the condensate filter to LERF. The process condensate pump is a centrifugal pump constructed of 316 stainless steel.

Condensate Filters. After leaving the condensate collection tank, the process condensate is filtered to remove solids. The primary condensate filter (F-C-1) has a welded steel housing. A second filter system (F-C-3), installed downstream is also used to filter the process condensate. This system has duplex in-line filters in cast iron housing. Both filters employ a filter material that is compatible with the process condensate.

Process Condensate Radiation Monitoring, Sampling and Diversion System. The process condensate transferred to LERF is monitored continuously for radiation. If radiation levels exceed established limits, an alarm is received and interlocks immediately divert the stream back to the condensate collection tank (or the feed tank) and shut off the process condensate pump. This ensures process condensate containing excessive radionuclides due to an accidental carryover from the vapor-liquid separator is not transferred to LERF.

Seal Pot. The condensate collection tank receives condensed liquids from the vessel ventilation system. A seal pot collects the drainage before discharge into the condensate collection tank and isolates the tank from the vessel ventilation system.

Condensate Recycle System. For waste minimization, a portion of the process condensate from tank C-100 is recycled for use as decontamination solution for the deentrainment pad sprays and seal water for the recirculation pump (P-B-1) and slurry pump (P-B-2). Use of process condensate instead of raw water results in approximately 10 percent reduction in waste volume generated during continuous operation of the 242-A Evaporator. Filtered raw water also is available as a backup for sprays and seal water. A 2-inch (5.1 centimeters) diameter carbon steel line, stainless steel centrifugal pump (P-C106), and filters (F-C-5 and F-C-6) supply process condensate from tank C-100 to the pad sprays and pump seals. The filters are disposable cartridge filters in carbon steel housings arranged in parallel with one filter in service while the other is in standby.

4.1.4 Integrity Assessments

The integrity assessment report (Appendix 4B, Integrity Assessment Report) discusses:

- The standards used during design and construction of the 242-A Evaporator and the adequacy of those standards
- The characteristics of the DST waste processed
- The adequacy of the materials of construction to provide corrosion protection from the waste processed
- The age of the tanks and the affect of age on tank integrity
- The results of the leak tests, visual inspections, and tank wall thickness inspections
- The frequency and scope of future integrity assessment
- Deficiencies in secondary containment design. These deficiencies are discussed in-the integrity assessment report.

An independent, qualified, registered professional engineer certified the integrity assessment.

The inspections, tests, and analyses performed provide assurance that the 242-A Evaporator tank system has adequate design, sufficient structural strength, and sufficient compatibility with the waste to not collapse, rupture, or fail during operation. No evidence of degradation was noted during the visual test, ultrasonic test, or leak test. Both condensate collection tank C-100 and the vapor-liquid separator/reboiler loop passed leak tests. The frequency of subsequent integrity assessments has been established at every 10 years. This frequency is based on the results of the 1998 integrity assessment.

4.1.4.1 PC-5000

An integrity assessment for PC-5000 was performed, including a hydrostatic leak/pressure test at 10.5 kilograms per square centimeter gauge (150 pounds per square inch). A statement by an independent, qualified, registered professional engineer attesting to the integrity of the piping system is included in *Integrity Assessment Report for the 242-A Evaporator/LERF Waste Transfer Piping, Project W105* (WHC 1993), along with the results of the leak/pressure test. The next integrity assessment for PC-5000 will be conducted in the calendar year 2008. The schedule for conducting integrity assessments will be at

a frequency of every 10 (calendar) years unless otherwise required by an IQRPE or as required for system repairs and upgrades. All integrity assessments will be conducted in accordance with WAC 173-303-640.

4.1.5 Additional Requirements for Existing Tanks

Refer to information in Section 4.1.2 and the integrity assessment report, which includes measuring tank wall thicknesses, evaluating corrosion protection, and performing leak tests.

4.1.6 Secondary Containment and Release Detection for Tank Systems

This section describes the design and operation of secondary containment sumps, drain lines, and leak detection systems for the 242-A Evaporator.

4.1.6.1 Requirements for All Tank Systems

The Construction Specification for 242-A Evaporator-Crystallizer Facilities Project B-100 (Vitro 1974) was used during preparation, design, and construction of the tank and secondary containment systems. The integrity assessment report details how the construction specification relates to the national codes and standards.

Constructing the building and vessels per this specification ensures that foundations are capable of supporting tank and secondary containment systems and that uneven settling and failures from pressure gradients do not occur. The integrity assessment report (Appendix 4B) states that the 242-A Evaporator has adequate design, sufficient structural strength, and sufficient compatibility with the wastes to not collapse, rupture, or fail during service loads associated with normal operations and that the building structure was designed and constructed to withstand a design basis earthquake".

The integrity assessment report (Appendix 4B) describes the building and secondary containment system. This system is designed to ensure any release is detected within 24 hours. The secondary containment system also is designed to contain 100 percent of the maximum operating capacity of the vapor-liquid separator/reboiler loop, and the drain systems are sloped to allow collection of solution and have sufficient capacity to drain this volume in less than the required 24 hours.

The integrity assessment report describes the protective coating material and sealant used to protect concrete and joints from attack by leaks to the secondary containment. The materials of construction for the sump and drain lines are also compatible with the waste processed at the 242-A Evaporator.

4.1.6.2 242-A Building Secondary Containment

The 242-A Building serves as a secondary containment vault for the vapor-liquid separator (C-A-1), condensate collection tank (C-100), and ancillary equipment used for transferring mixed waste at the 242-A Evaporator. The concrete for the operating area was poured to form a monolithic structure. Where needed, joints in the concrete were fabricated with preformed filler conforming to the standards of the American Society of Testing and Materials. Joint filler is sealed with a polysulfide sealant per the requirements of the construction specifications (Vitro 1974).

Before restart in 1994, a new acrylic special protective coating was applied to the concrete in the pump, evaporator, and condenser rooms. The coating meets the requirements of the construction specifications (Vitro 1974), including resistance to very high radiations doses, temperatures of 77o C, and spills of 25 percent caustic solution.

The following six rooms contain equipment used to process or store*mixed waste:

- Pump room
- Evaporator room
- Condenser room
- Ion exchange room
- Load out room* (used for temporary storage of mixed waste)
- Hot equipment storage room.

4.1.6.2.1 Pump Room

The pump room secondary containment walls are 0.38 to 0.56-meter (1.25 to 1.84-feet) thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The pump room floor is lined with 0.64-centimeter (0.25-inch) stainless steel and the concrete walls and ceiling cover blocks are painted with a special protective coating. The pump room contains pipe jumpers used to transport feed and slurry solutions between the vapor-liquid separator and the DST System, and the process recirculation loop, recirculation pump (P-B-1), and slurry pump (P-B-2).

Leaks in the pump room collect in the pump room sump, a 1.5-meter (4.9-feet) by 1.5-meter (4.9-feet) by 1.8-meter (5.9 feet) deep sump with a 0.64-centimeter (0.25-inch) stainless steel liner. The pump room sump collects spills from various sources for transfer to the feed tank, 241-AW-102. Figure 4.6 provides a simplified process flow schematic of sources, which drain to the pump room sump. Drainage to the sump includes:

- Leaks to the pump room floor from equipment in the pump room
- Evaporator room floor drain
- Hot equipment storage room floor drain
- Load out room floor drain
- Raw water backflow preventer drain

Solution in the pump room sump is transferred to the feed tank (241-AW-102) using a steam jet. A 10-inch secondary containment overflow line is provided for draining large volumes of solution should a catastrophic tank failure occur. Because the overflow line provides a direct path between the air space of tank 241-AW-102 and the pump room, a minimum level of water must be maintained in the sump to prevent cross ventilation. A leak into the pump room sump would be detected by a rise in the sump level. Instrumentation provided alarms on high sump level.

The recirculation and slurry pumps in the pump room are equipped with mechanical seals having pressurized water introduced between the seals. The seal water is maintained at a pressure that exceeds the process pressure at the seal to ensure water leaks into the process solution, but waste solution does not leak out. Water from seal leakage is collected in funnels in the pump room and routed to feed tank 241-AW-102 via the 10-inch overflow line described previously.

4.1.6.2.2 Evaporator Room

The evaporator room secondary containment walls are 0.56-meter-thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The evaporator room contains the vapor-liquid separator vessel (C-A-1), part of the recirculation loop, the reboiler, the 42-inch vapor line, and line used to empty the vapor-liquid separator to feed tank 241-AW-102.

Leaks in the evaporator room flow to a floor drain that routes through a 3-inch line to the pump room sump described in Section 4.1.6.2.1. A leak in the evaporator room would be detected by a rise in the pump room sump level. The floor of the evaporator room and a portion of the pump room floor are 3.0 meters below grade to contain the entire contents of the vapor-liquid separator, reboiler, and recirculation loop in the event of a catastrophic failure. The floor and walls of the evaporator room up to an elevation of 1.8 meters are painted with a special protective coating.

4.1.6.2.3 Condenser Room

The condenser room secondary containment walls are 0.36- to 0.56-meter-thick reinforced concrete. The secondary containment floor is 0.51-meter-thick reinforced concrete. The condenser room contains all the components of the process condensate system described in Section 4.1.3.1 (refer Figure 4.4), including tank C-100.

Leaks in the condenser room flow to two floor drains that join and route through a 6-inch line to feed tank 241-AW-102. Leaks in the condenser room are detected by the following:

- Unexpected changes in liquid level in tank C-100. Instrumentation is provided to monitor liquid level in the tank, including high- and low-level alarms.
- Daily visual inspections of process condensate system components and piping.

The floor and walls of the condenser room up to an elevation of 1.2 meters are painted with a special protective coating.

4.1.6.2.4 Load out and Hot Equipment Storage Rooms

The load out and hot equipment storage rooms secondary containment walls are 0.30- to 0.56-meter (0.98- to 1.84-feet) thick reinforced concrete. The secondary containment floors are 0.15-meter (0.49-feet) thick reinforced concrete. The room contains two recirculation lines and samplers used to sample the feed and slurry streams. The lines and samplers are located in a shielded enclosure adjacent to the pump room wall.

The load out and hot equipment storage room contains two sumps: the drain sump and decontamination sump. The sumps are 0.91 meter in diameter, about 1.2 meters deep, and lined with stainless steel. Both sumps drain via a 3-inch drain line to the pump room sump described in Section 4.1.6.2.1. The sumps, floor, and walls of the load out and hot equipment storage room up to an elevation of 3.8 meters are painted with a special protective coating.

Leaks in the sampler piping, flow into two drains in the sample enclosure, which drain via a 2-inch line to the decontamination sump, which drains to the pump room sump (described in 4.1.6.2.1). Leak detectors in the sampler enclosures or a rise in the pump room sump level detects leaks in the sampler piping.

4.1.6.2.5 242-A Building Drain Lines

Figure 4.6 provides a simplified process flow schematic of sources routed to the 242-A Building drain lines. The 242-A TSD unit boundary includes these lines up until they exit the 242-A Building. At this point, the lines are considered DST system components. Four lines serve to drain the 242-A Building and equipment to feed tank 241-AW-102:

- Pump room sump drain line (DR-334): a 10-inch carbon steel line that transfers process condensate overflow/diverted liquids and empty out of the pump room sump to the feed tank
- Vapor-liquid separator vessel drain line (DR-335): a 10-inch carbon steel line that allows gravity drain of the vessel to the feed tank
- Condenser room drain line (DR-343): a 6-inch carbon steel line that drains potential leakage from the condenser room.
- Diverted process condensate drain line (DR-338): process condensate liquid drains through DR-338 into sump drain line (DR-334) which drains to 241-AW-102.

The four lines are sloped to drain about 170 meters to feed tank 241-AW-102 via the drain pit (241-AW-02D). Although WAC 173-303-640(1)(c) exempts systems that serve as secondary containment from requiring secondary containment, drain lines DR-334, DR-335, and DR-338 have outer encasement piping.

The drain lines are connected to a cathodic protection system to prevent external corrosion from contact with the soil. The cathodic protection system consists of:

- A rectifier that converts supplied alternating current voltage to an adjustable direct current voltage
- Numerous anodes buried near the underground piping and connected to the rectifier.
- Return wiring that connects the piping to the rectifier, completing the circuit.
- The rectifiers are inspected to component degradation has not occurred. Test stations along the system are checked annually to verify 0.85 volt is maintained on the system, as required by the National Association of Corrosion Engineers.

Further detail regarding design and construction of DR-334,-335,-338 and -343 is provided in DOE/RL-90-39 (Hanford Facility Dangerous Waste Permit Application Double-Shell Tank System). Further detail regarding the design, operation, maintenance, and inspection of the cathodic protect system for these lines are also provided in DOE/RL-90-39.

4.1.6.3 Transfer Line Containment

This section describes the design and operation of secondary containment and leak detection systems for transfer lines between the DST System and the 242-A Evaporator, and from 242-A to LERF (one line only, PC-5000). The 242-A TSD boundary for lines running between 242A and the DST System ends at exterior wall of 242-A building. At this point, these lines (e.g., feed and slurry line piping) are DST System components. For further detail regarding SN-269, SN-270, SL-167, and SL-168 refer to DOE/RL-90-39.

The PC-5000 transfer line transfers process condensate (Section 4.1.2) from the 242-A building to LERF. The 242-A TSD unit boundary includes PC-5000 up to the LERF fence line (Chapter 1.0, topographic map, and Section 4.1.2, for the TSD unit boundary)

4.1.6.3.1 Feed Line Piping

Two feed lines (SN-269 and SN-270) (one in service and one spare), each consist of 3-inch transfer piping within a 6-inch secondary containment encasement piping. Both the transfer and encasement pipes are constructed of Schedule 40 carbon steel. The lines run below grade about 120 meters from pump pit 241-AW-02E (above feed tank 241-AW-102) to the 242-A Building.

To detect transfer-piping failures, leak detector risers equipped with conductivity probes are installed on the encasement lines. The transfer piping and encasements are sloped towards the conductivity probe, which, on leak detection, annunciates an alarm in the 242-A Evaporator control room. A valve in the pump pit (241-AW-02E) can be opened to drain solution from the encasement pipe into the pit, which drains to feed tank 241-AW-102.

4.1.6.3.2 Slurry Line Piping

The slurry pump (P-B-2) transfers solution through one of two transfer lines: SL-167, for transfer to valve pit 241-AW-B (standard configuration), or SL-168 for transfer to valve pit 241-AW-A (alternate configuration). Slurry solution can be routed via double-encased piping from these valve pits to any designated DST slurry receiver. Both slurry transfer lines consist of 2-inch transfer piping within a 4-inch secondary containment encasement piping. Both the transfer and encasement pipes are constructed of Schedule 40 carbon steel. The lines run below grade about 73 meters between the 242-A Building and the valve pits.

These slurry lines contain leak detector risers and conductivity probes similar to the feed line piping described in Section 4.1.6.3.1.

4.1.6.3.3 PC-5000

The process condensate transfer line (PC-5000) from the 242-A Evaporator is centrifugally cast, fiberglass-reinforced epoxy thermoset resin pressure pipe fabricated to meet the requirements of ASME D2997 (ASME 1984). The 3-inch (7.6-cm) carrier piping is centered and supported within 6-inch (15.2-cm) containment piping. Pipe supports are fabricated of the same material as the pipe, and meet the strength requirements of ANSI B31.3 (ANSI 1987) for dead weight, thermal, and seismic loads.

Drawing H-2-79604 provides details of the piping from the 242-A Evaporator to LERF.

This permit includes the portion of the PC-5000 line leaving the 242-A Evaporator facility to the fence line of LERF (Chapter 1.0 and topographic maps for unit boundary).

Single-point electronic leak detection elements are installed along the transfer line at 305-meter (1000 foot) intervals. The leak detection elements are located in the bottom of specially designed test risers. Each sensor element employs a conductivity sensor, which provides a signal to the

242-A Evaporator control room when a potential leak is detected. If a leak develops in the carrier pipe, fluid will travel down the exterior surface of the carrier pipe or the interior of the containment pipe. As moisture contacts a sensor unit, a general alarm sounds in the 242-A Evaporator control room on the Monitoring Control System. In addition, the zone of the sensor unit causing the general alarm can be determined using the leak detection-monitoring panel. Upon verification of a leak, the pump located in the 242-A Evaporator is shut down, stopping the flow of aqueous waste through the transfer line. A low-volume air purge of the annulus between the carrier pipe and the containment pipe is provided to prevent condensation buildup and minimize false alarms by the leak detection elements.

If a leak is detected using visual inspection of the PC-5000 transfer line encasement at the encasement catch tank (TK-PC-101) in the LERF catch basin (242AL-43), the shift manager is notified. The Shift Manger will direct shutdown of the aqueous waste through the PC-5000 transfer line.

4.1.6.4 Additional Requirements for Specific Types of Systems

Addressed in this section are additional requirements in WAC 173-303-640 for vault systems like the 242-A Building to ensure neither buildup of ignitable vapors nor does infiltration of precipitation occur. This section also addresses secondary containment for ancillary equipment and piping associated with the tank systems.

4.1.6.4.1 Vault Systems

The 242-A Building is a vault constructed partially below ground, providing secondary containment for the tank systems. The DST System waste processed at the 242-A Evaporator is designated ignitable and reactive because of the presence of nitrite and nitrate salts, which are considered oxidizers per 49 CFR 173. Because of their low volatility, these compounds are unlikely to be present in the vapor phase of the tank systems at the 242-A Evaporator. However, to prevent the spread of contamination, the vapor-liquid separator (C-A-1) is ventilated and maintained at lower air pressure than the building air space. This ensures air leakage is from uncontaminated building air space into the tank vapor space. Vapors from the vapor-liquid separator flow to the vacuum condenser system described in Section 4.0.

The condensate collection tank (C-100), collects process condensate that is not designated ignitable or reactive.

The tank systems and ancillary equipment are located within the 242-A Building, which is completely enclosed to prevent run-on and infiltration of precipitation into the secondary containment system.

4.1.6.4.2 Ancillary Equipment

The 242-A Building provides secondary containment for ancillary equipment. Double containment is provided for the feed and slurry transfer lines between the 242-A Building and the AW Tank Farm by pipe-in-pipe arrangements. Therefore, all ancillary equipment has secondary containment and the daily inspection requirements in WAC 173-303-640(4)(f) are not applicable.

4.1.7 Variances from Secondary Containment Requirements

The integrity assessment report (Appendix 4B) discusses the following three deficiencies associated with the secondary containment system:

Pump Room Sump. The pump room sump does not comply with secondary containment requirements because liquid must be kept in the sump to provide a seal to prevent airflow between the pump room and feed tank 241-AW-102. Although the sump has a 0.63-centimeter (0.25-inch)-thick stainless steel liner to prevent corrosion of the concrete floor, the sump does not have secondary containment.

Routine Discharges through Secondary Containment. The configuration of the 242-A Evaporator process requires routine, batch discharges of dangerous waste through secondary containment drain lines. These routine discharges include the following.

- Steam condensate, cooling water, and process condensate sample stations drain to the feed tank, 241-AW-102, through drain line DR-343. Total discharge is about 38 liters (10 gallons) per month during operation.
- Sample bottle water sprays down in the feed and slurry sample stations drain to the decontamination sump in the load out and hot equipment storage room. The decontamination sump then drains to the pump room sump. Total discharge is about 76 liters per month during operation.

Transfer Piping Wall Penetrations. Three dangerous waste transfer line piping sections passing through the 242-A Building wall are single-walled, i.e., no secondary confinement in the wall (about 56-centimeter-thick reinforced concrete).

These deficiencies were identified to Ecology, October 28, 1993. Ecology's response stated, "No physical revision of the pipe wall penetrations or the floor drains in the evaporator pump room will be required prior to evaporator restart". The response required the following.

- If at any time leakage is seen or detected from these installations, or if for any reason these installations are repaired or rebuilt, they will be rebuilt or repaired in accordance with regulations.
- Should a spill occur in the evaporator pump room the sump and the piping shall be rinsed three times as required in WAC 173-303-160. 'Appropriate' in this case means that the original regulation was written for a free container, not a sump, so that judgment will have to be used in the application of the regulation. The rinsate shall be transferred to the double-shell tanks.

4.1.8 Tank Management Practices

All waste to be processed at the 242-A Evaporator must be sampled to determine if the waste is compatible with the materials of construction at the 242-A Evaporator. Before each campaign, candidate feed tanks are sampled per the requirements of the waste analysis plan (Chapter 3.0). Based on the results, three possible options are implemented.

- The waste is acceptable for processing without further actions.
- The waste is unacceptable for processing as a single batch, but is acceptable if blended with other waste that is going to be processed.
- The waste is unacceptable for processing.

The 242-A Evaporator process is controlled by the MCS. The MCS computer monitors liquid levels in the vapor-liquid separator (C-A-1) and condensate collection tank (C-100). The MCS system manages liquid levels in the C-A-1 using an auto-cascade function that controls feed delivery to the C-A-1 vessel. The MCS system also manages liquid levels in the C-100 using an auto-cascade function to maintain the tank level at approximately 50-percent. The MCS has alarms that annunciate on high-liquid levels for both C-A-1 and C-100 to notify operators that actions must be taken to prevent overfilling of these vessels.

An interlock is activated when high-liquid level in the vapor-liquid separator (C-A-1) is detected, automatically shutting down the feed transfer pump at feed tank 241-AW-102, thereby preventing overfilling of the vessel and carryover of slurry into the process condensate system. The condensate collection tank (C-100) has an overflow line that routes solution to feed tank 241-AW-102 in case of overfilling.

Process and instrumentation drawings are listed in Section 4.3.

The MCS also provides an automated interlock to shutdown the recirculation pump (P-B-1) and slurry pump (P-B-2) if a leak is detected. The recirculation pump (P-B-1) and slurry pump (P-B-2) will be shutdown automatically using the MCS interlock and/or manually at the direction of the Shift Manager or 242-A Evaporator Control Room Operator if a leak occurs. The process condensate pump (P-C-100) will be shut down manually at the direction of the Shift Manager or 242-A Evaporator Control Room Operator if a leak occurs.

4.1.9 Labels or Signs

A labeling upgrade was completed before restart in 1994 for tank C-100 to identify the waste contents and major risks associated with waste stored within the tank. Tank C-100 ancillary piping is labeled "PROCESS CONDENSATE" to alert trained personnel which pipes in the condenser room contain dangerous waste. The vapor-liquid separator (C-A-1) is located in the evaporator room, a normally unoccupied area. This area is posted as a high radiation area with ALARA access controlled and limited to trained personnel only. The tank labels are visible from the walls of the tank enclosure rooms, which are less than 15 meters from the tank systems; therefore, label visibility requirements are met.

4.1.10 Air Emissions

Tank systems that contain extremely hazardous waste, and is acutely toxic by inhalation must be designed to prevent the escape of such vapors. The DST System waste in the vapor-liquid separator, C-A-1, is designated extremely hazardous waste; however, no determination has been performed to determine if the waste is acutely or chronically toxic. Most of the toxic compounds in the DST waste are not volatile, but because of the high radioactivity of the waste, controls are included to prevent or mitigate the release of tank vapors. The vapor-liquid separator is maintained under vacuum to ensure air leakage is from uncontaminated building air space into the tank vapor space. The boiling vapor in C-A-1 passes through deentrainment pads and sprays to prevent liquid and solid carryover into the vapor section of the tank. The vapor stream passes through three condensers that remove the condensable components. The noncondensable vapors pass through HEPA filters before being discharged to the environment.

4.1.11 Management of Ignitable or Reactive Wastes in Tank Systems

Although the DST System waste reprocessed at the 242-A Evaporator is designated ignitable because of the presence of oxidizers (nitrates and nitrites), the waste does not meet the definition of a combustible or flammable liquid given in National Fire Protection Association (NFPA) code number 30 (NFPA 1996). The buffer zone requirements in NFPA-30, which require tanks containing combustible or flammable solutions be a safe distance from each other and from public way, are not applicable.

An analysis is performed on the DST System waste to be processed to verify the waste does not react exothermically at the elevated temperatures at the 242-A Evaporator. The waste analysis plan (Chapter 3.0) discusses waste acceptance requirements due to reactive waste designation.

4.1.12 Management of Incompatible Wastes in Tank Systems

Waste transferred to the 242-A Evaporator must be compatible before mixing. The waste analysis plan (Chapter 3.0) includes waste compatibility requirements.

4.2 AIR EMISSIONS CONTROL

This section addresses the requirements of Air Emission Standards for Process Vents, under Subpart AA (incorporated by reference in WAC 173-303-690).

4.2.1 Applicability of Subpart AA Standards

The 242-A Evaporator performs distillation that specifically requires evaluation of process vents for the applicability of 40 CFR 264 Subpart AA.

Waste processed at the 242-A Evaporator routinely contains greater than 10 parts per million organic concentrations; therefore, organic air emissions are subject to 40 CFR 264.1032, which requires organic emissions from all affected vents at the Hanford Facility be less than 1.4 kilograms per hour and 2.8 megagrams per year, or control devices be installed to reduce organic emissions by 95%.

The 242-A Evaporator has one process ventilation system that vents both the vapor-liquid separator (C-A-1) and the condensate collection tank (C-100). The vent lines from both tanks combine before entering an off-gas system consisting of a deentrainer, a prefilter/demister, HEPA filters, and an exhaust fan. The vessel vent off-gas system is located on the third floor of the condenser room, with the exhaust stack extending horizontally through the east wall of the building at an elevation of 14.7 meters

above ground level. The exhaust stack bends to run vertically with the discharge point 18.6 meters above ground level.

The annual average flow rate for the vessel vent is given in *Radionuclide Air Emissions Report for the Hanford Site - Calendar* Year *1995* (DOE-RL 1996) as 18 cubic meters per minute and the total annual flow was 9.6 E+06 cubic meters. During waste processing, the airflow is about 20.5 cubic meters per minute, with about 4.3 cubic meters per minute ventilated from tank C-100 and the remainder from the vapor-liquid separator and air in leakage.

Organic emissions occur during waste processing, which is less than 6 months (182 days) each year. This is the maximum annual operating time for the 242-A Evaporator, as shutdowns are required during the year for maintenance outages, candidate feed tank analysis, and establishing transfer routes for staging waste in the DST System. The total operating time for the two campaigns in 1994 was 86 days.

4.2.2 Process Vents - Demonstrating Compliance

This section outlines how the 242-A Evaporator complies with the requirements of 40 CFR 264, Subpart AA, including a discussion of the basis for meeting the organic emission limits, calculations demonstrating compliance, and conditions for reevaluating compliance.

4.2.2.1 Basis for Meeting Limits/Reductions

The TSD units at the Hanford Facility subject to 40 CFR 264, Subpart AA meet the organic air emission limits of 1.4 kilograms per hour and 2.8 megagrams per year, established in 40 CFR 264.1032, by the design of the facility. The 242-A Evaporator and the other TSD units collectively can meet these standards without the use of air pollution control devices.

4.2.2.2 Demonstrating Compliance

Process vent organic air emissions are controlled by establishing limits for acceptance of waste at the 242-A Evaporator. Before startup of each campaign, the waste to be processed is sampled in the DST System to determine the organic content. If the concentrations of organic constituents are less than the limits in the waste analysis plan (Chapter 3.0), the waste can be processed, provided the Hanford Facility will not exceed 1.4 kilograms per hour and 2.8 megagrams per year. The waste acceptance limits in the waste analysis plan are based on equilibrium calculations and assumptions given in *Organic Emission Calculations for the 242-A Evaporator Vessel Vent System* (WHC 1996). The calculation to determine organic emissions consists of the following steps:

1. Determine the emission rate of each candidate feed tank organic constituent by multiplying the constituent concentration by the corresponding partition factor in *Organic Emission Calculations for the 242-A Evaporator Vessel Vent System* (WHC 1996).
2. Sum the emission rates of all organic constituents to determine the emission rate for the candidate feed tank. The maximum emission rate for the campaign is the rate from the candidate tank with the greatest emission rate.
3. Determine the total amount of emission during the campaign by using operating time and a weighted average emission rate, based on the volume of each candidate feed tank processed.

The organic emission rates and quantity of organics emitted during the campaign are determined using these calculations and are included in the operating record for each campaign, as required by 40 CFR 264.1035. The Hanford Facility has a system to ensure organic emissions from units subject to 40 CFR 264, Subpart AA are less than the limits of 1.4 kilograms per hour and 2.8 megagrams per year. Records documenting total organic emissions are available for Ecology review on request.

4.2.2.3 Reevaluating Compliance with Subpart AA Standards

Calculations to determine compliance with Subpart AA will be reviewed when any of the following conditions occur at the 242-A Evaporator:

- Changes in the configuration or operation that affect the assumptions in the Organic Emission Calculations for the 242-A Evaporator Vessel Vent System (WHC 1996)
- Annual operating time exceeds 182 days

4.3 ENGINEERING DRAWINGS

The drawings in Table 4.1 are process and instrumentation diagrams for the systems at the 242-A Evaporator that contact mixed waste. These drawings are provided for general information, and demonstrate adequacy of the tank systems design.

Table 4.1. Process and Instrumentation Diagrams

System	Drawing Number	Drawing Title
Vapor-Liquid Separator	H-2-98988 Sheet 1	P & ID Evaporator Recirc System
Reboiler/Recirculation Line	H-2-98988 Sheet 2	P & ID Evaporator Recirc System
Slurry System	H-2-98989 Sheet 1	P & ID Slurry System
Condensate Collection Tank	H-2-98990 Sheet 1	P & ID Process Condensate System
Secondary Containment Drain System	H-2-98995 Sheet 1	P & ID Drain System
Secondary Containment Drain System	H-2-98995 Sheet 2	P & ID Drain System
Condensers	H-2-98999 Sheet 1	P & ID Vacuum Condenser System
Pump Room Sump	H-2-99002 Sheet 1	P & ID Jet Gang Valve System
Condensate Recycle System	H-2-99003 Sheet 1	P & ID Filtered Raw Water System
Process Condensate Line PC-5000	H-2-79604	Piping Plot for PC-5000 between 242 A and the LERF fence line

The drawings in Table 4.2 are for secondary containment systems for the 242-A Evaporator. Because secondary containment systems are the final barrier for preventing the release of dangerous waste into the environment, modifications that affect the secondary containment systems will be submitted to the Washington State Department of Ecology, as a Class 1, 2, or 3 Permit modifications, as required by WAC 173-303-830.

Table 4.2. 242-A Evaporator Secondary Containment Systems Drawings

System	Drawing Number	Drawing Title
242-A Building	H-2-69277 Sheet 1	Structural Foundation Plan Sections & General Notes - Areas 1 & 2
	H-2-69278 Sheet 1	Structural Foundation Elevations & Details - Areas 1 & 2
	H-2-69279 Sheet 1	Structural First Floor Plan & AMU - Areas 1 & 2
Pump Room Sump Drainage	H-2-69352 Sheet 1	Sections Process Waste Drainage
242-A Building Drainage	H-2-69354 Sheet 1	Plan Process Waste Drainage
Pump Room Sump	H-2-69369 Sheet 1	Pump Room Sump Assembly & Details

Figure 4.1. 242-A Evaporator Simplified Process Flow Diagram

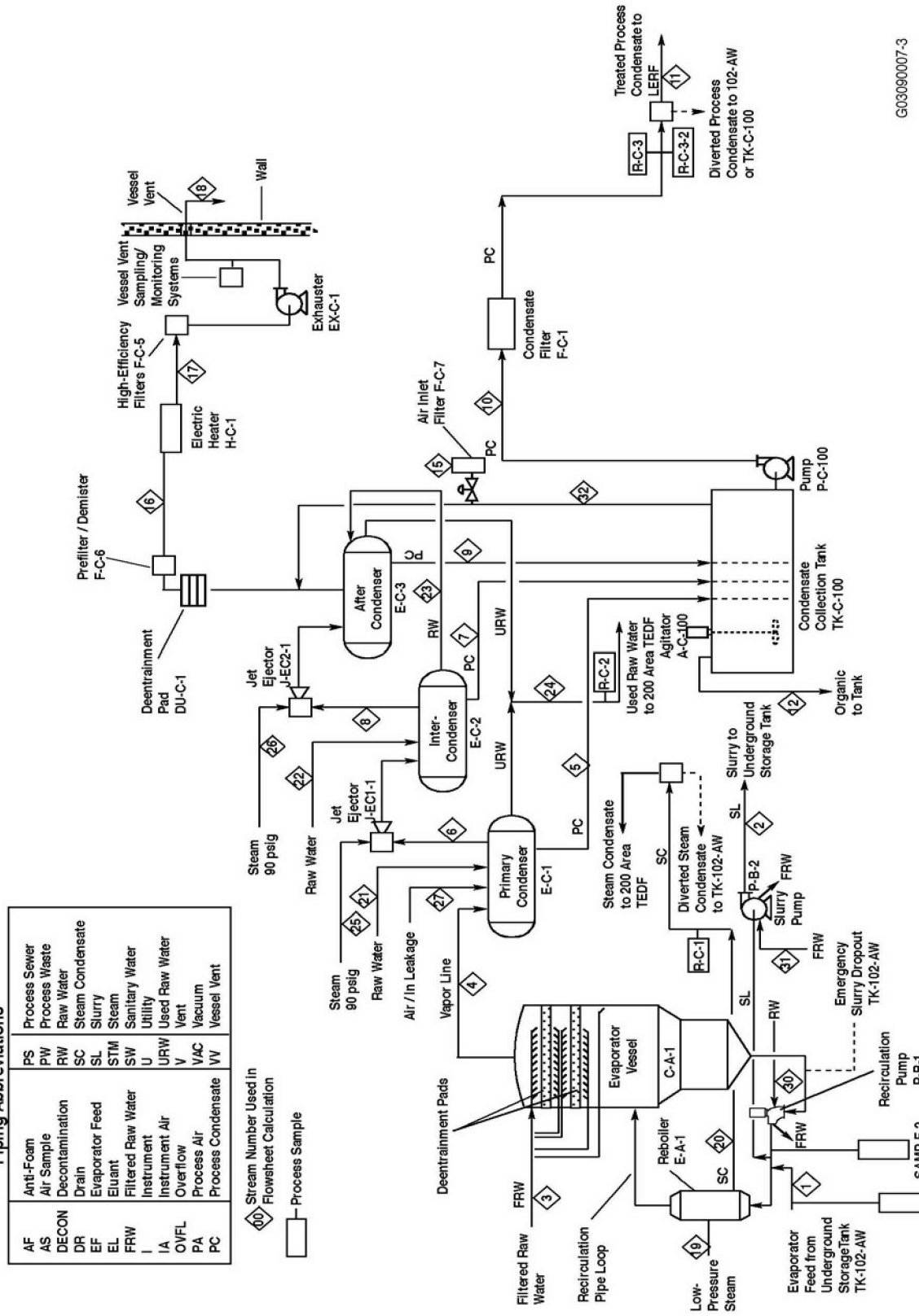


Figure 4.2. 242-A Evaporator Process Loop

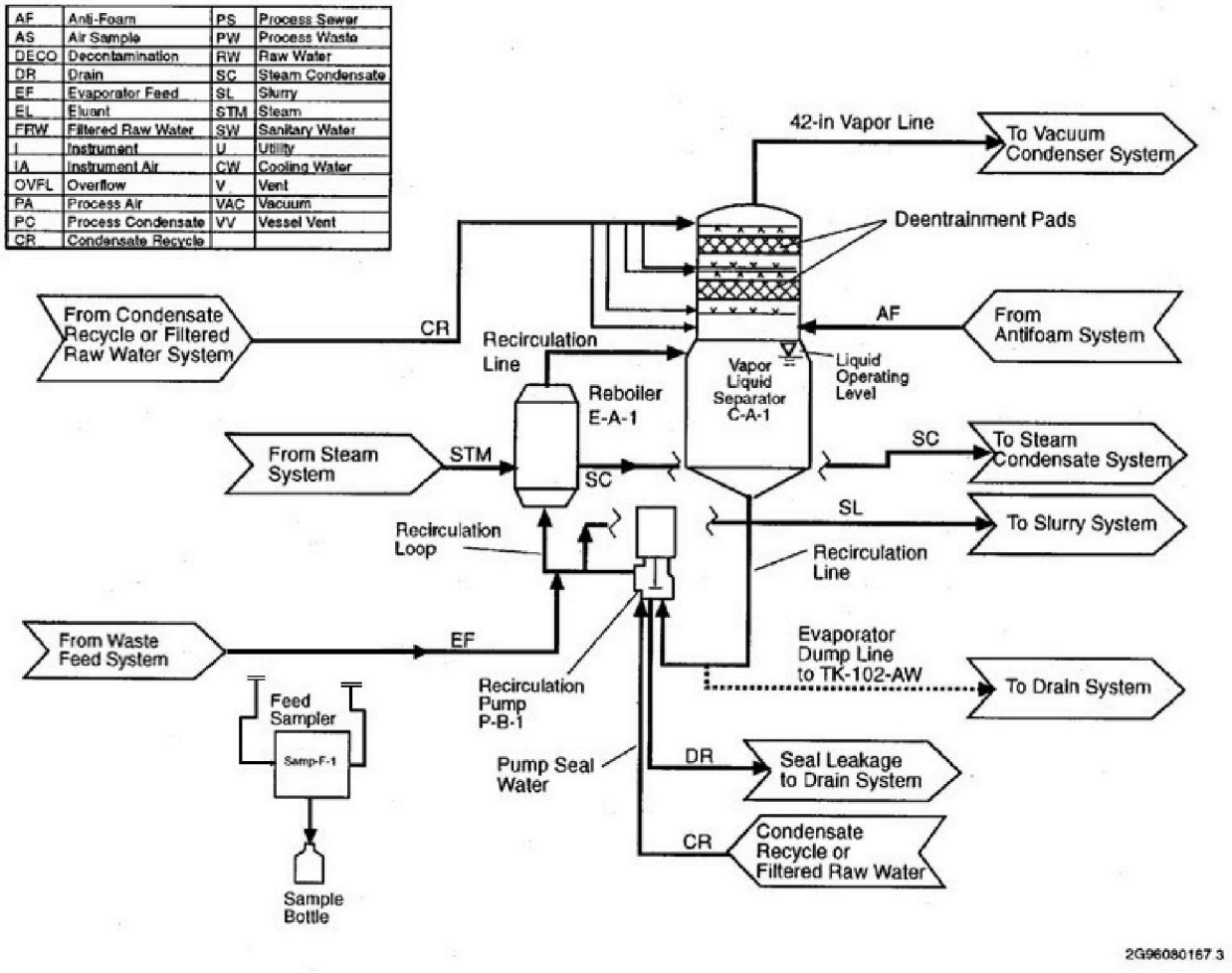


Figure 4.3. 242-A Evaporator Slurry System

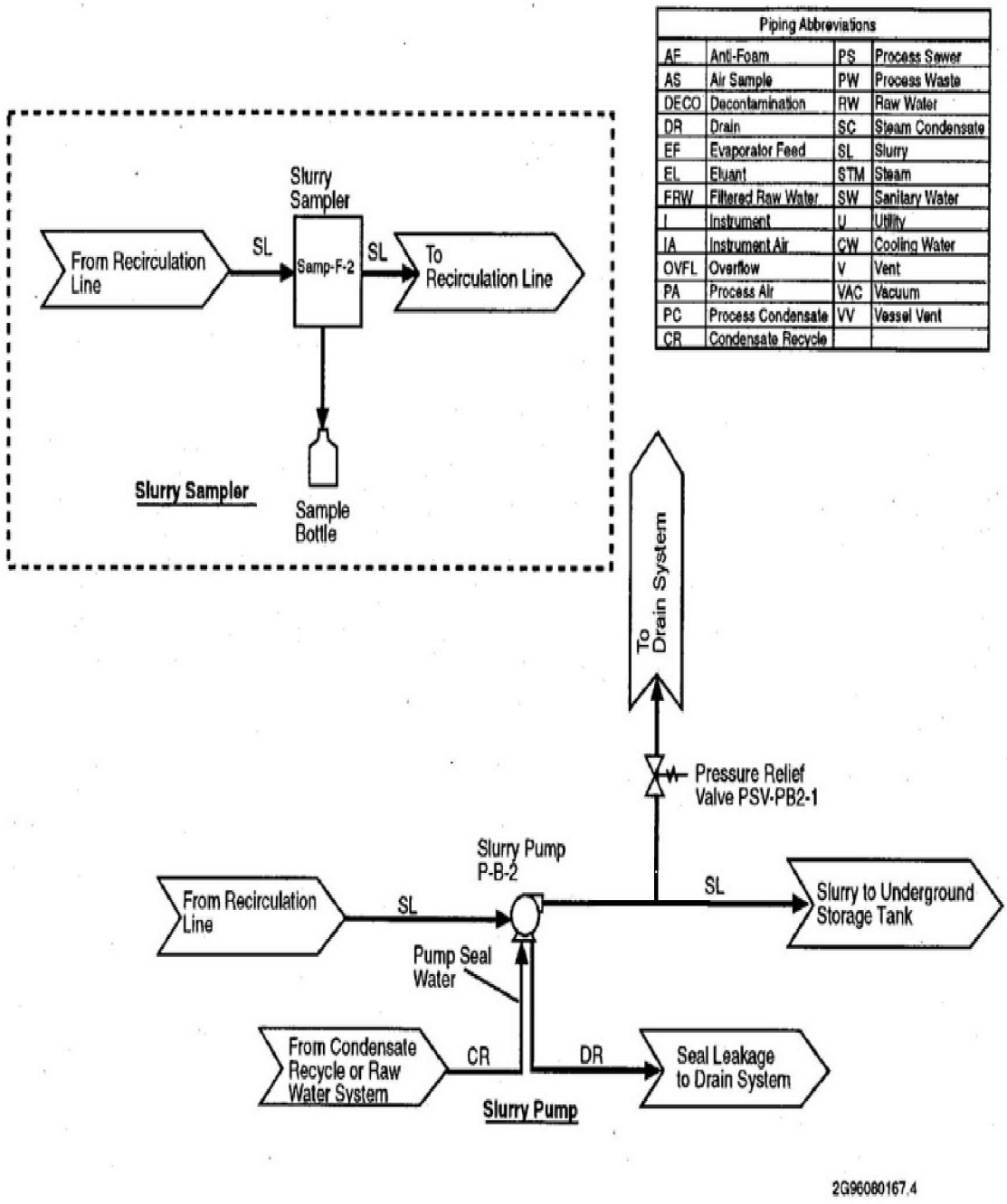
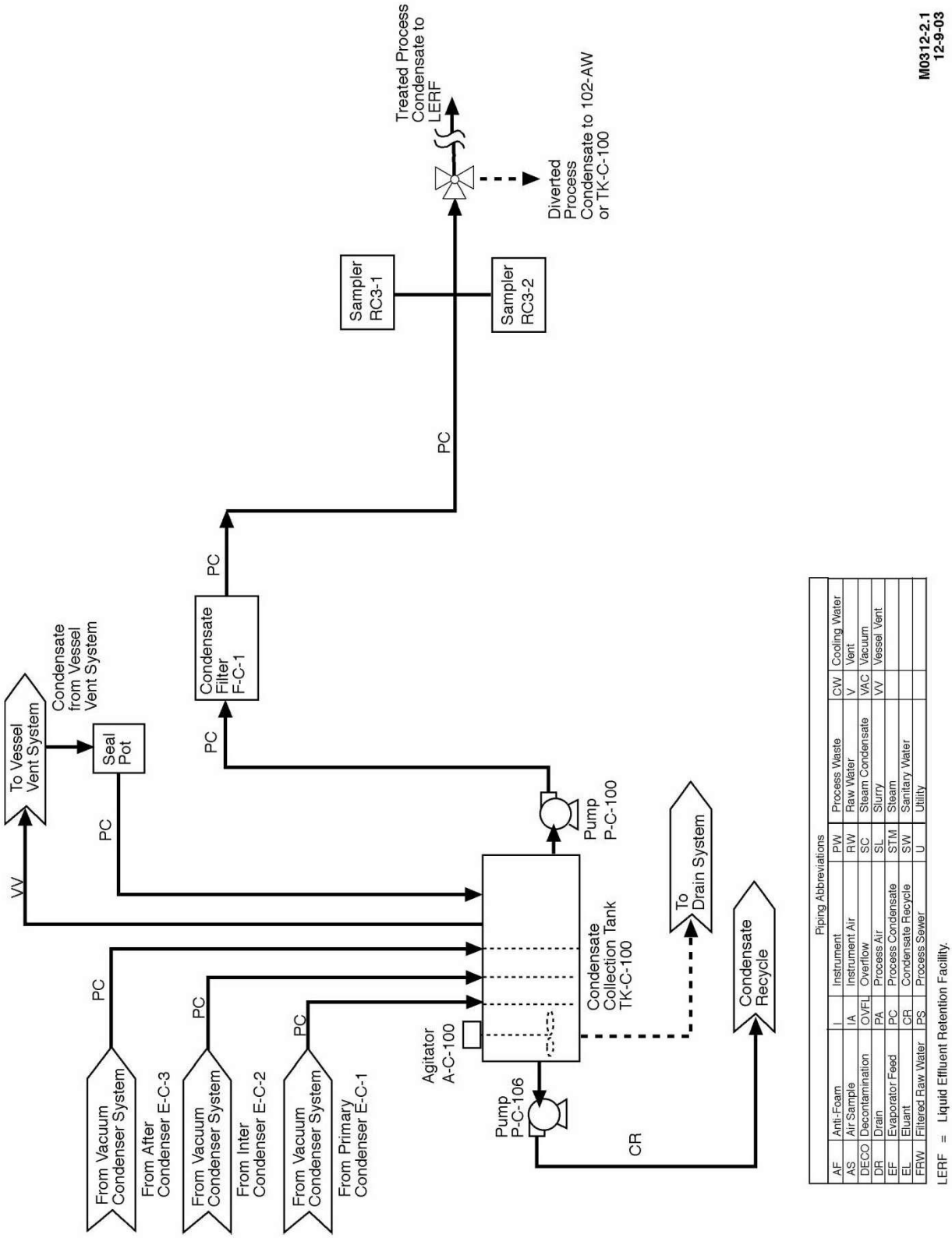


Figure 4.4. 242-A Evaporator Process Condensate System



1 **Figure 4.5. 242-A Evaporator Vacuum Condenser System**

2
3

Piping Abbreviations			
AF	Anti-Foam	PS	Process Sewer
AS	Air Sample	PW	Process Waste
DECO	Decontamination	RW	Raw Water
DR	Drain	SC	Steam Condensate
EF	Evaporator Feed	SL	Slurry
EL	Eluant	STM	Steam
FRW	Filtered Raw Water	SW	Sanitary Water
I	Instrument	U	Utility
IA	Instrument Air	CW	Cooling Water
OVFL	Overflow	V	Vent
PA	Process Air	VAC	Vacuum
PC	Process Condensate	VV	Vessel Vent
CR	Condensate Recycle		

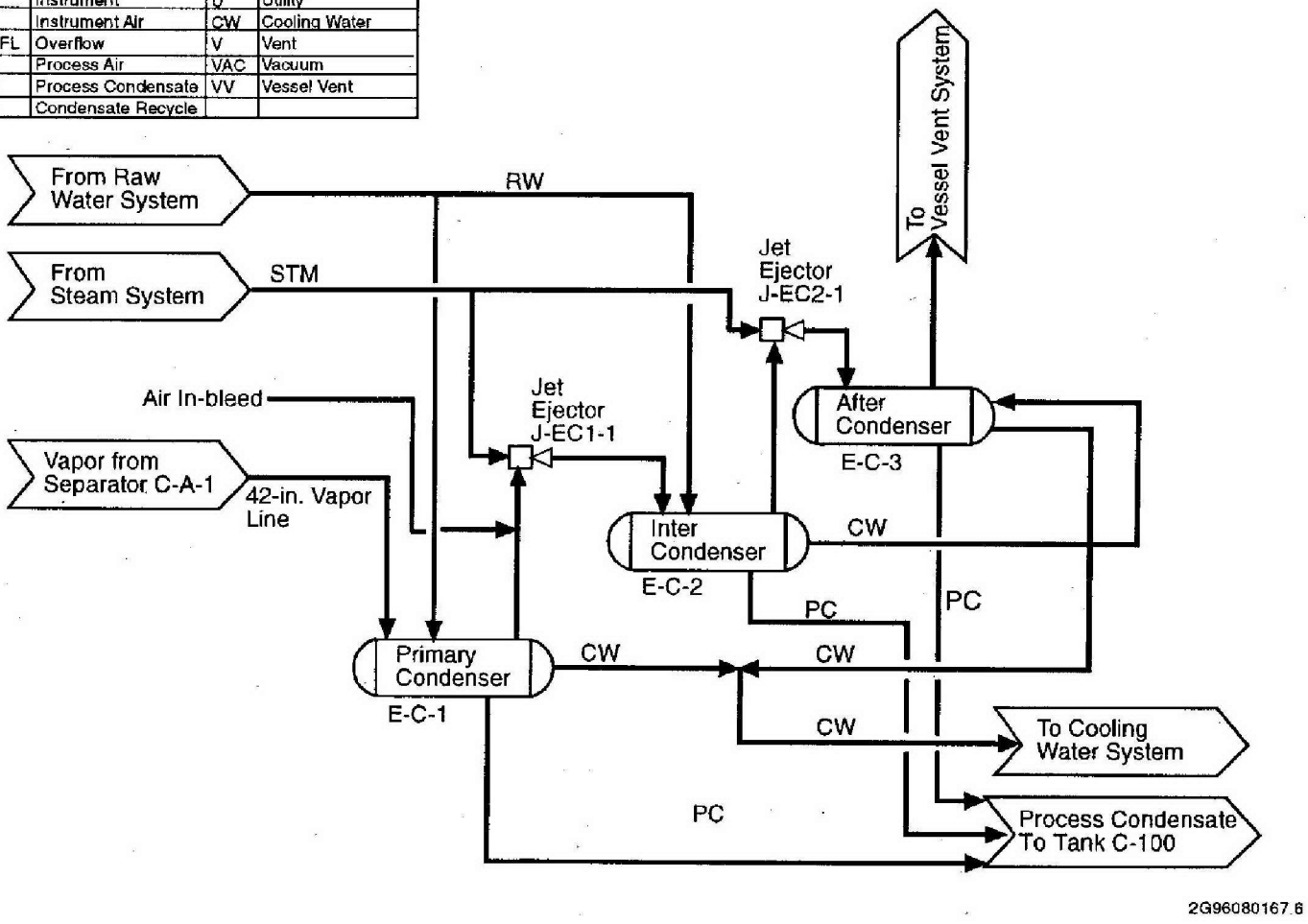
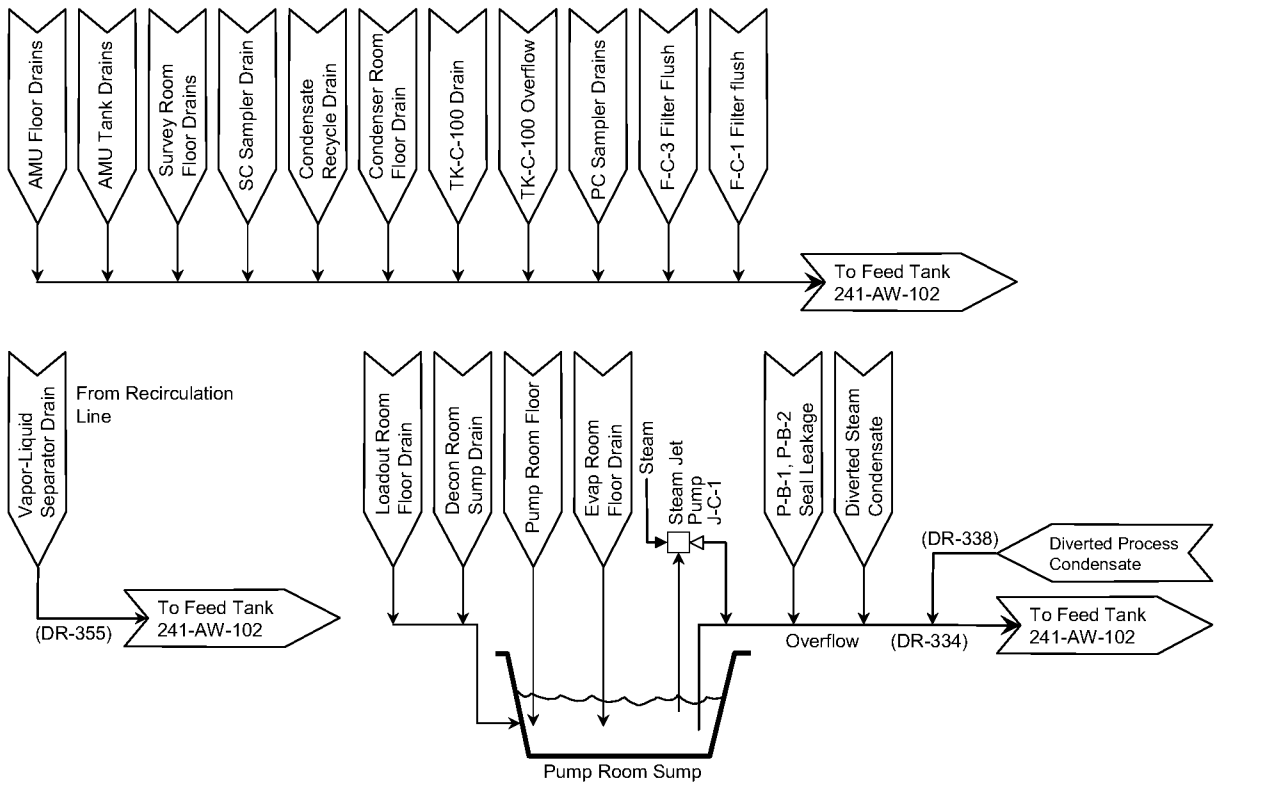


Figure 4.6. 242-A Evaporator Drain System



CHG0508-15

Chapter 11.0 Closure and Financial Assurance

11.0 CLOSURE AND FINANCIAL ASSURANCE 11.1
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11.0 CLOSURE AND FINANCIAL ASSURANCE

This chapter describes the planned activities and performance standards for closing the 242-A Evaporator. Final closure will begin when the 242-A Evaporator is no longer needed.

Where information regarding treatment, management, and disposal of the radioactive source byproduct material and/or special nuclear components of mixed waste (as defined by the Atomic Energy Act of 1954 as amended) has been incorporated into this document, it is not incorporated for the purpose of regulating the radiation hazards of such components under the authority of this permit or chapter 70.105 RCW and its implementing regulations but is provided for information purposes only.

11.1 CLOSURE PLAN/FINANCIAL ASSURANCE FOR CLOSURE

The 242-A Evaporator will be clean closed with respect to dangerous waste contamination that resulted from operation as a TSD unit. To facilitate closure, the 242-A Evaporator is being viewed as consisting of six components: tanks, ancillary equipment, piping, concrete floors/liners, structures, and underlying soil. Only areas that have treated, stored, or handled dangerous waste will undergo closure activities. Remedial actions with respect to contamination that was not a result of use of these areas for treatment, storage, or handling of dangerous waste are outside the scope of this closure plan.

Contaminated equipment, tanks, and piping removed from the 242-A Evaporator will be considered "debris" and transported to an appropriate permitted treatment, storage, or disposal unit for final disposition. Uncontaminated structures will be left for future use or disassembled, dismantled, and removed for disposal. Uncontaminated equipment and structures could include aqueous makeup, HVAC and piping, steam condensate and cooling water piping, the control room, change rooms and administrative/office areas.

The pipes located west and north of the 242-A Evaporator, which connect to A Farm and AW Farm, are in the same bundles with pipes used for transfers between tanks in the DST System. To minimize radiation exposure during closure, these pipes will be closed at the same time the piping for the DST System is closed. Closure of these pipes will be performed per Double-Shell Tank System Dangerous Waste Permit Application (DOE/RL-90-39).Clean closure requires decontamination or removal and disposal of all dangerous waste, waste residues, contaminated equipment, soil, or other material established in accordance with the clean closure performance standards of WAC 173-303-610(2). This and future closure plan revisions will provide for compliance with these performance standards. All work will be performed ALARA with respect to worker exposure to dangerous and/or any other workplace hazards. Activities that are planned to achieve clean closure are presented in the following sections.

11.2 CLOSURE PERFORMANCE STANDARD

Clean closure, as provided for in this plan, and in accordance with WAC 173-303-610(2), will eliminate future maintenance and will be protective of human health and the environment.

After closure, the appearance of the land where the 242-A Evaporator is located will be consistent with the appearance and future use of the surrounding land areas. This closure plan proposes to leave clean structures and equipment in place after closure for potential future operations. This need will be evaluated at the time of closure.

11.2.1 Closure Standards for Metal Surfaces, and Concrete

This closure plan proposes use of a 'clean debris surface' (defined in the following paragraph) as the clean closure performance standard for the metal surfaces, and concrete that will remain after closure. This approach is consistent with Ecology guidance (Ecology 1994) for achievement of clean closure.

Attainment of a clean debris surface can be verified visually in accordance with the standard that states, "A clean debris surface means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to no more than 5% of each square inch of surface area" (40 CFR 268.45).

Decontamination of concrete, per the 'debris rule' is based on a physical extraction method (40 CFR 268.45, Table 1). The performance standard is based on removal of the contaminated layer of debris. The physical extraction performance standard for concrete is removal of 0.6 centimeter of the surface layer and treatment to a clean debris surface.

11.2.2 Closure Standards for Tanks

Using the 242-A Evaporator's decontamination system, the tank system could be flushed and decontaminated. The rinsate will be sampled and analyzed. Results of the analysis with less than designation limits for the constituents of concern will be accepted as indicating that the tanks are clean with respects to dangerous waste residues. An alternative to decontaminating the tanks is to remove and dispose of the tanks accordingly.

11.2.3 Closure Standards for Internal and/or External Piping

The internal and/or external piping of 242-A Evaporator will be flushed and drained as part of closure. For piping where the contaminated surfaces can be inspected, an inspection will be performed to see if the piping meets the clean debris surface standard in 40 CFR 268.45 incorporated by reference and can be declared non-dangerous in accordance with WAC 173-303-071(3)(qq). If it is not possible to inspect the contaminated surfaces or meet the clean debris surface performance standard, the particular piping of concern will be removed, designated, and disposed of accordingly.

The feed sampler (SAMP-F-1) located in a sample enclosure in the Hot Equipment Storage room has been isolated and blanked and will be closed during closure of the 242-A Evaporator. The feed sampler line was designed so that the piping does not contain any level/flat segments and thus facilitates active gravity drainage of liquids. The remaining portion of the feed sampler line that exists between Nozzles J and K is sloped 1° from Nozzle J to a 180° bend and sloped 1° from the 180° bend to Nozzle K.

Dangerous and/or mixed-waste materials generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

11.2.4 Closure Standards for Ancillary Equipment

Ancillary equipment is defined as pumps and other miscellaneous equipment not otherwise specified in this closure plan. Ancillary equipment will be removed and disposed.

11.2.5 Closure Standards for Underlying Soils

Clean closure of soil under the 242-A Evaporator will be accomplished by determining that the coated concrete floor and stainless steel liners, kept contaminants from reaching the soil. The coated concrete and liners provided secondary containment for all the tanks, process piping, and ancillary equipment within the building. Unless inspections identify potential through-thickness cracks indicating containment failure and a subsequent potential for soil contamination from TSD unit operations, the soil will be considered clean closed. However, if inspections identify such cracks, and there have been documented spills in the vicinity, potential soil contamination will be investigated. Soils will be sampled and analyzed for constituents of concerns. If the soil analytical results determine that, the constituents of concern are at or below agreed to regulatory cleanup levels, the soil will be considered clean closed. Permit Condition II.K defines regulatory cleanup levels. Sampling and disposal objectives will be determined at the time of closure activities through the data quality objectives process. If verification sampling is required, a sampling analysis plan will be prepared before closure in a manner consistent with Ecology guidance (Ecology 1994) for achievement of clean closure.

11.3 CLOSURE ACTIVITIES

At the time of closure, the closure plan will be modified as necessary to reflect current regulations and information. If it is determined that clean closure is not possible, the closure plan will be modified to address required postclosure activities.

11.3.1 General Closure Activities

Closure of the 242-A Evaporator will include removal of accumulated liquid waste (i.e., liquid remaining from evaporator campaigns) by transferring the waste to the DST System and/or LERF. After the waste has been removed, clean closure of the tanks, process equipment, the piping, concrete/liners, and the structures will be accomplished by decontaminating the components, if required and demonstrating that clean closure performance standards are met in accordance with WAC 173-303-610. Clean closure of the soil will be accomplished by demonstrating that the concrete and liners kept the contaminants from reaching the soil. If it is determined that soil contamination is possible, investigation and cleanup of the soils will also be managed in accordance with WAC 173-303-610(2)(b).

Equipment or materials (personnel protective equipment, steam cleaners, etc.) used in performing closure activities will be decontaminated or disposed at a permitted TSD facility as appropriate.

11.3.2 Constituents of Concern for Closure for 242-A Evaporator

Based on process knowledge and the risk to human health and the environment, the constituents of concern for closure will be selected from the list of dangerous waste numbers in Chapter 1.0 through the data quality objective process.

11.3.3 Removing Dangerous Waste

All of the waste inventory at the 242-A Evaporator will be processed before closure. Any residue remaining in piping and equipment will be removed to an appropriate TSD unit.

11.3.4 Decontaminating Structures, Equipment, and Soils

Before closure activities begin, all waste inventories will be removed. To facilitate closure, tanks, internal and/or external piping, ancillary equipment, concrete floors/liners, structures, and soil directly beneath the structure will be decontaminated, as necessary, to demonstrate that the clean closure performance standards are met.

Removal and disposal of most of the components will be determined at the time of closure. Clean closure of the soil will be accomplished by demonstrating that the concrete/liners kept contaminants from reaching the soil.

11.3.4.1 Tanks

In accordance with WAC 173-303-640 (8) at closure all pumpable waste will be removed from the interior of the tanks, including the internal components such as the process condensate agitator. Both interior and exterior tanks surfaces will be decontaminated by flushing or spraying with steam, a water-soluble cleaner, or other approved method, or removed as debris and disposed appropriately.

If the tanks are decontaminated, the tanks will be inspected visually for compliance with the clean debris surface standard (40 CFR 268.45, Table 1, Extraction Technologies). If any areas are found not to meet the clean debris surface performance standard, these areas will be decontaminated in-place. Per the debris rule, only removal of contaminants from the surface layer is necessary for metal surfaces. Contamination will be removed as specified in 40 CFR 268.45, Table 1, Extraction Technologies and/or other Ecology approved methods.

If the decontamination option is used, the outside of the tanks also will be inspected for compliance to the clean debris surface standard. Any areas found not to meet this performance standard will be decontaminated in-place. Contamination will be removed from the surface layer using any of the methods described for internal tank decontamination as specified in *Alternate Treatment Standards for Hazardous Debris* (40 CFR 268.45, Table 1, Extraction Technologies and/or other Ecology approved methods).. Before using decontamination solutions on the outside of the tanks, the floor will be inspected for cracks or other openings that could provide a pathway to soil. This inspection will be performed as described in Section 11.2.1 of this chapter in conjunction with mapping of potential through-thickness cracks. Any such cracks will be mapped. The cracks will be sealed before beginning treatment or other engineered containment devices (e.g., collection basins) will be used to collect and contain solutions.

Decontamination waste will be generated as a result of decontamination activities. Decontamination waste may include but not be limited to the following: contaminated rags, and decontamination residue (liquids and solvents used in the decontamination process). This waste will be collected, designated, and managed in accordance with WAC 173-303. If it is not possible to meet the closure by removal or decontamination (clean closure) performance standard, contaminated portions of the tanks could be removed, designated, and disposed of in accordance with 40 CFR 268, incorporated by reference by WAC 173-303-140 as appropriate. The inspections for a clean debris surface will be documented on an inspection record.

11.3.4.2 Internal and/or External Piping and Ancillary Equipment

The internal piping and ancillary equipment for the 242A Evaporator will be flushed and drained as part of closure. For piping where the contaminated surfaces can be inspected, an inspection will be performed to see if the piping meets the clean debris surface standard in 40 CFR 268.45 and can be declared non-dangerous. If it is not possible to meet the clean debris surface standard or the piping cannot be inspected, portions of the internal piping will be removed, designated, and disposed of accordingly.

External piping (transfer lines) and ancillary equipment between 242A and LERF consists of below grade and above grade piping. Below grade piping will be dispositioned at closure either by removal, designation and disposal in accordance with WAC 173-303-610(5) and 40 CFR 268 or closed in accordance with another Ecology approved process. For above grade piping, it will be dispositioned consistent with the provisions for internal piping.

Rinsate from the external piping and internal piping will be processed through ETF. Details regarding the process for rinsing any internal and external piping and ancillary equipment will be provided in the closure plan in accordance with WAC 173-303-610(3)(a)(v) upon modification as stated in Section 11.6 Dangerous and/or mixed-waste generated during closure activities will be managed in accordance with WAC 173-303-610(5). Removal of any dangerous wastes or dangerous constituents during partial or final closure will be handled in accordance with applicable requirements of WAC 173-303-610(5).

If the performance standards are not met, the interior surfaces will be cleaned using an appropriate decontamination method and the method repeated until the surfaces meet the clean closure performance standard.

The 207-A pump pit, located east of the 242-A Evaporator, will be closed using the performance standards for pipes and concrete (e.g., WAC 173-303-610(5) and 40 CFR 268 debris rule standards Table 1, Extraction technologies.). A visual inspection will be performed. If the interior surfaces meet the performance standards (clean debris surface), the 207-A pump pit will be considered clean closed.

If the performance standards are not met for any components described above, the interior surfaces will be cleaned using an Ecology approved decontamination method and the method repeated until the surfaces meet the clean closure (clean debris surface) performance standard; or a decision will be made to remove, designate and dispose of piping and equipment in accordance with WAC 173-303.

11.3.4.3 Concrete/Liner

The coated concrete floor and the pump room sump liner provide secondary containment for all the tanks, process piping, and ancillary equipment. All concrete and liners will be inspected visually and surveyed radiologically before any decontamination. The purpose of the inspection will be twofold: to identify and map any cracks in the concrete that might have allowed contaminants a pathway to the soil below and to identify areas that potentially are contaminated with dangerous waste or dangerous waste residues. The inspection standard will be a clean debris surface as defined in Section 11.2 .1. The inspection of the concrete for a clean debris surface will be documented on an inspection record. Those areas already meeting the standard will be clean closed as is.

Those potentially contaminated areas will undergo decontamination to meet the clean closure standard of a clean debris surface. The concrete will be washed down; the rinsate collected, designated, and disposed of accordingly. The concrete will be re-inspected for a clean debris surface. Concrete surfaces indicated by visual examination, as potentially still being contaminated will have the surface layer removed to a depth of 0.6 centimeter by scabbing or other approved methods. This will not threaten the environment, even if potential through-thickness cracks had been found during the inspection, because concrete decontamination (scabbing) will not employ liquid solutions that could enter cracks and because scabbing residues will be vacuumed away from cracks as any residue is generated.

Achievement of a clean debris surface will be documented on an inspection record. Decontamination residues will be collected, designated, and managed as appropriate.

11.3.4.4 Structures

If contaminated with either dangerous or mixed waste constituents, structures will be decontaminated and/or disassembled, if necessary, packaged, and disposed in accordance with existing land disposal restrictions (WAC 173-303-140).

Closure steps could include the following activities.

- Containerize (as necessary and practicable) and remove any remaining waste.

- Review operating records for spillage incidents and visually inspect area surfaces for evidence of contamination or for cracks that could harbor contamination or allow the escape of decontamination solutions. Inspect storage area surfaces for visible evidence of contamination (e.g., discoloration, material degradation, wetness, and odor). If contamination is evident, the affected area(s) will be decontaminated.

- Decontaminate walls and floors to minimize the potential for loose contamination and to facilitate any required radiation surveys and/or chemical field screening. Wash down could be by water rinse or high-pressure, low-volume steam cleaning coupled with a detergent wash. After decontamination, the building walls and floor will be compared to closure performance standards.

- Collect rinsate and manage as dangerous waste for appropriate disposal.

- Secure (lock) personnel entries into building and post doors with appropriate warning signs.

Clean closure of structures will occur in accordance with WAC 173-303-610. Remediation of soil contamination beneath or around containment buildings will be performed in conjunction soil closure requirements.

11.3.4.5 Underlying Soils

Clean closure of soil under the 242-A Evaporator will be accomplished by demonstrating that the coated concrete floor and stainless steel liners kept contaminants from reaching the soil. The coated concrete floor provided secondary containment for all the tanks, process piping, and ancillary equipment. Unless inspections identify potential through-thickness cracks indicating containment failure and a subsequent potential for soil contamination from TSD unit operations, the soil will be considered clean closed. However, if inspections identify such cracks, and there have been documented spills in the vicinity, potential soil contamination will be investigated.

Where it is possible to inspect visually directly beneath the tanks, a visual inspection will be performed. Where it is not possible to inspect visually beneath the tanks, an evaluation of the tank integrity will be made. The condition of the tank will be evaluated to determine if there was any potential for leakage. If no cracks, severe corrosion, or evidence of leaks is observed, it will be reasoned that mixed or dangerous waste solutions could not have penetrated to the soil directly below the tank.

11.4 MAXIMUM WASTE INVENTORY

The 242-A Evaporator is used to treat mixed waste from the DST System by removing water and most volatile organics. Two waste streams leave the 242-A Evaporator following the treatment process. The first waste stream, the concentrated slurry (in which approximately half the water content is removed and a portion of the volatile organics), is pumped back into the DST System. The second waste stream, process condensate (containing a portion of the volatile organics removed form the mixed waste during the evaporation process), is routed through condensate filters before being transferred to LERF. The 242-A Evaporator is used to treat up to 870,642 liters of mixed waste per day.

Tank C-100 receives process condensate and potentially contaminated drainage from the vessel vent system. The maximum design capacity for the C-100 tank is 67,380 liters.

Vapor-liquid separator, C-A-1, is located in the evaporator room and is used to separate vapor from the boiling slurry solution and deentrain liquid from the vapor before it enters the condensers in the condenser room. The maximum design capacity of C-A-1 is 103,217 liters.

11.5 CLOSURE OF TANKS

Clean closure of 242-A Evaporator will consist of the removal and disposal of all dangerous waste and the decontamination and/or removal and disposal of contaminated equipment, including tanks.

11.6 SCHEDULE FOR CLOSURE

Closure of 242-A Evaporator is not anticipated to occur within the next 15 to 20 years. The actual year of closure will depend on the time required for current waste to be processed and what role the 242-A Evaporator will play in processing additional waste generated during future activities in the 200 Areas. Other factors affecting the year of closure include changes in operational requirements, lifetime extension upgrades, and unforeseen factors. When a definite closure date is established, a revised closure plan will be submitted to Ecology. The activities required to complete closure are planned to be accomplished within 180 days in accordance with WAC 173-303-640(4)(c). Should a modified schedule be necessary, a revised schedule will be presented and agreed to before closure in accordance with WAC 173-303-640(4)(b).

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Hanford Facility RCRA Permit Modification Notification Forms

Part III, Operating Unit 11

Integrated Disposal Facility

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Submitted by Co-Operator

6/25/13
Date

Reviewed by RL Program Office:

For J.D. Dowell

6/25/13
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Hanford Facility RCRA Permit III.16:

PART III, OPERATING UNIT 11 UNIT-SPECIFIC CONDITIONS
INTEGRATED DISPOSAL FACILITY

This document sets forth the operating conditions for the Integrated Disposal Facility (IDF).

III.11.A COMPLIANCE WITH APPROVED PERMIT

The Permittees shall comply with all requirements set forth in the Integrated Disposal Facility (IDF) Permit conditions, the Appendices specified in Permit Condition III.11.A and the Amendments specified in Permit Conditions III.11.B through III.11.I. All subsections, figures, and tables included in these portions are enforceable unless stated otherwise:

OPERATING UNIT 11:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 3.0	Waste Analysis Plan, dated June 30, 2013~~April 9, 2006~~
Chapter 4.0	Process Information, dated December 31, 2008
Appendix 4A	Design Report (as applicable to critical systems), dated March 31, 2008
Appendix 4B	Construction Quality Assurance Plan, dated April 9, 2006
Appendix 4C	Response Action Plan, dated April 9, 2006
Appendix 4D	Technical specifications document (RPP-18-489 Rev 0), dated December 31, 2006
Chapter 5.0	Ground Water Monitoring, dated June 30, 2010
Chapter 6.0	Procedure to Prevent Hazards, dated June 20, 2013~~December 31, 2012~~
Addendum J.1	Contingency Plan – Pre-Active Life, dated June 30, 2012
Addendum J.2	Contingency Plan – Active Life, dated June 30, 2012
Chapter 8.0	Personnel Training, dated November 21, 2007
Chapter 11.0	Closure and Post Closure Requirements, dated December 31, 2008

General and Standard Hanford Facility RCRA Permit, WA7 89000 8967 (Permit) conditions (Part I and Part II Conditions) applicable to the IDF are identified in Permit Attachment 3 (Permit Applicability Matrix).

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1[1]	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. The Chapter 6 date change is associated with a recently processed Class 2 modification.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology: 6/24/13

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

E. R. Skinnarland | Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1], if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
Integrated Disposal Facility	**Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.1 :

3.1 DESCRIPTION OF UNIT PROCESSES AND ACTIVITIES

The IDF will be a single, expandable disposal facility constructed to RCRA Subtitle C standards, half of which is for disposal of mixed waste the other half will be for disposal of low-level waste. Initial capacity for mixed waste disposal is 82,000 cubic meters of waste with an ultimate capacity of up to 450,000 cubic meters of waste. Disposal capacity beyond the initial 82,000 cubic meters will require a modification to the Part B Permit. The mixed waste types to be disposed in the IDF include vitrified LAW from the RPP-WTP and DBVS. Additionally, mixed waste generated by IDF operations will be disposed of in IDF.

The mission of the RCRA portion of the IDF is to provide an approved disposal facility for the permanent, environmentally safe disposition of mixed waste and RCRA waste.

For ILAW, and BVW the container packaging and handling will be designed to maintain containment of each waste type, limit intrusion, and limit human exposure at the IDF. ILAW containers will be transported from the RPP-WTP to the IDF using a tractor-trailer system. BVW will be transported from the DBVS staging area to IDF using a similar system. Transport of the ILAW and BVW to the landfill will occur along a pre-determined route.

The lined landfill will have a leachate collection and removal system. The leachate collection tanks will be operated in accordance with the generator provisions of WAC 173-303-200 and are not subject to this WAP.

Additional information is located in Chapter 1.0 (IDF Part A), ~~Chapter 2.0 (Facility Description),~~ and Chapter 4.0 (Process Information).

WAC 173-303-830 Modification Class [1,2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, the chapter on "Facility Description" was eliminated.

Modification Approved: [✓] Yes [ ] No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
Integrated Disposal Facility	**Part III, Operating Unit 11**

Description of Modification:

Chapter 3.0, Section 3.2 :

3.2 IDENTIFICATION AND CLASSIFICATION OF WASTE

The ILAW, BVW, and newly generated mixed waste will be accepted for disposal. The mixed waste disposed of at the IDF is received from waste generated within IDF, and two other Hanford Facility TSD units (RPP-WTP and DBVS). The following waste will not be accepted for disposal at this TSD unit:

- Waste is not accepted for disposal when the waste contains free-standing liquid unless all free-standing liquid:
  - Has been removed by decanting or other methods
  - Has been mixed with sorbent or stabilized (solidified) so that free-standing liquid is no longer observed
  - Otherwise has been eliminated
  - Container is very small, such as an ampoule
  - Container is a labpack and is disposed in accordance with WAC 173-303-161 or 40 Code of Federal Regulations (CFR) 264.316
  - Container is designed to hold free liquids for use other than storage, such as a battery or capacitor.

  There could be cases in which small amounts of residual liquids are present in mixed waste containers because condensate has formed following packaging or free liquids remain in debris items (e.g., pumps, tubing) even after draining. When it is not practical to remove this residual liquid, the free liquid must be eliminated to the extent possible by adding a quantity of sorbent sufficient to sorb all residual liquids.

  Free liquid is determined by SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Method*, Method 9095 (Paint Filter Liquids Test) [WAC 173-303-140(4)(b) and 40 CFR 264.314(d)] only for waste that has the potential for free liquid formation.
- Gaseous waste not accepted for disposal if the is waste packaged at a pressure in excess of 1.5 atmospheres at 20°C
- Pyrophoric waste is not accepted for disposal. Waste containing less that 1 weight percent pyrophoric material partially or completely dispersed in each package is not considered pyrophoric for the purposes of this requirement.
- Solid acid waste is not accepted for disposal [WAC 173-303-140 (4)(c)]
- Extremely hazardous waste that does not meet WAC 173-303-140(4)(d) is not accepted for disposal. Extremely hazardous waste that has been treated could be disposed in accordance with Revised Code of Washington (RCW) 70.105.050(2), "Hazardous Waste Management".
- Organic/carbonaceous waste that does not meet WAC 173-303-140(4)(d) is not accepted for disposal
- Waste not meeting the LDR treatment standards is not accepted for disposal [40 CFR 268 and WAC 173-303-140(4)]

Waste streams will be evaluated during pre-shipment review to ensure that the waste streams do not contain constituents incompatible with the liner system in concentration sufficient to degrade the liner. Table 1 provides a list of chemicals shown to be incompatible with the liner material at 100% concentrations (WHC-SD-WM-TI-714). In general, mixed waste that meets federal and state treatment standards would be compatible with the TSD unit liner system. Waste accepted at the IDF will be compatible with the liner. Constituents in Table 1 will not be accepted for disposal (refer to Section 3.4.92.1.3 for waste stream compatibility).

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:

Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.4.0 as the reference.

Modification Approved: [✓] Yes [ ] No (state reason for denial)

Reason for denial:

Reviewed by Ecology:

E. R. Skinnarland 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.3 :

3.3 MANAGEMENT OF WASTE

The ILAW, BVW, and newly generated wastes (see Section 3.3.1~~1.3.1~~) generated during normal operations of this TSD unit are accepted at this TSD unit for disposal. The two onsite TSD units (RPP-WTP and DBVS) transferring/shipping waste to this TSD unit hereafter are referred to as the 'generator' unless otherwise denoted in this WAP. The waste acceptance process for transfers from the generator is identified in Figure 1.

Written waste tracking procedure(s) are implemented to ensure waste received at the TSD unit matches the manifest or transfer papers, to ensure that the waste is tracked though the TSD unit to final disposition, and to maintain the information required in WAC 173-303-380. The waste tracking process provides a mechanism to track waste through a uniquely identified container. The unique identifier is a barcode (or equivalent) that is recorded in the Solid Waste Information Tracking System (SWITS). This mechanism encompasses the waste acceptance process, the movement of waste, the processing of waste, and management of the waste. The container identification number provides traceability between the TSD unit and the hard copy of records that are maintained as part of the operating record to ensure information relative to the location, quantity, and physical and chemical characteristics of the waste are available.

The following sections describe the process for waste acceptance and the different types of information and knowledge reviewed/required during the acceptance process. The process for management of waste is described in Section 3.4~~Chapter 4.0~~

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.3.1 and Section 3.4 as the references.

Modification Approved: [✓] Yes [ ] No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
~~E. R. Skinnarland~~ SDA 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1 :

3.4.1 Pre-Shipment Review

Pre-shipment review takes place before waste can be scheduled for transfer or shipment to this TSD unit. The review focuses on whether the waste stream is defined accurately and meets the TSD unit waste acceptance criteria and whether the LDR status is determined correctly. Only waste determined to be acceptable for storage (see Section 3.4.1.2.2~~4.0~~) and/or disposal is scheduled. This determination is based on the information provided by the generator. The pre-shipment review consists of waste stream approval and the waste shipment approval process. The following sections discuss the pre-shipment review process. The information obtained during the pre-shipment review, at a minimum, includes all information necessary to safely dispose of the waste. The pre-shipment review ensures the waste is characterized and the data provided qualify as 'acceptable knowledge' (Section 3.4.1.4~~2.1.5~~).

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.4.1.2.2 and Section 3.4.1.4 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland
6/24/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1.1 :

3.4.1.1 Pre-Shipment Review of Wastes

Pre-shipment review for ILAW and BVW waste containers will take place at RPP-WTP and the DBVS staging area respectively before either type of containers can be scheduled for transfer to the IDF. The review will focus on whether the waste stream is defined accurately, meets the waste acceptance criteria, and the land disposal restrictions (LDR) status was determined correctly. Only waste determined to be acceptable for storage (see section 3.4.1.2.24.0) and/or disposal will be scheduled. This determination will be based on the information provided by the generator. The pre-transfer review will consist of the waste profile documentation and waste transfer approval process. The following sections discuss the pre-transfer review process. ILAW and BVW containers received for land disposal will be at least 90 % full. The information obtained from the generator, at a minimum, will contain five elements: (1) documentation to ensure waste can be managed pursuant to the Part A, Form 3, (2) documentation to ensure the waste is not a prohibited waste in accordance with Section 3.21.2, (3) a determination if the waste is an ignitable, reactive, or incompatible waste as defined in WAC 173-303-040, (4) documentation that waste meets LDR requirements of 40 CFR 268 and WAC 173-303-140, and (5) operational restrictions on acceptance of waste.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.4.1.2.2 and Section 3.2 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
Integrated Disposal Facility	**Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1.2.1 :

3.4.1.2.1 Waste Stream Approval for ILAW and BVW

During the waste profile documentation process, the IDF waste acceptance organization will obtain the following information:

- Description of waste generating process
- Characterization data
- Dangerous waste numbers
- LDR data (as specified in Section 3.4.107.0)
- Composition of ILAW and BVW including regulated constituents of concern (refer to Chapter 1.0 of the permit application -Part A Form).

The waste profile documentation process will be as follows.

1. Appropriate generator fills out waste profile documentation.
2. The IDF designated waste acceptance organization reviews the waste profile information against the waste acceptance criteria for each ILAW or BVW transfer.
3. If discrepancies are noted, the IDF designated waste acceptance organization requests additional information from the generator to address discrepancies for either: (1) inconsistent information and (2) information not constituting acceptable knowledge (refer to Section 3.4.1.4.12.1.5).

WAC 173-303-830 Modification Class [1,2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.4.10 and Section 3.4.1.4.1 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1.2.2 :

3.4.1.2.2 Waste Stream Approval for Newly Generated Mixed Waste

The waste stream approval process for wastes generated during IDF operations (except for leachate) consists of reviewing stream information supplied on a waste stream profile and supporting documentation. The waste stream profile requires the following supporting documentation:

- Generator information (e.g., name, address, point-of-contact, telephone number)
- Waste stream name
- Waste generating process description
- Waste numbers
- Chemical characterization information [e.g., characterization method(s), chemicals present, concentration ranges]
- Designation information
- LDR information including identification of underlying hazardous constituents if applicable
- Waste type information (e.g., physical state, adsorbents used, inert materials, stabilizing agents used)
- Packaging information (e.g., container type, maximum weight, size).

Attachments could consist of container drawings, process flow information, analytical data, etc.

In some cases, such as variable waste streams, the waste stream profile information could be general in nature. In these cases, more detailed information is gathered during the waste shipment approval process on a per shipment basis. This information is reviewed against the TSD unit waste acceptance criteria to ensure the waste is acceptable for receipt. If conformance issues are found during this review, additional information is requested that could include analytical data or a sample to be analyzed. If the waste cannot be received, the TSD unit pursues acceptance of the waste at an alternate TSD unit. Once the waste meets the waste acceptance criteria, the TSD unit assigns the profile to a waste specification record and establishes a waste verification frequency based on the requirements found in Section 3.4.2~~2.3~~. Profile information is re-evaluated as discussed in Section 3.4.7~~6.0~~.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.4.2 and Section 3.4.7 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1.3 :

3.4.1.3 Waste Transfer/Shipment Approval Process

After the appropriate generator has received the waste profile documentation approval from IDF (refer to Section 3.4.1.2.1~~2.1.3~~), the generator waste transfer will be subjected to the waste transfer approval process. Only those ILAW and BVW containers approved under the waste profile documentation as part of the waste transfer approval process will be transferred to the IDF. During the waste transfer approval process, the IDF designated waste acceptance organization will obtain the following information.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.4.1.2.1 as the reference.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
~~E. R. Skinnarland~~ SDahl 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.1.4.1 :

3.4.1.4.1 General Acceptable Knowledge Requirements

One or more of the following types of information could be considered, provided that the information is of sufficient quality to demonstrate compliance with applicable waste acceptance criteria:

- Mass balance from a controlled process that has a specified output for a specified input
- Material safety data sheet on chemical products
- Test data from a surrogate sample
- Analytical data on the waste or a waste from a similar process.

In addition, acceptable knowledge requirements can be met using a combination of analytical data or screening results and one and/or more of the following information:

- Interview information
- Logbooks
- Procurement records
- Qualified analytical data
- Radiation work package
- Procedures and/or methods
- Process flow charts
- Inventory sheets
- Vendor information
- Mass balance from an uncontrolled process (e.g., spill cleanup)
- Mass balance from a process with variable inputs and outputs (e.g., washing/cleaning methods).

If the information is sufficient to quantify the constituents of regulatory concern and to determine waste characteristics as required by the regulations and TSD unit waste acceptance criteria, the information is considered acceptable. Adequate acceptable knowledge includes (1) general waste knowledge requirements and/or (2) LDR waste knowledge requirements.

(1) **General waste knowledge requirements**. At a minimum, the generator supplies enough information for the waste to be managed at this TSD unit (refer to Section 3.4.1.12.1.3). The minimum level of acceptable knowledge consists of designation data where the constituents causing a waste number to be assigned are quantified and that data address any TSD unit operational parameters necessary for proper management of the waste.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.4.1.1 as the reference.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.2 :

3.4.2 Verification

Verification is an assessment performed by this TSD unit to substantiate that the waste received is the same as represented by the analysis supplied by the generator for the pre-shipment review. Verification for ILAW and BVW containers will contain one element, a 100% container receipt inspection. Physical/chemical screening will not be performed on the ILAW or BVW containers. Waste is not accepted by the TSD unit for disposal until the required elements of verification have been completed, including evaluation of any data obtained from verification activities. All conformance issues identified during the verification process are resolved in accordance with Section 3.4.3~~2.3.3~~. Verification activity results will be documented by the IDF designated waste acceptance organization.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.4.3 as the reference.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
~~E. R. Skinnarland~~ SDyhl 6/14/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.3 :

3.4.3 Waste Acceptance

Initial acceptance of waste occurs only after the confirmation process described in Section 3.42.0 is complete. Conformance issues identified during the confirmation process are documented and managed in accordance with Section 3.4.1.2.22.3. Conformance issues that must be corrected before waste acceptance include the following:

- Waste that is not identified in the Part A, Form 3 (Chapter 1.0)
- Waste does not match approved profile documentation
- Designation, physical, and/or chemical characterization discrepancy
- Incorrect LDR paperwork
- Packaging discrepancy
- Manifest discrepancies as described in WAC 173-303-370(4).

WAC 173-303-830 Modification Class [1,2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.4 and Section 3.4.1.2.2 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.9 :

3.4.9 Procedures for Ignitable, Reactive, and Incompatible Waste

Waste stream compatibility (i.e., compatibility between individual waste streams and compatibility between waste streams and landfill design and construction parameters) and waste stream ignitability will be assessed on a case-by-case basis. Criteria for assessing and determining compatibility and ignitability will be identified in either the facility Waste Acceptance Criteria, Waste Analysis Plan, or other protocol or procedure as appropriate. Should these wastes be accepted, appropriate administrative and engineering controls will be implemented as necessary.

This TSD unit does not accept reactive waste (refer to Section 3.2~~1.2~~ and Section 3.4.1.1~~2.0~~). The TSD unit ensures that reactive waste is not accepted at this TSD unit in the following manner.

- Pre-shipment review will identify whether the waste is reactive based on the definition contained in WAC 173-303-040.
- If analysis of the characterization information leads to a conclusion that the waste is a reactive waste, the containers, or waste will not be accepted.

The types of prohibited waste not accepted at this TSD unit as listed in Section 3.2~~1.2~~.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, these references should have been corrected to identify Section 3.2 and Section 3.4.1.1 as the references.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

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Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
Integrated Disposal Facility	**Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.10 :

3.4.10 Provisions for Complying With Federal and State Land Disposal Restriction Requirements

State-only and federal LDR requirements restrict the land disposal of certain types of waste subject to RCRA and RCW 70.105, "Hazardous Waste Management", as amended. Waste managed on the Hanford Facility falls within the purview of these LDRs per 40 CFR 268 and WAC 173-303-140. The treatment standards for mixed waste disposed at IDF are based on the dangerous waste numbers accepted as documented on the IDF Part A as well as additional information necessary for identifying treatability groups etc.

The IDF will not perform sampling and analysis to determine compliance with treatment standards contained in 40 CFR 268. Any sampling and analysis results required to demonstrate compliance with concentration-based treatment standards contained in 40 CFR 268.40 will be obtained by IDF waste acceptance organization from the generator, during the waste profile documentation process to meet the requirements of 40 CFR 268.7(c)(2). Sampling and analysis results will be placed into the unit-specific portion of the Hanford Facility operating record. Other LDR records are identified in WAC 173-303-380(1)(m) and will be obtained from the generator, by IDF personnel as part of either the waste profile documentation process or the waste transfer approval process. The treated waste must meet all applicable LDRs to be accepted for disposal at the IDF. IDF will obtain the LDR certification from the treatment unit.

Mixed waste constituents that are subject to LDRs are identified in 40 CFR 268.40 by reference in WAC 173-303-140(2), the extremely hazardous waste disposal requirements for DOE facilities contained in RCW 70.105.050(2), and the state-only LDRs contained in WAC 173-303-140(4)(b)-(d). The mixed waste must meet certain treatment standards, as specified in 40 CFR 268.40, RCW 70.105.050(2), and WAC 173-303-140(4)(b)-(d), if the waste is to be land disposed. Any waste requiring LDR treatment must be treated prior to acceptance into the IDF.

State-only LDRs for mixed waste will be met in the following manner:

- Extremely hazardous waste disposal requirements in RCW 70.105.050(2) concerning "all reasonable methods" will be met by the treatment performed to meet 40 CFR 268, WAC 173-303-140(4)(b)-(d), and DOE requirements for disposal. If no treatment is required to meet 40 CFR 268, WAC 173-303-140(4)(b)-(d), or DOE requirements, no treatment is required to dispose of extremely hazardous waste at the IDF.
- Special requirements for bulk and containerized liquids in WAC 173-303-140(4)(b) are identical to the landfill requirements contained in 40 CFR 264.314. For mixed waste, including the provisions when to perform the paint filter test, these requirements are described in Section 3.21.2 of the WAP.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.2 as the reference.

Modification Approved: ☑ Yes ☐ No (state reason for denial) Reason for denial:	Reviewed by Ecology: E. R. Skinnarland SDuhl 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
Integrated Disposal Facility	**Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.4.11 :

3.4.11 Off-Specification Waste

Off-Specification ILAW or BVW is waste not meeting the waste acceptance criteria as described in Section 3.4~~2.0~~, Confirmation Process. ILAW or BVW streams determined to be off-specification may be temporarily stored in the RCRA lined portion of the IDF pending resolution of discrepancy or return to generating TSD as long as these wastes meet LDR. ILAW and BVW may be temporarily stored in the RCRA lined portion of the IDF, provided the temperature administrative control limit is not exceeded, until sufficiently cool for disposal.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, this reference should have been corrected to identify Section 3.4 as the reference.

Modification Approved: [✓] Yes [ ] No (state reason for denial)
Reason for denial:

Reviewed by Ecology:

~~E. R. Skinnarland~~ SDahl 6/4/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.6 :

3.6 RECORDKEEPING

Recordkeeping requirements that will be applicable to this WAP are described in Chapter 12.0, and as follows:

- Confirmation records described in Section 3.4~~2.0~~ will be maintained in accordance with Condition II.I.1.b of the Hanford Facility RCRA Permit, Dangerous Waste Portion (Ecology 2001).
- Waste profile documentation described in Section 3.4.1.2.1~~2.0~~ will be maintained in accordance with Condition II.I.1.j of the Hanford Facility RCRA Permit, Dangerous Waste Portion.
- LDR records described in Section 3.4.10~~7.0~~ will be maintained in accordance with WAC 173-303-380(1)(m) in the IDF unit-specific portion of the Hanford Facility operating record.

WAC 173-303-830 Modification Class [1,2]	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. This change is administrative in nature as it corrects the formatting (numbering) to reflect the changes to the sections of the permit when it was finalized (and renumbered/modified). When this unit was finalized, Chapter 12.0 was eliminated and references should have been corrected to identify Section 3.4, Section 3.4.1.2.1, and Section 3.4.10 as the references.

Modification Approved: [✓] Yes [ ] No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland Date 6/24/13

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class [1]1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Integrated Disposal Facility**	Permit Part **Part III, Operating Unit 11**

Description of Modification:
Chapter 3.0, Section 3.7 :

3.7 REFERENCES

~~AOAC, 2000, *Official Methods of Analysis of AOAC International*, Vols. I and II, 17th Edition, Association of Official Analytical Chemists, Gaithersburg, Maryland.~~

~~APHA, 1998, *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, American Public Health Association, American Water Works Association, and Water Environment Federation, Washington, D.C.~~

~~ASTM, 2002, *Annual Book of ASTM Standards*, American Society for Testing and Materials, Philadelphia, Pennsylvania.~~

~~DOE/RL-88-20, *Hanford Facility Dangerous Waste Permit Application, Low-Level Burial Grounds*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.~~

~~DOE/RL-88-21, *Hanford Facility Dangerous Waste Part A Permit Application*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.~~

~~DOE/RL-91-28, latest revision, *Hanford Facility Dangerous Waste Permit Application, General Information Portion*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.~~

~~DOE/RL-2003-12, *Hanford Facility Dangerous Waste Permit Application, Integrated Disposal Facility*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.~~

Ecology, 2001, "Hanford Facility RCRA Permit, Dangerous Waste Portion", Washington State Department of Ecology, Olympia, Washington as amended.

~~EPA 1994, "Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes", U.S. Environmental Protection Agency, OSWER 9938.4-03, PB94-963603, April 1994.~~

~~EPA-600/4-79-020, *Methods for Chemical Analysis of Water and Wastes*, U.S. Environmental Protection Agency, Cincinnati, Ohio.~~

~~SNT-TC-1A, 2001, *Personnel Qualification and Certification in Nondestructive Testing*, American Society for Nondestructive Testing, Columbus, Ohio.~~

SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Method*, latest edition, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D.C.

~~WA7890008967, latest revision, *Hanford Facility Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste*, Washington State Department of Ecology, Olympia, Washington.~~

WHC-SD-WM-TI-714, *High-Density Polyethylene Liner Chemical Compatibility for Radioactive Mixed Waste Trenches*, 1995, Westinghouse Hanford Company, Richland, Washington.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1

Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes. The changes are administrative in nature as it corrects the references to reflect the changes to the sections of the permit when it was finalized. This specific references deleted were not used in the document and should have been deleted during the final editing for the permit.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 6/24/13 Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Remove and Replace the Following Sections:

Remove Part III Permit Conditions, dated December 31, 2012, and replace with Permit Conditions, dated June 30, 2013.

Remove Chapter 3.0, dated April 9, 2006, and replace with Chapter 3.0, dated June 30, 2013.

PART III, OPERATING UNIT 11 UNIT-SPECIFIC CONDITIONS
INTEGRATED DISPOSAL FACILITY

This document sets forth the operating conditions for the Integrated Disposal Facility (IDF).

III.11.A COMPLIANCE WITH APPROVED PERMIT

The Permittees shall comply with all requirements set forth in the Integrated Disposal Facility (IDF) Permit conditions, the Appendices specified in Permit Condition III.11.A and the Amendments specified in Permit Conditions III.11.B through III.11.I. All subsections, figures, and tables included in these portions are enforceable unless stated otherwise:

OPERATING UNIT 11:

Chapter 1.0	Part A Form, dated October 1, 2008
Chapter 3.0	Waste Analysis Plan, dated June 30, 2013
Chapter 4.0	Process Information, dated December 31, 2008
Appendix 4A	Design Report (as applicable to critical systems), dated March 31, 2008
Appendix 4B	Construction Quality Assurance Plan, dated April 9, 2006
Appendix 4C	Response Action Plan, dated April 9, 2006
Appendix 4D	Technical specifications document (RPP-18-489 Rev 0), dated December 31, 2006
Chapter 5.0	Ground Water Monitoring, dated June 30, 2010
Chapter 6.0	Procedure to Prevent Hazards, dated June 20, 2013
Addendum J.1	Contingency Plan – Pre-Active Life, dated June 30, 2012
Addendum J.2	Contingency Plan – Active Life, dated June 30, 2012
Chapter 8.0	Personnel Training, dated November 21, 2007
Chapter 11.0	Closure and Post Closure Requirements, dated December 31, 2008

General and Standard Hanford Facility RCRA Permit, WA7 89000 8967 (Permit) conditions (Part I and Part II Conditions) applicable to the IDF are identified in Permit Attachment 3 (Permit Applicability Matrix).

III.11.B AMENDMENTS TO THE APPROVED PERMIT

III.11.B.1 Portions of Permit Attachment 4, *Hanford Emergency Management Plan* that are not made enforceable by inclusion in the applicability matrix for that document, are not made enforceable by reference in this document.

III.11.B.2 Permittees must comply with all applicable portions of the Permit. The facility and unit-specific recordkeeping requirements are distinguished in the General Information Portion of the Permit, and are tied to the Permit conditions.

III.11.B.3 The scope of this Permit is restricted to the landfill construction and operation as necessary to dispose of: 1) immobilized low activity waste from the WTP, and 2) the Demonstration Bulk Vitrification System and IDF operational waste as identified in Chapter 4.0. Future expansion of the RCRA trench, or disposal of other wastes not specified in this Permit, is prohibited unless authorized via modification of this Permit.

III.11.B.4	In accordance with WAC 173-303-806(11)(d), this Permit shall be reviewed every five (5) years after the effective date and modified, as necessary, in accordance with WAC 173-303-830(3).
III.11.B.5	Inspection Requirements – Pre-Active Life Period and Active Life Period
III.11.B.5.a	The Permittees will conduct inspections of the IDF according to the following requirements:
III.11.B.5.a.1	Prior to the start of the active life of the IDF as defined in WAC 173-303-040, according to Chapter 6.0, Table 6.2.
III.11.B.5.a.2	Following the start of the active life of the IDF as defined in WAC 173-303-040, according to Chapter 6.0, Table 6.2A.
III.11.B.5.b	The Permittees will remedy any problems revealed by inspections conducted pursuant to Permit Condition III.11.B.5.a on a schedule, which prevents hazards to the public health and the environment and as agreed to in writing, by Ecology. Where a hazard is imminent or has already occurred, remedial action must be taken immediately.
III.11.B.5.c	Reserved
III.11.B.5.d	Rainwater Management
III.11.B.5.e	Prior to the start of the active life of the IDF, the Permittees will manage the discharge of such water in accordance with the pollution prevention and best management practices required by State Waste Discharge Permit Number ST 4511.
III.11.B.5.e.1	Management of Liquids Collected in the Leachate Collection and Removal System (LCRS), Leak Detection System (LDS), and Secondary Leak Detection System (SLDS) prior to the start of the active life of the IDF.
III.11.B.5.e.2	Permittees shall manage the liquid in the LCRS system in a manner that does not allow the fluid head to exceed 30.5 cm above the flat 50-foot by 50-foot LCRS sump HDPE bottom liner, and the LCRS sump trough, except for storms that exceed the 25-year, 24-hour storm event [(WAC 173-303-665(2)(h)(ii)(B). Liquid with a depth greater than 30.5 cm above the LCRS liner will be removed at the earliest practicable time after detection (not to exceed 5 working days).
III.11.B.5.e.3	Accumulated liquid of pumpable quantities in the LDS and SLDS will be managed in a manner that does not allow the fluid head to exceed 30.5 cm above the LDS liner or SLDS liner [WAC 173-303-665(2)(h)(i)(C)(iii)]. Liquid with a depth greater than 30.5 cm above a liner will be removed at the earliest practicable time after detection (not to exceed 5 working days).
III.11.B.5.e.4	The Permittees will use a flow meter to check if the amount of actual liquid pumped corresponds to the amount accumulated in the leachate collection tank to verify the proper function of the leachate collection and removal sump pumps with each use. The Permittees will document in the IDF portion of the facility operating record appropriate quality assurance/quality control requirements for selection and operation of the flow meter based on the required verification. In addition, the Permittees will evaluate the leachate transfer lines for freeze and thaw damage when ambient conditions may cause such damage to occur. The Permittees will document the methods and criteria used for purposes of this evaluation, along with an appropriate justification.
III.11.B.5.e.5	The Permittee will inspect for liquids after significant rainfall events.
III.11.B.5.e.6	The Permittee will annually verify monitoring gauges and instruments are in current calibration; calibration will be performed annually or more frequently at intervals suggested by the manufacturer (refer to Chapter 4.0, §4.3.7.4)

III.11.B.5.f The Permittees will monitor liquids in the Leachate Collection and Removal System and Leak Detection System to ensure the action leakage rate (Chapter 4.0, Appendix 4A) is not exceeded. The Leachate Collection and Removal System will be inspected per Permit Condition III.11.B.5.c.

III.11.B.5.g Soil Stabilization

Prior to the first placement of waste in the IDF, the Permittee will apply soil stabilization materials as needed to prevent soil erosion in and around the landfill.

III.11.C DESIGN REQUIREMENTS

III.11.C.1 IDF is designed in accordance with WAC 173-303-665 and WAC 173-303-640 as described in Chapter 4.0. Design changes impacting IDF critical systems shall be performed in accordance with Permit Conditions III.11.D.1.d.i and III.11.D.1.d.ii.

III.11.C.1.a IDF Critical Systems include the following: The leachate collection and removal system (LCRS), leachate collection tank (LCT), leak detection system (LDS), liner system (LS), and closure cap. H-2 Drawings for the LCRS, LCT, LDS, and LS are identified in Appendix 4A, Section 3 of this Permit. Drawings for the closure cap will be provided pursuant to Permit Condition III.11.C.1.b.

The Permittees shall construct and operate the IDF in accordance with all specifications contained in RPP-18489 Rev 0. Critical systems, as defined in the definitions section of the Site-Wide RCRA Permit, are identified in Appendix 4A, Section 1 of this Permit.

III.11.C.1.b Landfill Cap

At final closure of the landfill, the Permittees shall cover the landfill with a final cover (closure cap) designed and constructed [WAC 173-303-665(6), WAC 173-303-806(4)(h)] to: Provide long-term minimization of migration of liquids through the closed landfill; Function with minimum maintenance; Promote drainage and minimize erosion or abrasion of the cover; Accommodate settling and subsidence so that the cover's integrity is maintained; and have a permeability less than or equal to the permeability of any bottom liner system or natural sub soils present.

III.11.C.1.c Compliance Schedule

Proposed conceptualized final cover design is presented in Chapter 11, Closure and Financial Assurance. Six months prior to start of construction of IDF landfill final cover (but no later than 6 months prior to acceptance of the last shipment of waste at the IDF), the Permittees shall submit IDF landfill final cover design, specifications and CQA plan to Ecology for review and approval. No construction of the final cover may proceed until Ecology approval of the final design is given, through a permit modification.

III.11.C.1.d The Permittees shall notify Ecology at least sixty (60) calendar days prior to the date it expects to begin closure of the IDF landfill in accordance with WAC 173-303-610(c).

III.11.C.2 Design Reports

III.11.C.2.a New Tank Design Assessment Report

Permittees shall generate a written report in accordance with WAC 173-303-640(3)(a), providing the results of the leachate collection tank system design assessment. The report shall be reviewed and certified by an Independent Qualified Registered Professional Engineer (IQRPE)[1] in accordance with WAC-173-303-810(13)(a).

[1] "Independent qualified registered professional engineer," as used here and elsewhere with respect to Operating Unit 11, means a person who is licensed by the state of Washington, or a state which has reciprocity with the state of Washington as defined in RCW 18.43.100, and who is not an employee of the owner or operator of the facility for which construction or modification certification is required. A qualified professional engineer is an engineer with expertise in the specific area for which a certification is given.

III.11.C.2.b Compliance Schedule

Permittees shall submit the leachate collection tank design assessment report to Ecology along with the IQRPE certification, prior to construction of any part of the tank system including ancillary equipment.

III.11.D CONSTRUCTION REQUIREMENTS

III.11.D.1 Construction Quality Assurance

III.11.D.1.a Ecology shall provide field oversight during construction of critical systems. In cases where an Engineering Change Notice (ECN) and/or Non Conformance Report (NCR) are required, Ecology and the Permittees shall follow steps for processing changes to the approved design per Permit Conditions III.11.D.1.d.i and III.11.D.1.d.ii.

III.11.D.1.b Permittees shall implement the Construction Quality Assurance Plan (CQA plan) (Appendix 4B of the permit) during construction of IDF.

III.11.D.1.b.1 The Permittees will not receive waste in the IDF until the owner or operator has submitted to Ecology by certified mail or hand delivery a certification signed by the CQA officer that the approved CQA plan has been successfully carried out and that the unit meets the requirements of WAC 173-303-665(2)(h) or (j); and the procedure in WAC 173-303-810(14)(a) has been completed. Documentation supporting the CQA officer's certification shall be furnished to Ecology upon request.

III.11.D.1.c Construction inspection reports

Permittees shall submit a report documenting the results of the leachate tank installation inspection. This report must be prepared by an independent, qualified installation inspector or a professional independent, qualified, registered, professional engineer either of whom is trained and experienced in the proper installation of tank systems or components. The Permittees will remedy all discrepancies before the tank system is placed in use. This report shall be submitted to Ecology 90 days prior to IDF operation and be included in the IDF Operating Record. [WAC 173-303-640(3)(h)].

III.11.D.1.d ECN/NCR Process for Critical Systems

Portions of the following conditions for processing engineering change notices and non-conformance reporting were extracted from and supersede Site Wide General Permit Condition II.L.

III.11.D.1.d.1 Engineering Change Notice for Critical Systems

During construction of the IDF, the Permittees shall formally document changes to the approved designs, plans, and specifications, identified in Appendices 4A, 4B, 4C, and 4D of this permit, with an Engineering Change Notice (ECN). The Permittees shall maintain all ECNs in the IDF unit-specific Operating Record and shall make them available to Ecology upon request or during the course of an inspection. The Permittees shall provide to Ecology copies of proposed ECNs affecting any critical system within five (5) working days of initiating the ECN. Identification of critical systems is included in Permit Condition III.11.C.1 and Appendix 4A of this permit. Within five (5) working days,

Ecology will review a proposed ECN modifying a critical system and inform the Permittees whether the proposed ECN, when issued, will require a Class 1, 2, or 3 Permit modification.

III.11.D.1.d.2 Non-conformance Reporting for Critical Systems

III.11.D.1.d.2.a During construction of the IDF, the Permittees shall formally document with a Nonconformance Report (NCR), any work completed which does not meet or exceed the standards of the approved design, plans and specifications, identified in Appendices 4A, 4B, 4C and 4D of this Permit. The Permittees shall maintain all NCRs in the IDF unit-specific Operating Record and shall make them available to Ecology upon request, or during the course of an inspection.

III.11.D.1.d.2.b The Permittees shall provide copies of NCRs affecting any critical or regulated system to Ecology within five (5) working days after identification of the nonconformance. Identification of critical systems is included in Permit Condition III.11.C.1 and Appendix 4A of this permit. Ecology will review a NCR affecting a critical system and notify the Permittees within five (5) working days, in writing, whether a Permit modification is required for any nonconformance, and whether prior approval is required from Ecology before work proceeds, which affects the nonconforming item.

III.11.D.1.d.2.c As-Built Drawings

Upon completing construction of IDF, the Permittees shall produce as-built drawings of the project, which incorporate the design and construction modifications resulting from all project ECNs and NCRs, as well as modifications made pursuant to WAC 173-303-830. The Permittees shall place the drawings into the Operating Record within twelve (12) months of completing construction.

III.11.D.2 The Permittees shall not reduce the minimum frequency of destructive testing less than one test per 500 feet of seam, without prior approval in writing from Ecology

III.11.E GROUND WATER AND GROUND WATER MONITORING

Ground water shall be monitored in accordance with WAC 173-303 and the provisions contained in the Ecology-approved facility ground water monitoring plan (Chapter 5.0). All wells used to monitor the ground water beneath the unit shall be constructed in accordance with the provisions of WAC 173-160.

III.11.E.1 Ground Water Monitoring Program

III.11.E.1.a Prior to initial waste placement in the IDF landfill, the Permittees shall sample all ground water monitoring wells in the IDF network twice quarterly for one first year to determine baseline conditions. For the first sampling event (and only the first), samples for each well will include all constituents in 40 CFR 264 Appendix IX. Thereafter, sampling will include only those constituents as specified in Chapter 5.0, Table 5-2: chromium (filtered and unfiltered the first year to compare results), specific conductance, TOC, TOX, and pH. Other constituents to be monitored but not statistically compared include alkalinity, anions, ICP metals, and turbidity. These will provide important information on hydrogeologic characteristics of the aquifer and may provide indications of encroaching contaminants from other facilities not associated with IDF.

III.11.E.1.b After the baseline monitoring is completed, and data is analyzed, the Permittees and Ecology shall assess revisions to Chapter 5.0, Table 5-2. Subsequent samples will be collected annually and will include constituents listed in Table 5-2 as approved by Ecology. All data analysis will employ Ecology approved statistical methods pursuant to WAC 173-303-645. Changes to Chapter 5.0 will be subject to the permit modification procedures under WAC 173-303-830.

III.11.E.1.c All constituents used as tracers to assess performance of the facility through computer modeling should be sampled at least annually to validate modeling results. Groundwater monitoring data and analytes to be monitored will be reviewed periodically as defined in Chapter 5.0 of this Permit.

III.11.E.1.d Upon Ecology approval of the leachate monitoring plan, leachate monitoring and groundwater monitoring activities should be coordinated as approved by Ecology to form an effective and efficient means of monitoring the performance of the IDF facility.

III.11.E.1.e Groundwater monitoring data shall be reported to Ecology annually by July 30.

III.11.F LEACHATE COLLECTION COMPONENT MANAGEMENT

Permittees shall design, construct, and operate all leachate collection systems to minimize clogging during the active life and post closure period

III.11.F.1 Leachate Collection and Removal System (LCRS)

III.11.F.1.a At least 120 days prior to initial waste placement in the IDF, the Permittees shall submit a Leachate monitoring plan to Ecology for review, approval, and incorporation into the permit. Upon approval by Ecology, this plan will be incorporated into the Permit as a class 1' modification. The Permittees shall not accept waste into the IDF until the requirements of the leachate monitoring plan have been incorporated into this permit.

III.11.F.1.b Leachate in the LCRS (primary sump) shall be sampled and analyzed monthly for the first year of operation of the facility and quarterly thereafter (pursuant to WAC 173-303-200). Additionally, leachate shall be sampled and analyzed to meet waste acceptance criteria at the receiving treatment storage and disposal facility.

III.11.F.1.c Permittees shall manage the leachate in the LCRS system in a manner that does not allow the fluid head to exceed 30.5 cm above the flat 50-foot by 50-foot LCRS sump HDPE bottom liner except for rare storm events as discussed in Chapter 4.0, §4.3.6.1 and the LCRS sump trough [(WAC 173-303-665(2)(h)(ii)(B). Liquid with a depth greater than 30.5 cm above the SLDS liner will be removed at the earliest practicable time after detection (not to exceed 5 working days).

III.11.F.1.d After initial waste placement, Permittees shall manage all leachate from the permitted cell as dangerous waste (designated with Dangerous Waste Number F039) in accordance with WAC 173-303.

III.11.F.2 Monitoring and Management of Leak Detection System (LDS/ secondary sump)

III.11.F.2.a Permittees shall manage the leachate in the LDS system in a manner that does not allow the fluid head to exceed 30.5 cm above the LDS liner (WAC 173-303-665(2)(h)(ii)(B).

III.11.F.2.b Permittees shall monitor and record leachate removal for comparison to the Action Leakage Rate (ALR) as described in Appendix 4C, Response Action Plan. If the leachate flow rate in the LDS exceeds the ALR, the Permittees shall implement the Ecology approved response action plan (Appendix 4C).

III.11.F.2.c Leachate from the LDS (secondary sump) shall be sampled semi-annually if a pumpable quantity of leachate is available for sampling.

III.11.F.2.d Accumulated liquid of pumpable quantities in the LDS will be managed in a manner that does not allow the fluid head to exceed 30.5 cm above the LDS liner [WAC 173-303-665(2)(h)(i)(C)(iii)]. Liquid with a depth greater than 30.5 cm above the LDS liner will be removed at the earliest practicable time after detection (not to exceed 5 working days).

III.11.F.3 Monitoring and Management of the Secondary Leak Detection System (SLDS)

III.11.F.3.a At least 180 days prior to initial waste placement, the, the Permittees shall submit to Ecology for approval a sub-surface liquids monitoring and operations plan (SLMOP) for the SLDS to include the following: monitoring frequency, pressure transducer configuration, liquid collection and storage processes, sampling and analysis and response actions. The SLMOP shall be approved by Ecology prior to placement of waste in the IDF, and incorporated into the Permit as a Class 1' modification.

III.11.F.3.b Permittees shall monitor and manage the SLDS (tertiary sump) pursuant to the approved sub-surface liquids monitoring and operations plan.

III.11.F.3.c Accumulated liquid of pumpable quantities in the SLDS will be managed in a manner that does not allow the fluid head to exceed 30.5 cm above the SLDS liner [WAC 173-303-665(2)(h)(i)(C)(iii)]. Liquid with a depth greater than 30.5 cm above the SLDS liner will be removed at the earliest practicable time after detection (not to exceed 5 working days).

III.11.F.3.d After initial waste placement, Permittees shall manage all leachate from the permitted cell as dangerous waste in accordance with WAC 173-303.

III.11.G CONSTRUCTION WATER MANAGEMENT

III.11.G.1 During construction, it is anticipated that liquids will accumulate on top of all liners and sumps. Permittees shall manage the construction wastewater in accordance with State Waste Discharge Permit ST 4511.

III.11.G.2 Liquid accumulation within the LCRS, LDS, and SLDS prior to initial waste placement will be considered construction wastewater (i.e., not leachate).

III.11.H LANDFILL LINER INTEGRITY MANAGEMENT & LANDFILL OPERATIONS

III.11.H.1 Permittees shall design, construct, and operate the landfill in a manner to protect the liners from becoming damaged. Temperature: Waste packages with elevated temperatures shall be evaluated and managed in a manner to maintain the primary (upper) liner below the design basis temperature for the liner (e.g.,160 F). Weight: Waste, fill material and closure cover shall be placed in a manner that does not exceed the allowable load bearing capacity of the liner (weight per area 13,000 lb/ft^2). Puncture: At least 3 feet of clean backfill material shall be placed as an operations layer over the leachate collection and removal system to protect the system from puncture damage.

III.11.H.1.a All equipment used for construction and operations inside of the IDF shall meet the weight limitation as specified in Permit Condition III.H.1. Only equipment that can be adequately supported by the operations layer as specified in Permit Condition III.H.1 (e.g., will not have the potential to puncture the liner) shall be used inside of the IDF. All equipment used for construction and operations outside of the IDF shall not damage the berms. Changes to any equipment will follow the process established by condition II.R of the site wide permit. Within 120 days from the effective date for the permit, a process for demonstrating compliance with this condition shall be submitted for review by Ecology. This process will be incorporated into appropriate IDF operating procedures prior to IDF operations.

III.11.H.2 The Permittees shall construct berms and ditches to prevent run-on and run-off in accordance with the requirements of Section 4.3.8 of this permit. Before the first placement of waste in the IDF, the Permittees shall submit to Ecology a final grading and topographical map on a scale sufficient to identify berms and ditches used to control run-on and run-off. Upon approval, Ecology will incorporate these maps into the permit as a Class 1' modification.

III.11.H.3 The Permittees shall operate the RCRA IDF Cell (Cell1) in accordance with WAC 173-303-665(2) and the operating practices described in Chapters 3.0, 4.0, 6.0, 7.0, 8.0 and Appendix 4A, §1, subsection 7, except as otherwise specified in this Permit.

III.11.H.4 The Permittees shall maintain a permanent and accurate record of the three-dimensional location of each waste type, based on grid coordinates, within the RCRA IDF Cell (Cell1) in accordance with WAC 173-303-665(5).

III.11.I WASTE ACCEPTANCE CRITERIA

The only acceptable waste form approved for disposal at the RCRA cell of IDF are IDF operational waste, Immobilized Low Activity Waste (ILAW) in glass form from the Waste Treatment Plant (WTP) Low Activity Waste (LAW) Vitrification facility and ILAW from the Bulk Vitrification Research Demonstration and Development facility (up to 50 boxes). Specifics about waste acceptance criteria for each of these wastes are detailed below.

No other waste forms may be disposed at the RCRA cell of IDF unless authorized via a Final Permit modification decision. Requests for Permit modifications must be accompanied by an analysis adequate for Ecology to comply with SEPA, as well as by a risk assessment and groundwater modeling to show the environmental impact. Permit Condition III.11.I.5 outlines the process by which waste sources in the IDF are modeled in an ongoing risk budget and a ground water impact analysis.

III.11.I.1 Six months prior to IDF operations Permittees shall submit to Ecology for review, approval, and incorporation into the permit, all waste acceptance criteria to address, at a minimum, the following: physical/chemical criteria, liquids and liquid containing waste, land disposal restriction treatment standards and prohibitions, compatibility of waste with liner, gas generation, packaging, handling of packages, minimization of subsidence.

III.11.I.1.a All containers/packages shall meet void space requirements pursuant to WAC 173-303-665(12).

III.11.I.1.b Compliance Schedule

III.11.I.1.b.1 Six months prior to IDF operations, the Permittees shall submit to Ecology for review, approval, and incorporation into the permit any necessary modifications to the IDF Waste Acceptance Plan (Appendix 3A of the permit application, DOE/RL-2003-12, Rev 1).

III.11.I.2 ILAW Waste Acceptance Criteria

The only ILAW forms acceptable for disposal at IDF are: (1) approved glass canisters that are produced in accordance with the terms, conditions, and requirements of the WTP portion of the Permit, and (2) the 50 bulk vitrification test boxes as specified in the DBVS test plans.

To assure protection of human health and the environment, it is necessary that the appropriate quality of glass be disposed at IDF. The LDR Treatment Standard for eight metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver), when associated with High Level Waste, is HLVIT (40 CFR 268). Because these metals are constituents in the Hanford Tanks Waste, the LDR standard for ILAW disposed to IDF is HLVIT.

For any ILAW glass form(s) that DOE intends to dispose of in IDF, DOE will provide to Ecology for review, an ILAW Waste Form Technical Requirements Document (IWTRD). The IWTRD will contain:

III.11.I.2.a WTP ILAW Waste Acceptance Criteria

III.11.I.2.a.1 A description of each specific glass formulation that DOE intends to use including a basis for why each specific formulation is proposed for use, which specific tank wastes the glass formulation is proposed for use with, the characteristics of the glass that are key to satisfactory performance (e.g., VHT, PCT, and TCLP and/or other approved performance testing methodologies that the parties agree are appropriate and necessary), the range in key characteristics anticipated if the specific glass formulation is produced on a production basis with tank waste, and the factors that DOE must protect against in producing the glass to ensure the intended glass characteristics will exist in the actual ILAW.

III.11.I.2.a.2 A performance assessment that provides a reasonable basis for assurance that each glass formulation will, once disposed of in IDF in combination with the other waste volumes and waste forms planned for disposal at the entire Integrated Disposal Facility, be adequately protective of human health and the environment; and will not violate or be projected to violate all applicable state and federal laws, regulations and environmental standards.

Within 60 days of a request by Ecology, the Permittees shall provide a separate model run using Ecology's assumptions and model input.

III.11.I.2.a.3 A description of production processes including management controls and quality assurance/quality control requirements that assure that glass produced for each formulation will perform in a reasonably similar manner to the waste form assumed in the performance assessment for that formulation.

The Permittees shall update the IWTRD consistent with the above requirements for review by Ecology consistent with their respective roles and authority as provided under the TPA. Ecology comments shall be dispositioned through the Review Comment Record (RCR) process and will be reflected in further modeling to modify the IDF ILAW Chapter 3.0, Waste Analysis Plan as appropriate.

The initial IWTRD contained glass formulation data as required by Permit Condition III.11.I.2.a.1, and was submitted on December 18, 2006 (AR Accession # 0906020182). The performance assessment required by Permit Condition III.11.I.2.a.2, and the quality assurance/quality control requirements process required by Permit Condition III.11.I.2.a.3 shall be submitted for Ecology review as soon as possible after issuance of the Final Tank Closure and Waste Management EIS and receipt of underlying codes and data packages, and at least 180 days prior to the date DOE expects to receive waste at IDF. At a minimum, the Permittees shall submit updates to the IWTRD to Ecology every five years or more frequently with the next one due December 31, 2014, if any of the following conditions exist:

- The Permittees submits a permit modification request allowing additional waste forms to be disposed of at IDF,
- The WTP or other vitrification facility change their glass formulations from those previously included in the IWTRD
- An unanticipated event or condition occurs that Ecology determines would warrant an update to the IWTRD.

III.11.I.2.a.4	The Permittees shall not dispose of any WTP ILAW not described and evaluated in the IWTRD.
III.11.I.3	ILAW Waste Acceptance Criteria Verification
III.11.I.3.a	Six months prior to disposing of ILAW in the IDF, the Permittees will submit an ILAW verification plan to Ecology for review and approval. This plan will be coordinated with WTP, Ecology, and the Permittees personnel. This plan will outline the specifics of verifying ILAW waste acceptance through WTP operating parameters, and/or glass sampling. The Plan will include physical sampling requirements for batches, glass formulations, and/or feed envelopes.
III.11.I.4	Demonstration Bulk Vitrification System (DBVS) Bulk Vitrification Waste Acceptance Criteria
III.11.I.4.a	Bulk Vitrification waste forms that are acceptable to be disposed of at IDF are up to 50 boxes of vitrified glass produced pursuant to the DBVS RD&D Permit from processing Hanford Tank S-109 tank waste.
III.11.I.4.b	If Bulk Vitrification is selected as a technology to supplement the Waste Treatment Plant, the IDF portion of the Permit will need to be modified to accept Bulk Vitrification Full Scale production waste forms. This modification will need to be accompanied by appropriate TPA changes (per M-062 requirements) and adequate risk assessment information sufficient for the Department of Ecology to meet its SEPA obligations.
III.11.I.4.c	DBVS Waste Acceptance Verification will occur on 100% of the waste packages. Pursuant to the DBVS RD&D Permit, a detailed campaign test report will be produced and submitted to Ecology detailing results of all testing performed on each waste package that is produced. IDF personnel shall review these reports to verify that the waste packages meet IDF Waste Acceptance Criteria.
III.11.I.4.d	The Permittees shall not dispose of any waste forms that do not comply with all appropriate and applicable treatment standards, including all applicable Land Disposal Restrictions (LDR).
III.11.I.5	Modeling – Risk Budget Tool
III.11.I.5.a	The Permittees must create and maintain a modeling - risk budget tool, which models the future impacts of the planned IDF waste forms (including input from analyses performed as specified in Permit Conditions III.11.I.2.a through III.11.I.2.a.ii) and their impact to underlying vadose and ground water. This software tool will be submitted for Ecology review as soon as possible after issuance of Final Tank Closure and Waste Management EIS and receipt of underlying codes and data packages, and at least 180 days prior to the date DOE expects to receive waste at IDF. The risk budget tool shall be updated at least every 5 years. The model will be updated more frequently if needed, to support permit modifications or SEPA Threshold Determinations whenever a new waste stream or significant expansion is being proposed for the IDF. This risk budget tool shall be conducted in manner that is consistent with state and federal requirements, and represents a risk analysis of all waste previously disposed of in the entire IDF (both cell 1 and cell 2) and those wastes expected to be disposed of in the future for the entire IDF to determine cumulative impacts. The groundwater impact should be modeled to evaluate fate and transport in the groundwater aquifer(s) and should be compared against various performance standards including but not limited to drinking water standards (40 CFR 141 and 40 CFR 143). Ecology will review modeling assumptions, input parameters, and results and will provide comments to the Permittees. Ecology comments shall be dispositioned through the Review Comment Record (RCR) process and will be reflected in further modeling to modify the IDF ILAW waste acceptance criteria as appropriate.

III.11.I.5.a.1 The modeling-risk budget tool will include a sensitivity analysis reflecting parameters and changes to parameters as requested by Ecology.

III.11.I.5.a.2 If these modeling efforts indicate results within 75% of a performance standard [including but not limited to federal drinking water standards (40 CFR 141 and 40 CFR 143)], Ecology and the Permittees will meet to discuss mitigation measures or modified waste acceptance criteria for specific waste forms.

III.11.I.5.a.3 When considering all the waste forms to be disposed of in IDF, the Permittees shall not dispose of any waste that will result (through forward looking modeling or in real groundwater concentrations data) in a violation of any state or federal regulatory limit, specifically including but not limited to drinking water standards for any constituent as defined in 40 CFR 141 and 40 CFR 143.

III.11.I.6 The Permittees shall not dispose of any waste that is not in compliance with state and federal requirements as identified in Chapter 13.0.

III.11.I.6.a In accordance with DOE's authority under the Atomic Energy Act of 1954, as amended and other applicable law, prior to disposing of any mixed immobilized low-activity waste (ILAW) in the IDF, DOE will certify to the State of Washington that it has determined that such ILAW is not high-level waste and meets the criteria and requirements outlined in DOE's consultation with the U.S. Nuclear Regulatory Commission beginning in 1993 (Letter from R.M. Bernero, USNRC to J. Lytle, USDOE, dated March 2, 1993; Letter from J. Kinzer, USDOE, to C. J. Paperiello, USNRC, Classification of Hanford Low-Activity Tank Waste Fraction, dated March 7, 1996; and Letter from C.J. Paperiello, USNRC, to J. Kinzer, USDOE, Classification of Hanford Low-Activity Tank Waste Fraction, dated June 9, 1997). While the requirement to provide such certification is an enforceable obligation of this permit, the provision of such certification does not convey, or purport to convey, authority to Ecology to regulate the radioactive hazards of the waste under this permit.

III.11.I.7 IDF Operational Waste Acceptance Criteria

III.11.I.7.a IDF operational activities (including decontamination, cleanup, and maintenance) will generate a small amount of waste. Waste that can meet IDF waste acceptance without treatment will be disposed of at the IDF. All other IDF operational waste will be managed pursuant to WAC 173-303-200.

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PART III UNIT-SPECIFIC CONDITIONS FOR FINAL STATUS OPERATIONS

OPERATING UNIT 11

Integrated Disposal Facility

Chapter 3.0 Waste Analysis Plan

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WASTE ANALYSIS [C]

This chapter provides information on the chemical, biological, and physical characteristics of the waste treated for disposal. The information includes descriptions required by WAC 173-303-300(5) contained in the *Waste Analysis Plan for the Integrated Disposal Facility*.

CHEMICAL, BIOLOGICAL, AND PHYSICAL ANALYSIS [C-1]

The primary mission of the IDF will be to dispose of vitrified waste generated on the Hanford Site. This includes vitrified LAW from the RPP-WTP and DBVS, and low-level radioactive waste. Additionally, waste generated through IDF operations will be disposed of in IDF. Waste to be disposed of in IDF is assigned dangerous waste numbers found in Chapter 1.0.

WASTE ANALYSIS PLAN [C-2]

The *Waste Analysis Plan for the Integrated Disposal Facility* summarizes waste acceptance processes and contains the following information: unit description, confirmation process, selection of waste analysis parameters, selection of sampling procedures, selection of a laboratory, laboratory testing, and analytical methods, selection of waste re-evaluation frequencies, special procedural requirements, and recordkeeping requirements.

GLOSSARY

AEA	Atomic Energy Act of 1954
BVW	bulk vitrification waste
CAP	corrective action plan
CFR	Code of Federal Regulations
COLIWASA	composite liquid waste sampler
°C	degree Celsius
DOE-ORP	U.S. Department of Energy, Office of River Protection
DOE-RL	U.S. Department of Energy, Richland Operations Office
DBVS	Demonstration Bulk Vitrification System
DST	double-shell tank
Ecology	Washington State Department of Ecology
IDF	Integrated Disposal Facility
ILAW	immobilized low-activity waste
LDR	land disposal restriction
NDE	nondestructive examination
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RCW	Revised Code of Washington
RPP-WTP	River Protection Project-Waste Treatment Plant
SWITS	Solid Waste Information Tracking System
TRU	transuranic
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and/or disposal
WAC	Washington Administrative Code
WAP	waste analysis plan

1 **METRIC CONVERSION CHART**

Into metric units			Out of metric units		
If you know	Multiply by	To get	If you know	Multiply by	To get
Length			**Length**		
inches	25.40	millimeters	millimeters	0.03937	inches
inches	2.54	centimeters	centimeters	0.393701	inches
feet	0.3048	meters	meters	3.28084	feet
yards	0.9144	meters	meters	1.0936	yards
miles (statute)	1.60934	kilometers	kilometers	0.62137	miles (statute)
Area			**Area**		
square inches	6.4516	square centimeters	square centimeters	0.155	square inches
square feet	0.09290304	square meters	square meters	10.7639	square feet
square yards	0.8361274	square meters	square meters	1.19599	square yards
square miles	2.59	square kilometers	square kilometers	0.386102	square miles
acres	0.404687	hectares	hectares	2.47104	acres
Mass (weight)			**Mass (weight)**		
ounces (avoir)	28.34952	grams	grams	0.035274	ounces (avoir)
pounds	0.45359237	kilograms	kilograms	2.204623	pounds (avoir)
tons (short)	0.9071847	tons (metric)	Tons (metric)	1.1023	tons (short)
Volume			**Volume**		
ounces (U.S., liquid)	29.57353	milliliters	milliliters	0.033814	ounces (U.S., liquid)
quarts (U.S., liquid)	0.9463529	liters	liters	1.0567	quarts (U.S., liquid)
gallons (U.S., liquid)	3.7854	liters	liters	0.26417	gallons (U.S., liquid)
cubic feet	0.02831685	cubic meters	cubic meters	35.3147	cubic feet
cubic yards	0.7645549	cubic meters	cubic meters	1.308	cubic yards
Temperature			**Temperature**		
Fahrenheit	subtract 32 then multiply by 5/9ths	Celsius	Celsius	multiply by 9/5ths, then add 32	Fahrenheit
Energy			**Energy**		
kilowatt hour	3,412	British thermal unit	British thermal unit	0.000293	kilowatt hour
kilowatt	0.94782	British thermal unit per second	British thermal unit per second	1.055	kilowatt
Force/Pressure			**Force/Pressure**		
pounds (force) per square inch	6.894757	kilopascals	kilopascals	0.14504	pounds per square inch

2 06/2001

3 Source: *Engineering Unit Conversions*, M. R. Lindeburg, PE., Third Ed., 1993, Professional
4 Publications, Inc., Belmont, California.
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3.0 INTEGRATED DISPOSAL FACILITY WASTE ANALYSIS PLAN

Pursuant to WAC 173-303-300(5) this waste analysis plan (WAP) documents the waste acceptance process, sampling methodologies, analytical techniques, and overall processes that will be undertaken for mixed waste accepted for disposal at the Integrated Disposal Facility (IDF). . Mixed waste disposed at the IDF will be limited to vitrified low-activity waste (LAW) from the RPP-WTP and DBVS and mixed waste generated by IDF operations. (see Chapter 1, Part A Form). Vitrified LAW generated by RPP-WTP is known as Immobilized Low Activity Waste (ILAW) and generated by DBVS is known as Bulk Vitrified Waste (BVW). The IDF will be located in the 200 East Area of the Hanford Facility.

The IDF also will receive low-level waste for disposal. Mixed waste will not be placed in the low-level waste portion of the IDF. The requirements of this WAP are applicable to mixed waste and are not applicable to the low-level radioactive waste. The term 'treatment, storage, and/or disposal (TSD) unit' is used throughout this WAP to refer to the IDF. Activities will be performed by the IDF operating organization, waste acceptance organization, or its delegated representative.

Although the treatment and disposal of radioactive waste (i.e., source, special nuclear, and by-product materials as defined by the *Atomic Energy Act of 1954*) are not within the scope of *Resource Conservation and Recovery Act* (RCRA) *of 1976* or WAC 173-303, information is provided for general knowledge.

3.1 DESCRIPTION OF UNIT PROCESSES AND ACTIVITIES

The IDF will be a single, expandable disposal facility constructed to RCRA Subtitle C standards, half of which is for disposal of mixed waste the other half will be for disposal of low-level waste. Initial capacity for mixed waste disposal is 82,000 cubic meters of waste with an ultimate capacity of up to 450,000 cubic meters of waste. Disposal capacity beyond the initial 82,000 cubic meters will require a modification to the Part B Permit. The mixed waste types to be disposed in the IDF include vitrified LAW from the RPP-WTP and DBVS. Additionally, mixed waste generated by IDF operations will be disposed of in IDF.

The mission of the RCRA portion of the IDF is to provide an approved disposal facility for the permanent, environmentally safe disposition of mixed waste and RCRA waste.

For ILAW, and BVW the container packaging and handling will be designed to maintain containment of each waste type, limit intrusion, and limit human exposure at the IDF. ILAW containers will be transported from the RPP-WTP to the IDF using a tractor-trailer system. BVW will be transported from the DBVS staging area to IDF using a similar system. Transport of the ILAW and BVW to the landfill will occur along a pre-determined route.

The lined landfill will have a leachate collection and removal system. The leachate collection tanks will be operated in accordance with the generator provisions of WAC 173-303-200 and are not subject to this WAP.

Additional information is located in Chapter 1.0 (IDF Part A) and Chapter 4.0 (Process Information).

3.2 IDENTIFICATION AND CLASSIFICATION OF WASTE

The ILAW, BVW, and newly generated mixed waste will be accepted for disposal. The mixed waste disposed of at the IDF is received from waste generated within IDF, and two other Hanford Facility TSD units (RPP-WTP and DBVS). The following waste will not be accepted for disposal at this TSD unit:

- Waste is not accepted for disposal when the waste contains free-standing liquid unless all free-standing liquid:
  - Has been removed by decanting or other methods
  - Has been mixed with sorbent or stabilized (solidified) so that free-standing liquid is no longer observed
  - Otherwise has been eliminated
  - Container is very small, such as an ampoule
  - Container is a labpack and is disposed in accordance with WAC 173-303-161 or 40 Code of Federal Regulations (CFR) 264.316
  - Container is designed to hold free liquids for use other than storage, such as a battery or capacitor.

  There could be cases in which small amounts of residual liquids are present in mixed waste containers because condensate has formed following packaging or free liquids remain in debris items (e.g., pumps, tubing) even after draining. When it is not practical to remove this residual liquid, the free liquid must be eliminated to the extent possible by adding a quantity of sorbent sufficient to sorb all residual liquids.

  Free liquid is determined by SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Method*, Method 9095 (Paint Filter Liquids Test) [WAC 173-303-140(4)(b) and 40 CFR 264.314(d)] only for waste that has the potential for free liquid formation.

- Gaseous waste not accepted for disposal if the is waste packaged at a pressure in excess of 1.5 atmospheres at 20°C
- Pyrophoric waste is not accepted for disposal. Waste containing less that 1 weight percent pyrophoric material partially or completely dispersed in each package is not considered pyrophoric for the purposes of this requirement.
- Solid acid waste is not accepted for disposal [WAC 173-303-140 (4)(c)]
- Extremely hazardous waste that does not meet WAC 173-303-140(4)(d) is not accepted for disposal. Extremely hazardous waste that has been treated could be disposed in accordance with Revised Code of Washington (RCW) 70.105.050(2), "Hazardous Waste Management"
- Organic/carbonaceous waste that does not meet WAC 173-303-140(4)(d) is not accepted for disposal
- Waste not meeting the LDR treatment standards is not accepted for disposal [40 CFR 268 and WAC 173-303-140(4)]
- Waste streams will be evaluated during pre-shipment review to ensure that the waste streams do not contain constituents incompatible with the liner system in concentration sufficient to degrade the liner. Table 1 provides a list of chemicals shown to be incompatible with the liner material at 100% concentrations (WHC-SD-WM-TI-714). In general, mixed waste that meets federal and state treatment standards would be compatible with the TSD unit liner system. Waste accepted at the IDF will be compatible with the liner. Constituents in Table 1 will not be accepted for disposal (refer to Section 3.4.9 for waste stream compatibility).

3.3 MANAGEMENT OF WASTE

The ILAW, BVW, and newly generated wastes (see Section 3.3.1) generated during normal operations of this TSD unit are accepted at this TSD unit for disposal. The two onsite TSD units (RPP-WTP and DBVS) transferring/shipping waste to this TSD unit hereafter are referred to as the 'generator' unless otherwise denoted in this WAP. The waste acceptance process for transfers from the generator is identified in Figure 1.

Written waste tracking procedure(s) are implemented to ensure waste received at the TSD unit matches the manifest or transfer papers, to ensure that the waste is tracked though the TSD unit to final disposition, and to maintain the information required in WAC 173-303-380. The waste tracking process provides a mechanism to track waste through a uniquely identified container. The unique identifier is a barcode (or equivalent) that is recorded in the Solid Waste Information Tracking System (SWITS). This mechanism encompasses the waste acceptance process, the movement of waste, the processing of waste, and management of the waste. The container identification number provides traceability between the TSD unit and the hard copy of records that are maintained as part of the operating record to ensure information relative to the location, quantity, and physical and chemical characteristics of the waste are available.

The following sections describe the process for waste acceptance and the different types of information and knowledge reviewed/required during the acceptance process. The process for management of waste is described in Section 3.4.

3.3.1 Newly Generated Waste within the IDF

This TSD unit generates mixed waste as a result of operational (e.g., chemical, radiological) activities. These activities include, transfer functions along with inspection, decontamination, cleanup, maintenance tasks and leachate collection. The IDF generated operational waste will be maintained in accordance with generator provisions of WAC 173-303-200 and WAC 173-303-600 (3) (d). Any newly generated waste (except leachate) not meeting IDF waste acceptance criteria will be designated and sent to another permitted TSD or to a 90 day accumulation area. IDF leachate will be managed in accordance with WAC 173-303-200 and transferred to LERF/ETF (or other permitted TSD) for treatment. Solids or residuals resulting from IDF leachate treatment may be designated/packaged and sent back to the IDF for burial or to another permitted TSD.

Figure 1. Waste Transfers and Analysis Plan Onsite TSD Units Flow Diagram.

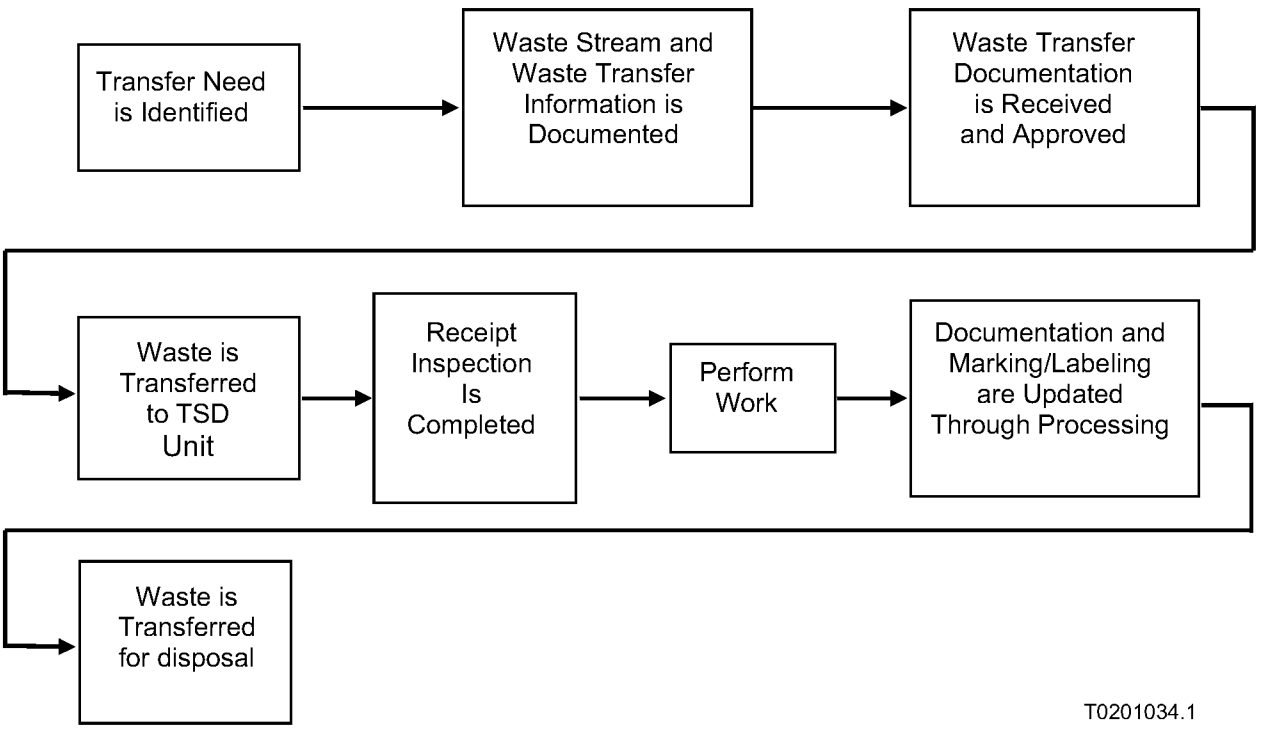


Table 1. Chemicals Incompatible With the High Density Polyethylene Liner (in concentrated form)*

Chemical	CAS Number
Amyl chloride	543-59-9
Aqua regia	8007-56-5
Bromic acid	15541-45-4
Bromobenzene	108-86-1
Bromoform	75-25-2
Calcium bisulfite	13780-03-5
Calcium sulfide	20548-54-3
Diethyl benzene	25340-17-4
Diethyl ether	60-29-7
Bromine	7726-95-6
Chlorine	7782-50-5
Fluorine	7782-41-4
Ethyl chloride	75-00-3
Ethylene trichloride	79-01-6
Nitrobenzene	98-95-3
Perchlorobenzene	118-74-1
Propylene dichloride	78-87-5
Sulfur trioxide	7446-11-9
Sulfuric acid (fuming)	8014-95-7
Thionyl chloride	7719-09-7
Vinylidene chloride.	75-35-4

CAS = Chemical Abstract Service.
* WHC-SD-WM-TI-714

3.4 CONFIRMATION PROCESS

WAC 173-303-300 (1) requires confirmation on mixed waste before acceptance of waste into a waste management unit. The confirmation process consists of two parts, pre-shipment review, and verification. Confirmation activities are performed in accordance with TSD unit-specific governing documentation. The confirmation process is detailed in Figure 2 for ILAW and BVW.

3.4.1 Pre-Shipment Review

Pre-shipment review takes place before waste can be scheduled for transfer or shipment to this TSD unit. The review focuses on whether the waste stream is defined accurately and meets the TSD unit waste acceptance criteria and whether the LDR status is determined correctly. Only waste determined to be acceptable for storage (see Section 3.4.1.2.2) and/or disposal is scheduled. This determination is based on the information provided by the generator. The pre-shipment review consists of waste stream approval and the waste shipment approval process. The following sections discuss the pre-shipment review process. The information obtained during the pre-shipment review, at a minimum, includes all information necessary to safely dispose of the waste. The pre-shipment review ensures the waste is characterized and the data provided qualify as 'acceptable knowledge' (Section 3.4.1.4).

3.4.1.1 Pre-Shipment Review of Wastes

Pre-shipment review for ILAW and BVW waste containers will take place at RPP-WTP and the DBVS staging area respectively before either type of containers can be scheduled for transfer to the IDF. The review will focus on whether the waste stream is defined accurately, meets the waste acceptance criteria, and the land disposal restrictions (LDR) status was determined correctly. Only waste determined to be acceptable for storage (see section 3.4.1.2.2) and/or disposal will be scheduled. This determination will be based on the information provided by the generator. The pre-transfer review will consist of the waste profile documentation and waste transfer approval process. The following sections discuss the pre-transfer review process. ILAW and BVW containers received for land disposal will be at least 90 % full. The information obtained from the generator, at a minimum, will contain five elements: (1) documentation to ensure waste can be managed pursuant to the Part A, Form 3, (2) documentation to ensure the waste is not a prohibited waste in accordance with Section 3.2, (3) a determination if the waste is an ignitable, reactive, or incompatible waste as defined in WAC 173-303-040, (4) documentation that waste meets LDR requirements of 40 CFR 268 and WAC 173-303-140, and (5) operational restrictions on acceptance of waste.

During the waste profile documentation process for ILAW and BVW containers, the generator will have the responsibility to provide relevant information pertaining to the proper management of the waste. Characterization information pertaining to the treatment of ILAW and BVW will be obtained during the waste profile documentation process.

3.4.1.2 Waste Stream Approval Process for Wastes

The waste stream approval process consists of reviewing stream information supplied on a waste stream profile and supporting documentation to allow receipt of the waste into the IDF. Waste stream compatibility (i.e., compatibility between individual waste streams and compatibility between waste streams and landfill design and construction parameters) will be assessed on a case-by-case basis. Criteria for assessing and determining compatibility will be identified in either the facility Waste Acceptance Criteria, Waste Analysis Plan, or other protocol or procedure as appropriate

3.4.1.2.1 Waste Stream Approval for ILAW and BVW

During the waste profile documentation process, the IDF waste acceptance organization will obtain the following information:

- Description of waste generating process
- Characterization data
- Dangerous waste numbers
- LDR data (as specified in Section 3.4.10)
- Composition of ILAW and BVW including regulated constituents of concern (refer to Chapter 1.0 of the permit application -Part A Form).

The waste profile documentation process will be as follows.

1. Appropriate generator fills out waste profile documentation.
2. The IDF designated waste acceptance organization reviews the waste profile information against the waste acceptance criteria for each ILAW or BVW transfer.
3. If discrepancies are noted, the IDF designated waste acceptance organization requests additional information from the generator to address discrepancies for either: (1) inconsistent information and (2) information not constituting acceptable knowledge (refer to Section 3.4.1.4.1).

   Information (waste profile documentation) is resubmitted by the generator addressing concerns in Item 3.

   - If concerns are addressed, waste profile documentation is approved.
   - If concerns are not addressed and met, waste profile documentation is not approved until concerns are corrected.

3.4.1.2.2 Waste Stream Approval for Newly Generated Mixed Waste

The waste stream approval process for wastes generated during IDF operations (except for leachate) consists of reviewing stream information supplied on a waste stream profile and supporting documentation. The waste stream profile requires the following supporting documentation:

- Generator information (e.g., name, address, point-of-contact, telephone number)
- Waste stream name
- Waste generating process description
- Waste numbers
- Chemical characterization information [e.g., characterization method(s), chemicals present, concentration ranges]
- Designation information
- LDR information including identification of underlying hazardous constituents if applicable
- Waste type information (e.g., physical state, adsorbents used, inert materials, stabilizing agents used)
- Packaging information (e.g., container type, maximum weight, size).

Attachments could consist of container drawings, process flow information, analytical data, etc.

In some cases, such as variable waste streams, the waste stream profile information could be general in nature. In these cases, more detailed information is gathered during the waste shipment approval process on a per shipment basis. This information is reviewed against the TSD unit waste acceptance criteria to

ensure the waste is acceptable for receipt. If conformance issues are found during this review, additional information is requested that could include analytical data or a sample to be analyzed. If the waste cannot be received, the TSD unit pursues acceptance of the waste at an alternate TSD unit. Once the waste meets the waste acceptance criteria, the TSD unit assigns the profile to a waste specification record and establishes a waste verification frequency based on the requirements found in Section 3.4.2. Profile information is re-evaluated as discussed in Section3.4.7.

3.4.1.3 Waste Transfer/Shipment Approval Process

After the appropriate generator has received the waste profile documentation approval from IDF (refer to Section 3.4.1.2.1), the generator waste transfer will be subjected to the waste transfer approval process. Only those ILAW and BVW containers approved under the waste profile documentation as part of the waste transfer approval process will be transferred to the IDF. During the waste transfer approval process, the IDF designated waste acceptance organization will obtain the following information.

For each ILAW or BVW container transfer that is a candidate for disposal in the TSD unit, the generator will provide the following information:

- Container identification number
- Profile number
- Waste description
- Generator information (e.g., name, address, point-of-contact, telephone number)
- Container information (e.g., type, size, weight)
- Waste numbers
- LDR certification
- Packaging materials and quantities.

The ILAW and BVW container transfer approval process will be as follows.

1. The generator obtains information from existing database, operating record, or generator records on each ILAW container to be transferred under the approved waste profile documentation.
2. Information is submitted to the TSD unit designated waste acceptance organization by the generator and is reviewed for the following:
   - Consistency with approved waste profile documentation
   - Consistency with waste acceptance criteria within the IDF.
3. If discrepancies are identified, the TSD unit designated waste acceptance organization will request additional information from the generator to address any discrepancies.
4. Information (waste package documentation) is resubmitted by the generator addressing concerns in Item 3.
5. If discrepancies are addressed, this information is forwarded to the TSD waste acceptance organization.
6. If discrepancies are not addressed, transfer is not approved until discrepancies are corrected.

3.4.1.4 Acceptable Knowledge Requirements

The TSD unit ensures that all information used to make waste management decisions is based on adequate characterization data as described in the following sections. The TSD unit evaluates the data to ensure that the data are adequate acceptable knowledge for management of the waste.

3.4.1.4.1 General Acceptable Knowledge Requirements

One or more of the following types of information could be considered, provided that the information is of sufficient quality to demonstrate compliance with applicable waste acceptance criteria:

- Mass balance from a controlled process that has a specified output for a specified input
- Material safety data sheet on chemical products
- Test data from a surrogate sample
- Analytical data on the waste or a waste from a similar process.

In addition, acceptable knowledge requirements can be met using a combination of analytical data or screening results and one and/or more of the following information:

- Interview information
- Logbooks
- Procurement records
- Qualified analytical data
- Radiation work package
- Procedures and/or methods
- Process flow charts
- Inventory sheets
- Vendor information
- Mass balance from an uncontrolled process (e.g., spill cleanup)
- Mass balance from a process with variable inputs and outputs (e.g., washing/cleaning methods).

If the information is sufficient to quantify the constituents of regulatory concern and to determine waste characteristics as required by the regulations and TSD unit waste acceptance criteria, the information is considered acceptable. Adequate acceptable knowledge includes (1) general waste knowledge requirements and/or (2) LDR waste knowledge requirements.

(1) General waste knowledge requirements. At a minimum, the generator supplies enough information for the waste to be managed at this TSD unit (refer to Section 3.4.1.1). The minimum level of acceptable knowledge consists of designation data where the constituents causing a waste number to be assigned are quantified and that data address any TSD unit operational parameters necessary for proper management of the waste.

When process knowledge indicates that constituents, which if present in the waste might cause the waste to be regulated, are input to a process, but not expected to be in the waste, sampling and analysis must be performed to ensure the constituents do not appear in the waste above applicable regulatory levels. This requirement can be met through chemical screening. This sampling and analysis are required only for initial characterization of the waste stream.

When the available information does not qualify as acceptable knowledge or is not sufficient to characterize a waste for management, the sampling and testing methods outlined in WAC 173-303-110 are used to determine whether a waste designates as ignitable, corrosive, reactive, and/or toxic and whether the waste contains free liquids as applicable. If the analysis is performed to complete characterization after acceptance of the waste by the TSD unit, this WAP governs the sampling and testing requirements.

(2) LDR waste knowledge. The TSD unit operating record contains all information required to document that the appropriate treatment standards have been met or will be met after the waste is treated unless otherwise excepted in this section.

- Both ILAW and BVW will be LDR compliant waste streams prior to acceptance at the IDF. Vitrification at the WTP and DBVS will facilitate LDR compliance for the majority of the mixed waste disposed of at IDF. IDF operational waste will be treated as needed to meet LDR at another TSD other than WTP or the DBVS

- This TSD unit may use analytical data as necessary to ensure that the applicable requirements found in 40 CFR 268.7 and WAC 173-303-140 (4) are met.

3.4.1.4.2 Methodology to Ensure Compliance with LDR Requirements

The generators are subject to LDR requirements and are required to submit all information notifications and certifications described in WAC 173-303-380 (1), (j), (k), (n), and (o). Mixed waste not meeting the treatment standards cannot be disposed at this TSD unit.

The following are general requirements for certification or information notification.

- The waste is subject to LDR and the waste has been treated. The generator supplies the appropriate LDR certification information (40 CFR 268).

- The waste is subject to LDR and the generator has determined that the waste meets the LDR as generated. The generator develops the certification based on process knowledge and/or analytical data and supplies the appropriate LDR certification information necessary to demonstrate compliance with the LDR treatment standards of 40 CFR 268 and WAC 173-303-140. State-only LDRs do not require this type of certification.

When demonstrating that a concentration-based LDR treatment standard has been met, a representative sample of the waste must be submitted for analysis. This sample could be taken by the treatment facility or the generator and is required to comply with the LDR treatment standards contained in 40 CFR 268.40 and 268.48 for underlining hazardous constituents.

3.4.2 Verification

Verification is an assessment performed by this TSD unit to substantiate that the waste received is the same as represented by the analysis supplied by the generator for the pre-shipment review. Verification for ILAW and BVW containers will contain one element, a 100% container receipt inspection. Physical/chemical screening will not be performed on the ILAW or BVW containers. Waste is not accepted by the TSD unit for disposal until the required elements of verification have been completed, including evaluation of any data obtained from verification activities. All conformance issues identified during the verification process are resolved in accordance with Section 3.4.3. Verification activity results will be documented by the IDF designated waste acceptance organization.

Sampling and analysis for non-vitrification mixed waste (e.g., treatment residues from treatment of IDF leachate that are returned to IDF for disposal) will not occur at the IDF but will occur at another permitted TSD.

3.4.2.1 Container Receipt Inspection

Container receipt inspection is a mandatory element of the confirmation process.

3.4.2.1.1 Container Receipt Inspection for ILAW and BVW

The ILAW and BVW container receipt inspection will be performed by IDF designated waste acceptance organization. The following criteria will be evaluated during container receipt inspection:

- Number of containers
- Size of containers
- Labels
- Container integrity.

Discrepancies identified during the container receipt inspection will be communicated to generator. Discrepancies will be resolved before the containers are unloaded. Once the discrepancies are resolved, the ILAW containers will be unloaded and disposed. Should discrepancies remain unresolved after 30 days, Ecology will be notified and daily walk around inspections conducted.

3.4.2.2 Physical Screening Process

The ILAW and BVW containers are not required to be physically screened because the generator verifies the waste meet the waste acceptance criteria for IDF.

3.4.2.3 Chemical Screening Process

Chemical screening is a verification element for containerized mixed waste. The ILAW and BVW containers are not required to be chemically screened because the generator verifies the waste meet the waste acceptance criteria for IDF.

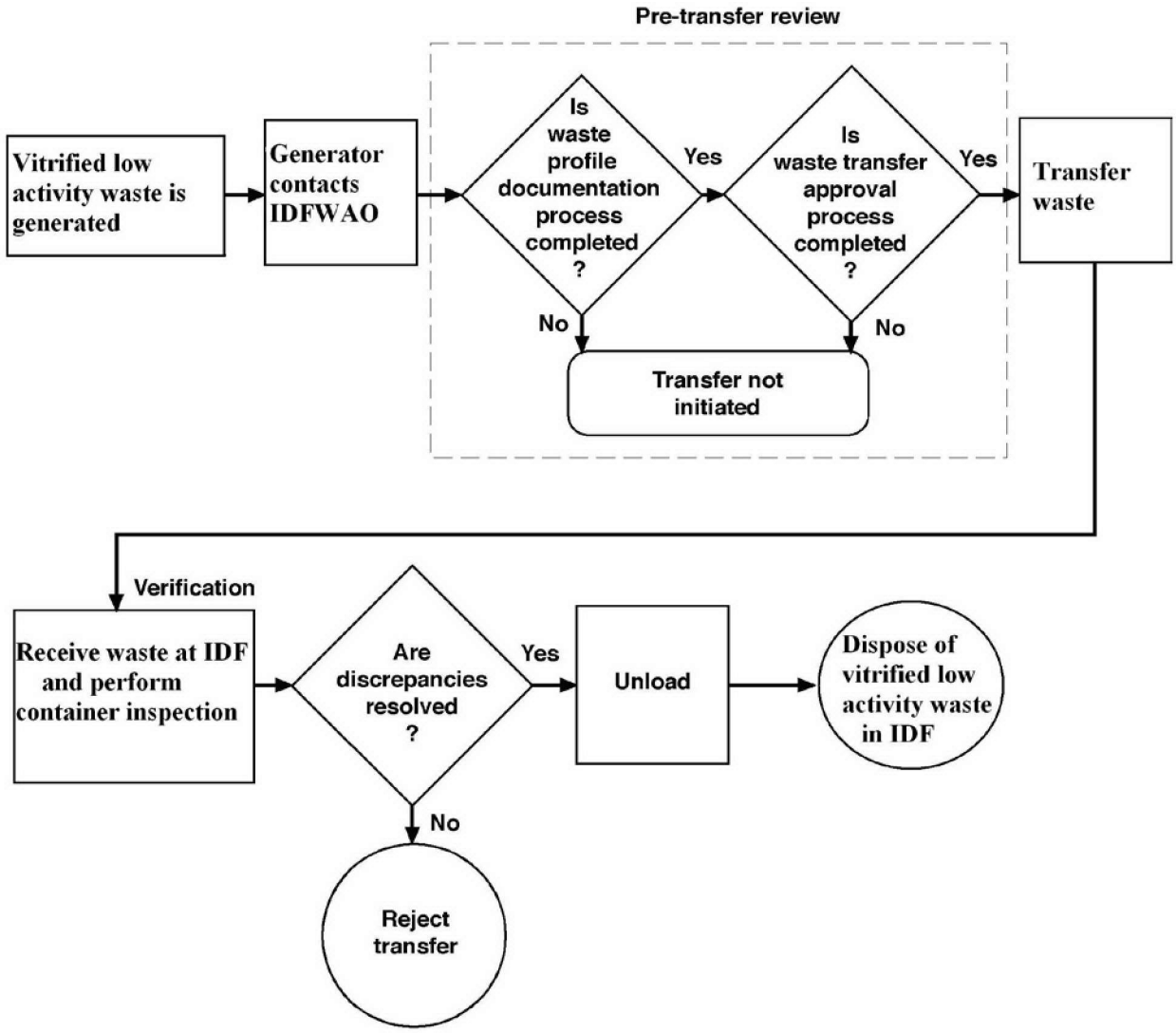
3.4.3 Waste Acceptance

Initial acceptance of waste occurs only after the confirmation process described in Section 3.4 is complete. Conformance issues identified during the confirmation process are documented and managed in accordance with Section 3.4.1.2.2. Conformance issues that must be corrected before waste acceptance include the following:

- Waste that is not identified in the Part A, Form 3 (Chapter 1.0)
- Waste does not match approved profile documentation
- Designation, physical, and/or chemical characterization discrepancy
- Incorrect LDR paperwork
- Packaging discrepancy
- Manifest discrepancies as described in WAC 173-303-370(4).

For waste shipments with unresolved conformance issue(s) that exceed 90 days, this TSD will notify Ecology at least once per calendar quarter.

Figure 2. Vitrification or Alternative Method Transfer and Waste Analysis Plan Process Flow Diagram



IDF = Integrated Disposal Facility
IDFWAO = IDF Waste Acceptance Organization

3.4.4 Selecting Waste Analysis Parameters

The ILAW and BVW containers will be managed without the need to perform sampling and analysis at the TSD. No parameters will be required to be identified.

Table 2. Parameters and Rationale for Physical Screening

Parameter	Method*	Rationale for selection
Nondestructive examination	Field method	Confirm consistency between waste and shipping documentation.

*Procedures based on manufacturer's recommended methodology unless otherwise noted. When regulations require a specific method, the method is followed.

SW-846, *Test Methods for Evaluating Solid Waste*, latest edition, U.S. Environmental Protection Agency, Washington, D.C.

WAC 173-303, "Dangerous Waste Regulations

3.4.5 Selecting Sampling Procedures

Any required sampling and analysis of the ILAW and BVW containers will be performed at the generator before the containers are closed. Sampling and analysis for IDF operational mixed waste will not occur at the IDF but at another Hanford TSD.

3.4.6 Selecting A Laboratory, Laboratory Testing, And Analytical Methods

Any required sampling and analysis of the ILAW and BVW containers will be performed before the containers are closed at the RPP-WTP and DBVS respectively. No Laboratory, laboratory testing or analytical methods will be required to be identified.

3.4.7 Selecting Waste Re-Evaluation Frequencies

The re-evaluation (repeat and review) frequency for ILAW to review a waste generating process and associated waste profile documentation is every 2 years, or more often if conditions in WAC 173-303-300(4)(a) arise. Since BVW will be generated over a shorter time period, frequency for review will be every six months.

When a waste generating process and associated waste profile documentation is re-evaluated, IDF personnel or designated waste acceptance organization could request the generator to do one or more of the following:

- Verify the current waste profile documentation is accurate
- Supply new waste profile documentation.

When a waste profile is re-evaluated, the TSD unit could request the organization generating the waste to do one of the following:

- Verify the current waste profile is accurate
- Supply a new waste profile
- Submit a sample for parameter analysis.

3.4.8 Special Waste Analysis Procedural Requirements

Special procedural requirements for the IDF will include procedures for ignitable, reactive, and incompatible waste, and provisions for complying with federal and state LDR requirements. This section discusses any special process requirements for receiving mixed waste at this TSD unit.

3.4.9 Procedures for Ignitable, Reactive, and Incompatible Waste

Waste stream compatibility (i.e., compatibility between individual waste streams and compatibility between waste streams and landfill design and construction parameters) and waste stream ignitability will be assessed on a case-by-case basis. Criteria for assessing and determining compatibility and ignitability will be identified in either the facility Waste Acceptance Criteria, Waste Analysis Plan, or other protocol or procedure as appropriate. Should these wastes be accepted, appropriate administrative and engineering controls will be implemented as necessary.

This TSD unit does not accept reactive waste (refer to Section 3.2 and Section 3.4.1.1). The TSD unit ensures that reactive waste is not accepted at this TSD unit in the following manner.

- Pre-shipment review will identify whether the waste is reactive based on the definition contained in WAC 173-303-040.
- If analysis of the characterization information leads to a conclusion that the waste is a reactive waste, the containers, or waste will not be accepted.

The types of prohibited waste not accepted at this TSD unit as listed in Section 3.2.

3.4.10 Provisions for Complying With Federal and State Land Disposal Restriction Requirements

State-only and federal LDR requirements restrict the land disposal of certain types of waste subject to RCRA and RCW 70.105, "Hazardous Waste Management", as amended. Waste managed on the Hanford Facility falls within the purview of these LDRs per 40 CFR 268 and WAC 173-303-140. The treatment standards for mixed waste disposed at IDF are based on the dangerous waste numbers accepted as documented on the IDF Part A as well as additional information necessary for identifying treatability groups etc.

The IDF will not perform sampling and analysis to determine compliance with treatment standards contained in 40 CFR 268. Any sampling and analysis results required to demonstrate compliance with concentration-based treatment standards contained in 40 CFR 268.40 will be obtained by IDF waste acceptance organization from the generator, during the waste profile documentation process to meet the requirements of 40 CFR 268.7(c)(2). Sampling and analysis results will be placed into the unit-specific portion of the Hanford Facility operating record. Other LDR records are identified in WAC 173-303-380(1)(m) and will be obtained from the generator, by IDF personnel as part of either the waste profile documentation process or the waste transfer approval process. The treated waste must meet all applicable LDRs to be accepted for disposal at the IDF. IDF will obtain the LDR certification from the treatment unit.

Mixed waste constituents that are subject to LDRs are identified in 40 CFR 268.40 by reference in WAC 173-303-140(2), the extremely hazardous waste disposal requirements for DOE facilities contained in RCW 70.105.050(2), and the state-only LDRs contained in WAC 173-303-140(4)(b)-(d). The mixed waste must meet certain treatment standards, as specified in 40 CFR 268.40, RCW 70.105.050(2), and WAC 173-303-140(4)(b)-(d), if the waste is to be land disposed. Any waste requiring LDR treatment must be treated prior to acceptance into the IDF.

State-only LDRs for mixed waste will be met in the following manner:

- Extremely hazardous waste disposal requirements in RCW 70.105.050(2) concerning "all reasonable methods" will be met by the treatment performed to meet 40 CFR 268, WAC 173-303-140(4)(b)-(d), and DOE requirements for disposal. If no treatment is required to meet 40 CFR 268, WAC 173-303-140(4)(b)-(d), or DOE requirements, no treatment is required to dispose of extremely hazardous waste at the IDF.
- Special requirements for bulk and containerized liquids in WAC 173-303-140(4)(b) are identical to the landfill requirements contained in 40 CFR 264.314. For mixed waste, including the provisions when to perform the paint filter test, these requirements are described in Section 3.2 of the WAP.
- Solid acid waste requirements in WAC 173-303-140(4)(c) can be met through knowledge of the treatment process. Sampling and analysis following treatment is not required to meet this state-only LDR. Disposal of treated solid acid waste still displaying the WSC2 characteristic can occur only when the waste is treated to reduce the harmful properties or characteristics of the waste.
- Organic/Carbonaceous waste prohibition requirements in WAC 173-303-140(4)(d) do not apply to the Hanford Facility because the Hanford Facility is operating under WAC 173-303-140(4)(d)(iii), in accordance with a sitewide 1,609 kilometers (1,000-mile) inapplicability certification. Sampling and analysis is not required to determine the organic/carbonaceous content of a mixed waste.
- Ecology allows treatment of Organic/Carbonaceous waste in lieu of meeting the inapplicability certification requirements (WAC-173-303-140(4)(d)(iii) through macro-encapsulation for hazardous debris only.

3.4.11 Off-Specification Waste

Off-Specification ILAW or BVW is waste not meeting the waste acceptance criteria as described in Section 3.4, Confirmation Process. ILAW or BVW streams determined to be off-specification may be temporarily stored in the RCRA lined portion of the IDF pending resolution of discrepancy or return to generating TSD as long as these wastes meet LDR. ILAW and BVW may be temporarily stored in the RCRA lined portion of the IDF, provided the temperature administrative control limit is not exceeded, until sufficiently cool for disposal.

3.5 WASTE TRACKING

The IDF will monitor and record the placement of waste packages. At the time of final placement of each package, the position and serial number of the package will be logged.

3.6 RECORDKEEPING

Recordkeeping requirements that will be applicable to this WAP are as follows:

- Confirmation records described in Section 3.4 will be maintained in accordance with Condition II.I.1.b of the Hanford Facility RCRA Permit, Dangerous Waste Portion (Ecology 2001).
- Waste profile documentation described in Section 3.4.1.2.1 will be maintained in accordance with Condition II.I.1.j of the Hanford Facility RCRA Permit, Dangerous Waste Portion.
- LDR records described in Section 3.4.10 will be maintained in accordance with WAC 173-303-380(1)(m) in the IDF unit-specific portion of the Hanford Facility operating record.

3.7 REFERENCES

Ecology, 2001, "Hanford Facility RCRA Permit, Dangerous Waste Portion", Washington State Department of Ecology, Olympia, Washington as amended.

SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Method*, latest edition, Office of Solid Waste, U.S. Environmental Protection Agency, Washington, D.C.

WHC-SD-WM-TI-714, *High-Density Polyethylene Liner Chemical Compatibility for Radioactive Mixed Waste Trenches*, 1995, Westinghouse Hanford Company, Richland, Washington.

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Hanford Facility RCRA Permit Modification Notification Forms

Part III, Operating Unit 16

400 Area Waste Management Unit

Index

Page 2 of 3 Hanford Facility RCRA Permit III.16 Conditions

Page 3 of 3 Addendum G, 400 Area Waste Management Unit Training Matrix

Submitted by Co-Operator: 5/29/13
Date

Reviewed by RL Program Office: 5.20.13
Date

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **400 Area Waste Management Unit**	Permit Part **Part III, Operating Unit 16**

Description of Modification:
Hanford Facility RCRA Permit III.16:

PART III, OPERATING UNIT GROUP 16 PERMIT CONDITIONS
400 Area Waste Management Unit

UNIT DESCRIPTION:

The 400 Area Waste Management Unit (WMU) is in the Property Protected Area (PPA) at the Fast Flux Test Facility (FFTF), in Hanford's 400 Area. The 400 Area WMU consists of two container storage units:

- Fuel Storage Facility (FSF, Building 403). The FSF is a large steel-frame, metal-sided, high bay building. Its dimensions are 34 x 27 x 12 meters (112 x 90 x 40 feet). The container storage unit is on the ground-level floor. In it are two large steel boxes that store sodium-contaminated core component pots (CCPs). The Permittees do not plan to store more mixed waste than is currently stored in the facility; however, the FSF is physically capable of storing additional mixed waste. They will store any additional wastes at the 400 Area WMU in the Interim Storage Area.
- Interim Storage Area, 4718 (ISA). The ISA consists of 156 x 247 meters (513 x 247 feet) totally fenced area. This area is for aboveground dry cask storage of spent fuel. A concrete pad in the ISA, which measures 27 x 37 meters (90 x 120 feet), was used for dry cask storage, but will not necessarily be used for mixed waste management. The rest of the ISA surface is gravel. The ISA is generally flat. However, it is graded to drain in accordance with the general drainage plan for the FFTF PPA. Inside the ISA, there is also one building along the west fence line, and open on the side. This building, Building 432A, is not authorized for mixed waste management.

The scale map in Addendum A shows the location of each storage unit. The only mixed waste stored in these two container storage units is elemental sodium, and sodium potassium (D001, D003, and WSC2), sodium hydroxide (D002), and potassium hydroxide (D002) and debris (e.g., piping, equipment, and components) contaminated with elemental sodium, sodium potassium, sodium hydroxide, and potassium hydroxide. The 400 Area WMU will not store, treat, or dispose of bulk metallic sodium or bulk sodium hydroxide.

LIST OF ADDENDA SPECIFIC TO OPERATING UNIT GROUP 16

Addendum A	Part A Form, dated June 30, 2012
Addendum B	Waste Analysis Plan, dated June 30, 2012
Addendum C	Process Information, dated December 31, 2012
Addendum D	Groundwater Monitoring – Reserved
Addendum E	Security Requirements, dated June 30, 2009
Addendum F	Preparedness and Prevention, dated September 30, 2012
Addendum G	Personnel Training, dated June 30 2013~~September 30, 2012~~
Addendum H	Closure Plan, dated June 30, 2009
Addendum I	Inspection Requirements, dated September 30, 2009
Addendum J	Contingency Plan, dated December 31, 2011

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class '1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Administrative and informational changes.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 5/13/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class '1, if appropriate.

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part
400 Area Waste Management Unit	**Part III, Operating Unit 16**

Description of Modification:
Addendum G, 400 Area Waste Management Unit Training Matrix:

400 Area Waste Management Unit Training Matrix

	Training Category*				
Permit Attachment 5, Training Category	General Hanford Facility Training	Contingency Plan Training	Emergency Coordinator Training	Operations Training	
400 Area WMU DWTP implementing plan	Orientation Program	Emergency Response (Contingency Plan)	Emergency Coordinator Training	General Waste Management	Container Management
Job title/position					
Nuclear Chemical Operator	X	X			X
D&D Worker	X	X			
Operations Manager~~Supervisor~~	X	X			
Field Work Supervisor	X	X			
Environmental Compliance Officer	X			X	
Building Emergency Director	X		X		
Waste Service Provider	X			X	
Sampler	X			X	

*Refer to the 400 Area WMU Dangerous Waste Training Plan (DWTP) for a complete description.

WAC 173-303-830 Modification Class [1] [2]	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:	X			

Enter relevant WAC 173-303-830, Appendix I Modification citation number: B.5.b
Enter wording of WAC 173-303-830, Appendix I Modification citation:
Other changes. Changes in titles of personnel that do not affect the type or decrease the amount of training given to employees. The title "Operations Supervisor" is changed to "Operations Manager" since "Operations Manager" is consistent with the terminology used in facility documents. This change will help to eliminate confusion.

Modification Approved: ☑ Yes ☐ No (state reason for denial)
Reason for denial:

Reviewed by Ecology:
E. R. Skinnarland 5/13/13
Date

[1] Class 1 modifications requiring prior Agency approval.

[2] If the proposed modification does not match any modification listed in WAC 173-303-830 Appendix I, then the proposed modification should automatically be given a Class 3 status. This status may be maintained by the Department of Ecology, or down graded to a Class 1, if appropriate.

Remove and Replace the Following Sections:

Remove Part III Permit Conditions, dated December 31, 2012, and replace with Permit Conditions, dated June 30, 2013.

Remove Addendum G, dated September 30, 2012, and replace with Addendum G, dated June 30, 2013.

PART III, OPERATING UNIT GROUP 16 PERMIT CONDITIONS

400 Area Waste Management Unit

UNIT DESCRIPTION:

The 400 Area Waste Management Unit (WMU) is in the Property Protected Area (PPA) at the Fast Flux Test Facility (FFTF), in Hanford's 400 Area. The 400 Area WMU consists of two container storage units:

- Fuel Storage Facility (FSF, Building 403). The FSF is a large steel-frame, metal-sided, high bay building. Its dimensions are 34 x 27 x 12 meters (112 x 90 x 40 feet). The container storage unit is on the ground-level floor. In it are two large steel boxes that store sodium-contaminated core component pots (CCPs). The Permittees do not plan to store more mixed waste than is currently stored in the facility; however, the FSF is physically capable of storing additional mixed waste. They will store any additional wastes at the 400 Area WMU in the Interim Storage Area.
- Interim Storage Area, 4718 (ISA). The ISA consists of 156 x 247 meters (513 x 247 feet) totally fenced area. This area is for aboveground dry cask storage of spent fuel. A concrete pad in the ISA, which measures 27 x 37 meters (90 x 120 feet), was used for dry cask storage, but will not necessarily be used for mixed waste management. The rest of the ISA surface is gravel. The ISA is generally flat. However, it is graded to drain in accordance with the general drainage plan for the FFTF PPA. Inside the ISA, there is also one building along the west fence line, and open on the side. This building, Building 432A, is not authorized for mixed waste management.

The scale map in Addendum A shows the location of each storage unit. The only mixed waste stored in these two container storage units is elemental sodium, and sodium potassium (D001, D003, and WSC2), sodium hydroxide (D002), and potassium hydroxide (D002) and debris (e.g., piping, equipment, and components) contaminated with elemental sodium, sodium potassium, sodium hydroxide, and potassium hydroxide. The 400 Area WMU will not store, treat, or dispose of bulk metallic sodium or bulk sodium hydroxide.

LIST OF ADDENDA SPECIFIC TO OPERATING UNIT GROUP 16

Addendum A	Part A Form, dated June 30, 2012
Addendum B	Waste Analysis Plan, dated June 30, 2012
Addendum C	Process Information, dated December 31, 2012
Addendum D	Groundwater Monitoring – Reserved
Addendum E	Security Requirements, dated June 30, 2009
Addendum F	Preparedness and Prevention, dated September 30, 2012
Addendum G	Personnel Training, dated June 30, 2013
Addendum H	Closure Plan, dated June 30, 2009
Addendum I	Inspection Requirements, dated September 30, 2009
Addendum J	Contingency Plan, dated December 31, 2011

DEFINITIONS

The term **"CCP" or Core Component Pot** means one of 109 cylindrical containers, each containing 3.75 gallons of un-reacted sodium totaling 405 gallons, currently stored as mixed waste in the FFTF Fuel Storage Facility. The CCPs were previously filled with sodium and used in the FFTF Interim Decay Storage Vessel to store spent FFTF Driver Fuel Assemblies under inert gas.

ACRONYMS

FFTF	Fast Flux Test Facility
CCP	Core Component Pot
PPA	Property Protected Area
ISA	Interim Storage Area
FSF	Fuel Storage Facility
WMU	Waste Management Unit

III.16.A COMPLIANCE WITH UNIT-SPECIFIC PERMIT CONDITIONS

III.16.A.1 The Permittees will comply with all conditions in this Chapter and its addenda with respect to dangerous waste management and dangerous waste management units in the 400 Area WMU, in addition to conditions in Permit Parts I and II.

III.16.B GENERAL WASTE MANAGEMENT

III.16.B.1 The Permittees are authorized to accept, according to the waste acceptance procedure documented in Addendum B, Section B.2, mixed debris generated from demolition and decommissioning of the Fast Flux Test Facility reactor system containing or contaminated with residual elemental sodium and sodium hydroxide. The Permittee will store these wastes in the ISA.

III.16.B.2 The Permittees are authorized to store core component pots generated prior to the effective date of this permit in two large metal boxes in the 400 Area WMU, FSF.

III.16.B.3 The Permittees are authorized store mixed waste in the ISA up to a maximum capacity of 19,000 gallons.

III.16.B.4 The Permittees will maintain the physical structure of dangerous waste management units in the 400 Area WMU as documented in the Unit Description above and Addendum C, Figures C.1 and C.2.

III.16.B.5 The Permittees will maintain appropriate administrative controls and work practices to ensure that only wastes specified in Permit Condition III.16.B.1, are received by the ISA for storage, and that no co-mingling or cross-contamination of the waste stream specified in Permit Condition III.16.B.1 with any other waste stream may occur.

III.16.C WASTE ANALYSIS

III.16.C.1 The Permittees will have an accurate and complete waste profile for the waste stream identified in Permit Condition III.16.B.1. This waste profile will be signed and dated upon approval by the 400 Area WMU authorized representative. [WAC 173-303-380(1)(a)]

III.16.C.2 The Permittees will make a copy of the waste profile required by Permit Condition III.16.C.1 available upon request. [WAC 173-303-815(2)(b)(ii)]

III.16.D RECORDKEEPING AND REPORTING

III.16.D.1 The Permittees will place the following into the Hanford Facility Operating Record, 400 Area WMU File required by Permit Condition II.I.2. [WAC 173-303-380]

III.16.D.2 Records required by WAC 173-303-380(1)(o), incorporated by reference;

III.16.E SECURITY

III.16.E.1 The Permittees will post warning signs at all entrances to the FSF and the ISA specified in Addendum E, Section E.1.1. [WAC 173-303-310(2)(a)]

III.16.F PREPAREDNESS AND PREVENTION

III.16.F.1 The Permittees will comply with the Addendum F, Preparedness and Prevention requirements specific to the 400 Area WMU. [WAC 173-303-340]

III.16.G CONTINGENCY PLAN

III.16.G.1 The Permittees will comply with Addendum J, Contingency Plan in addition to the requirements of Permit Condition II.A when applicable. [WAC 173-303-350]

III.16.H INSPECTIONS

III.16.H.1 The Permittees will perform inspections of the 400 Area WMU according to Addendum I, Inspection Plan for inspecting all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment that help prevent, detect, or respond to hazards to the public health or the environment pursuant to the requirements of WAC 173-303-320 [WAC 173-303-320(2)]

III.16.I TRAINING PLAN

III.16.I.1 The Permittees will include Addendum G unit-specific training requirements in the written training plan required by Permit Condition II.C. [WAC 173-303-330]

III.16.J OTHER GENERAL REQUIREMENTS

III.16.J.1 The Permittees will comply with the requirements of WAC 173-303-395(1)(a)-(c), incorporated by reference, for prevention of reaction of ignitable, reactive, or incompatible wastes.

III.16.J.2 Land Disposal Restriction Requirements

III.16.J.2.a The Permittees will ensure a schedule of compliance and any applicable associated work requirements are included in the land disposal restrictions report required by the HFFACO Milestone M-26, incorporated by reference by Permit Condition II.O for treatment and/or acquisition of treatment capacity for wastes which are or are expected to be stored in the 400 Area WMU container storage units.

III.16.K CLOSURE

III.16.K.1 The Permittees will close the 400 Area WMU Container Storage Units in accordance with Addendum H, Closure Plan. [WAC 173-303-610(4)]

III.16.L POST CLOSURE

Reserved

III.16.M CRITICAL SYSTEMS

Reserved

III.16.N RESERVED

III.16.O CONTAINERS

III.16.O.1 Container Management Standards

III.16.O.1.a The Permittees will ensure that all containers remain in good condition. If a container holding mixed waste is not in good condition (e.g., severe rusting or corrosion, or apparent structural defects), or if it begins to leak, the Permittee must transfer the waste from the container to a container that is in good condition or place the leaking container in an appropriate over-pack container. [WAC 173-303-630(2)]

III.16.O.1.b	The Permittees shall ensure that all containers are constructed of carbon steel or stainless steel, or other materials compatible with metallic sodium and sodium hydroxide. [WAC 173-303-630(4)]
III.16.O.1.c	The Permittees must remove spilled or leaked waste within secondary containment pursuant to WAC 173-303-630(7)(a)(ii), incorporated by reference.
III.16.O.1.d	Requirements for the Fuel Storage Facility
III.16.O.1.e	The Permittee will maintain an inert gas (argon or nitrogen) cover within each large metal box to prevent contact of the metallic sodium with the water vapor in the air and the formation of free liquids.
III.16.O.1.f	The Permittees will place large boxes stored in the FSF in drip pans to ensure a base free of cracks or gaps, and ensure that the large boxes are elevated or otherwise protected from contact with accumulated liquids.
III.16.O.1.g	Requirements for the Interim Storage Area
III.16.O.1.h	The Permittee may store wastes in the ISA in standard metal containers (e.g., 208-liter drums), large metal boxes fabricated to accommodate the size and shape of a particular component or debris, or unique components removed from FFTF that when closed in accordance with WAC 173-303-630(5)(a) serve as a primary container.
III.16.O.1.i	The Permittees will manage unique components stored in the ISA on the gravel surface with sufficient open space between components and between components and the fence line to accommodate inspections and movement of equipment.
III.16.O.1.j	The Permittees will not place wastes in the open-sided structure (Building 432A) within the ISA identified in the Unit Description above.

400 Area Waste Management Unit Training Matrix

	Training Category*				
Permit Attachment 5, Training Category	General Hanford Facility Training	Contingency Plan Training	Emergency Coordinator Training	Operations Training	
400 Area WMU DWTP implementing plan	Orientation Program	Emergency Response (Contingency Plan)	Emergency Coordinator Training	General Waste Management	Container Management
Job title/position					
Nuclear Chemical Operator	X	X			X
D&D Worker	X	X			
Operations Manager	X	X			
Field Work Supervisor	X	X			
Environmental Compliance Officer	X			X	
Building Emergency Director	X		X		
Waste Service Provider	X			X	
Sampler	X			X	

*Refer to the 400 Area WMU Dangerous Waste Training Plan (DWTP) for a complete description.

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Quarter Ending March 31, 2013 24590-HLW-PCN-ENV-11-007

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant Update Corrosion Evaluation Data Sheet for the HLW Canister Decontamination Handling System (HDH) Canister Decon Vessels in Appendix 10.9 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

D. M. Busche 2/11/13
Date

Reviewed by ORP Program Office:

D. L. Noyes 2/21/13
Date

Quarter Ending March 31, 2013 24590-HLW-PCN-ENV-11-007

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update the HLW facility *Corrosion Evaluation HLW HDH-VSL-00002 & HDH-VSL-00004 (HLW) Canister Decon Vessels* in Appendix 10.9 of the DWP. This PCN will replace one permit Material Selection Data Sheet incorporated into the DWP with one source Corrosion Evaluation Data Sheet as indicated in the Table below. Note the title of the data sheet has been changed from the permit version "Plant Item Material Selection Data Sheet" to the source "Corrosion Evaluation."

The following source document is submitted to replace the permit document currently in Appendix 10.9:

Appendix 10.9			
Replace:	24590-HLW-HDH-P0003 Rev. 1	With:	24590-HLW-N1D-HDH-00003 Rev. 8

This modification requests Ecology approval and incorporation into the permit, the specific changes to the document that have been issued since the last revision of the permitted version; the changes are described in Revision History. The revised corrosion evaluation provides more detailed information which resulted in substantial changes to the document. The following identifies those changes:

- Added the facility room location
- Added discussion of heating and cooling coils and temperature ranges
- Added corrosion allowance for cooling coils
- Expanded discussion on Titanium corrosion resistance under paragraph a, General Corrosion
- Added general description of parameters including in selecting materials including, heat transfer, material thickness effects, corrosion and fouling
- Updated expected pH range
- Updated Operating Modes Considered
- Deleted temperature of high pressure steam that is used to raise temperature of decontamination solution
- Updated Design Pressure
- Updated Operating Modes
- Updated References and Bibliography, including CCN 240368

This modification requests Ecology approval and incorporation into the permit, the specific changes to this data sheet, as indicated by revision bars, that have been issued since the last revision of the permitted version. Revisions are the result of ongoing design changes. The following identifies the significant types of changes on the attached data sheets:

None.

In accordance with Permit Condition III.10.C.2.e, this permit modification may include page changes to the Permit, attachments, and permit application supporting documentation. The necessary permit changes were submitted for Ecology's approval. Ecology is requested to approve the attached permit changes and incorporate the changes in the next revision of the WTP DWP.

Quarter Ending March 31, 2013 24590-HLW-PCN-ENV-11-007

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur:	Reviewed by Ecology:
[X] Yes [ ] Denied (state reason below)	S. Dahl 4/16/13 Date
Reason for denial:	

CORROSION EVALUATION

ISSUED BY
RPP-WTP PDC

HDH-VSL-00002 & HDH-VSL-00004 (HLW)
Canister Decon Vessels

- Design Temperature (°F) (max/min): 225/40
- Design Pressure (psig) (internal/external): 15/FV
- Location: Room H-B035; out cell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached Process Corrosion Data Sheet

Operating Modes Considered:

- The tank is filled with the acidic decontamination solution at normal operating temperature.
- Internal coils are present to maintain temperature at 149 °F for decontamination.
- Internal coils are present to cool contents to 104 °F following decontamination.
- Rinsing, draining, and drying preparatory to lay-up.

Materials Considered:

Material (UNS No.)	Acceptable Material	Unacceptable Material
Carbon Steel		X
Type 304L (S30403)		X
Type 316L (S31603)		X
6% Mo (N08367/N08926)		X
Hastelloy® C-22® (N06022)		X
Ti-2 (R50400)	X	

Recommended Material: UNS R50400 Grade 2

Recommended Corrosion Allowance: Vessel -- 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)
Cooling coils – No corrosion allowance is required because cooling coils can be replaced.
Additionally, a corrosion allowance is impractical as heat transfer efficiency is lost with increasing thickness.

Process & Operations Limitations:

- None identified

Concurrence NA
Operations

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	MET	APPROVER
8	10/29/12	Extensive re-write; no rev bars Update design pressure Include additional general discussion on titanium corrosion-resistance throughout Include additional references Remove personal communications references Include updated PCDS	DLAdler	RBDavis	NA	

REVISION HISTORY CORROSION EVALUATION

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	MET	APPROVER
7	11/18/10	Include CA for internal coils Text modification due to design change Incorporate revised PCDS Add AEA notice Editorial and format changes	DLAdler	RBDavis	NA	SWVail
6	5/27/05	Update wear allowance based on 24590-WTP-RPT-M-04-0008	DLAdler	JRDivine	NA	APRangus
5	9/18/04	Incorporate new PCDS Add section p – Inadvertent Addition of Nitric Acid	DLAdler	JRDivine	NA	APRangus
4	3/15/04	Revised to incorporate comments from review of DWP document	DLAdler	JRDivine	NA	APRangus
3	12/16/03	Update design pressure Additional Vessel Add DWPA note Re-format references Append updated MSDS	DLAdler	JRDivine	NA	APRangus
2	10/29/02	Editorial changes Append amended MSDS	DLAdler	JRDivine	NA	SMKirk
1	9/12/02	Add DWP note Revise to remove open issues	DLAdler	JRDivine	NA	SKirk
0	6/2/02	Initial Issue	DLAdler	JRDivine	SS	SK

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

This bound document contains a total of 8 sheets.

CORROSION EVALUATION

Corrosion Considerations:

Canister decontamination vessels hold the filled canister and the ceric nitrate solution during decontamination. Internal coils are used to maintain the decontamination solution at 149 °F. After the decontamination solution is drained from the vessel, spray rings rinse the canister with nitric acid and demineralized water. The decontamination vessels are located such that replacement is possible should it be necessary.

When cooling and heating coils are included in the design of a vessel, heat exchanger, or cooler they are generally specified without extra thickness that defeats or slows the heat transfer. The design objective is to efficiently transfer heat. Typically, heating elements and coils are designed in such a fashion that they can be replaced. The decontamination vessels are located in the HLW hot cells; should retubing be required, the vessels can be removed and either discarded and replaced.

a General Corrosion
Corrosion rates of Type 304 stainless steel in Ce-IV/nitric acid solutions depend on temperature, nitric acid concentration, and cerium concentration, but are typically about 350 mpy. Thus, the neat solution is good for decontamination of stainless steel but cannot be stored in stainless steel containers.

Craig (1989) states that Ti is very resistant to nitric acid; except that in the 20-70 % concentration range the corrosion rate is relatively high, with a maximum at about 45 %. The use of about 12% acid minimizes this. Corrosion is inhibited by Ti^{+4}, Cr^{+6}, and Fe^{+3} ions as well as by other oxidizing ions. Ce^{+4} is not mentioned; however, it is expected to behave similarly.

Titanium is a very reactive metal that shows remarkable corrosion resistance to oxidizing acids over a wide range of concentrations and temperatures because of a passive oxide film that is formed instantaneously. Like stainless steels, titanium depends on this oxide film for its corrosion resistance. If damaged, the film reforms readily as long as there is some source of oxygen in the environment. Therefore, it performs best in oxidizing media such as warm nitric acid. The oxide film formed on titanium is more adherent and therefore more protective than that on stainless steel. Titanium alloys perform well in media that would cause pitting and crevice corrosion in stainless steels (e.g., seawater, wet chlorine, organic chlorides). More information on the corrosion resistance of titanium can be found in CCN 240368, *Supplemental Information for Corrosion Evaluation 24590-HLW-N1D-HDH-00003*, 23 May, 2012.

The conditions under which Ti Grade 2 is susceptible to corrosion are strongly reducing acids, alkaline peroxide solutions, and molten chloride salts. Crevice corrosion can occur in hot halide or sulfate solutions; however, neither condition exists in the present application.

Titanium is highly resistant to oxidizing acids over a wide range of concentrations and temperatures up to 160 °F. Common acids in this category include nitric, chromic, perchloric, and hypochlorous acids. These oxidizing compounds ensure oxide film stability. Low, but finite, corrosion rates from continued surface oxidation may be observed at higher temperatures and highly oxidizing conditions. Titanium offers excellent resistance over the full concentration range at sub-boiling temperatures. At higher temperatures, however, titanium's corrosion resistance is highly dependent on nitric acid purity. In hot, very pure solutions or vapor condensates of nitric acid, significant general corrosion (and trickling acid condensate attack) may occur in the 20 to 70 wt % range. Corrosion is inhibited when the nitric acid solution is contaminated with various metallic species such as Si, Cr, Fe, Ti, or various precious metal ions (e.g., Pt, Ru). Titanium often exhibits superior performance to stainless steel alloys in high temperature metal-contaminated nitric acid media, such as those associated with the Purex Process for U_3O_8 recovery. Titanium's own corrosion product Ti^{+4}, is a very potent inhibitor.

Partridge, Lerch and Bosuego (1979) performed a series of corrosion experiments on the decontamination of TRU contaminated metal surfaces. Titanium was found to be very resistant to corrosion in a cerium (IV)-nitric acid solution. Corrosion tests at 194 °F (90 °C) measured a corrosion rate of ~0.014 mpy.

Uniform corrosion loss on the HDH-VSL-00002 and HDH-VSL-00004 pressure boundary materials will be negligible over the expected life.

West Valley Nuclear Services has not examined their Ti-2 vessel for corrosion. However, they do not believe it has been a problem. Another reason that Ti was selected was that it was recommended by Battelle-Northwest (PNNL). PNNL recommended it because electrodes used in several earlier studies were Ti and had not visibly degraded.

The corrosion rates on the heating and cooling coils should be similar to the Grade 2 used for vessel fabrication. The design of the heating and cooling coils is optimized for heat transfer. Heat transfer is the ability of a surface to transfer heat from one side to the opposite side. The inverse of the heat transfer is the resistance to heat flow; the resistance can be minimized by the design, flow, surface area, and tube wall thickness. Five component resistances make up the total resistance to heat transfer: tube-side boundary fluid layer, tube-side fouling, tube metal thickness, shell-side fouling, and shell-side boundary fluid layer. For the HDH cooling coils the fluid boundary layers and fouling on each side are expected to be small and the resistance to heat transfer is dependent on the thickness of the surface and the transfer coefficient of the material. From the design perspective, once titanium has been selected, the thickness becomes the only tool the engineer has to optimize heat transfer. Thin heat transfer surfaces use corrosion resistant materials, thereby increasing the life and reducing the extra thickness material needed to anticipate corrosion loss. (CCN 240368).

Specifying a corrosion resistant alloy for heat exchange surfaces is customary at the WTP. A zero corrosion allowance can be specified for stainless steels, duplex stainless steels, copper alloys, nickel alloys, and titanium providing process conditions can be controlled. The high resistance of these alloys to corrosion prevents buildup of corrosion products. Titanium is corrosion resistant and has excellent heat transfer properties as well. Zero corrosion allowance is recommended for titanium heat transfer surface in the Canister Decontamination Vessels.

CORROSION EVALUATION

Conclusion:
Commercially-pure titanium, Grade 2, is an acceptable alloy based on the referenced literature specific to decontamination (i.e., West Valley). Based on an examination of the chemical and electrochemical behaviors of Ti alloys and Ce^{+4} solutions, no corrosion problem appears to exist. Based on the low corrosion rates, no corrosion allowance is required for the heat transfer surfaces.

b Pitting Corrosion
The vessel material and solution chemistry combination are one-of-a-kind applications, no direct pitting corrosion data is available for the chemistry listed in the Process Corrosion Data Sheet. However, Ti is resistant to pitting in chloride solutions although the effects of a highly oxidizing medium, such as Ce^{+4}, with chloride are have not been studied, other than the experience at West Valley and that reported by Partridge, Lerch, and Bosuego (1979). However, in this system, there should be no chloride except for that brought over with any external ^{137}Cs contamination. This should amount only to 0.13 Ci of ^{137}Cs, equivalent to about 1.5 mg of Cs and therefore 0.4 mg of chloride. With approximately 800 L of solution, the chloride is expected to be about 0.5 ppb.

Conclusion:
Pitting of the Decontamination Vessel is not expected to be a problem.

c End Grain Corrosion
End grain attack is the preferential corrosion attack of a metal. When metals are worked and formed into shapes, rods, and bars by rolling, the grains becomes elongated along the rolling direction. The rolling is a continuous process and the shapes, rods, and bars are sliced to lengths perpendicular to the rolling direction. The exposed end grains are more susceptible to corrosion because of a combination of high stress, inclusions, high surface density of the grain boundaries, and micro fissures. These represent easy pathways for the solution chemistry and mass transfer reactions. End grain attack is specific to the cold worked materials. End grain attack is generally not a concern for plate, forgings, castings, pipes, and tubes. Materials that are rolled and solution annealed are also not a problem. Commercially pure Titanium Grade 2 is supplied in the annealed condition for corrosion resistance.

Conclusion:
End grain corrosion is not expected on Titanium Grade 2, and, therefore, is not expected in this system.

d Stress Corrosion Cracking
Ti Grade 2 is fully resistant to stress corrosion cracking in aqueous solutions and is largely immune to SCC in general. The exceptions are the general group of organic solvents, anhydrous methanol, methanol halide-solutions, red fuming nitric acid, nitrous oxide, liquid or solid cadmium, and liquid mercury (CCN 240368). Past work at West Valley has shown that cracking of the decontamination vessel is not a concern.

Conclusion:
Ti-2 is acceptable.

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting.

f Corrosion at Welds
Corrosion at welds is not considered a problem in the proposed environment: compatible weld consumables, materials, and methods are required. The welding procedure specification (WPS) has been qualified (PQR) according the WTP specifications and good practices. Quality control of the welding process is expected to prevent welding problems, and non destructive testing is expected to identify and provide evidence of proper welding. West Valley reports no problems with similar titanium vessels. Proper welding techniques will be required (H_2, O_2, or N_2 shall not be present in the welding cover gas).

Conclusion:
Weld corrosion is not considered a problem because of welding and fabrication controls.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are not conducive to microbial growth.

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Corrosion fatigue is a potential problem if the component is free to vibrate. In WTP vessels, because of possible earthquake concerns, all components are well anchored and virtually immovable. Corrosion fatigue is not expected to be a problem because all attachments are fully supported and movement is minimal. The temperature cycle is minimal, 70 °F max delta, and is not expected to generate a thermal fatigue load. The longest cantilever is the heating/cooling coil and the entry point into the vessel; however, the bulk of the weight is on the frame lugs welded to the vessel. The design and material will accommodate these loads.

Conclusions
Proper design and material choice mitigates this concern.

CORROSION EVALUATION

i Vapor Phase Corrosion
West Valley has encountered no problems.

Conclusion:
Not expected to be a concern.

j Erosion
Velocities are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not expected to be a concern.

k Galling of Moving Surfaces
Not applicable because of no moving parts.

Conclusion:
Not applicable.

l Fretting/Wear
As designed, there is no contact between surfaces of the vessel or the coils and the canister.

Conclusion:
Fretting is not expected.

m Galvanic Corrosion
The canister is expected to be anodic relative to the vessel. The canister is purposely being corroded to clean the surface and so this state is acceptable. Gaseous corrosion reaction products such as hydrogen will likely bubble to the top and mix with the room air, not permeate into the titanium. Because of the strong oxidizing nature of the solution, hydrogen, if present, is not expected to survive long enough to diffuse into the Ti.

Conclusion:
The hydrogen generation from the hydrolysis of water at the Ti-2 surface is not expected to be a concern.

n Cavitation
None expected.

Conclusion:
Not believed to be of concern.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Addition of Nitric Acid
Vessels normally contain nitric acid and operate at a low pH.

Conclusion:
Not applicable.

CORROSION EVALUATION

References:

1. 24590-WTP-RPT-M-04-0008, Rev. 3, *Evaluation Of Stainless Steel and Nickel Alloy Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. 0CD, *WTP Process Corrosion Data*
3. Craig, BD, Editor, 1989, *Handbook of Corrosion Data*, ASM International, Metals Park, OH 44073
4. Deleted
5. Deleted
6. Partridge J, Lerch R, and Bosuego G. 1979. *Decontamination of TRU Contaminated Metals*, HEDL-TC-1503, Hanford Engineering Development Laboratory, Richland, WA.
7. CCN 240368, memorandum, R Davis to D Adler and others, *Supplemental Information For Corrosion Evaluation 24590-HLW-N1D-HDH-00003*, 23 May, 2012

Bibliography:

1. 24590-HLW-MVD-HDH-00006, *Mechanical Data Sheet for Canister Decon Vessel 1, 24590-HLW-MV-HDH-VSL-00002. Canister Decon Vessel 2, 24590-HLW-MV-HDH-VSL-00004.*
2. Bray, LA, 1988, *Development of a Chemical Process Using Nitric Acid-Cerium (IV) for Decontamination of High-Level Waste Canisters*, Battelle, Pacific Northwest Laboratory, Richland, WA 99352
3. Bray, LA, MR Elmore, KJ Carson, RJ Elovich, GM Richardson, and LD Anderson, 1992, *Decontamination Testing of Radioactive-Contaminated Stainless Steel Coupons Using a Ce(IV) Solution*, Battelle, Pacific Northwest Laboratory, Richland, WA 99352
4. Deleted
5. Clark W and Gens TA. 1961. *Study of Dissolution of Reactor Fuels Containing Zirconium in a Titanium Vessel*, ORNL-3118. Oak ridge National Laboratory, Oak Ridge, TN.

CORROSION EVALUATION

24590-WTP-RPT-PR-04-0001, Rev. 0CD
WTP Process Corrosion Data

PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) Canister decon vessel (HDH-VSL-00002, HDH-VSL-00004)

Facility HLW

In Black Cell? No

Chemicals	Unit[1]	Contract Maximum[2]		Non-Routine		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/L	1.15E-03	1.92E-03			
Chloride	g/L					
Fluoride	g/L					
Iron	g/L	7.39E-01	7.37E-01			
Nitrate	g/L	2.42E+02	2.42E+02			
Nitrite	g/L					
Phosphate	g/L					
Sulfate	g/L					
Mercury	g/L					
Carbonate	g/L					
Undissolved solids	wt %	5.45E-02	5.45E-02			
Other (Pb)	g/L	2.23E-04	1.69E-04			
Other(Cerium)	g/L	6.81E+01	6.81E+01			
pH	N/A					Note 3
Temperature	°F					Note 4

List of Organic Species:

References

System Description: 24590-HLW-3YD-HDH-00002
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: HDH01, HDH05, HDH03, NAR21
Off Normal Input Stream # (e.g., overflow from other vessels): N/A
P&ID: N/A
PFD: 24590-HLW-M5-V17T-00006
Technical Reports: N/A

Notes:

1. Concentrations less than 1x 10^{-4} g/L do not need to be reported; list concentration values to three significant digits max.
2. Data developed from a mass balance model which has constituents in the plant feed which are important to corrosion, adjusted to contract maximum values.
3. Approximate pH 0 to 10 (sheets 92-97, 24590-HLW-M4C-HDH-00001, Rev 0).
* 4. Maximum temperature of acidic solutions is 175 °F (sheet 95, 24590-HLW-M4C-HDH-00001, Rev 0)
Normal operating temperatures range from about 80 °F to about 155 °F (sheets 92-97, 24590-HLW-M4C-HDH-00001, Rev 0).
The vessel contains coils that carry high pressure steam for heating of solutions.

Assumptions

* Referenced calculation 24590-HLW-M4C-HDH-00001 has been revised. Maximum temperature of acidic solutions based on HDH05 in revision 2 of referenced calculation is 149 °F. Normal operating temperature range is 80 to 149 °F. According to the system description, 24590-HLW-3YD-HDH-00002, decontamination fluid will be at 149 ± 5 °F, and the contents will be cooled to 104 °F or below before transfer.

CORROSION EVALUATION

24590-WTP-RPT-PR-04-0001, Rev. 0CD
WTP Process Corrosion Data

Routine Operations

The canister decon vessel is used to hold the filled canister and ceric nitrate solution during the decontamination process. Nitric acid and demineralized water spray washes also take place in this vessel.
* High-pressure steam is supplied to coils to raise the solution temperature from 73 °F to 149 °F and is held at 149 °F for 6 hours during the decontamination process. Heating and cooling coils maintain the temperature of the liquid at the desired temperatures over the cycle. The nitric acid solution is drained from the vessel. Spray rings will rinse the canister with nitric acid and demineralized water. The canister is then removed from the vessel.

Non-Routine Operations that Could Affect Corrosion or Erosion

None identified.

* Due to a change in design, steam is no longer directly supplied to the vessel. Hot water is provided to the vessel to heat the solution to 149 °F.

Table III.10.E.C – HLW Vitrification Plant Tank Systems Description

Mixed Waste Tank Systems Name	Unit Designation	Engineering Description (Drawing Nos, Specification Nos, etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
HDH-VSL-00003 (Waste Neutralization Vessel) HDH-VSL-00004 (Canister Decon Vessel 2)		-M0-HDH-P0012001, Rev 1 -M0-HDH-P0012002, Rev 1 -MV-HDH-P0003, Rev 1 -MVD-HDH-P0003, Rev 2 -MVD-HDH-00006, Rev 5 -MVD-HDH-P0009, Rev 0 -N1D-HDH-~~P0003~~-00003, Rev ~~1~~8 -N1D-HDH-P0005, Rev 1 -N1D-HDH-P0007, Rev 1 -P1-P01T-00001, Rev 9 -P1-P01T-00002, Rev 7 -3YD-HDH-00002[a] **24590-WTP** -3PS-G000-T0002, Rev 8 -3PS-MV00-T0001, Rev4 -3PS-MV00-T0002, Rev 3 -3PS-MV00-T0003, Rev 3		
HLW Melter Cave Support Handling System HSH-TK-00001 (Decontamination Tank Melter Cave 1) HSH-TK-00002 (Decontamination Tank Melter Cave 2)	HSH	**24590-HLW** -M6-HSH-00004001, Rev 1 -M6-HSH-00004001, Rev 1 -M6-HSH-20004001, Rev 1 -M6-HSH-20004002, Rev 1 -M0-HSH-P0072, Rev 1 -N1D-HSH-P0001, Rev 1 -P1-P01T-00002, Rev 7	Section 4.1.4.7; Tables 4-4 and 4-6; Figures C1-1 and C1-4 of Operating Unit Group 10, Addendum C of this Permit.	HSH-TK-00001 = 4,000 HSH-TK-00002 = 4,000
HLW Vitrification Plant Radioactive Liquid Waste Disposal System	RLD	**24590-HLW** -3YD-RLD-00001[a] -M5-V17T-P0007001, Rev 1	Section 4.1.5.5; Tables 4-4 and 4-6; Figures C1-1 and C1-4 of Operating Unit Group 10, Addendum C of this Permit.	RLD-VSL-00002 = 334 RLD-VSL-00007 = 18,145

Issued by
RPP-WTP PDC

Quarter Ending March 31, 2013

24590-HLW-PCN-ENV-12-002

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Replace Piping and Instrumentation Diagrams (P&ID) for the HLW Melter Offgas Treatment Process System (HOP) in Appendix 10.2 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

D. M. Busche — 3/21/2013 Date

GRANT W. RYAN for

Reviewed by DRP Program Office:

D. L. Noyes — 4/8/13 Date

Quarter Ending March 31, 2013 24590-HLW-PCN-ENV-12-002

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update and replace the following P&IDs for the HOP in Appendix 10.2 of the DWP. The additional drawings are the result of converting source drawings into multiple sheets in an effort to provide clearer representation of this system, including additional details for instrumentation and logic controls.

Appendix 10.2			
Replace:	24590-HLW-M6-HOP-00006, Rev.5	With:	24590-HLW-M6-HOP-00006001, Rev. 0
			24590-HLW-M6-HOP-00006002, Rev. 0
	24590-HLW-M6-HOP-20006, Rev. 6		24590-HLW-M6-HOP-20006001, Rev. 0
			24590-HLW-M6-HOP-20006002, Rev. 0

The referenced P&IDs have been revised. They incorporate changes provided in applicable document change forms (e.g., DCN, SCN, SDDR, FCN, FCR, etc.) and changes associated with the resolution to comments on change documents since the issuance of the last revision of the permitted drawings. This modification requests Ecology approval and incorporation into the permit, the specific changes to these P&IDs that are indicated by revision notes and clouds. Revisions are the result of ongoing design changes.

Significant changes to the P&IDs are summarized below:

- Converted drawing from a single sheet to multi-sheet drawings
- Modified, deleted, and added notes, holds, and references
- Expanded instruments and logic controls information
- Incorporated changes from change documentation identified in the Notes section on each drawing
- Drawings were superseded in accordance with 24590-WTP-GPP-PADC-009, *Project Document Control*

24590-HLW-M6-HOP-00006001, Rev. 0:

- Reduced size and changed slope of demin water supply lines HOP-ZE-00025-S11B-011/2 and HOP-ZE-00026-S11B-011/2
- Added reducers at nozzles N01 and N02

24590-HLW-M6-HOP-00006002, Rev. 0:

- Changed slope of spare lines at nozzles N04, N05, N06, and N20
- Changed set pressures on pressure safety valves (PSV)
- Changed line numbers, valves, and reducers
- Added atmospheric reference to HOP-PT-0124 (unclouded change in Grid E4; identified in 24590-HLW-M6PR-HOP-00010)
- Added radar windows and associated purge flange and separation spool pieces to the radar wave guides to HOP-LT-0110 (unclouded change in Grid F4; identified in 24590-HLW-M6N-30-00007)
- Added instrument rack HOP-RK-00017 (Grids F5 and F6)
- Enhanced instrumentation presentation to define/clarify functional requirements of system controls (unclouded changes in Grids E6, F4/F5, G4/G5, and H2/H3/H4; identified in 24590-HLW-M6N-HOP-00187)

24590-HLW-M6-HOP-20006001, Rev. 0:

- Reduced size and changed slope of demin water supply lines HOP-ZE-00098-S11B-011/2 and HOP-ZE-00099-S11B-011/2

- Added reducers at nozzles N01 and N02

24590-HLW-M6-HOP-20006802, Rev. 0:

- Changed set pressures on PSVs
- Changed line numbers, valves, and reducers
- Added atmospheric reference to HOP-PT-2124 (unclouded change in Grid E4; identified in 24590-HLW-M6PR-HOP-00010)
- Added radar windows and associated purge flange and separation spool pieces to the radar wave guides to HOP-LT-2110 (unclouded change in Grid F3; identified in 24590-HLW-M6N-30-00007)
- Added instrument rack HOP-RK-00016 (Grids F5 and F6)
- Enhanced instrumentation presentation to define/clarify functional requirements of system controls (unclouded changes in Grids E6, F3/F4/F5, G3/G4/G5, and H2/H3/H4; identified in 24590-HLW-M6N-HOP-00196)

This PCN updates information in Appendix 10.2 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.

The following outstanding change documents have been submitted to Ecology pursuant to Permit Condition III.10.C.9.h and are maintained in the WTP Operating Record:
None

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

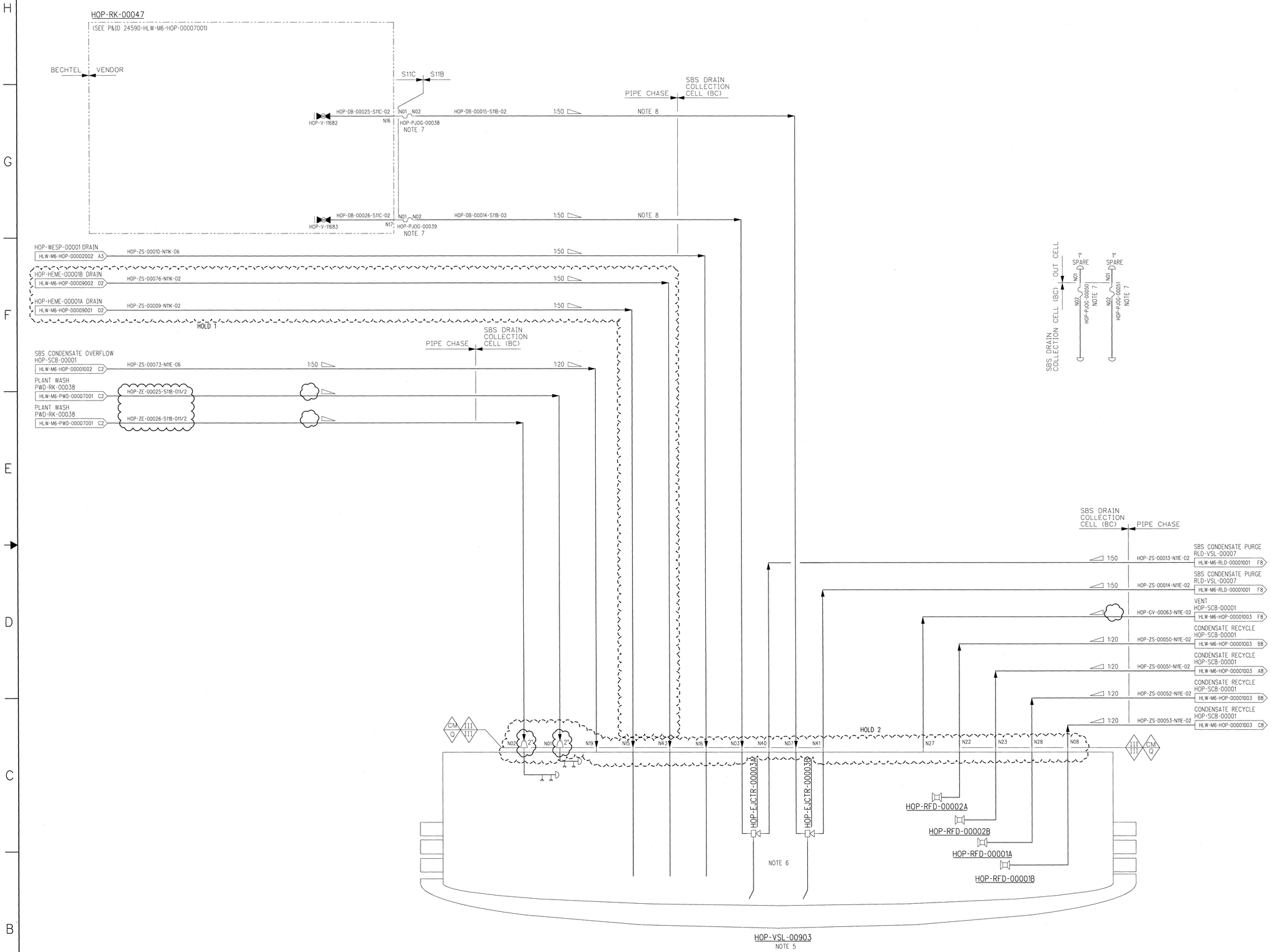
Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl 4/23/13 Date

HOP-VSL-00903 MELTER 1 SBS CONDENSATE RECEIVER VESSEL	HOP-EJCTR-00003A HOP-VSL-00903 VESSEL EJECTOR (STEAM EJECTOR)	HOP-EJCTR-00003B HOP-VSL-00903 VESSEL EJECTOR (STEAM EJECTOR)	HOP-RFD-00002A HOP-VSL-00903 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00002B HOP-VSL-00903 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00001A HOP-VSL-00903 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00001B HOP-VSL-00903 REVERSE FLOW DIVERTER (FLUIDIC PUMP)
7898 GAL MAX OPER VOL 12FT ID X 7FT 9IN T-T	44 GPM 1134 LB/HR	44 GPM 1134 LB/HR	MODEL 140L 80 GPM	MODEL 140L 80 GPM	MODEL 140L 80 GPM	MODEL 140L 80 GPM



NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, UNLESS OTHERWISE NOTED.
5. SEE 24590-HLW-M6-HOP-00004001, -00004002, -00004003, -00004004, AND -00004005 FOR DETAILS ON PULSE JET MIXER AND CHARGE VESSELS.
6. EJECTORS AND RFD'S INSIDE VESSEL ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III.
7. THE GEOMETRY OF JOGGLED (OFFSET) PENETRATION IS QUALITY LEVEL Q FOR RADIATION PROTECTION. THE QUALITY LEVEL AND SEISMIC CATEGORY DESIGNATIONS OF PIPING WITHIN JOGGLES ARE THE SAME AS CONNECTING PIPING. PIPING WITHIN SPARE JOGGLES IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I.
8. LINES REQUIRE 34 FT OF BAROMETRIC HEAD ABOVE THE TOP OF THE VESSEL. THE BAROMETRIC HEAD REQUIREMENT SHALL BE FULLY CONTAINED IN THE R5 AREA.
9. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-HLW-M6-HOP-00006 REV 6. THE ONLY CHANGES TO THIS DRAWING INCLUDES INFORMATION FROM 24590-HLW-M6N-HOP-00151, AND 24590-HLW-M6N-30-00023. ADDED HOLD 2. THIS P&ID WAS REVIEWED BY E&NS FOR ALL LIMITED CHANGE DOCUMENTS THAT WERE PREVIOUSLY ISSUED TO IT (SEE CCN 253989).

HOLD/OPEN ITEMS:

1. PENDING DETERMINATION OF HEME FUNCTIONAL SAFETY REQUIREMENTS.
2. PENDING COMPLETION OF 24590-WTP-DVM-M-03-001, ITEM-19.

REFERENCES:

1. 24590-HLW-3YD-HOP-00001, SYSTEM DESCRIPTION FOR THE HLW MELTER OFFGAS TREATMENT PROCESS AND PROCESS VESSEL VENT EXHAUST (HOP AND PVV SYSTEMS).

DRAWING INDEX	
DWG NO	TITLE
24590-HLW-M6-HOP-00006001	HOP MELTER 1 PRIM OFF SCB COND HOP-VSL-00903
24590-HLW-M6-HOP-00006002	HOP MELTER 1 PRIM OFF SCB COND HOP-VSL-00903

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	APP	WTP BCC	Eric Cash		1/10/13

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC

ISSUE STAMP

	BY	DATE
ORIGINATOR	AP Plants	1/10/13
CHECKER	Lisa Johnson	1/10/13
APPROVER	Kathy L Clark	1/10/13
REVIEWER	Renee Siccama	1/10/13
		1/10/13

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	30

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-HLW-ADR-M-03-001 REV: 3
E&NS SCREENING REQUIRED? [X] YES [ ] NO E&NS INITIAL IF YES: [illegible]
SCREENING IS REQUIRED FOR

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - HLW MELTER OFFGAS TREATMENT PROCESS SYSTEM MELTER 1 PRIMARY OFFGAS SCRUBBER CONDENSATE HOP-VSL-00903

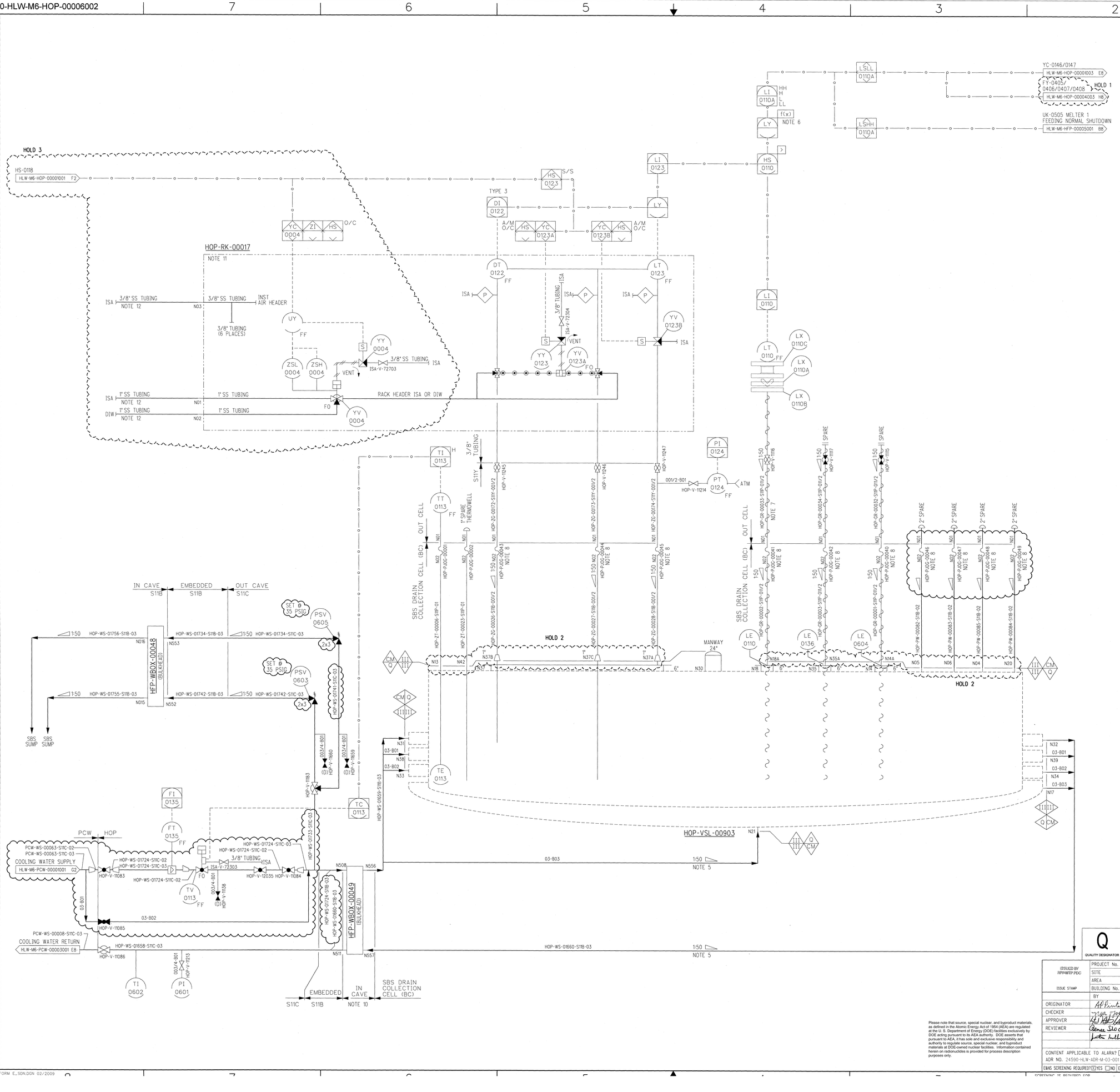
SCALE: NONE
24590-HLW-M6-HOP-00006001
REV 0

'E' SIZE - 44x34

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

FORM E_SDN.DGN 02/2009

PLOTTED BY: spookes C:\Work\spookes\dms03839\HLW\M6\HOP\00006001.dgn



NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. COOLING WATER SUPPLY AND RETURN PIPES TO SLOPE FROM WALLBOX LOCATED ABOVE PROCESS VESSEL.
6. FUNCTION CONVERTS TANK LEVEL IN INCHES TO GALLONS.
7. RADAR GUIDE TUBE IS TO BE ROUTED TO TRANSMITTER.
8. THE GEOMETRY OF JOGGLED (OFFSET) PENETRATION IS QUALITY LEVEL Q FOR RADIATION PROTECTION. THE QUALITY LEVEL AND SEISMIC CATEGORY DESIGNATIONS OF PIPING WITHIN JOGGLES ARE THE SAME AS CONNECTING PIPING. PIPING WITHIN SPARE JOGGLES IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I.
9. INSTRUMENTS ARE QUALITY LEVEL CM UNLESS OTHERWISE NOTED. INSTRUMENT, ROOT VALVE AND TUBING CONFINEMENT REQUIREMENTS ARE THE SAME AS THE CONNECTING PROCESS PIPE, UNLESS OTHERWISE NOTED.
10. MAIN HEADER REQUIRES 34 FT OF BAROMETRIC HEAD ABOVE TOP OF VESSEL.
11. TUBING TO BE ROUTED BY C&I PER 24590-WTP-3PS-JQ08-T0001.
12. CONSTRUCTION SHALL FIELD ROUTE TUBING PER MECHANICAL SYSTEMS DETAIL (FUTURE) DRAWING.
13. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-HLW-M6-HOP-00006 REV 6. THE ONLY CHANGE TO THIS DRAWING INCLUDES INFORMATION FROM 24590-HLW-M6N-HOP-00139, -00187,24590-HLW-M6LN-HOP-00004, -00005, -00013, 24590-HLW-M6PR-HOP-00010, 24590-HLW-M6N-30-00007, ADDED HOP-RK-00017, AND HOLDS 2 AND 3. THIS P&ID WAS REVIEWED BY E&NS FOR ALL LIMITED CHANGE DOCUMENTS THAT WERE PREVIOUSLY ISSUED AGAINST IT (SEE CCN 253989 FOR A COMPREHENSIVE LIST OF AFFECTED CHANGE DOCUMENTS).

HOLD/OPEN ITEMS:

1. PENDING PJM/RFD DESIGN.
2. PENDING COMPLETION OF 24590-WTP-DVM-M-03-001, ITEM-19.
3. PENDING RVP DIRECTION.

REFERENCES:

1. 24590-HLW-3YD-HOP-00001, SYSTEM DESCRIPTION FOR THE HLW MELTER OFFGAS TREATMENT PROCESS AND PROCESS VESSEL VENT EXHAUST (HOP AND PVV SYSTEMS).

Q
QUALITY DESIGNATOR

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 13	AFP				1/10/13

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	30

	BY	DATE
ORIGINATOR	AF Pinto	1/10/13
CHECKER	Yasir Hoffmann	1/10/13
APPROVER	Gil Hatchett	1/10/13
REVIEWER	Aaron Slocum	1/10/13
	John Hillesland	1/10/13

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-HLW-ADR-M-03-001 REV: 3
EMS SCREENING REQUIRED? [X] YES [ ] NO EMS INITIAL IF YES

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - HLW MELTER OFFGAS TREATMENT PROCESS SYSTEM MELTER 1 PRIMARY OFFGAS SCRUBBER CONDENSATE HOP-VSL-00903

SCALE: NONE

24590-HLW-M6-HOP-00006002 REV 0

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

HOP-VSL-00904 MELTER 2 SBS CONDENSATE RECEIVER VESSEL	HOP-EJCTR-00929A HOP-VSL-00904 VESSEL EJECTOR (STEAM EJECTOR)	HOP-EJCTR-00929B HOP-VSL-00904 VESSEL EJECTOR (STEAM EJECTOR)	HOP-RFD-00003A HOP-VSL-00904 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00003B HOP-VSL-00904 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00004A HOP-VSL-00904 REVERSE FLOW DIVERTER (FLUIDIC PUMP)	HOP-RFD-00004B HOP-VSL-00904 REVERSE FLOW DIVERTER (FLUIDIC PUMP)
7898 GAL MAX OPER VOL 12FT ID X 7FT 9IN T-T	44 GPM 1134 LB/HR	44 GPM 1134 LB/HR	MODEL 140L 80 GPM	MODEL 140L 80 GPM	MODEL 140L 80 GPM	MODEL 140L 80 GPM

HFP-RK-00002
(SEE P&ID 24590-HLW-M6-HFP-20004001/2)

BECHTEL | VENDOR

S11C | S11B

PIPE CHASE | SBS DRAIN COLLECTION CELL (BC)

1 HOP-DB-00027-S11C-02 — HOP-V-11684 — N01 N02 — HOP-DB-00022-S11B-02 — 1:50 — NOTE 8
N16 HOP-PJOG-00108 NOTE 7

HOP-DB-00028-S11B-02 — HOP-V-11685 — N01 N02 — HOP-DB-00021-S11B-02 — 1:50 — NOTE 8
N17 HOP-PJOG-00109 NOTE 7

HOP-WESP-00002 DRAIN — HLW-M6-HOP-20002002 A3 — HOP-ZS-00100-N11K-06 — 1:50

HOLD 1

HOP-HEME-00002B DRAIN — HLW-M6-HOP-20009002 D2 — HOP-ZS-00101-N11K-02 — 1:50

HOP-HEME-00002A DRAIN — HLW-M6-HOP-20009001 D2 — HOP-ZS-00102-N11K-02 — 1:50

PIPE CHASE | SBS DRAIN COLLECTION CELL (BC)

SBS CONDENSATE OVERFLOW HOP-SCB-00002 — HLW-M6-HOP-20001002 C2 — HOP-ZS-00089-N11E-06 — 1:50 — 1:20

PLANT WASH PWD-RK-00043 — HLW-M6-PWD-20002001 C2 — HOP-ZE-00098-S11B-011/2

PLANT WASH PWD-RK-00043 — HLW-M6-PWD-20002001 C2 — HOP-ZE-00099-S11B-011/2

SBS DRAIN COLLECTION CELL (BC) | OUT CELL

"I" SPARE — N02 N01 — HOP-PJOG-00120 NOTE 7

"I" SPARE — N02 N01 — HOP-PJOG-00121 NOTE 7

SBS DRAIN COLLECTION CELL (BC) | PIPE CHASE

1:20 — HOP-ZS-00117-N11E-02 — SBS CONDENSATE PURGE RLD-VSL-00007 — HLW-M6-RLD-00001001 F8

1:20 — HOP-ZS-00118-N11E-02 — SBS CONDENSATE PURGE RLD-VSL-00007 — HLW-M6-RLD-00001001 F8

HOP-GV-00083-N11E-02 — VENT HOP-SCB-00002 — HLW-M6-HOP-20001003 F8

1:20 — HOP-ZS-00093-N11E-02 — CONDENSATE RECYCLE HOP-SCB-00002 — HLW-M6-HOP-20001003 B8

1:20 — HOP-ZS-00094-N11E-02 — CONDENSATE RECYCLE HOP-SCB-00002 — HLW-M6-HOP-20001003 A8

1:20 — HOP-ZS-00095-N11E-02 — CONDENSATE RECYCLE HOP-SCB-00002 — HLW-M6-HOP-20001003 B8

1:20 — HOP-ZS-00096-N11E-02 — CONDENSATE RECYCLE HOP-SCB-00002 — HLW-M6-HOP-20001003 C8

HOLD 2

CM Q | III III — N02 2" N01 2" N19 N15 N43 N16 N03 N40 N07 N41 N27 N22 N23 N28 N08 — III III | CM Q

HOP-RFD-00003A
HOP-RFD-00003B
HOP-RFD-00004A
HOP-RFD-00004B
HOP-EJCTR-00929A
HOP-EJCTR-00929B
NOTE 6

HOP-VSL-00904
NOTE 5

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. SEE 24590-HLW-M6-HOP-20004001, -20004002, -20004003, -20004004, AND -20004005 FOR DETAILS ON PULSE JET MIXER AND CHARGE VESSELS.
6. EJECTORS AND RFD'S INSIDE VESSEL ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III.
7. THE GEOMETRY OF JOGGLED (OFFSET) PENETRATIONS IS QUALITY LEVEL Q FOR RADIATION PROTECTION. THE QUALITY LEVEL AND SEISMIC CATEGORY DESIGNATIONS OF PIPING WITHIN JOGGLES ARE THE SAME AS CONNECTING PIPING. PIPING WITHIN SPARE JOGGLES IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I.
8. LINES REQUIRE 34 FT OF BAROMETRIC HEAD ABOVE THE TOP OF THE VESSEL. THE BAROMETRIC HEAD REQUIREMENT SHALL BE FULLY CONTAINED IN THE R5 AREA.
9. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-HLW-M6-HOP-20006 REV. 7. THE ONLY CHANGES TO THIS DRAWING INCLUDES INFORMATION FROM 24590-HLW-M6N-HOP-00152 AND 24590-HLW-M6N-30-00023. ADDED HOLD 2. THIS P&ID WAS REVIEWED BY E&NS FOR ALL LIMITED CHANGE DOCUMENTS THAT WERE PREVIOUSLY ISSUED TO IT (SEE CCN 253989).

HOLD/OPEN ITEM:

1. PENDING DETERMINATION OF HEME FUNCTIONAL SAFETY REQUIREMENTS.
2. PENDING COMPLETION OF 24590-WTP-DVM-M-03-001, ITEM-19.

REFERENCES:

1. 24590-HLW-3YD-HOP-00001, SYSTEM DESCRIPTION FOR THE HLW MELTER OFFGAS TREATMENT PROCESS AND PROCESS VESSEL VENT EXHAUST (HOP AND PVV SYSTEMS).

DRAWING INDEX

DWG NO	TITLE
24590-HLW-M6-HOP-20006001	HOP MELTER 2 PRIM OFF SCB COND HOP-VSL-00904
24590-HLW-M6-HOP-20006002	HOP MELTER 2 PRIM OFF SCB COND HOP-VSL-00904

Q — QUALITY DESIGNATOR

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	APP	[illegible]	[illegible]	[illegible]	1/10/13

ISSUED BY RPP-WTP PDC — ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	30

	BY	DATE
ORIGINATOR	APPinto	1/10/13
CHECKER	[illegible]	1/10/13
APPROVER	[illegible]	1/10/13
REVIEWER	[illegible]	1/10/13
	[illegible]	1/10/13

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-HLW-ADR-M-03-001 REV: 3
SAFETY SCREEN REQUIRED? [X] YES [ ] NO EMS INITIAL IF YES [illegible]

SAFETY SCREEN IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREQ-002

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - HLW MELTER OFFGAS TREATMENT PROCES SYSTEM MELTER 2 PRIMARY OFFGAS SCRUBBER CONDENSATE HOP-VSL-00904

SCALE: NONE

24590-HLW-M6-HOP-20006001 REV 0

E SIZE - 44x34
COMPUTER GENERATED - MANUAL CHANGES NOT PERMITTED

R11575261

1/10/2013 7:56:33 AM

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

FORM E_SDN.DGN 02/2003

PLOTTED BY: sjoakes
C:\Work\sjoakes\dms0383\HLWMEHOP20006001.dgn

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. COOLING WATER SUPPLY AND RETURN PIPES TO SLOPE FROM WALLBOX LOCATED ABOVE PROCESS VESSEL.
6. FUNCTION CONVERTS TANK LEVEL IN INCHES TO GALLONS.
7. RADAR GUIDE TUBE IS TO BE ROUTED TO TRANSMITTER.
8. THE GEOMETRY OF JOGGLED (OFFSET) PENETRATION IS QUALITY LEVEL Q FOR RADIATION PROTECTION. THE QUALITY LEVEL AND SEISMIC CATEGORY DESIGNATIONS OF PIPING WITHIN JOGGLES ARE THE SAME AS CONNECTING PIPING. PIPING WITHIN SPARE JOGGLES IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I.
9. INSTRUMENTS ARE QUALITY LEVEL CM UNLESS OTHERWISE NOTED. INSTRUMENT, ROOT VALVE AND TUBING CONFINEMENT REQUIREMENTS ARE THE SAME AS THE CONNECTING PROCESS PIPE, UNLESS OTHERWISE NOTED.
10. MAIN HEADER REQUIRES 34 FT OF BAROMETRIC HEAD ABOVE TOP OF VESSEL.
11. TUBING TO BE ROUTED BY C&I PER 24590-WTP-3PS-JQ08-T0001.
12. CONSTRUCTION SHALL FIELD ROUTE TUBING PER MECHANICAL SYSTEMS DETAIL (FUTURE) DRAWING.
13. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-HLW-M6-HOP-20006 REV. 7. THE ONLY CHANGES TO THIS DRAWING INCLUDES INFORMATION FROM 24590-HLW-M6N-HOP-00196, 24590-HLW-M6LN-HOP-00004, -00013, 24590-HLW-M6PR-HOP-00010, 24590-HLW-M6N-30-00007, ADDED HOP-RK-00016, AND HOLDS 2 AND 3. THIS P&ID WAS REVIEWED BY E&NS FOR ALL LIMITED CHANGE DOCUMENTS THAT WERE PREVIOUSLY ISSUED AGAINST IT (SEE CCN 253989 FOR A COMPREHENSIVE LIST OF AFFECTED CHANGE DOCUMENTS).

HOLD/OPEN ITEM:

1. PENDING PJM/RFD DESIGN.
2. PENDING COMPLETION OF 24590-WTP-DVM-M-03-001, ITEM-19.
3. PENDING RVP DIRECTION

REFERENCES:

1. 24590-HLW-3YD-HOP-00001, SYSTEM DESCRIPTION FOR THE HLW MELTER OFFGAS TREATMENT PROCESS AND PROCESS VESSEL VENT EXHAUST (HOP AND PVV SYSTEMS).

HOLD 1
HOLD 2
HOLD 3

HOP-RK-00016
NOTE 11

HOP-VSL-00904

Q
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 13	APP				1/10/13

REVISION HISTORY

ISSUED BY RPP/WTP PDC

ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	30

	BY	DATE
ORIGINATOR	APinto	1/10/13
CHECKER		1/10/13
APPROVER		1/10/13
REVIEWER		1/10/13
		1/10/13

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-HLW-ADR-M-03-001 REV: 3
SAFETY SCREEN REQUIRED? [X] YES [ ] NO E&NS INITIAL IF YES
SAFETY SCREEN IS REQUIRED FOR

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - HLW MELTER OFFGAS TREATMENT PROCESS SYSTEM MELTER 2 PRIMARY OFFGAS SCRUBBER CONDENSATE HOP-VSL-00904

SCALE: NONE
24590-HLW-M6-HOP-20006002
REV 0

"E" SIZE - 44x34

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

FORM F SDNLDGN 02/2003

PLOTTED BY: gpookes
Work\gpookes\dms\838391\HLW\M6\HOP\20006002.dgn

Table III.10.E.C – HLW Vitrification Plant Tank Systems Description

Mixed Waste Tank Systems Name	Unit Designation	Engineering Description (Drawing Nos, Specification Nos, etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
		24590-WTP -3PS-G000-T0002, Rev 8 -3PS-MV00-T0001, Rev 4 -3PS-MV00-T0002, Rev 3 -3PS-MV00-T0003, Rev 3		
Melter Off-gas Treatment Process System HOP-VSL-00903 (Melter 1 SBS Condensate Receiver Vessel) HOP-VSL-00904 (Melter 2 SBS Condensate Receiver Vessel)	HOP	**24590-HLW** -3YD-HOP-00001[a] -M5-V17T-P0003, Rev 1 -M5-V17T-P20003, Rev 1 -M6-HOP-00004, Rev 4 -M6-HOP-00006001, Rev ~~5~~0 -M6-HOP-00006002, Rev 0 -M6-HOP-20004, Rev 5 -M6-HOP-20006001, Rev ~~6~~0 -M6-HOP-20006002, Rev 0 -MVD-HOP-P0001, Rev 2 -MVD-HOP-P0012, Rev 1 -MV-HOP-P0001, Rev 2 -MV-HOP-P0003, Rev 2 -N1D-HOP-P0009, Rev 2 -P1-P01T-00001, Rev 9 **24590-WTP** -3PS-G000-T0002, Rev 8 -3PS-MV00-T0001, Rev 4 -3PS-MV00-T0002, Rev 3 -3PS-MV00-T0003, Rev 3	Section 4.1.4.3; Tables 4-4 and 4-6; Figures C1-1 and C1-4 of Operating Unit Group 10, Addendum C of this Permit.	HOP-VSL-00903 = 9891 HOP-VSL-00904 = 9891

Issued by
RPP-WTP PDC
R50032585

Quarter Ending June 30, 2013 24590-LAW-PCN-ENV-11-008

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Update General Arrangement (GA) drawing 24590-LAW-P1-P01T-00005, *General Arrangement Plan at El. 48'-0"*, in Appendix 9.4 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

Donna Busche 4/23/13
D. M. Busche Date

Reviewed by ORP Program Office:

5/14/13
D. L. Noyes Date

Quarter Ending June 30, 2013 24590-LAW-PCN-ENV-11-008

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 modification is to update LAW Facility GA drawing 24590-LAW-P1-P01T-00005, *General Arrangement Plan at El. 48'-0"*, in Appendix 9.4 of the DWP.

Appendix 9.4			
Replace:	24590-LAW-P1-P01T-00005, Rev 3	With:	24590-LAW-P1-P01T-00005, Rev 4

The referenced GA drawing has been revised. It incorporates changes provided in applicable document change forms (e.g., DCN, SCN, SDDR, FCN, FCR, etc.) and changes associated with the resolution to comments on change documents since the issuance of the last revision of the permitted drawing. This modification requests Ecology approval and incorporation into the permit the specific changes to this drawing that are indicated by revision notes and clouds. Revisions are the result of ongoing design changes.

Significant changes to the GA drawing are summarized below:

- Revised notes and holds
- Modified drawing to reflect partition wall/door deletion and changes (Rooms L-0304G, L-0316, L-0306, L-0307, L-0303, and L-0312)
- Revised callout and layout for Platform LP0304A (formerly called LP0304E) (El. 53'-4¾" Room L-0202)
- Added C3V-HEPA-00004G (Room L-0319A)
- Deleted Scrubber Viewing Windows (Room L-0304F). Changing the system to negative pressure upstream of the secondary offgas system eliminated any access issues to support daily visual inspection of the caustic scrubber
- Added Platform LP0301, door, ASX-HEPA-00040 and ASX-PMP-00006/7, and adjusted location of ASX-HEPA-00025 (Room L-0301)
- Updated C2V, UPE, and LVE equipment dimensions and locations in Rooms L-0313, L-0311, and L-0309
- Added C3V hoods and removed Platform LP0304G (Room L-0304G)
- Relocated ASX equipment in Rooms L-0301 and L-0302 and C3V FCU in Room L-0304H

The following outstanding change documents have been submitted to Ecology pursuant to Permit Condition III.10.C.9.h and are maintained in the WTP Operating Record:

- 24590-LAW-P1N-P01T-00036
- 24590-WTP-FC-C-12-0325

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

Quarter Ending June 30, 2013

24590-LAW-PCN-ENV-11-008

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: A.1 and A.3

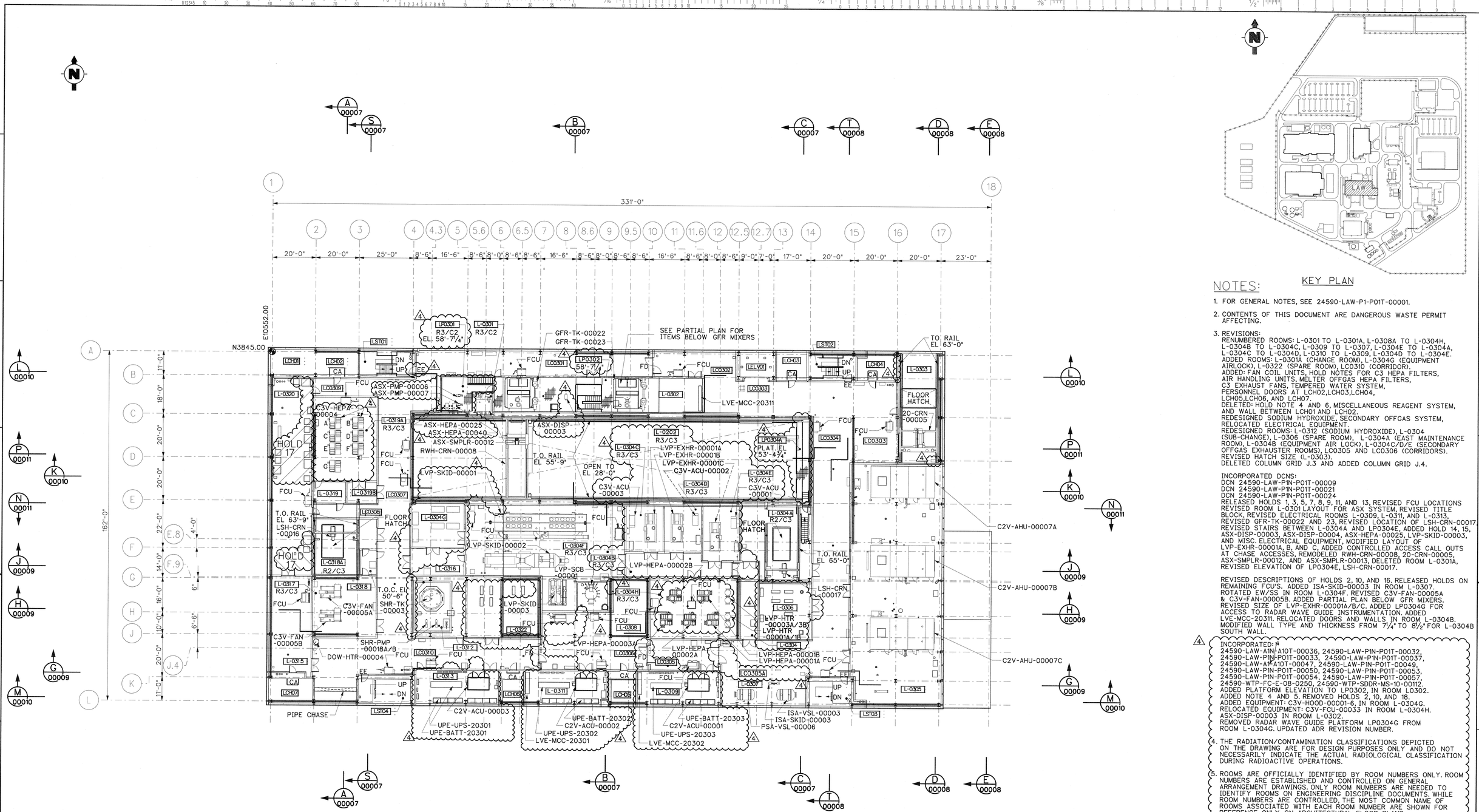
Enter wording of WAC 173-303-830, Appendix I Modification citation: A.1. Administrative and informational changes
A.3. Equipment replacement or upgrading with functionally equivalent components (e.g., pipes, valves, pumps, conveyors, controls).

Modification Approved/Concur: [✓] Yes [ ] Denied (state reason below)

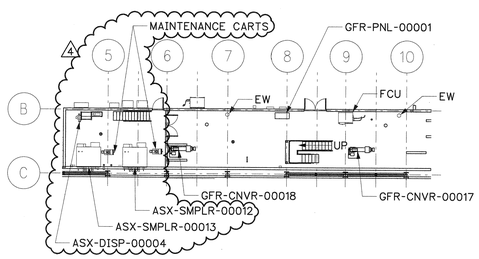
Reason for denial:

Reviewed by Ecology:

S. Dahl — Date: 6-4-13



PLAN AT EL 48'-0"



PARTIAL PLAN AT EL 48'-0"

KEY PLAN

NOTES:

1. FOR GENERAL NOTES, SEE 24590-LAW-P1-P01T-00001.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. REVISIONS:
   RENUMBERED ROOMS: L-0301 TO L-0301A, L-0308A TO L-0304H, L-0304B TO L-0304C, L-0309 TO L-0307, L-0304E TO L-0304A, L-0304C TO L-0304D, L-0310 TO L-0309, L-0304D TO L-0304E.
   ADDED ROOMS: L-0301A (CHANGE ROOM), L-0304G (EQUIPMENT AIRLOCK), L-0322 (SPARE ROOM), LC0310 (CORRIDOR).
   ADDED: FAN COIL UNITS, HOLD NOTES FOR C3 HEPA FILTERS, AIR HANDLING UNITS, MELTER OFFGAS HEPA FILTERS, C3 EXHAUST FANS, TEMPERED WATER SYSTEM, PERSONNEL DOORS AT LCH02,LCH03,LCH04, LCH05,LCH06, AND LCH07.
   DELETED: HOLD NOTE 4 AND 6, MISCELLANEOUS REAGENT SYSTEM, AND WALL BETWEEN LCH01 AND LCH02.
   REDESIGNED SODIUM HYDROXIDE, SECONDARY OFFGAS SYSTEM, RELOCATED ELECTRICAL EQUIPMENT.
   REDESIGNED ROOMS: L-0312 (SODIUM HYDROXIDE), L-0304 (SUB-CHANGE), L-0306 (SPARE ROOM), L-0304A (EAST MAINTENANCE ROOM), L-0304B (EQUIPMENT AIR LOCK), L-0304C/D/E (SECONDARY OFFGAS EXHAUSTER ROOMS), LC0305 AND LC0306 (CORRIDORS).
   REVISED HATCH SIZE (L-0303).
   DELETED COLUMN GRID J.3 AND ADDED COLUMN GRID J.4.

   INCORPORATED DCNS:
   DCN 24590-LAW-P1N-P01T-00009
   DCN 24590-LAW-P1N-P01T-00021
   DCN 24590-LAW-P1N-P01T-00024
   RELEASED HOLDS 1, 3, 5, 7, 8, 9, 11, AND 13, REVISED FCU LOCATIONS
   REVISED ROOM L-0301 LAYOUT FOR ASX SYSTEM, REVISED TITLE BLOCK, REVISED ELECTRICAL ROOMS L-0309, L-0311, AND L-0313.
   REVISED GFR-TK-00022 AND 23, REVISED LOCATION OF LSH-CRN-00017.
   REVISED STAIRS BETWEEN L-0304A AND LP0304E, ADDED HOLD 14, 15,
   ASX-DISP-00003, ASX-DISP-00004, ASX-HEPA-00025, LVP-SKID-00003, AND MISC. ELECTRICAL EQUIPMENT, MODIFIED LAYOUT OF LVP-EXHR-00001A, B, AND C, ADDED CONTROLLED ACCESS CALL OUTS AT CHASE ACCESSES, REMODELED RWH-CRN-00008, 20-CRN-00005, ASX-SMPLR-00012, AND ASX-SMPLR-00013, DELETED ROOM L-0301A, REVISED ELEVATION OF LP0304E, LSH-CRN-00017.

   REVISED DESCRIPTIONS OF HOLDS 2, 10, AND 16. RELEASED HOLDS ON REMAINING FCU'S. ADDED ISA-SKID-00003 IN ROOM L-0307.
   ROTATED EW/SS IN ROOM L-0304F. REVISED C3V-FAN-00005A & C3V-FAN-00005B. ADDED PARTIAL PLAN BELOW GFR MIXERS.
   REVISED SIZE OF LVP-EXHR-00001A/B/C. ADDED LP0304G FOR ACCESS TO RADAR WAVE GUIDE INSTRUMENTATION. ADDED LVE-MCC-20311. RELOCATED DOORS AND WALLS IN ROOM L-0304B. MODIFIED WALL TYPE AND THICKNESS FROM 7/16" TO 8½" FOR L-0304B SOUTH WALL.
4. INCORPORATED IN
   24590-LAW-A1N-A10T-00036, 24590-LAW-P1N-P01T-00032,
   24590-LAW-P1N-P01T-00033, 24590-LAW-P1N-P01T-00037,
   24590-LAW-A1N-A10T-00047, 24590-LAW-P1N-P01T-00049,
   24590-LAW-P1N-P01T-00050, 24590-LAW-P1N-P01T-00053,
   24590-LAW-P1N-P01T-00054, 24590-LAW-P1N-P01T-00057,
   24590-WTP-FC-E-08-0250, 24590-WTP-SDDR-MS-10-00112.
   ADDED PLATFORM ELEVATION TO LP0302, IN ROOM L-0302.
   ADDED NOTE 4 AND 5. REMOVED HOLDS 2, 10, AND 18.
   ADDED EQUIPMENT: C3V-HOOD-00001-6, IN ROOM L-0304G.
   RELOCATED EQUIPMENT: C3V-FCU-00033 IN ROOM L-0304H.
   ASX-DISP-00003 IN ROOM L-0302.
   REMOVED RADAR WAVE GUIDE PLATFORM LP0304G FROM ROOM L-0304G. UPDATED ADR REVISION NUMBER.
4. THE RADIATION/CONTAMINATION CLASSIFICATIONS DEPICTED ON THE DRAWING ARE FOR DESIGN PURPOSES ONLY AND DO NOT NECESSARILY INDICATE THE ACTUAL RADIOLOGICAL CLASSIFICATION DURING RADIOACTIVE OPERATIONS.
5. ROOMS ARE OFFICIALLY IDENTIFIED BY ROOM NUMBERS ONLY. ROOM NUMBERS ARE ESTABLISHED AND CONTROLLED ON GENERAL ARRANGEMENT DRAWINGS. ONLY ROOM NUMBERS ARE NEEDED TO IDENTIFY ROOMS ON ENGINEERING DISCIPLINE DOCUMENTS. WHILE ROOM NUMBERS ARE CONTROLLED, THE MOST COMMON NAME OF ROOMS ASSOCIATED WITH EACH ROOM NUMBER ARE SHOWN FOR REFERENCE ONLY ON ARCHITECTURAL FLOOR PLANS.

HOLDS:

4. 2. DELETED
   10. DELETED
   12. DELETED
   14. DELETED
   15. DELETED
   17. C & I EQUIPMENT PENDING VENDOR SELECTION FROM CONTROL SYSTEMS.
   18. DELETED

LEGEND:

CA	CONTROLLED ACCESS
EE	EMERGENCY EXIT
FCU	FAN COIL UNIT
FD	FIRE DOOR
L-XXXX	ROOM, CELL, (VAULT) OR TUNNEL
LCXXXX	
LMXXXX	MEZZANINE
LPXXXX	ROOM PLATFORM
LPCXXXX	CORRIDOR PLATFORM
LCHXX	CHASE
LELVXX	ELEVATOR
LSTXX	STAIR
	EQUIPMENT LAYDOWN AREA
	CONCRETE
	CHECKERED PLATE
	GRATING
	EMERGENCY EYEWASH
	LADDER
	EMERGENCY SHOWER/EYEWASH
	FLOOR PENETRATION

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
	DWG-W375LV-PL00046, REV D	TH	CMS	PR	CJW	11/25/03
0	ISSUED FOR DESIGN - SUPERSEDES					
2	REVISED TO INCORPORATE CHANGES IN NOTE 3	DLL	CMS	PR	DRJ	12/19/05
3	REVISED TO INCORPORATE CHANGES IN NOTE 3	TH	CMS	JM	JWR	11/1/06
4	REVISED TO INCORPORATE CHANGES IN NOTE 3	CWS	RLS		CWS	11-16-11

REVISION HISTORY

ISSUED BY RPP-WTP PDC

	BY	DATE
ORIGINATOR	TIMOTHY E. HAWKINS	11/25/03
CHECKER	CRAIG M. SALERNO	11/25/03
APPROVER	C. J. WINKLER	11/25/03
REVIEWER	PHIL REICHERT	11/25/03

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO 4
ADR NO. 24590-LAW-ADR-PL-03-006 REV 1
SAFETY SCREEN REQUIRED? [X] YES [ ] NO EMS INITIAL IF YES

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	20

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

LAW VITRIFICATION BUILDING GENERAL ARRANGEMENT PLAN AT EL. 48'-0"

SCALE: 1/16"=1'-0"

24590-LAW-P1-P01T-00005 REV 4

3D BY: csalerno
K:\csalerno\dm\dk3921-24590LAWPP01T00005.DGN

FORM F 9DP1.DGN 03/2003

Issued by
RPP-WTP PDC

Quarter Ending March 31, 2013

24590-LAW-PCN-ENV-13-001

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 2: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Update the Independent, Qualified, Registered Professional Engineer (IQRPE) Structural Integrity Assessment Report for the LAW Facility HEPA Filter Housings in Appendix 9.11 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

D. M. Busche — Date: 3/13/13

Reviewed by ORP Program Office:

D. L. Noyes — Date: 3/20/13

Quarter Ending March 31, 2013 24590-LAW-PCN-ENV-13-001

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update the Structural Integrity Assessment of the LAW LVP HEPA Filter Housings in Appendix 9.11 of the DWP. This report will replace the previously issued LVP HEPA Housing structural integrity assessment report: 24590-CM-HC4-HXYG-00240-01-00007, Rev. 00A (AREVA : IA-3006866-000).

Appendix 9.11			
Replace	24590-CM-HC4-HXYG-00240-01-00007, Rev 00A - AREVA IA-3006866-000	With:	IQRPE Structural Integrity Assessment Report for the LAW LVP HEPA Filter Housings, 24590-CM-HC4-HXYG-00240-02-00008 Rev. 00A - AREVA-IA-3006866-001

This modification requests Ecology approval and incorporation into the permit the attached integrity assessment report. This report includes the five HEPA Filter Housings (LVP-HEPA-00001A/2A/3A, -00001B/2B), also known as Miscellaneous Units (MU) or Plant Items associated with the LVP system as shown on Piping and Instrumentation Diagram Drawing 24590-LAW-M6-LVP-00001003. This integrity assessment incorporates updated structural analysis provided in 24590-QL-POA-MKH0-00001-18-00005, Rev. 00D and 24590-LAW-VDCN-MS-12-00001.

For each item of "Information Assessed" in the structural integrity assessment report, the items listed under the "Source of Information" column were reviewed and found to furnish adequate design requirements and controls to ensure the design fully satisfies the requirements of Washington Administrative Code, WAC-173-303-640, *Dangerous Waste Regulations, Tank Systems.*

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

WAC 173-303-830 Modification Class:	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: N/A

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class 1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl 4/18/13 Date

ISSUED BY
RPP-WTP PDC

R11578874

24590-CM-HC4-HXYG-00240-02-00008

REV 00A

SUBCONTRACT SUBMITTAL
REVIEW NOT REQUIRED

AFS-13-0042

March 4, 2013

Mr. Gary Ellers
Subcontract Administrator
Bechtel National, Inc.
2435 Stevens Center Place
Richland, Washington 99354

Dear Mr. Ellers:

BECHTEL NATIONAL, INC. CONTRACT NO. 24590-CM-HC4-HXYG-00240 IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP HEPA FILTER HOUSINGS (LVP-HEPA-00001A/2A/3A AND -00001B/2B (IA-3006866-001)

The integrity assessment of the subject HEPA Filter Housings has been completed per the contract requirements and is enclosed for your use. The assessment found that the design is sufficient to ensure that the HEPA Filter Housings are adequately designed and have sufficient structural strength, compatibility with the waste(s) to be processed/stored/treated, and corrosion protection to ensure that they will not collapse, rupture, or fail.

If you have any questions, please contact Tarlok Hundal at (509) 371-1975, or via email at tarlok.hundal@areva.com.

Sincerely,

Elizabeth W. Smith, C.P.M
Subcontract Administrator
AREVA Federal Services LLC
Richland Office

Enclosure (1)

LK

cc: D. C. Pfluger, MS5-I w/enclosure (2)

IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT FOR LAW LVP HEPA FILTER HOUSINGS (LVP-HEPA-00001A/2A/3A and -00001B/2B)

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts; that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

IQRPE STRUCTURAL INTEGRITY ASSESSMENT REPORT
FOR
LAW LVP HEPA FILTER HOUSINGS
(LVP-HEPA-00001A/2A/3A and -00001B/2B)

"I, Tarlok Singh Hundal, have reviewed and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the LAW LVP HEPA Filter Housings, as required by the Washington Administrative Code, *Dangerous Waste Regulations*, Section WAC-173-303-640(3) (a) through (g) applicable components."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design fully satisfies the requirements of the WAC.

The attached review is nine (9) pages numbered one (1) through nine (9).

T S Hundal
Signature

3/4/13
Date

Scope	Scope of this Integrity Assessment	The scope of this integrity assessment includes five HEPA Filter Housings (LVP-HEPA-00001A/2A/3A, -00001B/2B), also known as Miscellaneous Units (MUs) or Plant Items associated with the LVP system as shown on P&ID Drawing 24590-LAW-M6-LVP-00001003. The HEPA Filters provide the final removal of radioactive particulates to protect downstream equipment from contamination from the combined primary offgas and vessel vent streams. These HEPA Filter Housings are mounted on the concrete pads of floor slab in Room L-0304H at Elevation 48'-0" of the LAW facility as shown on General Arrangement Plan Drawing 24590-LAW-P1-P01T- 00005. **NOTE: This report supersedes the previous issued following integrity assessment report: 24590-CM-HC4-HXYG-00240-01-00007, Rev. 00A (AREVA Federal Services LLC report #: IA-3006866-000).**
	Summary of Assessment	For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design requirements and controls to ensure that the design fully satisfies the requirements of Washington Administrative Code (WAC), Chapter 173-303 WAC, *Dangerous Waste Regulations,* Section WAC-173-303-640 (3) (a) through (g) applicable elements of the *Tank Systems.*

References	Material Requisition, Specifications, and Plant Drawings	Material Requisition (MR): 24590-QL-MRA-MKH0-00001, Rev. 7, Safe Change HEPA Housing (Q). Specifications: The following Specifications with their respective revision and Specification Change Notices (SCNs) are listed in the above listed MR: 24590-WTP-3PS-MKH0-T0001, Engineering Specification for Safe Change HEPA Filter Housing; 24590-WTP-3PS-MKH0-T0002, Engineering Specification for Nuclear Grade High Efficiency Particulate Air (HEPA) Filters (ASME AG-1 Section FK Filters); 24590-WTP-3PS-MKH0-T0003, Engineering Specification for Remote Change HEPA Filter Housings; 24590-WTP-3PS-MKH0-T0007, Engineering Specification for Axial Flow HEPA Filter Housings; 24590-WTP-3PS-MDH0-T0001, Engineering Specification for Heating, Ventilating, and Air Conditioning System Seismic Category III and IV Ductwork (Q); 24590-WTP-3PS-G000-T0001, Engineering Specification for Supplier Quality Assurance Program Requirements; 24590-WTP-3PS-G000-T0002, Engineering Specification for Positive Material Identification (PMI) for Shop Fabrication; 24590-WTP-3PS-G000-T0003, Engineering Specification for Packaging, Handling, and Storage Requirements; 24590-WTP-3PS-FB01-T0001, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks. Plant Drawings: 24590-LAW-P1-P01T-00005, Rev. 4, LAW Vitrification Building General Arrangement Plan at El. 48'-0"; 24590-LAW-P1-P23T-00052, Rev. 3, LAW Vitrification Building Equipment Location Plan El. 48'-0"/Area 5; 24590-WTP-D0-S13T-00003, Rev. 3, Civil/Structural Standards-Abbreviations and Legend; 24590-WTP-DB-S13T-00007, Rev. 1, Civil/Structural Standards-Standard Concrete Equipment Pads; 24590-WTP-DB-S13T-00008, Rev. 0 , Civil/Structural Standards-Standard Concrete Equipment Pads; 24590-LAW-DD-S13T-00308, Rev. 2, LAW Vitrification Main Building LVP-HEPA Equipment Anchorage at El. (+) 48'-0"; 24590-LAW-M6-LVP-00001003, Rev. 0, P&ID- LAW Secondary Offgas/Vessel Vent Process System HEPA Filters; 24590-LAW-M5-V17T-00010, Rev. 4, Process Flow Diagram LAW Vitrification Ammonia & Secondary Offgas (System AMR & LVP), including DCNs # 24590-LAW-M5N-V17T-00012 and 24590-LAW-M5N-V17T-00015.

References (cont'd)	Vendor Drawings, Mechanical Data Sheet, and System Description	Vendor Fabrication Drawings (*Bechtel Status Code 1, 2, or 4 Drawings): 24590-QL-POA-MKH0-00001-04-00068, Rev. 00G, MKD LVP Exhaust RPF-2H2W-K-316L-TITO; 24590-QL-POA-MKH0-00001-04-00069, Rev. 00E, MKD LVP Exhaust RPF-2H2W-K-316L-TITO Specifications; 24590-QL-POA-MKH0-00001-04-00136, Rev. 00D, Gaskets for RPF Transition, Test, Duct and Filter Housing for -115" W.G. Systems; 24590-QL-POA-MKH0-00001-04-00137, Rev. 00D, RPF Downstream Sample Test Duct (316L SST) for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00139, Rev. 00E, RPF-2H2W-K-316L-TITO Base /Drain Details; 24590-QL-POA-MKH0-00001-04-00141, Rev. 00E, RPF-2H2W-K-316L Housing Assembly for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00144, Rev. 00C, RPF-2H2W-K-316L Housing Parts Details for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00145, Rev. 00D, RPF-2H2W-K-316L Housing Parts Details for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00146, Rev. 00C, RPF-2H2W-K-316L Housing Parts Details for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00147, Rev. 00B, RPF-2H2W-K-316L Housing Parts Details for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00148, Rev. 00D, RPF-2H2W-K-316L Housing Lifting and Assembly for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00149, Rev. 00F, RPF-2H2W-K-316L-TITO Overall Transition Assembly for -115" W.G.; 24590-QL-POA-MKH0-00001-04-00150, Rev. 00D, RPF-2H2W-K-316L-TITO Transition Assembly; 24590-QL-POA-MKH0-00001-04-00155, Rev. 00E, RPF Square Elbow W/Square to 18" Round Transition and Flange (316L SST) for -115" W.G.; * Bechtel Status Code 1 Drawing is an "as fabricated vendor drawing" approved/accepted by Bechtel. Bechtel Status Code 2 Drawing is an "as fabricated vendor drawing" approved (with comments)/accepted by Bechtel. Bechtel Status Code 4 Drawing is an "as fabricated vendor drawing" approved without review by Bechtel. Mechanical Data Sheet (MDS), Vendor Document: 24590-QL-POA-MKH0-00001-01-00039, Rev. 00D, Safe Change HEPA Filter Housing (LVP-HEPA-00001A/2A/3A, -00001B/2B), (including SDDR-HV-09-00014 & SDDR-HV-10-00001). (Vendor Version: 24590-LAW-MKD-LVP-00013.) System Description: 24590-LAW-3YD-LOP-00001, Rev. 3, System Description for the LAW Primary Offgas (LOP) and Secondary Offgas/Vessel Vent (LVP) Systems (including SDCN # 24590-LAW-3YN-LOP-00011, -00012, and -00013).

Information Assessed		Source of Information	Assessment
Design	Plant Item design standards are appropriate and adequate for the vessel's intended use.	Specifications, Drawings, and Mechanical Data Sheet listed above under References; ASME AG-1, Code on Nuclear Air and Gas Treatment, American Society of Mechanical Engineers (1997 Edition with ASME AG-1a-2000 Addenda); ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers.	The LAW HEPA Filters Housings (LVP-HEPA-00001A/2A/3A and -00001B/2B) are considered as vessels. They are also interchangeably termed herein as MUs or Plant Items. The Engineering Specification for Safe Change HEPA Filter Housing and Mechanical Data Sheet require that the design and fabrication be per ASME AG-1 and ASME B&PV Code, Section IX. Supplemental detailed requirements for the HEPA Filters Housings fabrication are specified in various engineering specifications listed in the References section herein. These requirements include items such as, positive material identification, fabrication tolerances, welding procedures, welder qualifications, and testing records, NDE inspections and records, packaging, handling, and storage requirements. The Mechanical Data Sheet (MDS) for these MUs lists their Safety Class as Safety Significant (SS), Quality Level (Q), and Seismic Category (SC-III). The Vendor Fabrication drawings show that each HEPA Filter Housing unit pressure boundary panels exposed to offgas stream are built with 316L stainless steel plate. All other components of the units including structural support frame are built with 316 or 304/304L stainless steel material. The design requirements specified in the codes and specifications are appropriate and adequate for the intended use of these MUs.

Information Assessed		Source of Information	Assessment
Design (cont'd)	If a non-standard Plant Item is to be used, the design calculations demonstrate sound engineering principles of construction.	Material Requisitions and Engineering Specifications listed above under References; ASME AG-1, Code on Nuclear Air and Gas Treatment, American Society of Mechanical Engineers (1997 Edition with ASME AG-1a-2000 Addenda); ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; 24590-QL-POA-MKH0-00001-18-00005, Rev. 00D, Structural Analysis of Flanders/CSC LVP HEPA Filter Units (LVP-HEPA-00001A/2A/3A and -00001B/2B Housing Units Design Calculation), including 24590-LAW-VDCN-MS-12-00001.	The MUs in the LAW Secondary Offgas System (LVP) noted above are non-standard offgas treatment assemblies that are shop fabricated. The referenced Material Requisition and Specifications require that the ASME AG-1 Code and ASME B&PV Code, Section IX assemblies be delivered after design, fabrication, inspection, and testing. Review of the listed Design Calculation shows that sound engineering principles were used for the design and construction of the HEPA Filter Housings.
	Plant Item has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.	Specifications and Mechanical Data Sheet listed above under References; ASME AG-1, Code on Nuclear Air and Gas Treatment, American Society of Mechanical Engineers (1997 Edition with ASME AG-1a-2000 Addenda); ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; ASME B31.3, Process Piping, ASME Code for Process Piping, American Society of Mechanical Engineers; UBC 1997, Uniform Building Code, International Conference of Building Officials; 24590-QL-POA-MKH0-00001-18-00005, Rev. 00D, Structural Analysis of Flanders/CSC LVP HEPA Filter Units (LVP-HEPA-00001A/2A/3A and -00001B/2B Housing Units Design Calculation), including 24590-LAW-VDCN-MS-12-00001.	The LVP Engineering Specification for HEPA Filter Housings and Mechanical Data Sheet require that these MUs including all related components and appurtenances be designed and fabricated in accordance with the applicable sections of ASME AG-1 Code, ASME B&PV Code, Section IX, and ASME B31.3 Code. These codes require specific consideration of operating pressures, temperatures, corrosion allowance, and seismic loads in the design process. The Mechanical Data Sheet identifies the operating pressure and temperature ranges and seismic categories for the subject MUs. Conservatively a corrosion allowances of 0.04" is recommended for these MUs as identified in the MDS document. The UBC 1997 Code specifies the seismic loads for the SC-III equipment. The review of listed Design Calculation and reference documents (inclusive of current design changes as daughter documents) shows that the applicable seismic and other operating loads were appropriately considered in the design process and the MUs will have adequate strength to sustain them during their design-life.

Information Assessed		Source of Information	Assessment
Foundation	Plant Item foundation will maintain the load of a full vessel.	Specifications and Mechanical Data Sheet listed above under References; ASME AG-1, Code on Nuclear Air and Gas Treatment, American Society of Mechanical Engineers (1997 Edition with ASME AG-1a-2000 Addenda); ASME Boiler and Pressure Vessel (B&PV) Code, Section IX, Welding and Brazing Qualifications, American Society of Mechanical Engineers; 24590-WTP-DB-ENG-01-001, Rev. 1Q, Basis of Design; 24590-QL-POA-MKH0-00001-18-00005, Rev. 00D, Structural Analysis of Flanders/CSC LVP HEPA Filter Units (LVP-HEPA-00001A/2A/3A and -00001B/2B Housing Units Design Calculation), including 24590-LAW-VDCN-MS-12-00001.	The Engineering Specification for HEPA Filter Housings requires the use of ASME AG-1 Code and ASME B&PV Code, Section IX, for their design and fabrication processes. Both of these codes have adequate structural design requirements to ensure proper support for the MUs. The Basis of Design document requires that the supports and foundations shall be designed adequately to sustain all applicable loads including the full weight of the Plant Item. The review of Design Calculation report shows that the structural components (panels and structural framing members) of the HEPA Filter Housings have been designed adequately to handle the applicable full loads of the units. It should be noted that the evaluation of the HEPA Filter Housings foundation (concrete floor slab @ Elev. 48'-0") is not in the scope of this report. However, it is covered under separate integrity assessment report.
	If in an area subject to flooding, the Plant Item is anchored.	Drawings, Specifications, and Mechanical Data Sheet listed above under References; 24590-LAW-DDC-S13T-00028, Rev. 2, Misc. Equipment Anchorage (including ECCN # 00056).	As shown on the referenced drawings, the MUs included in this assessment are located on the 48'-0" floor elevation of the LAW facility. The Mechanical Data Sheet lists that submergence condition does not apply to these MUs, therefore, they need not be evaluated for any buoyant forces. However, in order to sustain any other applicable loads such as seismic loads, these units mounted on the raised pads are adequately anchored to the concrete floor slab as shown on the drawings and in the Misc. Equipment Anchorage calculation documents.

Information Assessed		Source of Information	Assessment
Foundation (cont'd)	Plant Item system will withstand the effects of frost heave.	Drawings listed above under References; 24590-WTP-DC-ST-01-001, Rev. 13, Structural Design Criteria.	The Structural Design Criteria document requires that all structural foundations extend into the surrounding soil below the 30 inch frost line in order to preclude frost heave. As shown on the referenced general arrangement drawings, the MUs considered in this assessment are installed in the LAW facility at Floor Elev. 48'-0" which is not subject to frost heave. Therefore, the subject MUs are not subject to the frost heave effects.
Waste Characteristics	Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)	System Description and Mechanical Data Sheet listed above under References; 24590-WTP-PER-PR-03-002, Rev. 3, Control of Toxic Vapors and Emissions from WTP Tank and Miscellaneous Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-M4C-V11T-00004, Rev. C, Calculation of Hydrogen Generation Rates and Times to Lower Flammability Limit for WTP.	The Mechanical Data Sheet presents the operating temperatures and pressures for MUs within the scope of this assessment. The System Description document identifies the offgas being handled by the MUs as hazardous, but not ignitable or flammable. The main safety function of the LVP system MUs is to prevent the escape of toxic and hazardous gas vapors to the environment, from the LAW Secondary Offgas System. MU component's design is required to provide an intact housing pressure boundary during normal and abnormal operations and during and after design level seismic events. Waste characteristics that are hazardous, such as ignitability, reactivity, and toxicity are appropriately addressed in the Control of Toxic Vapors and Emissions document and Prevention of Hydrogen Accumulation document. The System Description and Control of Toxic Vapors and Emissions documents describe that the LAW HEPA Filters remove toxic and radioactive particulates and aerosols to protect downstream equipment from contamination from the LAW LVP exhaust system. The Prevention of Hydrogen Accumulation document indicates that MUs in the LAW facility are not expected to generate hydrogen gas, therefore, they do not pose any hydrogen accumulation hazard. It is also substantiated in the Calculation for Hydrogen Generation Rates document that hydrogen generation is a liquid-phase phenomenon and since these MUs are a dry offgas system, hydrogen generation should not be an issue.

Information Assessed		Source of Information	Assessment
Waste Characteristics (cont'd)	Plant Item is designed to store or treat the wastes with the characteristics defined above and any treatment reagents.	Mechanical Data Sheet and System Description listed above under References.	The Mechanical Data Sheet adequately demonstrates the incorporation of identified waste characteristics into the MU design. Normal and abnormal operating conditions are discussed in the System Description. No reagents are added to the exhaust gases.
Compatibility	The waste types are compatible with each other.	System Description listed above under References.	The MUs herein assessed draw gases from the LAW melters and the process vessels to remove toxic and radioactive particulates and aerosols from the offgas constituents to protect the downstream equipment from contamination. The System Description document does not identify any compatibility issues relating to the offgas constituents listed above. Therefore, there are no concerns for compatibility of waste types.
	Plant Item material and protective coatings ensure the vessel structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system).	Mechanical Data Sheet, Drawings, and System Description listed above under References; ASME AG-1, Code on Nuclear Air and Gas Treatment, American Society of Mechanical Engineers (1997 Edition with ASME AG-1a-2000 Addenda).	The stainless steel material selected as indicated in the Mechanical Data Sheet (MDS) serves it purpose being corrosion resistant for the anticipated environment. Based upon these considerations, 316L stainless steel material was chosen for the HEPA Filter Housings components directly exposed to the offgas stream and the drawings show that this material is used for fabrication. The material selection and their thicknesses with built in margin of safety enveloping conservative corrosion allowance are adequate for these MUs. The MDS and drawings also show that the material used for sealing gaskets, Silicone (ASTM D1056) is an ASTM AG-1 approved material appropriate for the intended service. As these units operate in generally dry and actively ventilated conditions, external corrosion is not considered to be an issue. Therefore, the materials selected are adequate to provide the required 40-year service life as specified in System Description and Mechanical Data Sheet documents.

Information Assessed		Source of Information	Assessment
Corrosion Allowance	Corrosion allowance is adequate for the intended service life of the Plant Item.	Mechanical Data Sheet listed above under References.	The HEPA Filter Housing units will be operating in dry environments, therefore, no corrosion will be present in and around them and hence there is no evaluation of any known corrosive environment elements. However, the Mechanical Data Sheet document conservatively specifies a corrosion allowance of 0.04" for 40-year service life of the HEPA Filter Housings. This is appropriate for the equipment built with 316L stainless steel material and operating under dry-air conditions without any condensation.
Pressure Controls	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the Plant Item are exceeded.	System Description listed above under References.	The System Description provides a discussion of Normal and Off-Normal operations of the LAW Secondary Offgas LVP System. During normal operations the system is expected to run with little intervention. However, during Off Normal operation, the reduced pressure drop across HEPA Filter in secondary housings may indicate failure. Alarms will notify the operators for investigation of delta pressure reading and manual switching to secondary filter train upon the confirmation of failure. The failed filters are replaced and the primary train is placed back in service. Increase in pressure drop across HEPA Filters will be continuously monitored and scheduled for changing at a specified preset delta pressure level limit. The pressure monitors and controls described above are adequate to prevent exceeding the pressure design limits of the HEPA Filter Housing units.

Issued by
RPP-WTP PDC

Quarter Ending June 30, 2013 24590-PTF-PCN-ENV-09-001

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant

Update Mechanical System Data Sheets for the PTF Cesium Nitric Acid Recovery Process System (CNP) Cesium Evaporator Condensers and Cesium Nitric Acid Rectifier in Appendix 8.6. Remove the Mechanical System Data Sheet for the Pulse Jet Ventilation System (PJV) Drain Collection Vessel in Appendix 8.6 of the Dangerous Waste Permit (DWP); this vessel has been removed from the design.

Submitted by Co-Operator:

D. M. Busche 3/26/13 Date

Reviewed by ORP Program Office:

D. L. Noyes 4/22/13 Date

Quarter Ending June 30, 2013 24590-PTF-PCN-ENV-09-001

Hanford Facility RCRA Permit Modification Notification Form	
Unit: **Waste Treatment and Immobilization Plant**	Permit Part: **Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update the Mechanical System Data Sheets for the PTF CNP Condensers (CNP-HX-00001, -00002, -00003 and -00004) and CNP Evaporator Nitric Acid Rectifier (CNP-DIST-00001) in Appendix 8.6 of the DWP. This PCN will replace five permit Mechanical System Data Sheets incorporated into the DWP with five source Mechanical System Data Sheets as indicated in the Table below.

This PCN also removes one Mechanical System Data Sheet for the PJV Drain Collection Vessel (PJV-VSL-00002) that was removed from the design (see PCN 24590-PTF-PCN-ENV-09-007).

The following source documents are submitted to replace the permit documents currently in Appendix 8.6:

Appendix 8.6			
Replace:	24590-PTF-MED-CNP-P0003, Rev. 0	With:	24590-PTF-MED-CNP-00003, Rev. 4
	24590-PTF-MED-CNP-P0004, Rev. 1		24590-PTF-MED-CNP-00004, Rev. 5
	24590-PTF-MED-CNP-P0005, Rev. 0		24590-PTF-MED-CNP-00005, Rev. 4
	24590-PTF-MED-CNP-P0010, Rev. 0		24590-PTF-MED-CNP-00010, Rev. 3
	24590-PTF-MWD-CNP-P0001, Rev. 0		24590-PTF-MVD-CNP-00016, Rev. 1
Remove:	24590-PTF-MVD-PJV-P0003, Rev. 0	Explanation:	The vessel addressed by this data sheet, PJV-VSL-00002, was removed from the design.

This modification requests Ecology approval of and incorporation into the permit, the specific changes to these Data Sheets. Revisions are the result of incorporation of vendor design changes and equipment qualification data since the issue of the permitted version. The most recent revisions are indicated by revision triangles.

Significant changes common to all Mechanical System Data Sheets are summarized below:

- Addition of Manufacturer name and addition or updating of values for General Data or Design Data, Thermal/Hydraulic Data, Mechanical Data, and Material Data
- Addition of Notes for the Mechanical Data Sheet
- Addition of Equipment Qualification Data Sheet
- Addition of Seismic Analysis In-Structure Response Spectra graphs and data tabulation

24590-PTF-MVD-CNP-00016 (formerly 24590-PTF-MWD-CNP-00001):

- Data sheet type changed from "Mechanical Systems Data Sheet: Column" to "Mechanical Systems Data Sheet: Vessel"

This PCN updates information in Appendix 8.6 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.

The following outstanding change documents have been submitted to Ecology pursuant to permit condition III.10.C.9.h and are maintained in the WTP Operating Record:

- 24590-PTF-MED-CNP-00003: 24590-WTP-SDDR-MS-09-00117

Quarter Ending June 30, 2013

24590-PTF-PCN-ENV-09-001

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

WAC 173-303-830 Modification Class:	Class 1	Class 1[1]	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class 1[1] modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl 5/9/13 Date

ISSUED BY RPP-WTP PDC

MECHANICAL DATA SHEET
SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00002 4
Data Sheet No.
24590-PTF-MED-CNP-00003

R11105810

Project:	***RPP-WTP***	Description:	***Cesium Evaporator Primary Condenser***
Project No:	***24590***	P&ID:	***24590-PTF-M6-CNP-00010,*** ***24590-QL-POA-MEVV-00002-07-24*** 4
Site:	***Hanford***	Process Data: 4	***24590-PTF-MVC-CNP-00015*** 4
Process flow diagram:	***24590-PTF-M5-V17T-00014***	Manufacturer Name:	***Framatome ANP / Northwest Copper Works, Inc.***

General Data

Quality Level	***Q (Note 1 & 7)*** 4	TEMA (Class/Type)	***B***
Seismic Category	***SC-I (Note 7)*** 4	Flow Type (Counter current, etc)	*
Design Code	***ASME VIII Div 1***	Heat Exchanger Duty Btu/hr	***5,320,000***
Code Stamp	***Yes***	Heat Exchanger Area ft^2	***1,674***
NB Registration	***Yes***	ΔT (LMTD/Corrected LMTD) °F	***16.6***

Thermal/Hydraulic Data

	Shell Side		Tube Side	
Fluid Name	***In Steam Out***		***In Cooling Water Out***	
Fluid Quantities: Total lbm/hr	***5,257***		***296,000***	
Condensable Vapor (In/Out)	***5214***	***102***	***0***	***0***
Liquid	*	***5112***	***296,000***	***296,000***
Noncondensable	***42.7***	***42.7***	***0***	***0***
Temperature (In/Out) °F	***104*** 4	***94***	***80*** 4	***92*** 4
Specific Gravity	*	*	***1***	***1***
Viscosity Cp	*	*		
Molecular Weight	***18***			
Molecular Weight, Noncondensable	*	***29***		
Specific Heat Btu/lbm-°F	*	*	***1***	***1***
Thermal Conductivity Btu/hr-ft-°F	*	*		
Latent Heat Btu/lbm @ °F	***1,105.4***			
Inlet pressure psia	***1.10*** 4		4 ***84.7*** *	
Tube side Velocity ft/s			***7***	
Pressure Drop (Allowed) psi			***10.4***	
Fouling Resistance (Min) $hr\text{-}ft^2\text{-}°F/Btu$	***0.001***		***0.0015***	

Mechanical Data

	Shell Side		Tube Side	
Design Pressure (Max/Min) psig	***50***	***Full vacuum***	***100****	***Full vacuum****
Design Temperature (Max/Min) °F	***240***	***40***	***240***	***40***
Corrosion Allowance inch	***0.04***		***0.04***	
Erosion Allowance inch	*		*	
Shell OD/ID inch	***36 ID***		Overall Dimensions (H x W x L) inch	***115.75 x 48 x 251***
Total Number of Tubes	***406***		Tube OD inch	***1***

Material Data

Shell	***SA 240 304SS (max. carbon 0.030%)***	Shell Cover	***SA 240 304SS (max. carbon 0.030%)***
Channel/Bonnet	***SA 240 304SS (max. carbon 0.030%)***	Channel Cover	***SA 240 304SS (max. carbon 0.030%)***
Tube	***SA 213 304 SS Seamless*** 4 ***(max. carbon 0.030%)***	Floating Head Cover	***SA 240 304SS (max. carbon 0.030%)***
Stationary Tube Sheet	***SA 240 304SS (max. carbon 0.030%)***	Floating Tube Sheet	***N/A***
Shell Side Gaskets	***N/A***	Tube Side Gaskets	***304 SS Spiral Wound, PTFE Filler***
Partition Seals	*	Baffles/Supports	***SA 240 304SS (max. carbon 0.030%)***
Insulation	***None***	Forgings (Shell side)	***SA 182 F304SS (Max Carbon 0.030%)***
Bolting	***SA 193 B8 S30400 w/SA 194 Gr 8 Nuts***	Forgings (Channel)	***SA 182 F304SS (Max Carbon 0.030%)***

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00002

Data Sheet No.
24590-PTF-MED-CNP-00003

Construction Data *(To be determined by the supplier when not specified by the buyer)*

Cross Baffle Type	*	% Baffle Cut (Dia.)	*	Spacing (c/c) inch	*
Bypass Seal Arrangement	*	Longitudinal Seal Type	*	Expansion Joint Type	*
Inlet Nozzle ρV^2	*	Bundle Entrance ρV^2	*	Bundle Exit ρV^2	*
Tube Support Type	*	U-bend Support Type	*	Weight of Bundle lbf	*
Operating Weight lbf	*	Full of Water lbf	*	Weight of Shell lbf	*

Notes

* ***To be determined / confirmed by Seller***

*** ***Not Used.*** 4

4

(1) Vendor will provide item at BNI quality level Q specification, which corresponds with vendor quality level QL-2.

(2) Equipment Cyclic Data is from document 24590-QL-POA-MEVV-00002-10-00002.

(3) Vendor Design information is from document 24590-QL-POA-MEVV-00002-10-00011.

(4) The physical design parameters shall be determined by the seller based on TEMA and HEI standards.

(5) Contents of this document are Dangerous Waste Permit Affecting. 4

(6) Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only. 4

(7) For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore conservative. 4

(8) Allowable nozzle loads shall be per SC-I stainless steel nozzle design loads of 24590-WTP-3PS-MV00-T0001. 4

Safety screening / evaluation required? ☒Yes ☐No If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.

Rev	Description	By	Checked	EN&S	Approved	Date
4	Updated to incorporate 24590-WTP-M6N-M80T-00005 (Dangerous Waste Permit Affecting), DOE AEA note (6), reflect WSGM analysis, 24590-PTF-U0D-W16T-00001 changes, and update other data.	D. Tate	S. Thakkar	S Hall 5 Jul 09	J. Julyk	8/24/09
3	Incorporated Vendor Design Changes and Equipment Qualification data	R. Rickenbach	S. Thakkar	S. Woolfolk	J. Julyk	07/15/2008
2	Issued for Purchase, incorporates updated vendor data	J. Hickman	K. Sadle	N/A	J. Julyk	08/11/2004
1	Issued for Purchase	J. Hickman	E. Le	N/A	J. Julyk	02/12/2004
0	Issued for Purchase	M. Pratt	J. Hickman	N/A	S. Kirk	07/24/2002

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification

Component Tag Number	24590-PTF-ME-CNP-HX-00002 (4)	Safety Classification	☒ SC ☐ SS ☐ APC ☐ SDC ☐ SDS ☐ RRC Note 12 (4)
Manufacturer / Supplier	NORTHWEST COPPER WORKS, INC. / AREVA NP, INC.		
Requisition Number	24590-QL-POA-MEVV-00002		
Model	N/A	Seismic Category	☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV Note 12 (4)
Description (Include descriptive text [e.g., location, elevation])	CESIUM EVAPORATOR PRIMARY CONDENSER, ROOM P-0430, ELEVATION 77'-0".		
Safety Function(s)	Prevent post seismic disruption of H2 vessel purge air pathways, spread of contamination into C3 areas from PVP blowback. (4)		

Seismic Safety Function	☒ Yes ☐ No	Room Number(s):	P-0430
Maintenance Accessible	☒ Yes ☐ No	Method of Maintenance Access:	☐ Remote ☒ Hands On ☐ None
Seismic Operability Requirements: (4)	☐ During Seismic Event (4) ☐ After Seismic Event		
ITS Equipment Type:	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical

Equipment Environmental Qualification (EEQ)

Environment ☒ Mild ☐ Harsh Contamination Class: C3 Radiation Class: R3	Hi Rad Service ☐ Yes ☒ No	Design Life (yrs) ☐ 40 ☒ Other ____ Note 13 (4)

Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	95	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal Low Temperature (°F)	59	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal High Relative Humidity (%RH)	100	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Relative Humidity (%RH)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal High Pressure (in.-w.g.)	0	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Pressure (in.-w.g.)	-0.4	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Radiation Dose Rate (mR/hr)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Vibration Magnitude (g)	N/A	N/A	N/A	N/A (4)	NOTE 1
Vibration Frequency (Hz)	N/A	N/A	N/A	N/A (4)	NOTE 1
Additional Normal Information:	See Note 2 for pressure units.				

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Abnormal					
Abnormal High Temperature (°F)	4 115	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 4	NOTE 1
Abnormal Low Temperature (°F)	4 Note 10 40	8	hr/yr	24590-PTF-U0D-W16T-00001, Notes 8 & 10 4	NOTE 1
Abnormal High Relative Humidity (%RH)	100	24	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Relative Humidity (%RH)	4	22	hr/yr	24590-PTF-U0D-W16T-00001, Note 11 4	NOTE 1
Abnormal High Pressure (in.-w.g.)	4	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Pressure (in.-w.g.)	-7.3	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Radiation Dose Rate (mR/hr)	10, Note 5	0	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Wet Sprinkler System Present	Yes	2	4 hr	24590-PTF-U0D-W16T-00001	NOTE 1
Additional Abnormal Information	See Note 2 for pressure units.				
Design Basis Events (DBE)					
DBE High Temperature (°F)	125	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8 & 11 4	NOTE 1
DBE Low Temperature (°F)	40	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
DBE High Relative Humidity (%RH)	100	482	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Relative Humidity (%RH)	4 8	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE High Pressure (in.-w.g.)	4	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Pressure (in.-w.g.)	-7.3	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Radiation Dose Rate (mR/hr)	10 Note 5	4 0	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Flood Height (ft)	1.58	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Submergence (ft)	0 Note 6	4 N/A	4 N/A	4 24590-QL-POA-MEVV-00002-07-17	NOTE 1
Chemical/Spray Exposure	YES Note 9	12.5	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Additional DBE Information	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	2M, 5M, 19M Sodium Hydroxide 4 0.5M Nitric Acid 1M Sodium Permanganate

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	See Vendor Submital 24590-QL-POA-MEVV-00002-07-17
Mounting Method (bolts, welds, etc.)	CNP-SKID-00002, 24590-PTF-DD-S13T-00167
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks.	24590-WTP-3PS-SS90-T0001	001 4	N/A
Specified Seismic Load (BUYER)	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectre (ISRS) 4	24590-PTF-S0C-S15T-00057 4	00A 4	Calculation is not included in MR, see attached figures 16, 17, 22, 23 and 144 per CCN 185267. 4
Design Seismic Load (SELLER	4	4	4	Note 1 4
Qualification Method (SELLER)	4	4	4	Note 1 4
Qualification Report Number (SELLER)	4	4	4	Note 1 4
Submittal Number (BUYER)	TBD 4	TBD 4	TBD 4	None 4

Notes and Additional Information

Notes:

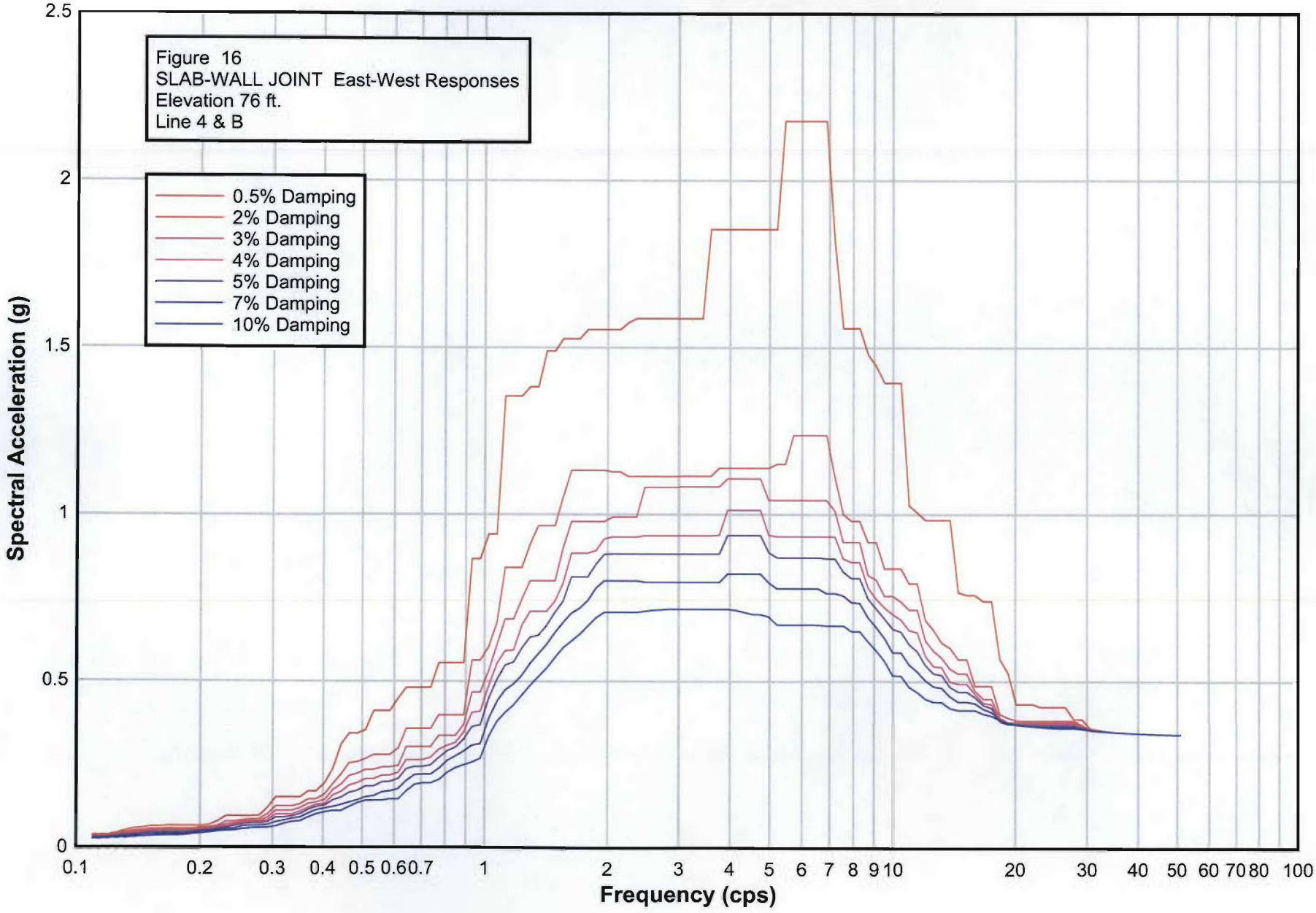
1. Data to be provided by seller through the submittal process as required on the G-321-E form.
2. Where pressure is given in inches of water column (in.-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in.-w.g.)
3. deleted. 4
4. The equipment qualification will be documented in accordance with the requirements in Appendix D of Engineering Specification for Environmental Qualification of Mechanical Equipment, document number 24590-WTP-3PS-G000-T0015. for the passive and active safety functions.
5. Abnormal and DBE radiation dose rates are set equal to normal and do not contribute to the total integrated dose. 4
6. Submergence depth is the difference between the lowest point on the equipment and the flood depth above the floor. The submergence depth is set to zero if the lowest section of the equipment is above the flood depth.
7. Environmental data from calculation 24590-PTF-U0D-W16T-00001 is for room environment only.
8. For application of AISC N690, 4 abnormal temperatures shall be applied as Normal Operation Temperature, T_O, with seismic effects, E_S. The Design basis event temperatures shall be applied as a Thermal Load generated by a postulated accident, T_A, without seismic effects, E_s. 4
9. See DBE Chemical Exposure Details. 4
10. Abnormal minimum temperature is set equal to the normal minimum temperature (59F) for the purposes of seismic 4 analysis. A DBE seismic event coincident with an extreme low abnormal temperature is not a credible scenario. [The probability of an abnormal minimum temperature is estimated as follows: temperatures <40 F occur 31% of the year (average historical weather data, 0.31 probability); a loss of heating is assumed to occur 8 hrs/yr (0.001 probability); combined probability is 0.31 x 0.001 = 0.00031 (3.1E-4). The combination of this event with a seismic DBE (4 E-04 probability) is not credible (<1 E-06 probability).]
11. Parameter value used on data sheet has been previously established and determined to provide more conservative 4 constraint than values derived from 24590-PTF-U0D-W16T-00001.
12. For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore 4 conservative.
13. Facility design life is 40 years. Seller will determine equipment design life and required maintenance / replacement 4 intervals to maintain qualification of equipment components subject to wear or aging.

References:

1. 24590-WTP-PSAR-ESH-01-002-02, Rev. 04E, Preliminary Documented Safety Analysis to Support Construction 4 Authorization; PT Facility Specific Information.
2. deleted. 4
3. 24590-PTF-M6-CNP-00010, Rev. 2, P&ID - PTF Cesium Nitric Acid Recovery Process System Rectifier and 4 Condensers.
4. 24590-PTF-U0D-W16T-00001, Rev. 0, PTF Room Environment Datasheet [Including DCNs: 24590-PTF-U0N-W16T-4 00001, 24590-PTF-U0N-W16T-00003, & 24590-PTF-U0N-W16T-00004].
5. 24590-WTP-DB-ENG-01-001, Rev. 1N, Basis Of Design. 4
6. 24590-QL-POA-MEVV-00002-07-09, Rev. 00C, DRAWING - 60% DESIGN - PRIMARY CONDENSER CNP-HX-4 00002
7. 24590-PTF-M6X-CNP-00037 Rev. 002, MS LINE LIST FOR P&ID 24590-PTF-M6-CNP-00010, REV. 2 4

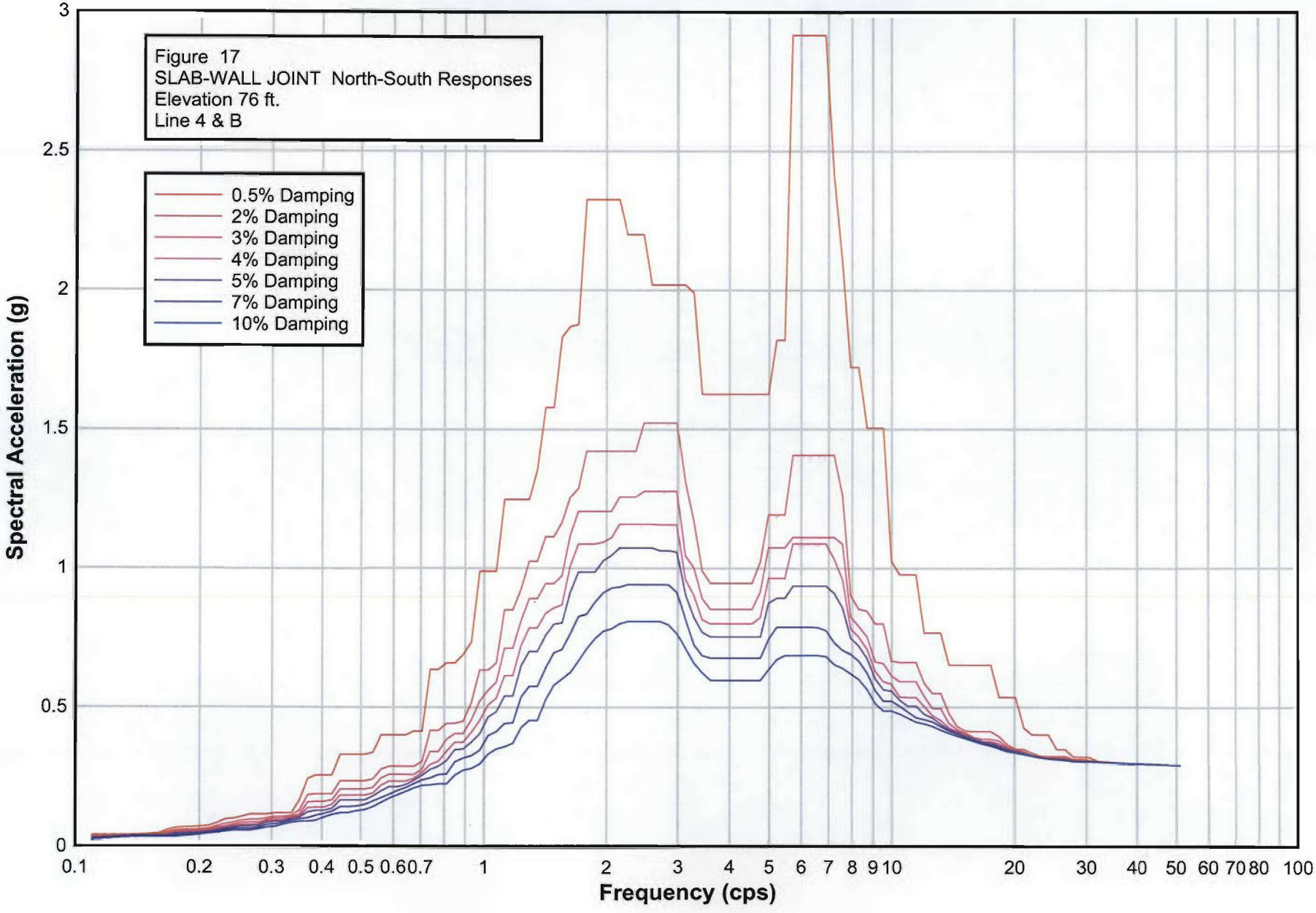
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



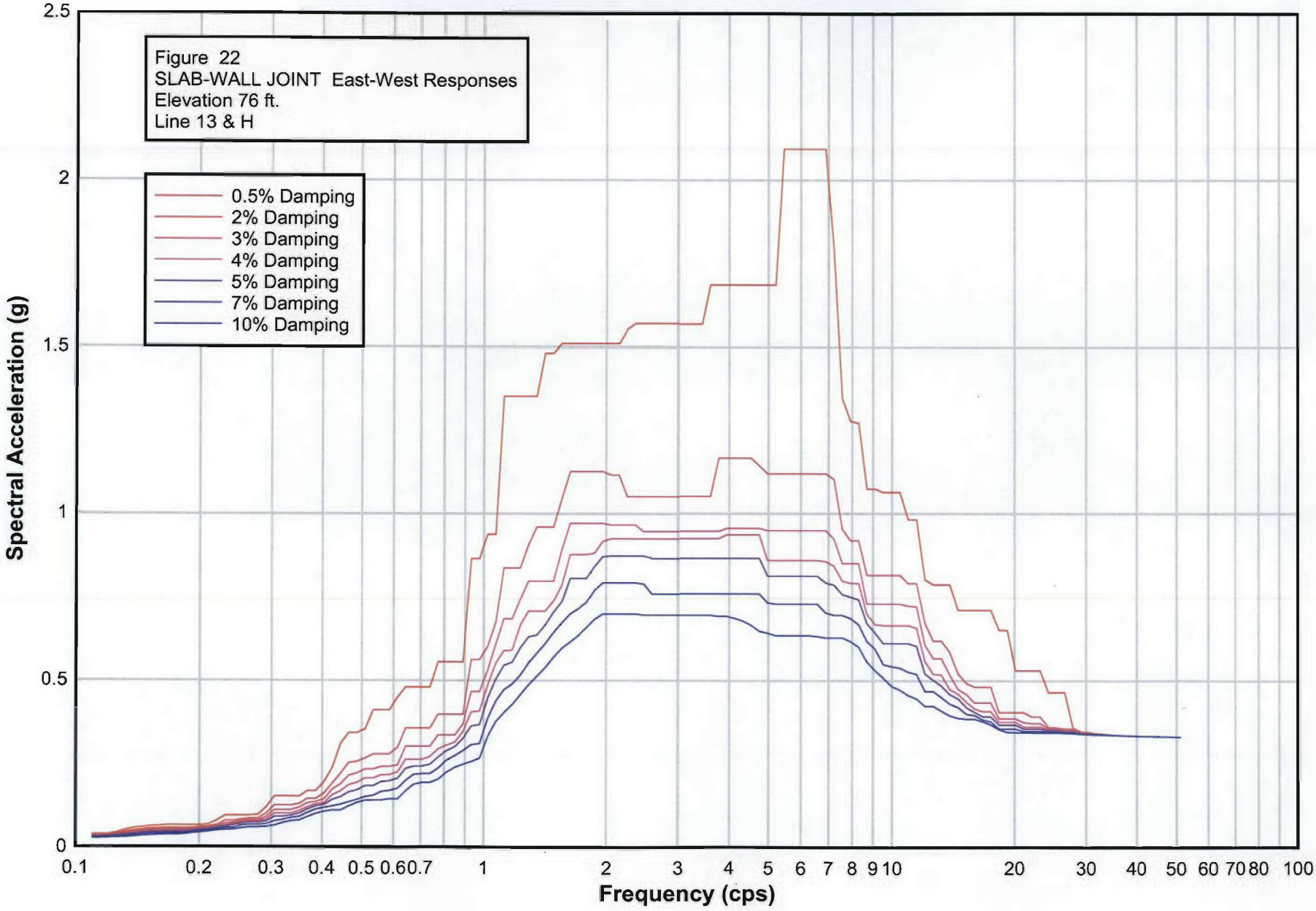
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 4



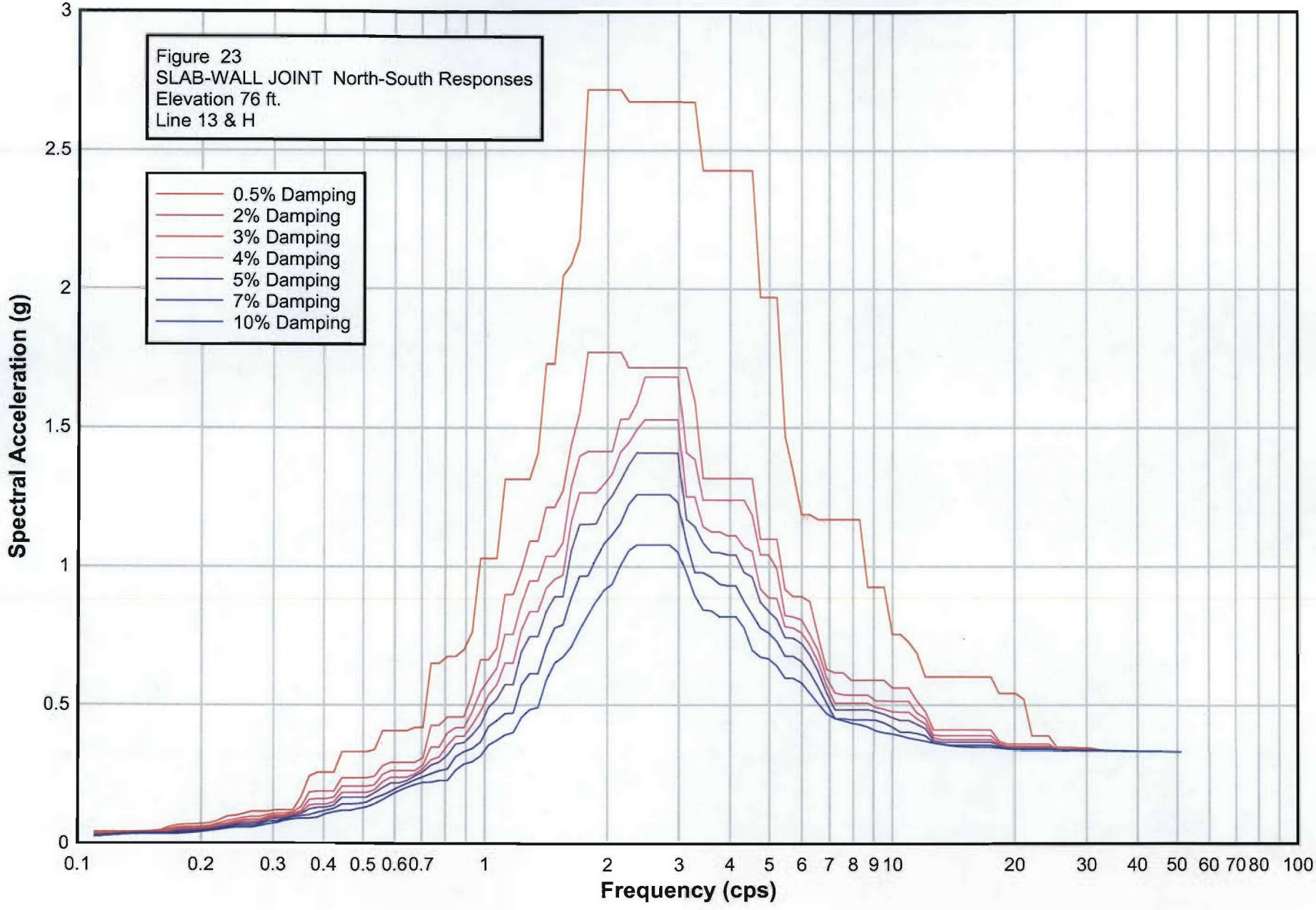
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



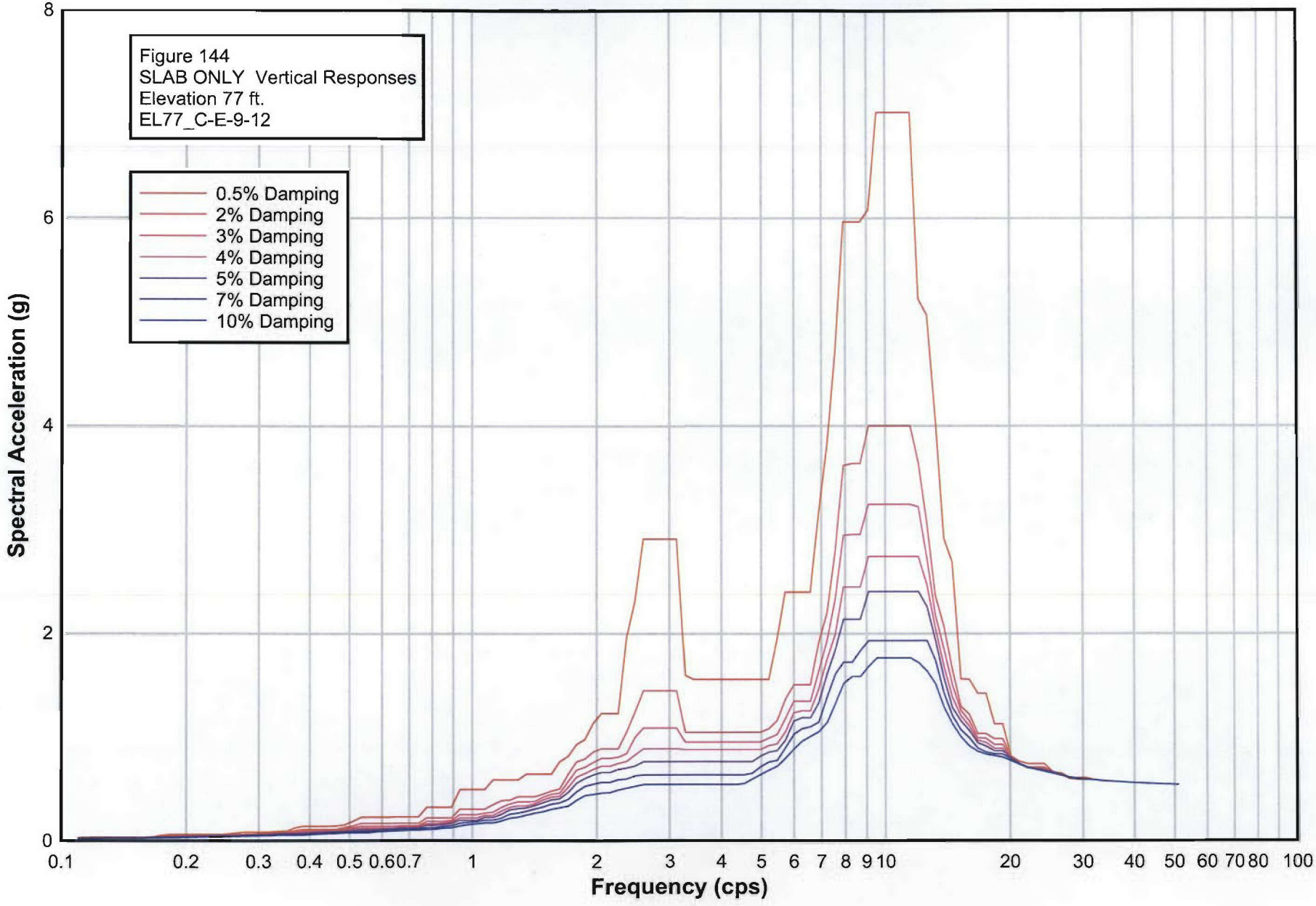
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 4



RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0331	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0398	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.056	0.1385	0.0489	0.1385	0.0449	0.1385	0.0414	0.1385	0.0384	0.1385	0.0345	0.1385	0.0304
0.1451	0.0582	0.1451	0.051	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0617	0.152	0.0547	0.152	0.0507	0.152	0.0473	0.152	0.0442	0.152	0.0392	0.152	0.0339
0.1592	0.0621	0.1592	0.0547	0.1592	0.0507	0.1592	0.0473	0.1592	0.0442	0.1592	0.0398	0.1592	0.0353
0.1668	0.0641	0.1668	0.0561	0.1668	0.0518	0.1668	0.0482	0.1668	0.0452	0.1668	0.0404	0.1668	0.0358
0.1748	0.0641	0.1748	0.0561	0.1748	0.0518	0.1748	0.0482	0.1748	0.0452	0.1748	0.0404	0.1748	0.0358
0.1831	0.0641	0.1831	0.0561	0.1831	0.0518	0.1831	0.0482	0.1831	0.0452	0.1831	0.0404	0.1831	0.037
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0496	0.1918	0.0478	0.1918	0.0446	0.1918	0.0405
0.2009	0.0642	0.2009	0.0584	0.2009	0.0559	0.2009	0.0536	0.2009	0.0514	0.2009	0.0475	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0526	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0595	0.2205	0.0573	0.2205	0.0533	0.2205	0.0485
0.231	0.0934	0.231	0.0774	0.231	0.0694	0.231	0.0631	0.231	0.0598	0.231	0.0556	0.231	0.0504
0.242	0.0934	0.242	0.0774	0.242	0.0722	0.242	0.0678	0.242	0.0638	0.242	0.0567	0.242	0.0513
0.2535	0.0934	0.2535	0.0818	0.2535	0.0771	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0554
0.2656	0.0934	0.2656	0.084	0.2656	0.0795	0.2656	0.0755	0.2656	0.0718	0.2656	0.0654	0.2656	0.0576
0.2783	0.0953	0.2783	0.0846	0.2783	0.0795	0.2783	0.0755	0.2783	0.0718	0.2783	0.0654	0.2783	0.0583
0.2915	0.1187	0.2915	0.0988	0.2915	0.0891	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0596
0.3054	0.1504	0.3054	0.1235	0.3054	0.1098	0.3054	0.0986	0.3054	0.0895	0.3054	0.0759	0.3054	0.0634
0.3199	0.1504	0.3199	0.1235	0.3199	0.1098	0.3199	0.0986	0.3199	0.0895	0.3199	0.0803	0.3199	0.0708
0.3352	0.1504	0.3352	0.1235	0.3352	0.1098	0.3352	0.0986	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1504	0.3511	0.1293	0.3511	0.1176	0.3511	0.1073	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.1683	0.3678	0.144	0.3678	0.1305	0.3678	0.1188	0.3678	0.1122	0.3678	0.1019	0.3678	0.0901
0.3853	0.1683	0.3853	0.144	0.3853	0.1348	0.3853	0.1282	0.3853	0.1222	0.3853	0.1119	0.3853	0.0995
0.4037	0.1943	0.4037	0.1602	0.4037	0.1429	0.4037	0.1309	0.4037	0.1262	0.4037	0.1173	0.4037	0.1059
0.4229	0.2369	0.4229	0.1909	0.4229	0.1723	0.4229	0.156	0.4229	0.1418	0.4229	0.1222	0.4229	0.1097
0.4431	0.3093	0.4431	0.2196	0.4431	0.1883	0.4431	0.1672	0.4431	0.1497	0.4431	0.1277	0.4431	0.1101
0.4642	0.3423	0.4642	0.2533	0.4642	0.2146	0.4642	0.186	0.4642	0.1645	0.4642	0.1352	0.4642	0.122
0.4863	0.3423	0.4863	0.2566	0.4863	0.2214	0.4863	0.1933	0.4863	0.1706	0.4863	0.1417	0.4863	0.1333
0.5094	0.353	0.5094	0.266	0.5094	0.2329	0.5094	0.2058	0.5094	0.1835	0.5094	0.1506	0.5094	0.1402

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.4107	0.5337	0.2781	0.5337	0.2329	0.5337	0.2058	0.5337	0.1835	0.5337	0.1543	0.5337	0.1408
0.5591	0.4107	0.5591	0.2781	0.5591	0.2405	0.5591	0.2157	0.5591	0.1952	0.5591	0.1655	0.5591	0.1408
0.5857	0.4107	0.5857	0.2781	0.5857	0.241	0.5857	0.2165	0.5857	0.1977	0.5857	0.1688	0.5857	0.1449
0.6136	0.4487	0.6136	0.2979	0.6136	0.2453	0.6136	0.2243	0.6136	0.2059	0.6136	0.1759	0.6136	0.1449
0.6428	0.48	0.6428	0.3562	0.6428	0.3018	0.6428	0.2625	0.6428	0.236	0.6428	0.2002	0.6428	0.1694
0.6734	0.48	0.6734	0.3562	0.6734	0.3018	0.6734	0.2625	0.6734	0.2428	0.6734	0.218	0.6734	0.1886
0.7055	0.48	0.7055	0.3562	0.7055	0.3018	0.7055	0.2625	0.7055	0.2428	0.7055	0.2198	0.7055	0.1933
0.7391	0.48	0.7391	0.3562	0.7391	0.3018	0.7391	0.27	0.7391	0.247	0.7391	0.2198	0.7391	0.1933
0.7743	0.5542	0.7743	0.3977	0.7743	0.3353	0.7743	0.2937	0.7743	0.2698	0.7743	0.2368	0.7743	0.2034
0.8111	0.5542	0.8111	0.3977	0.8111	0.3353	0.8111	0.3056	0.8111	0.2895	0.8111	0.2605	0.8111	0.2253
0.8497	0.5542	0.8497	0.3977	0.8497	0.3353	0.8497	0.3138	0.8497	0.3004	0.8497	0.2743	0.8497	0.2392
0.8902	0.5542	0.8902	0.3977	0.8902	0.3682	0.8902	0.3455	0.8902	0.3247	0.8902	0.2891	0.8902	0.2477
0.9326	0.8662	0.9326	0.5625	0.9326	0.4663	0.9326	0.4051	0.9326	0.3625	0.9326	0.3066	0.9326	0.2561
0.977	0.8662	0.977	0.5625	0.977	0.4663	0.977	0.4085	0.977	0.3679	0.977	0.311	0.977	0.2675
1.0235	0.9397	1.0235	0.6023	1.0235	0.5301	1.0235	0.485	1.0235	0.4471	1.0235	0.3868	1.0235	0.3327
1.0723	0.9397	1.0723	0.6755	1.0723	0.6093	1.0723	0.5524	1.0723	0.5049	1.0723	0.4387	1.0723	0.3788
1.1233	1.3542	1.1233	0.8403	1.1233	0.6861	1.1233	0.5909	1.1233	0.5475	1.1233	0.4739	1.1233	0.4054
1.1768	1.3542	1.1768	0.8403	1.1768	0.6861	1.1768	0.593	1.1768	0.5568	1.1768	0.4913	1.1768	0.4287
1.2328	1.3542	1.2328	0.8403	1.2328	0.7451	1.2328	0.6666	1.2328	0.5988	1.2328	0.5173	1.2328	0.4581
1.2916	1.3816	1.2916	0.9092	1.2916	0.8003	1.2916	0.709	1.2916	0.632	1.2916	0.5529	1.2916	0.4868
1.353	1.3816	1.353	0.9646	1.353	0.8003	1.353	0.709	1.353	0.6372	1.353	0.5822	1.353	0.5131
1.4175	1.4891	1.4175	0.9646	1.4175	0.8003	1.4175	0.709	1.4175	0.6669	1.4175	0.6106	1.4175	0.5387
1.485	1.4891	1.485	0.9646	1.485	0.8003	1.485	0.74	1.485	0.707	1.485	0.6462	1.485	0.5713
1.5557	1.5256	1.5557	1.0523	1.5557	0.8995	1.5557	0.7933	1.5557	0.7403	1.5557	0.6763	1.5557	0.6006
1.6298	1.5256	1.6298	1.1325	1.6298	0.9776	1.6298	0.8831	1.6298	0.8122	1.6298	0.704	1.6298	0.6204
1.7074	1.5256	1.7074	1.1325	1.7074	0.9776	1.7074	0.8831	1.7074	0.8122	1.7074	0.7191	1.7074	0.6405
1.7887	1.5537	1.7887	1.1325	1.7887	0.9776	1.7887	0.8831	1.7887	0.8122	1.7887	0.7414	1.7887	0.6653
1.8738	1.5537	1.8738	1.1325	1.8738	0.9776	1.8738	0.8911	1.8738	0.8509	1.8738	0.7792	1.8738	0.6908
1.963	1.5537	1.963	1.1325	1.963	0.9776	1.963	0.9255	1.963	0.8796	1.963	0.8012	1.963	0.7066
2.0565	1.5537	2.0565	1.1279	2.0565	0.991	2.0565	0.9319	2.0565	0.8812	2.0565	0.8012	2.0565	0.7066
2.1544	1.5537	2.1544	1.1279	2.1544	0.991	2.1544	0.9319	2.1544	0.8812	2.1544	0.8012	2.1544	0.7066
2.257	1.5743	2.257	1.1134	2.257	0.991	2.257	0.9319	2.257	0.8812	2.257	0.8012	2.257	0.7066
2.3645	1.5864	2.3645	1.1134	2.3645	0.991	2.3645	0.9319	2.3645	0.8812	2.3645	0.8012	2.3645	0.7066
2.4771	1.5864	2.4771	1.1134	2.4771	1.0817	2.4771	0.936	2.4771	0.8812	2.4771	0.7969	2.4771	0.71
2.595	1.5864	2.595	1.1134	2.595	1.0817	2.595	0.936	2.595	0.8812	2.595	0.7969	2.595	0.7136

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
2.7186	1.5864	2.7186	1.1134	2.7186	1.0817	2.7186	0.936	2.7186	0.8812	2.7186	0.7969	2.7186	0.7147
2.848	1.5864	2.848	1.1134	2.848	1.0817	2.848	0.936	2.848	0.8812	2.848	0.7969	2.848	0.7165
2.9836	1.5864	2.9836	1.1134	2.9836	1.0817	2.9836	0.936	2.9836	0.8812	2.9836	0.7969	2.9836	0.7168
3.1257	1.5864	3.1257	1.1134	3.1257	1.0817	3.1257	0.936	3.1257	0.8812	3.1257	0.7969	3.1257	0.7168
3.2745	1.5864	3.2745	1.1134	3.2745	1.0817	3.2745	0.936	3.2745	0.8812	3.2745	0.7969	3.2745	0.7168
3.4305	1.5864	3.4305	1.1134	3.4305	1.0817	3.4305	0.936	3.4305	0.8812	3.4305	0.7969	3.4305	0.7168
3.5938	1.8535	3.5938	1.1134	3.5938	1.0817	3.5938	0.936	3.5938	0.8812	3.5938	0.7969	3.5938	0.7168
3.7649	1.8535	3.7649	1.1379	3.7649	1.0817	3.7649	0.9372	3.7649	0.8812	3.7649	0.7969	3.7649	0.7168
3.9442	1.8535	3.9442	1.1379	3.9442	1.1062	3.9442	1.0119	3.9442	0.9368	3.9442	0.822	3.9442	0.7168
4.132	1.8535	4.132	1.1379	4.132	1.1062	4.132	1.0119	4.132	0.9368	4.132	0.822	4.132	0.7133
4.3288	1.8535	4.3288	1.1379	4.3288	1.1062	4.3288	1.0119	4.3288	0.9368	4.3288	0.822	4.3288	0.7073
4.5349	1.8535	4.5349	1.1379	4.5349	1.1062	4.5349	1.0119	4.5349	0.9368	4.5349	0.822	4.5349	0.7011
4.7508	1.8535	4.7508	1.1379	4.7508	1.1062	4.7508	1.0119	4.7508	0.9368	4.7508	0.822	4.7508	0.7005
4.977	1.8535	4.977	1.1379	4.977	1.0415	4.977	0.9371	4.977	0.8856	4.977	0.7959	4.977	0.6942
5.214	1.8535	5.214	1.15	5.214	1.0415	5.214	0.9333	5.214	0.8702	5.214	0.7781	5.214	0.6697
5.4623	2.1772	5.4623	1.15	5.4623	1.0415	5.4623	0.9333	5.4623	0.8702	5.4623	0.7781	5.4623	0.6697
5.7224	2.1772	5.7224	1.2364	5.7224	1.0415	5.7224	0.9333	5.7224	0.8702	5.7224	0.7781	5.7224	0.6697
5.9948	2.1772	5.9948	1.2364	5.9948	1.0415	5.9948	0.9333	5.9948	0.8702	5.9948	0.7781	5.9948	0.6697
6.2803	2.1772	6.2803	1.2364	6.2803	1.0415	6.2803	0.9333	6.2803	0.8702	6.2803	0.7781	6.2803	0.6697
6.5793	2.1772	6.5793	1.2364	6.5793	1.0415	6.5793	0.9333	6.5793	0.8702	6.5793	0.7781	6.5793	0.6692
6.8926	2.1772	6.8926	1.2364	6.8926	1.0415	6.8926	0.9333	6.8926	0.868	6.8926	0.7639	6.8926	0.6672
7.2208	1.8137	7.2208	1.111	7.2208	1.0099	7.2208	0.9333	7.2208	0.868	7.2208	0.7639	7.2208	0.6672
7.5646	1.5583	7.5646	1	7.5646	0.9162	7.5646	0.8668	7.5646	0.8278	7.5646	0.7569	7.5646	0.6672
7.9248	1.5583	7.9248	0.9797	7.9248	0.9162	7.9248	0.8567	7.9248	0.8091	7.9248	0.7367	7.9248	0.6498
8.3022	1.5583	8.3022	0.9797	8.3022	0.9162	8.3022	0.8567	8.3022	0.8091	8.3022	0.7348	8.3022	0.6498
8.6975	1.4793	8.6975	0.9161	8.6975	0.8178	8.6975	0.7806	8.6975	0.7481	8.6975	0.6917	8.6975	0.6191
9.1116	1.4446	9.1116	0.9161	9.1116	0.8046	9.1116	0.747	9.1116	0.7178	9.1116	0.6619	9.1116	0.5921
9.5455	1.3932	9.5455	0.8381	9.5455	0.7557	9.5455	0.7218	9.5455	0.6885	9.5455	0.6299	9.5455	0.5611
10	1.3932	10	0.8381	10	0.7557	10	0.7016	10	0.6574	10	0.5866	10	0.5174
10.4762	1.3932	10.4762	0.8381	10.4762	0.7387	10.4762	0.6854	10.4762	0.6486	10.4762	0.5866	10.4762	0.5168
10.975	1.0262	10.975	0.7928	10.975	0.715	10.975	0.6537	10.975	0.6116	10.975	0.5505	10.975	0.4833
11.4976	1.0052	11.4976	0.7928	11.4976	0.715	11.4976	0.6468	11.4976	0.5901	11.4976	0.5294	11.4976	0.4672
12.045	0.9828	12.045	0.6834	12.045	0.6222	12.045	0.576	12.045	0.5483	12.045	0.5027	12.045	0.4467
12.6186	0.9828	12.6186	0.6539	12.6186	0.5915	12.6186	0.5447	12.6186	0.5232	12.6186	0.4843	12.6186	0.4381
13.2194	0.9828	13.2194	0.6159	13.2194	0.5704	13.2194	0.5426	13.2194	0.5185	13.2194	0.48	13.2194	0.4372

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
13.8489	0.9828	13.8489	0.6008	13.8489	0.5377	13.8489	0.4983	13.8489	0.4828	13.8489	0.4541	13.8489	0.4191
14.5083	0.7664	14.5083	0.5661	14.5083	0.5231	14.5083	0.4917	14.5083	0.4685	14.5083	0.4378	14.5083	0.4132
15.1991	0.7585	15.1991	0.5661	15.1991	0.5231	15.1991	0.4917	15.1991	0.4685	15.1991	0.4378	15.1991	0.4132
15.9228	0.7585	15.9228	0.486	15.9228	0.4712	15.9228	0.4619	15.9228	0.4519	15.9228	0.4336	15.9228	0.4132
16.681	0.7406	16.681	0.486	16.681	0.4464	16.681	0.4345	16.681	0.4286	16.681	0.4167	16.681	0.4021
17.4753	0.7406	17.4753	0.486	17.4753	0.4464	17.4753	0.4302	17.4753	0.4198	17.4753	0.4072	17.4753	0.3961
18.3074	0.5678	18.3074	0.4016	18.3074	0.3905	18.3074	0.3859	18.3074	0.3808	18.3074	0.3844	18.3074	0.384
19.1791	0.5264	19.1791	0.3903	19.1791	0.3769	19.1791	0.3738	19.1791	0.3725	19.1791	0.3745	19.1791	0.3756
20.0923	0.4312	20.0923	0.3818	20.0923	0.3769	20.0923	0.3738	20.0923	0.3724	20.0923	0.3716	20.0923	0.3713
21.049	0.4312	21.049	0.3813	21.049	0.3769	21.049	0.3729	21.049	0.3697	21.049	0.3688	21.049	0.3684
22.0513	0.4312	22.0513	0.3813	22.0513	0.3769	22.0513	0.3729	22.0513	0.3697	22.0513	0.3674	22.0513	0.3663
23.1013	0.4224	23.1013	0.3813	23.1013	0.3769	23.1013	0.3729	23.1013	0.3697	23.1013	0.3657	23.1013	0.3645
24.2013	0.4224	24.2013	0.3813	24.2013	0.3769	24.2013	0.3729	24.2013	0.3697	24.2013	0.3652	24.2013	0.3626
25.3536	0.4224	25.3536	0.3813	25.3536	0.3769	25.3536	0.3729	25.3536	0.3697	25.3536	0.3652	25.3536	0.3614
26.5609	0.4224	26.5609	0.3813	26.5609	0.3769	26.5609	0.3729	26.5609	0.3697	26.5609	0.3652	26.5609	0.3614
27.8256	0.3851	27.8256	0.3813	27.8256	0.3769	27.8256	0.3729	27.8256	0.3697	27.8256	0.3652	27.8256	0.3612
29.1505	0.3851	29.1505	0.37	29.1505	0.3667	29.1505	0.3645	29.1505	0.363	29.1505	0.3606	29.1505	0.3584
30.5386	0.3591	30.5386	0.3537	30.5386	0.3541	30.5386	0.3547	30.5386	0.355	30.5386	0.355	30.5386	0.3546
31.9927	0.355	31.9927	0.3527	31.9927	0.3524	31.9927	0.3523	31.9927	0.3522	31.9927	0.352	31.9927	0.3518
33.516	0.3506	33.516	0.3507	33.516	0.3506	33.516	0.3505	33.516	0.3504	33.516	0.3503	33.516	0.3501
35.1119	0.3483	35.1119	0.3484	35.1119	0.3485	35.1119	0.3485	35.1119	0.3486	35.1119	0.3486	35.1119	0.3486
36.7838	0.3471	36.7838	0.3472	36.7838	0.3472	36.7838	0.3473	36.7838	0.3473	36.7838	0.3473	36.7838	0.3474
38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3464	38.5353	0.3464	38.5353	0.3464
40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3456	40.3702	0.3456	40.3702	0.3456
42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3449
44.3062	0.3441	44.3062	0.3441	44.3062	0.3441	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442
46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3436	46.4159	0.3436
48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343
50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3425

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0321	0.1098	0.0303	0.1098	0.0271	0.1098	0.0235
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0321	0.115	0.0303	0.115	0.0271	0.115	0.0257
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0321	0.1204	0.031	0.1204	0.0296	0.1204	0.0278
0.1262	0.0405	0.1262	0.0365	0.1262	0.0352	0.1262	0.0342	0.1262	0.0333	0.1262	0.0316	0.1262	0.0298
0.1322	0.0405	0.1322	0.0382	0.1322	0.0369	0.1322	0.0358	0.1322	0.0348	0.1322	0.0333	0.1322	0.0317
0.1385	0.0411	0.1385	0.0391	0.1385	0.0381	0.1385	0.0372	0.1385	0.0363	0.1385	0.0348	0.1385	0.0329
0.1451	0.0417	0.1451	0.0398	0.1451	0.0387	0.1451	0.0378	0.1451	0.0369	0.1451	0.0353	0.1451	0.0334
0.152	0.044	0.152	0.0402	0.152	0.0387	0.152	0.0378	0.152	0.0369	0.152	0.0353	0.152	0.0334
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.0378	0.1592	0.0369	0.1592	0.0353	0.1592	0.0334
0.1668	0.0584	0.1668	0.0506	0.1668	0.0463	0.1668	0.0426	0.1668	0.0395	0.1668	0.0353	0.1668	0.0334
0.1748	0.0644	0.1748	0.0566	0.1748	0.0522	0.1748	0.0484	0.1748	0.045	0.1748	0.0394	0.1748	0.0334
0.1831	0.0668	0.1831	0.0583	0.1831	0.0541	0.1831	0.0504	0.1831	0.047	0.1831	0.0415	0.1831	0.0356
0.1918	0.0678	0.1918	0.0585	0.1918	0.0543	0.1918	0.0507	0.1918	0.0474	0.1918	0.0418	0.1918	0.0382
0.2009	0.0697	0.2009	0.0596	0.2009	0.0543	0.2009	0.0513	0.2009	0.0485	0.2009	0.0436	0.2009	0.0411
0.2105	0.0722	0.2105	0.0619	0.2105	0.058	0.2105	0.0546	0.2105	0.0516	0.2105	0.0482	0.2105	0.0443
0.2205	0.0819	0.2205	0.071	0.2205	0.0652	0.2205	0.0601	0.2205	0.0573	0.2205	0.0529	0.2205	0.0476
0.231	0.096	0.231	0.0793	0.231	0.0704	0.231	0.0666	0.231	0.0632	0.231	0.0574	0.231	0.0529
0.242	0.0983	0.242	0.0845	0.242	0.0775	0.242	0.0718	0.242	0.0681	0.242	0.0621	0.242	0.0558
0.2535	0.1059	0.2535	0.0913	0.2535	0.0832	0.2535	0.0762	0.2535	0.0701	0.2535	0.0621	0.2535	0.0558
0.2656	0.1141	0.2656	0.0948	0.2656	0.0844	0.2656	0.0762	0.2656	0.0701	0.2656	0.0621	0.2656	0.0558
0.2783	0.1141	0.2783	0.0948	0.2783	0.0844	0.2783	0.078	0.2783	0.0739	0.2783	0.0675	0.2783	0.0605
0.2915	0.1141	0.2915	0.1004	0.2915	0.0942	0.2915	0.0888	0.2915	0.0839	0.2915	0.0759	0.2915	0.0673
0.3054	0.1177	0.3054	0.1054	0.3054	0.0985	0.3054	0.0924	0.3054	0.0871	0.3054	0.0783	0.3054	0.0694
0.3199	0.1177	0.3199	0.1054	0.3199	0.0985	0.3199	0.0924	0.3199	0.0889	0.3199	0.0837	0.3199	0.0776
0.3352	0.1177	0.3352	0.1094	0.3352	0.1051	0.3352	0.1012	0.3352	0.0975	0.3352	0.0913	0.3352	0.0842
0.3511	0.1652	0.3511	0.1285	0.3511	0.1129	0.3511	0.107	0.3511	0.103	0.3511	0.0961	0.3511	0.0879
0.3678	0.2416	0.3678	0.1833	0.3678	0.1566	0.3678	0.1365	0.3678	0.1213	0.3678	0.1003	0.3678	0.0879
0.3853	0.255	0.3853	0.187	0.3853	0.1595	0.3853	0.1386	0.3853	0.1268	0.3853	0.1091	0.3853	0.091
0.4037	0.255	0.4037	0.187	0.4037	0.1595	0.4037	0.1386	0.4037	0.1271	0.4037	0.1152	0.4037	0.1029
0.4229	0.255	0.4229	0.187	0.4229	0.1649	0.4229	0.1484	0.4229	0.1344	0.4229	0.1234	0.4229	0.1122
0.4431	0.329	0.4431	0.2338	0.4431	0.2038	0.4431	0.1815	0.4431	0.1644	0.4431	0.1404	0.4431	0.1188
0.4642	0.329	0.4642	0.2338	0.4642	0.2038	0.4642	0.1815	0.4642	0.1644	0.4642	0.1404	0.4642	0.1188
0.4863	0.329	0.4863	0.2338	0.4863	0.2038	0.4863	0.1815	0.4863	0.1644	0.4863	0.1424	0.4863	0.125
0.5094	0.329	0.5094	0.2338	0.5094	0.2038	0.5094	0.1815	0.5094	0.1644	0.5094	0.1479	0.5094	0.1295

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.3366	0.5337	0.2402	0.5337	0.2091	0.5337	0.1893	0.5337	0.1789	0.5337	0.1611	0.5337	0.1403
0.5591	0.3994	0.5591	0.2757	0.5591	0.2433	0.5591	0.2174	0.5591	0.1976	0.5591	0.173	0.5591	0.1559
0.5857	0.3994	0.5857	0.286	0.5857	0.257	0.5857	0.2329	0.5857	0.2125	0.5857	0.1854	0.5857	0.1716
0.6136	0.3994	0.6136	0.286	0.6136	0.257	0.6136	0.2329	0.6136	0.2125	0.6136	0.1986	0.6136	0.1834
0.6428	0.3994	0.6428	0.286	0.6428	0.257	0.6428	0.2329	0.6428	0.22	0.6428	0.2091	0.6428	0.1953
0.6734	0.4133	0.6734	0.286	0.6734	0.2573	0.6734	0.2433	0.6734	0.2362	0.6734	0.2239	0.6734	0.2086
0.7055	0.4133	0.7055	0.3041	0.7055	0.2763	0.7055	0.2647	0.7055	0.2547	0.7055	0.2378	0.7055	0.2184
0.7391	0.6352	0.7391	0.4157	0.7391	0.3392	0.7391	0.2923	0.7391	0.2745	0.7391	0.2448	0.7391	0.2198
0.7743	0.6352	0.7743	0.4157	0.7743	0.3392	0.7743	0.3048	0.7743	0.2868	0.7743	0.257	0.7743	0.2238
0.8111	0.6585	0.8111	0.4403	0.8111	0.3839	0.8111	0.3407	0.8111	0.3071	0.8111	0.2598	0.8111	0.2238
0.8497	0.6585	0.8497	0.4417	0.8497	0.4046	0.8497	0.3736	0.8497	0.3467	0.8497	0.3033	0.8497	0.2554
0.8902	0.6889	0.8902	0.4489	0.8902	0.4046	0.8902	0.3736	0.8902	0.3493	0.8902	0.3172	0.8902	0.2735
0.9326	0.7344	0.9326	0.5165	0.9326	0.454	0.9326	0.4087	0.9326	0.3743	0.9326	0.3257	0.9326	0.2797
0.977	0.988	0.977	0.6326	0.977	0.5215	0.977	0.4519	0.977	0.4046	0.977	0.3452	0.977	0.2961
1.0235	0.988	1.0235	0.6326	1.0235	0.56	1.0235	0.5076	1.0235	0.464	1.0235	0.3976	1.0235	0.3315
1.0723	0.988	1.0723	0.6582	1.0723	0.5892	1.0723	0.5317	1.0723	0.4833	1.0723	0.4119	1.0723	0.35
1.1233	1.2454	1.1233	0.849	1.1233	0.7113	1.1233	0.6128	1.1233	0.5401	1.1233	0.4417	1.1233	0.3579
1.1768	1.2454	1.1768	0.849	1.1768	0.7113	1.1768	0.6128	1.1768	0.5401	1.1768	0.4439	1.1768	0.3706
1.2328	1.2454	1.2328	0.9242	1.2328	0.8109	1.2328	0.7212	1.2328	0.6482	1.2328	0.5371	1.2328	0.4267
1.2916	1.2454	1.2916	1.0234	1.2916	0.889	1.2916	0.7839	1.2916	0.6998	1.2916	0.5744	1.2916	0.4525
1.353	1.3539	1.353	1.0234	1.353	0.889	1.353	0.7839	1.353	0.6998	1.353	0.5744	1.353	0.4525
1.4175	1.5778	1.4175	1.1114	1.4175	0.9435	1.4175	0.8371	1.4175	0.7571	1.4175	0.6404	1.4175	0.526
1.485	1.5778	1.485	1.1114	1.485	0.9435	1.485	0.8563	1.485	0.7981	1.485	0.6954	1.485	0.5786
1.5557	1.831	1.5557	1.163	1.5557	0.9714	1.5557	0.8673	1.5557	0.8026	1.5557	0.7075	1.5557	0.6018
1.6298	1.8691	1.6298	1.2535	1.6298	1.1171	1.6298	1.0068	1.6298	0.9124	1.6298	0.764	1.6298	0.6239
1.7074	1.8765	1.7074	1.2869	1.7074	1.2033	1.7074	1.0857	1.7074	0.9852	1.7074	0.825	1.7074	0.6665
1.7887	2.3239	1.7887	1.4211	1.7887	1.2033	1.7887	1.0857	1.7887	0.9852	1.7887	0.8339	1.7887	0.7098
1.8738	2.3239	1.8738	1.4211	1.8738	1.2033	1.8738	1.0857	1.8738	0.9852	1.8738	0.8769	1.8738	0.7461
1.963	2.3239	1.963	1.4211	1.963	1.2033	1.963	1.0919	1.963	1.0261	1.963	0.9107	1.963	0.7725
2.0565	2.3239	2.0565	1.4211	2.0565	1.2033	2.0565	1.108	2.0565	1.0451	2.0565	0.9279	2.0565	0.7815
2.1544	2.3239	2.1544	1.4211	2.1544	1.2547	2.1544	1.157	2.1544	1.0723	2.1544	0.9317	2.1544	0.8
2.257	2.1988	2.257	1.4211	2.257	1.2547	2.257	1.157	2.257	1.0723	2.257	0.9409	2.257	0.8088
2.3645	2.1988	2.3645	1.4211	2.3645	1.2547	2.3645	1.157	2.3645	1.0723	2.3645	0.9409	2.3645	0.8088
2.4771	2.1988	2.4771	1.5228	2.4771	1.2767	2.4771	1.157	2.4771	1.0723	2.4771	0.9409	2.4771	0.8088
2.595	2.0184	2.595	1.5228	2.595	1.2767	2.595	1.157	2.595	1.0723	2.595	0.9409	2.595	0.8088

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
2.7186	2.0184	2.7186	1.5228	2.7186	1.2767	2.7186	1.1545	2.7186	1.0625	2.7186	0.9409	2.7186	0.8088
2.848	2.0184	2.848	1.5228	2.848	1.2767	2.848	1.1545	2.848	1.0625	2.848	0.9399	2.848	0.7962
2.9836	2.0184	2.9836	1.5228	2.9836	1.2767	2.9836	1.1545	2.9836	1.0577	2.9836	0.9132	2.9836	0.7656
3.1257	2.0184	3.1257	1.3112	3.1257	1.0446	3.1257	0.9606	3.1257	0.9074	3.1257	0.8181	3.1257	0.713
3.2745	1.9901	3.2745	1.1665	3.2745	1.0008	3.2745	0.9022	3.2745	0.8233	3.2745	0.724	3.2745	0.6592
3.4305	1.6248	3.4305	0.9896	3.4305	0.8906	3.4305	0.8152	3.4305	0.7692	3.4305	0.6853	3.4305	0.6237
3.5938	1.6248	3.5938	0.9457	3.5938	0.8524	3.5938	0.8006	3.5938	0.7536	3.5938	0.6771	3.5938	0.5975
3.7649	1.6248	3.7649	0.9457	3.7649	0.8524	3.7649	0.8006	3.7649	0.7536	3.7649	0.6771	3.7649	0.5975
3.9442	1.6248	3.9442	0.9457	3.9442	0.8524	3.9442	0.8006	3.9442	0.7536	3.9442	0.6771	3.9442	0.5975
4.132	1.6248	4.132	0.9457	4.132	0.8524	4.132	0.8006	4.132	0.7536	4.132	0.6771	4.132	0.5975
4.3288	1.6248	4.3288	0.9457	4.3288	0.8524	4.3288	0.8006	4.3288	0.7536	4.3288	0.6771	4.3288	0.5975
4.5349	1.6248	4.5349	0.9457	4.5349	0.8524	4.5349	0.8006	4.5349	0.7536	4.5349	0.6771	4.5349	0.5975
4.7508	1.6248	4.7508	1.023	4.7508	0.9155	4.7508	0.8228	4.7508	0.7536	4.7508	0.6771	4.7508	0.5975
4.977	1.6248	4.977	1.191	4.977	1.0728	4.977	0.9637	4.977	0.875	4.977	0.745	4.977	0.6365
5.214	1.8207	5.214	1.191	5.214	1.0728	5.214	0.9637	5.214	0.8921	5.214	0.7878	5.214	0.6715
5.4623	1.8207	5.4623	1.191	5.4623	1.0728	5.4623	0.9637	5.4623	0.8921	5.4623	0.7878	5.4623	0.6865
5.7224	2.9149	5.7224	1.406	5.7224	1.1098	5.7224	1.0876	5.7224	0.9363	5.7224	0.7878	5.7224	0.6865
5.9948	2.9149	5.9948	1.406	5.9948	1.1098	5.9948	1.0876	5.9948	0.9363	5.9948	0.7878	5.9948	0.6865
6.2803	2.9149	6.2803	1.406	6.2803	1.1098	6.2803	1.0876	6.2803	0.9363	6.2803	0.7878	6.2803	0.6865
6.5793	2.9149	6.5793	1.406	6.5793	1.1098	6.5793	1.0876	6.5793	0.9363	6.5793	0.7865	6.5793	0.6865
6.8926	2.9149	6.8926	1.406	6.8926	1.1098	6.8926	1.0876	6.8926	0.9363	6.8926	0.7764	6.8926	0.6824
7.2208	2.4166	7.2208	1.406	7.2208	1.1098	7.2208	1.0322	7.2208	0.91	7.2208	0.7328	7.2208	0.6531
7.5646	2.1048	7.5646	1.2631	7.5646	1.0869	7.5646	0.9603	7.5646	0.8589	7.5646	0.7046	7.5646	0.6405
7.9248	1.7239	7.9248	0.9022	7.9248	0.8254	7.9248	0.7828	7.9248	0.7487	7.9248	0.69	7.9248	0.6204
8.3022	1.7239	8.3022	0.8525	8.3022	0.7912	8.3022	0.7524	8.3022	0.7205	8.3022	0.6659	8.3022	0.5997
8.6975	1.504	8.6975	0.8462	8.6975	0.7536	8.6975	0.7096	8.6975	0.6756	8.6975	0.623	8.6975	0.5646
9.1116	1.504	9.1116	0.8004	9.1116	0.6637	9.1116	0.629	9.1116	0.6017	9.1116	0.5591	9.1116	0.5122
9.5455	1.504	9.5455	0.8004	9.5455	0.6572	9.5455	0.5918	9.5455	0.5627	9.5455	0.5217	9.5455	0.4858
10	1.0253	10	0.666	10	0.6127	10	0.583	10	0.5582	10	0.5217	10	0.4858
10.4762	0.9769	10.4762	0.6615	10.4762	0.5918	10.4762	0.5361	10.4762	0.5247	10.4762	0.5026	10.4762	0.4744
10.975	0.9769	10.975	0.6615	10.975	0.5918	10.975	0.534	10.975	0.5032	10.975	0.4818	10.975	0.4602
11.4976	0.9769	11.4976	0.6615	11.4976	0.5918	11.4976	0.534	11.4976	0.5032	11.4976	0.462	11.4976	0.4453
12.045	0.767	12.045	0.5857	12.045	0.5386	12.045	0.5021	12.045	0.4738	12.045	0.4546	12.045	0.4387
12.6186	0.767	12.6186	0.5489	12.6186	0.495	12.6186	0.4679	12.6186	0.4603	12.6186	0.4466	12.6186	0.4298
13.2194	0.767	13.2194	0.5489	13.2194	0.495	13.2194	0.451	13.2194	0.4374	13.2194	0.429	13.2194	0.4161

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Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
13.8489	0.6514	13.8489	0.4765	13.8489	0.4405	13.8489	0.4243	13.8489	0.419	13.8489	0.4135	13.8489	0.4051
14.5083	0.6514	14.5083	0.4285	14.5083	0.4183	14.5083	0.4123	14.5083	0.4084	14.5083	0.4025	14.5083	0.3951
15.1991	0.6514	15.1991	0.4129	15.1991	0.4055	15.1991	0.4006	15.1991	0.3964	15.1991	0.391	15.1991	0.3853
15.9228	0.6514	15.9228	0.4115	15.9228	0.3896	15.9228	0.3881	15.9228	0.3858	15.9228	0.3814	15.9228	0.3762
16.681	0.6514	16.681	0.4115	16.681	0.3838	16.681	0.3759	16.681	0.3725	16.681	0.3708	16.681	0.3672
17.4753	0.6514	17.4753	0.4115	17.4753	0.3838	17.4753	0.3759	17.4753	0.3708	17.4753	0.3648	17.4753	0.3594
18.3074	0.5354	18.3074	0.3939	18.3074	0.3776	18.3074	0.3669	18.3074	0.3599	18.3074	0.3548	18.3074	0.3499
19.1791	0.5354	19.1791	0.3649	19.1791	0.3569	19.1791	0.3525	19.1791	0.3497	19.1791	0.3451	19.1791	0.3398
20.0923	0.5354	20.0923	0.3485	20.0923	0.3462	20.0923	0.3439	20.0923	0.3419	20.0923	0.3384	20.0923	0.3345
21.049	0.4241	21.049	0.3474	21.049	0.3402	21.049	0.3366	21.049	0.3343	21.049	0.3315	21.049	0.3287
22.0513	0.4	22.0513	0.3347	22.0513	0.3262	22.0513	0.3257	22.0513	0.3254	22.0513	0.3244	22.0513	0.323
23.1013	0.4	23.1013	0.3234	23.1013	0.32	23.1013	0.3187	23.1013	0.3182	23.1013	0.3181	23.1013	0.3178
24.2013	0.4	24.2013	0.3226	24.2013	0.3166	24.2013	0.3146	24.2013	0.3137	24.2013	0.3135	24.2013	0.3139
25.3536	0.3478	25.3536	0.3226	25.3536	0.3166	25.3536	0.3146	25.3536	0.3137	25.3536	0.3126	25.3536	0.3115
26.5609	0.3478	26.5609	0.3226	26.5609	0.3166	26.5609	0.3135	26.5609	0.3116	26.5609	0.3097	26.5609	0.3087
27.8256	0.3208	27.8256	0.3129	27.8256	0.3089	27.8256	0.3065	27.8256	0.305	27.8256	0.304	27.8256	0.3052
29.1505	0.3199	29.1505	0.3129	29.1505	0.3089	29.1505	0.3065	29.1505	0.305	29.1505	0.3036	29.1505	0.3035
30.5386	0.3182	30.5386	0.308	30.5386	0.3061	30.5386	0.3051	30.5386	0.3044	30.5386	0.3036	30.5386	0.3031
31.9927	0.3051	31.9927	0.3042	31.9927	0.304	31.9927	0.3036	31.9927	0.3033	31.9927	0.3028	31.9927	0.3023
33.516	0.3029	33.516	0.3021	33.516	0.3019	33.516	0.3018	33.516	0.3016	33.516	0.3014	33.516	0.3011
35.1119	0.3005	35.1119	0.3004	35.1119	0.3004	35.1119	0.3003	35.1119	0.3002	35.1119	0.3	35.1119	0.2998
36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2988	36.7838	0.2988	36.7838	0.2987
38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2976
40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2966
42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958
44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295
46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943
48.626	0.2936	48.626	0.2936	48.626	0.2936	48.626	0.2937	48.626	0.2937	48.626	0.2937	48.626	0.2937
50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.2931

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0332	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0397	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.0559	0.1385	0.0488	0.1385	0.0448	0.1385	0.0414	0.1385	0.0384	0.1385	0.0344	0.1385	0.0304
0.1451	0.058	0.1451	0.0509	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0615	0.152	0.0545	0.152	0.0506	0.152	0.0472	0.152	0.0441	0.152	0.0391	0.152	0.0338
0.1592	0.0621	0.1592	0.0545	0.1592	0.0506	0.1592	0.0472	0.1592	0.0442	0.1592	0.0397	0.1592	0.0352
0.1668	0.064	0.1668	0.056	0.1668	0.0518	0.1668	0.0482	0.1668	0.0451	0.1668	0.0404	0.1668	0.0357
0.1748	0.064	0.1748	0.056	0.1748	0.0518	0.1748	0.0482	0.1748	0.0451	0.1748	0.0404	0.1748	0.0357
0.1831	0.064	0.1831	0.056	0.1831	0.0518	0.1831	0.0482	0.1831	0.0451	0.1831	0.0404	0.1831	0.0369
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0495	0.1918	0.0478	0.1918	0.0446	0.1918	0.0404
0.2009	0.0642	0.2009	0.0583	0.2009	0.0558	0.2009	0.0535	0.2009	0.0514	0.2009	0.0474	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0525	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0596	0.2205	0.0573	0.2205	0.0533	0.2205	0.0484
0.231	0.0935	0.231	0.0775	0.231	0.0695	0.231	0.0631	0.231	0.0599	0.231	0.0556	0.231	0.0504
0.242	0.0935	0.242	0.0775	0.242	0.0723	0.242	0.0679	0.242	0.0638	0.242	0.0567	0.242	0.0514
0.2535	0.0935	0.2535	0.0818	0.2535	0.0772	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0555
0.2656	0.0935	0.2656	0.084	0.2656	0.0796	0.2656	0.0756	0.2656	0.0719	0.2656	0.0655	0.2656	0.0577
0.2783	0.0955	0.2783	0.0848	0.2783	0.0796	0.2783	0.0756	0.2783	0.0719	0.2783	0.0655	0.2783	0.0582
0.2915	0.1189	0.2915	0.0989	0.2915	0.0892	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0594
0.3054	0.1507	0.3054	0.1237	0.3054	0.1099	0.3054	0.0987	0.3054	0.0896	0.3054	0.076	0.3054	0.0634
0.3199	0.1507	0.3199	0.1237	0.3199	0.1099	0.3199	0.0987	0.3199	0.0896	0.3199	0.0803	0.3199	0.0708
0.3352	0.1507	0.3352	0.1237	0.3352	0.1099	0.3352	0.0987	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1507	0.3511	0.129	0.3511	0.1173	0.3511	0.1071	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.168	0.3678	0.1439	0.3678	0.1304	0.3678	0.1187	0.3678	0.1121	0.3678	0.1018	0.3678	0.0898
0.3853	0.168	0.3853	0.1439	0.3853	0.1347	0.3853	0.128	0.3853	0.1219	0.3853	0.1116	0.3853	0.0992
0.4037	0.1945	0.4037	0.1602	0.4037	0.1429	0.4037	0.1308	0.4037	0.126	0.4037	0.1171	0.4037	0.1057
0.4229	0.2372	0.4229	0.1909	0.4229	0.1723	0.4229	0.1559	0.4229	0.1417	0.4229	0.122	0.4229	0.1096
0.4431	0.3089	0.4431	0.2194	0.4431	0.1882	0.4431	0.1671	0.4431	0.1497	0.4431	0.1276	0.4431	0.11
0.4642	0.3419	0.4642	0.2528	0.4642	0.2142	0.4642	0.1857	0.4642	0.1641	0.4642	0.1349	0.4642	0.1216
0.4863	0.3419	0.4863	0.2563	0.4863	0.2211	0.4863	0.193	0.4863	0.1703	0.4863	0.1414	0.4863	0.1328
0.5094	0.353	0.5094	0.2661	0.5094	0.233	0.5094	0.2059	0.5094	0.1835	0.5094	0.1502	0.5094	0.1397

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Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.4106	0.5337	0.2779	0.5337	0.233	0.5337	0.2059	0.5337	0.1835	0.5337	0.1544	0.5337	0.1404
0.5591	0.4106	0.5591	0.2779	0.5591	0.2404	0.5591	0.2154	0.5591	0.1953	0.5591	0.1658	0.5591	0.1404
0.5857	0.4106	0.5857	0.2779	0.5857	0.241	0.5857	0.2165	0.5857	0.1978	0.5857	0.1688	0.5857	0.1445
0.6136	0.4488	0.6136	0.2977	0.6136	0.2451	0.6136	0.2241	0.6136	0.2057	0.6136	0.1756	0.6136	0.1445
0.6428	0.4791	0.6428	0.3556	0.6428	0.3014	0.6428	0.2618	0.6428	0.2352	0.6428	0.1994	0.6428	0.1686
0.6734	0.4791	0.6734	0.3556	0.6734	0.3014	0.6734	0.2618	0.6734	0.2421	0.6734	0.2173	0.6734	0.188
0.7055	0.4791	0.7055	0.3556	0.7055	0.3014	0.7055	0.2618	0.7055	0.2421	0.7055	0.2195	0.7055	0.1931
0.7391	0.4791	0.7391	0.3556	0.7391	0.3014	0.7391	0.2701	0.7391	0.2472	0.7391	0.2195	0.7391	0.1931
0.7743	0.5541	0.7743	0.3973	0.7743	0.3347	0.7743	0.2931	0.7743	0.2689	0.7743	0.2358	0.7743	0.2025
0.8111	0.5541	0.8111	0.3973	0.8111	0.3347	0.8111	0.3047	0.8111	0.2886	0.8111	0.2598	0.8111	0.2246
0.8497	0.5541	0.8497	0.3973	0.8497	0.3347	0.8497	0.3132	0.8497	0.2998	0.8497	0.2736	0.8497	0.2386
0.8902	0.5541	0.8902	0.3973	0.8902	0.3675	0.8902	0.345	0.8902	0.3244	0.8902	0.2889	0.8902	0.2477
0.9326	0.8648	0.9326	0.5613	0.9326	0.4653	0.9326	0.4044	0.9326	0.3621	0.9326	0.3063	0.9326	0.256
0.977	0.8648	0.977	0.5613	0.977	0.4653	0.977	0.4068	0.977	0.3663	0.977	0.3097	0.977	0.2664
1.0235	0.9377	1.0235	0.6004	1.0235	0.529	1.0235	0.4839	1.0235	0.4459	1.0235	0.3855	1.0235	0.3313
1.0723	0.9377	1.0723	0.6734	1.0723	0.6074	1.0723	0.5507	1.0723	0.5031	1.0723	0.4376	1.0723	0.3769
1.1233	1.3513	1.1233	0.8372	1.1233	0.6837	1.1233	0.5879	1.1233	0.5445	1.1233	0.4714	1.1233	0.403
1.1768	1.3513	1.1768	0.8372	1.1768	0.6837	1.1768	0.5898	1.1768	0.5538	1.1768	0.4886	1.1768	0.4271
1.2328	1.3513	1.2328	0.8372	1.2328	0.7428	1.2328	0.6644	1.2328	0.5968	1.2328	0.5156	1.2328	0.4567
1.2916	1.3513	1.2916	0.9066	1.2916	0.7979	1.2916	0.7068	1.2916	0.63	1.2916	0.5518	1.2916	0.4861
1.353	1.3513	1.353	0.9591	1.353	0.7979	1.353	0.7068	1.353	0.6351	1.353	0.5804	1.353	0.5117
1.4175	1.4799	1.4175	0.9591	1.4175	0.7979	1.4175	0.7068	1.4175	0.665	1.4175	0.609	1.4175	0.5377
1.485	1.4799	1.485	0.9591	1.485	0.7979	1.485	0.7368	1.485	0.7041	1.485	0.6435	1.485	0.5691
1.5557	1.5088	1.5557	1.0439	1.5557	0.892	1.5557	0.7863	1.5557	0.7357	1.5557	0.6723	1.5557	0.5965
1.6298	1.5088	1.6298	1.1255	1.6298	0.9707	1.6298	0.8769	1.6298	0.8063	1.6298	0.699	1.6298	0.6152
1.7074	1.5088	1.7074	1.1255	1.7074	0.9707	1.7074	0.8769	1.7074	0.8063	1.7074	0.7147	1.7074	0.6346
1.7887	1.5088	1.7887	1.1255	1.7887	0.9707	1.7887	0.8769	1.7887	0.8063	1.7887	0.7339	1.7887	0.6585
1.8738	1.5088	1.8738	1.1255	1.8738	0.9707	1.8738	0.882	1.8738	0.8424	1.8738	0.7711	1.8738	0.6831
1.963	1.5088	1.963	1.1255	1.963	0.9707	1.963	0.9172	1.963	0.8715	1.963	0.7938	1.963	0.6992
2.0565	1.5088	2.0565	1.1158	2.0565	0.9661	2.0565	0.9247	2.0565	0.8739	2.0565	0.7938	2.0565	0.6992
2.1544	1.5088	2.1544	1.1158	2.1544	0.9661	2.1544	0.9247	2.1544	0.8739	2.1544	0.7938	2.1544	0.6992
2.257	1.5515	2.257	1.0506	2.257	0.9661	2.257	0.9247	2.257	0.8739	2.257	0.7938	2.257	0.6992
2.3645	1.569	2.3645	1.0506	2.3645	0.9661	2.3645	0.9247	2.3645	0.8739	2.3645	0.7938	2.3645	0.6992
2.4771	1.569	2.4771	1.0506	2.4771	0.9467	2.4771	0.9247	2.4771	0.8739	2.4771	0.7899	2.4771	0.6957
2.595	1.569	2.595	1.0506	2.595	0.9467	2.595	0.9247	2.595	0.8664	2.595	0.7597	2.595	0.6957

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Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
2.7186	1.569	2.7186	1.0506	2.7186	0.9467	2.7186	0.9247	2.7186	0.8664	2.7186	0.7597	2.7186	0.6957
2.848	1.569	2.848	1.0506	2.848	0.9467	2.848	0.9247	2.848	0.8664	2.848	0.7597	2.848	0.6957
2.9836	1.569	2.9836	1.0506	2.9836	0.9467	2.9836	0.9247	2.9836	0.8664	2.9836	0.7597	2.9836	0.6957
3.1257	1.569	3.1257	1.0506	3.1257	0.9467	3.1257	0.9247	3.1257	0.8664	3.1257	0.7597	3.1257	0.6957
3.2745	1.569	3.2745	1.0506	3.2745	0.9467	3.2745	0.9247	3.2745	0.8664	3.2745	0.7597	3.2745	0.6957
3.4305	1.569	3.4305	1.0506	3.4305	0.9467	3.4305	0.9247	3.4305	0.8664	3.4305	0.7597	3.4305	0.6957
3.5938	1.6861	3.5938	1.0506	3.5938	0.9467	3.5938	0.9247	3.5938	0.8664	3.5938	0.7597	3.5938	0.6957
3.7649	1.6861	3.7649	1.1653	3.7649	0.9467	3.7649	0.9247	3.7649	0.8664	3.7649	0.7597	3.7649	0.6927
3.9442	1.6861	3.9442	1.1653	3.9442	0.955	3.9442	0.9362	3.9442	0.8664	3.9442	0.7597	3.9442	0.6927
4.132	1.6861	4.132	1.1653	4.132	0.955	4.132	0.9362	4.132	0.8664	4.132	0.7597	4.132	0.6862
4.3288	1.6861	4.3288	1.1653	4.3288	0.955	4.3288	0.9362	4.3288	0.8664	4.3288	0.7597	4.3288	0.6787
4.5349	1.6861	4.5349	1.1653	4.5349	0.955	4.5349	0.9362	4.5349	0.8664	4.5349	0.7597	4.5349	0.6657
4.7508	1.6861	4.7508	1.1423	4.7508	0.955	4.7508	0.9362	4.7508	0.8664	4.7508	0.7597	4.7508	0.6479
4.977	1.6861	4.977	1.1193	4.977	0.9483	4.977	0.8597	4.977	0.8132	4.977	0.7328	4.977	0.642
5.214	1.6861	5.214	1.1193	5.214	0.9483	5.214	0.8597	5.214	0.8132	5.214	0.7297	5.214	0.6348
5.4623	2.0932	5.4623	1.1193	5.4623	0.9483	5.4623	0.8597	5.4623	0.8132	5.4623	0.7297	5.4623	0.6348
5.7224	2.0932	5.7224	1.1193	5.7224	0.9483	5.7224	0.8597	5.7224	0.8132	5.7224	0.7297	5.7224	0.6348
5.9948	2.0932	5.9948	1.1193	5.9948	0.9483	5.9948	0.8597	5.9948	0.8132	5.9948	0.7297	5.9948	0.6348
6.2803	2.0932	6.2803	1.1193	6.2803	0.9483	6.2803	0.8597	6.2803	0.8132	6.2803	0.7297	6.2803	0.6348
6.5793	2.0932	6.5793	1.1193	6.5793	0.9483	6.5793	0.8597	6.5793	0.8132	6.5793	0.7297	6.5793	0.6316
6.8926	2.0932	6.8926	1.1193	6.8926	0.9483	6.8926	0.8564	6.8926	0.793	6.8926	0.7028	6.8926	0.6276
7.2208	1.7932	7.2208	1.1022	7.2208	0.9239	7.2208	0.8428	7.2208	0.7865	7.2208	0.6959	7.2208	0.6276
7.5646	1.3461	7.5646	0.9535	7.5646	0.851	7.5646	0.7985	7.5646	0.758	7.5646	0.6959	7.5646	0.6276
7.9248	1.2781	7.9248	0.9188	7.9248	0.851	7.9248	0.7913	7.9248	0.7507	7.9248	0.6862	7.9248	0.6173
8.3022	1.2719	8.3022	0.9188	8.3022	0.851	8.3022	0.7909	8.3022	0.7422	8.3022	0.6675	8.3022	0.6003
8.6975	1.0732	8.6975	0.8155	8.6975	0.7297	8.6975	0.6993	8.6975	0.6707	8.6975	0.6168	8.6975	0.5555
9.1116	1.0732	9.1116	0.8155	9.1116	0.7297	9.1116	0.6674	9.1116	0.6426	9.1116	0.594	9.1116	0.5293
9.5455	1.0632	9.5455	0.8155	9.5455	0.7297	9.5455	0.665	9.5455	0.6109	9.5455	0.548	9.5455	0.5075
10	1.0632	10	0.8155	10	0.7297	10	0.665	10	0.6109	10	0.5416	10	0.4824
10.4762	1.0632	10.4762	0.8155	10.4762	0.7297	10.4762	0.665	10.4762	0.6109	10.4762	0.5374	10.4762	0.4716
10.975	0.9814	10.975	0.7906	10.975	0.7235	10.975	0.665	10.975	0.6109	10.975	0.5256	10.975	0.4557
11.4976	0.9814	11.4976	0.7906	11.4976	0.7215	11.4976	0.6575	11.4976	0.603	11.4976	0.5189	11.4976	0.4453
12.045	0.8026	12.045	0.6724	12.045	0.6069	12.045	0.558	12.045	0.5202	12.045	0.4674	12.045	0.4231
12.6186	0.7876	12.6186	0.6185	12.6186	0.566	12.6186	0.5184	12.6186	0.5012	12.6186	0.4674	12.6186	0.4231
13.2194	0.7876	13.2194	0.6185	13.2194	0.566	13.2194	0.5166	13.2194	0.4839	13.2194	0.4493	13.2194	0.4086

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
13.8489	0.7876	13.8489	0.5849	13.8489	0.5168	13.8489	0.473	13.8489	0.458	13.8489	0.43	13.8489	0.3946
14.5083	0.7113	14.5083	0.5199	14.5083	0.4734	14.5083	0.4593	14.5083	0.4453	14.5083	0.4196	14.5083	0.3874
15.1991	0.7113	15.1991	0.4913	15.1991	0.4581	15.1991	0.4351	15.1991	0.4191	15.1991	0.3992	15.1991	0.3844
15.9228	0.7113	15.9228	0.4804	15.9228	0.433	15.9228	0.4151	15.9228	0.4052	15.9228	0.3955	15.9228	0.3844
16.681	0.7113	16.681	0.4804	16.681	0.433	16.681	0.4067	16.681	0.3923	16.681	0.3827	16.681	0.3771
17.4753	0.7113	17.4753	0.4804	17.4753	0.433	17.4753	0.4067	17.4753	0.3916	17.4753	0.3767	17.4753	0.3679
18.3074	0.6514	18.3074	0.4041	18.3074	0.3855	18.3074	0.3753	18.3074	0.367	18.3074	0.3555	18.3074	0.3535
19.1791	0.6514	19.1791	0.4041	19.1791	0.3855	19.1791	0.3753	19.1791	0.367	19.1791	0.3553	19.1791	0.3456
20.0923	0.5299	20.0923	0.4041	20.0923	0.3855	20.0923	0.3753	20.0923	0.367	20.0923	0.3553	20.0923	0.3452
21.049	0.5299	21.049	0.4041	21.049	0.3747	21.049	0.3613	21.049	0.3553	21.049	0.3481	21.049	0.3452
22.0513	0.5299	22.0513	0.3915	22.0513	0.3712	22.0513	0.3613	22.0513	0.3553	22.0513	0.3481	22.0513	0.3444
23.1013	0.5299	23.1013	0.3915	23.1013	0.3712	23.1013	0.3613	23.1013	0.3553	23.1013	0.3481	23.1013	0.3443
24.2013	0.4644	24.2013	0.3604	24.2013	0.357	24.2013	0.354	24.2013	0.3517	24.2013	0.348	24.2013	0.3443
25.3536	0.4644	25.3536	0.359	25.3536	0.3564	25.3536	0.354	25.3536	0.3517	25.3536	0.348	25.3536	0.3443
26.5609	0.4644	26.5609	0.3553	26.5609	0.3521	26.5609	0.3495	26.5609	0.3474	26.5609	0.3447	26.5609	0.3427
27.8256	0.3574	27.8256	0.3553	27.8256	0.3521	27.8256	0.3495	27.8256	0.3474	27.8256	0.3447	27.8256	0.3422
29.1505	0.3464	29.1505	0.3425	29.1505	0.3411	29.1505	0.3414	29.1505	0.3414	29.1505	0.341	29.1505	0.34
30.5386	0.3447	30.5386	0.3414	30.5386	0.3407	30.5386	0.3401	30.5386	0.3398	30.5386	0.3394	30.5386	0.3388
31.9927	0.3401	31.9927	0.3414	31.9927	0.3407	31.9927	0.3401	31.9927	0.3396	31.9927	0.3389	31.9927	0.3381
33.516	0.3388	33.516	0.3387	33.516	0.3386	33.516	0.3384	33.516	0.3381	33.516	0.3377	33.516	0.3372
35.1119	0.3367	35.1119	0.3367	35.1119	0.3367	35.1119	0.3366	35.1119	0.3365	35.1119	0.3364	35.1119	0.3361
36.7838	0.3355	36.7838	0.3355	36.7838	0.3354	36.7838	0.3354	36.7838	0.3354	36.7838	0.3353	36.7838	0.3352
38.5353	0.3346	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3344	38.5353	0.3343
40.3702	0.3338	40.3702	0.3338	40.3702	0.3338	40.3702	0.3337	40.3702	0.3337	40.3702	0.3337	40.3702	0.3336
42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.333	42.2924	0.333
44.3062	0.3325	44.3062	0.3325	44.3062	0.3325	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324
46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319
48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314
50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0322	0.1098	0.0303	0.1098	0.0272	0.1098	0.0237
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0322	0.115	0.0303	0.115	0.0273	0.115	0.0262
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0322	0.1204	0.0311	0.1204	0.0299	0.1204	0.0284
0.1262	0.0405	0.1262	0.0365	0.1262	0.0353	0.1262	0.0344	0.1262	0.0336	0.1262	0.032	0.1262	0.0302
0.1322	0.0405	0.1322	0.0383	0.1322	0.0371	0.1322	0.0361	0.1322	0.0351	0.1322	0.0337	0.1322	0.0321
0.1385	0.0413	0.1385	0.0394	0.1385	0.0384	0.1385	0.0375	0.1385	0.0366	0.1385	0.0351	0.1385	0.0332
0.1451	0.0418	0.1451	0.04	0.1451	0.0389	0.1451	0.038	0.1451	0.0371	0.1451	0.0355	0.1451	0.0336
0.152	0.0439	0.152	0.0401	0.152	0.0389	0.152	0.038	0.152	0.0371	0.152	0.0355	0.152	0.0336
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.038	0.1592	0.0371	0.1592	0.0355	0.1592	0.0336
0.1668	0.0585	0.1668	0.0506	0.1668	0.0463	0.1668	0.0427	0.1668	0.0396	0.1668	0.0355	0.1668	0.0336
0.1748	0.0645	0.1748	0.0567	0.1748	0.0523	0.1748	0.0485	0.1748	0.0451	0.1748	0.0395	0.1748	0.0336
0.1831	0.0669	0.1831	0.0583	0.1831	0.0542	0.1831	0.0505	0.1831	0.0472	0.1831	0.0416	0.1831	0.0355
0.1918	0.0679	0.1918	0.0586	0.1918	0.0544	0.1918	0.0508	0.1918	0.0476	0.1918	0.0419	0.1918	0.0382
0.2009	0.0698	0.2009	0.0597	0.2009	0.0545	0.2009	0.0516	0.2009	0.049	0.2009	0.0443	0.2009	0.0414
0.2105	0.0723	0.2105	0.0622	0.2105	0.0584	0.2105	0.055	0.2105	0.0518	0.2105	0.0484	0.2105	0.045
0.2205	0.082	0.2205	0.0711	0.2205	0.0653	0.2205	0.0602	0.2205	0.0577	0.2205	0.0535	0.2205	0.0484
0.231	0.0961	0.231	0.0794	0.231	0.0704	0.231	0.0665	0.231	0.0631	0.231	0.0585	0.231	0.0537
0.242	0.0988	0.242	0.0847	0.242	0.0776	0.242	0.0728	0.242	0.069	0.242	0.0628	0.242	0.0563
0.2535	0.1063	0.2535	0.0917	0.2535	0.0836	0.2535	0.0767	0.2535	0.0707	0.2535	0.0628	0.2535	0.0563
0.2656	0.1141	0.2656	0.0947	0.2656	0.0842	0.2656	0.0767	0.2656	0.0707	0.2656	0.0628	0.2656	0.0563
0.2783	0.1141	0.2783	0.0947	0.2783	0.0842	0.2783	0.0782	0.2783	0.0745	0.2783	0.0685	0.2783	0.0622
0.2915	0.1141	0.2915	0.1015	0.2915	0.0954	0.2915	0.09	0.2915	0.0852	0.2915	0.0773	0.2915	0.0688
0.3054	0.1186	0.3054	0.1064	0.3054	0.0994	0.3054	0.0934	0.3054	0.0881	0.3054	0.0794	0.3054	0.0724
0.3199	0.1186	0.3199	0.1064	0.3199	0.0994	0.3199	0.0935	0.3199	0.0908	0.3199	0.0861	0.3199	0.0806
0.3352	0.1186	0.3352	0.1112	0.3352	0.107	0.3352	0.1032	0.3352	0.0998	0.3352	0.0939	0.3352	0.0869
0.3511	0.1662	0.3511	0.1299	0.3511	0.1149	0.3511	0.109	0.3511	0.1051	0.3511	0.0982	0.3511	0.0901
0.3678	0.2421	0.3678	0.1836	0.3678	0.1568	0.3678	0.137	0.3678	0.1222	0.3678	0.1018	0.3678	0.0901
0.3853	0.2561	0.3853	0.1879	0.3853	0.1604	0.3853	0.14	0.3853	0.1286	0.3853	0.1111	0.3853	0.0931
0.4037	0.2561	0.4037	0.1879	0.4037	0.1604	0.4037	0.14	0.4037	0.1295	0.4037	0.1181	0.4037	0.1058
0.4229	0.2561	0.4229	0.1879	0.4229	0.1659	0.4229	0.1491	0.4229	0.1363	0.4229	0.1255	0.4229	0.1134
0.4431	0.3305	0.4431	0.236	0.4431	0.2057	0.4431	0.183	0.4431	0.1656	0.4431	0.1411	0.4431	0.1189
0.4642	0.3305	0.4642	0.236	0.4642	0.2057	0.4642	0.183	0.4642	0.1656	0.4642	0.1411	0.4642	0.1191
0.4863	0.3305	0.4863	0.236	0.4863	0.2057	0.4863	0.183	0.4863	0.1656	0.4863	0.1434	0.4863	0.1257
0.5094	0.3305	0.5094	0.236	0.5094	0.2057	0.5094	0.183	0.5094	0.1656	0.5094	0.1478	0.5094	0.1307

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.3378	0.5337	0.2419	0.5337	0.2105	0.5337	0.192	0.5337	0.1816	0.5337	0.1635	0.5337	0.142
0.5591	0.4058	0.5591	0.2801	0.5591	0.2478	0.5591	0.2214	0.5591	0.2006	0.5591	0.1739	0.5591	0.1574
0.5857	0.4058	0.5857	0.2915	0.5857	0.2621	0.5857	0.2377	0.5857	0.2172	0.5857	0.1878	0.5857	0.1747
0.6136	0.4058	0.6136	0.2915	0.6136	0.2621	0.6136	0.2377	0.6136	0.2172	0.6136	0.2028	0.6136	0.1889
0.6428	0.4058	0.6428	0.2915	0.6428	0.2621	0.6428	0.2377	0.6428	0.2257	0.6428	0.2153	0.6428	0.201
0.6734	0.4176	0.6734	0.2915	0.6734	0.2621	0.6734	0.2496	0.6734	0.2424	0.6734	0.229	0.6734	0.2118
0.7055	0.4176	0.7055	0.3079	0.7055	0.2812	0.7055	0.2691	0.7055	0.2585	0.7055	0.2404	0.7055	0.2196
0.7391	0.6488	0.7391	0.4251	0.7391	0.3472	0.7391	0.3008	0.7391	0.2825	0.7391	0.2517	0.7391	0.2204
0.7743	0.6488	0.7743	0.4251	0.7743	0.3472	0.7743	0.3112	0.7743	0.2928	0.7743	0.2621	0.7743	0.2275
0.8111	0.6742	0.8111	0.456	0.8111	0.398	0.8111	0.3532	0.8111	0.3182	0.8111	0.2686	0.8111	0.2275
0.8497	0.6742	0.8497	0.456	0.8497	0.4173	0.8497	0.3854	0.8497	0.3578	0.8497	0.3131	0.8497	0.2643
0.8902	0.6985	0.8902	0.456	0.8902	0.4173	0.8902	0.3854	0.8902	0.3632	0.8902	0.3306	0.8902	0.2863
0.9326	0.7612	0.9326	0.5383	0.9326	0.474	0.9326	0.427	0.9326	0.3916	0.9326	0.3416	0.9326	0.2945
0.977	1.0292	0.977	0.6621	0.977	0.5476	0.977	0.4756	0.977	0.4268	0.977	0.3654	0.977	0.3149
1.0235	1.0292	1.0235	0.6621	1.0235	0.5897	1.0235	0.5355	1.0235	0.4903	1.0235	0.4219	1.0235	0.3545
1.0723	1.0292	1.0723	0.7033	1.0723	0.6314	1.0723	0.5714	1.0723	0.5209	1.0723	0.4434	1.0723	0.372
1.1233	1.3137	1.1233	0.8999	1.1233	0.7545	1.1233	0.6502	1.1233	0.5729	1.1233	0.4678	1.1233	0.3909
1.1768	1.3137	1.1768	0.8999	1.1768	0.7545	1.1768	0.6502	1.1768	0.5729	1.1768	0.4701	1.1768	0.3999
1.2328	1.3137	1.2328	0.9857	1.2328	0.8645	1.2328	0.7685	1.2328	0.691	1.2328	0.5723	1.2328	0.4547
1.2916	1.3137	1.2916	1.0916	1.2916	0.9479	1.2916	0.8357	1.2916	0.746	1.2916	0.6124	1.2916	0.4829
1.353	1.4089	1.353	1.0916	1.353	0.9479	1.353	0.8357	1.353	0.746	1.353	0.6124	1.353	0.4909
1.4175	1.729	1.4175	1.213	1.4175	1.0369	1.4175	0.9214	1.4175	0.8354	1.4175	0.709	1.4175	0.5885
1.485	1.729	1.485	1.213	1.485	1.0369	1.485	0.9542	1.485	0.8918	1.485	0.778	1.485	0.6506
1.5557	2.0447	1.5557	1.2726	1.5557	1.0865	1.5557	0.9691	1.5557	0.8918	1.5557	0.789	1.5557	0.6724
1.6298	2.0861	1.6298	1.4394	1.6298	1.2876	1.6298	1.162	1.6298	1.057	1.6298	0.8882	1.6298	0.7096
1.7074	2.1771	1.7074	1.5528	1.7074	1.397	1.7074	1.2648	1.7074	1.1508	1.7074	0.9654	1.7074	0.7705
1.7887	2.7163	1.7887	1.7697	1.7887	1.4137	1.7887	1.2648	1.7887	1.1508	1.7887	0.9665	1.7887	0.8229
1.8738	2.7163	1.8738	1.7697	1.8738	1.4137	1.8738	1.2648	1.8738	1.1545	1.8738	1.0307	1.8738	0.8752
1.963	2.7163	1.963	1.7697	1.963	1.4137	1.963	1.296	1.963	1.2176	1.963	1.0825	1.963	0.9154
2.0565	2.7163	2.0565	1.7697	2.0565	1.4137	2.0565	1.332	2.0565	1.2549	2.0565	1.1146	2.0565	0.9373
2.1544	2.7163	2.1544	1.7697	2.1544	1.5305	2.1544	1.4116	2.1544	1.3081	2.1544	1.1549	2.1544	1.0039
2.257	2.6722	2.257	1.7165	2.257	1.5315	2.257	1.4444	2.257	1.3645	2.257	1.2229	2.257	1.0568
2.3645	2.6722	2.3645	1.7165	2.3645	1.5867	2.3645	1.4923	2.3645	1.409	2.3645	1.2586	2.3645	1.0784
2.4771	2.6722	2.4771	1.7165	2.4771	1.6824	2.4771	1.5289	2.4771	1.409	2.4771	1.2586	2.4771	1.0784
2.595	2.6722	2.595	1.7165	2.595	1.6824	2.595	1.5289	2.595	1.409	2.595	1.2586	2.595	1.0784

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.6722	2.7186	1.7165	2.7186	1.6824	2.7186	1.5289	2.7186	1.409	2.7186	1.2586	2.7186	1.0784
2.848	2.6722	2.848	1.7165	2.848	1.6824	2.848	1.5289	2.848	1.409	2.848	1.2586	2.848	1.0784
2.9836	2.6722	2.9836	1.7165	2.9836	1.6824	2.9836	1.5289	2.9836	1.4086	2.9836	1.2312	2.9836	1.0531
3.1257	2.6722	3.1257	1.7165	3.1257	1.4081	3.1257	1.249	3.1257	1.1684	3.1257	1.0862	3.1257	0.9782
3.2745	2.6722	3.2745	1.5912	3.2745	1.3838	3.2745	1.249	3.2745	1.1419	3.2745	0.9784	3.2745	0.8937
3.4305	2.4258	3.4305	1.3157	3.4305	1.2378	3.4305	1.1421	3.4305	1.0837	3.4305	0.977	3.4305	0.843
3.5938	2.4258	3.5938	1.3154	3.5938	1.2378	3.5938	1.1238	3.5938	1.0502	3.5938	0.961	3.5938	0.8401
3.7649	2.4258	3.7649	1.3154	3.7649	1.2378	3.7649	1.1238	3.7649	1.0494	3.7649	0.9359	3.7649	0.8192
3.9442	2.4258	3.9442	1.3154	3.9442	1.2378	3.9442	1.1098	3.9442	1.0413	3.9442	0.9304	3.9442	0.8192
4.132	2.4258	4.132	1.3154	4.132	1.2378	4.132	1.1098	4.132	1.0413	4.132	0.9304	4.132	0.8192
4.3288	2.4258	4.3288	1.3154	4.3288	1.2378	4.3288	1.069	4.3288	0.9785	4.3288	0.8739	4.3288	0.7783
4.5349	2.4258	4.5349	1.3154	4.5349	1.1837	4.5349	1.0539	4.5349	0.9618	4.5349	0.8274	4.5349	0.6979
4.7508	1.9701	4.7508	1.0977	4.7508	1.0417	4.7508	0.9199	4.7508	0.872	4.7508	0.7786	4.7508	0.6734
4.977	1.9701	4.977	1.0977	4.977	1.0417	4.977	0.8879	4.977	0.839	4.977	0.7604	4.977	0.6667
5.214	1.9701	5.214	1.0977	5.214	0.9918	5.214	0.8856	5.214	0.8097	5.214	0.7297	5.214	0.6413
5.4623	1.4677	5.4623	0.9173	5.4623	0.8237	5.4623	0.7835	5.4623	0.7434	5.4623	0.6763	5.4623	0.5975
5.7224	1.3373	5.7224	0.8915	5.7224	0.8183	5.7224	0.7788	5.7224	0.7416	5.7224	0.6761	5.7224	0.5967
5.9948	1.186	5.9948	0.8915	5.9948	0.8073	5.9948	0.7595	5.9948	0.7218	5.9948	0.6568	5.9948	0.5793
6.2803	1.186	6.2803	0.8742	6.2803	0.7554	6.2803	0.7165	6.2803	0.6807	6.2803	0.6166	6.2803	0.5424
6.5793	1.1682	6.5793	0.7476	6.5793	0.6961	6.5793	0.6558	6.5793	0.6206	6.5793	0.564	6.5793	0.5054
6.8926	1.1682	6.8926	0.6278	6.8926	0.5979	6.8926	0.5695	6.8926	0.5433	6.8926	0.5064	6.8926	0.4688
7.2208	1.1682	7.2208	0.6161	7.2208	0.5433	7.2208	0.5063	7.2208	0.4825	7.2208	0.4512	7.2208	0.4513
7.5646	1.1682	7.5646	0.6161	7.5646	0.5366	7.5646	0.5063	7.5646	0.4825	7.5646	0.4512	7.5646	0.4437
7.9248	1.1682	7.9248	0.5885	7.9248	0.535	7.9248	0.5063	7.9248	0.4825	7.9248	0.4463	7.9248	0.4346
8.3022	1.1682	8.3022	0.5885	8.3022	0.535	8.3022	0.5063	8.3022	0.4825	8.3022	0.4463	8.3022	0.4294
8.6975	0.9253	8.6975	0.5885	8.6975	0.535	8.6975	0.5063	8.6975	0.4825	8.6975	0.4463	8.6975	0.4203
9.1116	0.9253	9.1116	0.5885	9.1116	0.5144	9.1116	0.4908	9.1116	0.4754	9.1116	0.4448	9.1116	0.4063
9.5455	0.9253	9.5455	0.5885	9.5455	0.5144	9.5455	0.4844	9.5455	0.4667	9.5455	0.4352	9.5455	0.3996
10	0.7548	10	0.5609	10	0.5124	10	0.4745	10	0.4536	10	0.4198	10	0.3951
10.4762	0.7548	10.4762	0.5609	10.4762	0.5124	10.4762	0.4741	10.4762	0.444	10.4762	0.4021	10.4762	0.3892
10.975	0.7267	10.975	0.5609	10.975	0.5124	10.975	0.4741	10.975	0.444	10.975	0.4021	10.975	0.3809
11.4976	0.6866	11.4976	0.5132	11.4976	0.4705	11.4976	0.4496	11.4976	0.4297	11.4976	0.3972	11.4976	0.3755
12.045	0.6015	12.045	0.4763	12.045	0.4518	12.045	0.4317	12.045	0.415	12.045	0.3892	12.045	0.3696
12.6186	0.6015	12.6186	0.41	12.6186	0.3905	12.6186	0.381	12.6186	0.372	12.6186	0.3644	12.6186	0.3629
13.2194	0.6015	13.2194	0.41	13.2194	0.3885	13.2194	0.3742	13.2194	0.365	13.2194	0.3591	13.2194	0.3578

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
13.8489	0.6015	13.8489	0.41	13.8489	0.3885	13.8489	0.3742	13.8489	0.365	13.8489	0.3547	13.8489	0.3535
14.5083	0.6015	14.5083	0.41	14.5083	0.3885	14.5083	0.3742	14.5083	0.365	14.5083	0.3547	14.5083	0.3503
15.1991	0.6015	15.1991	0.41	15.1991	0.3885	15.1991	0.3742	15.1991	0.365	15.1991	0.3547	15.1991	0.3482
15.9228	0.6015	15.9228	0.41	15.9228	0.3885	15.9228	0.3742	15.9228	0.365	15.9228	0.3547	15.9228	0.3479
16.681	0.6015	16.681	0.41	16.681	0.3885	16.681	0.3742	16.681	0.365	16.681	0.3547	16.681	0.3479
17.4753	0.6015	17.4753	0.41	17.4753	0.3885	17.4753	0.3742	17.4753	0.365	17.4753	0.3547	17.4753	0.3479
18.3074	0.5419	18.3074	0.3695	18.3074	0.363	18.3074	0.3584	18.3074	0.3547	18.3074	0.3494	18.3074	0.3448
19.1791	0.5419	19.1791	0.3591	19.1791	0.352	19.1791	0.348	19.1791	0.3453	19.1791	0.3436	19.1791	0.3423
20.0923	0.5419	20.0923	0.3591	20.0923	0.352	20.0923	0.348	20.0923	0.3453	20.0923	0.3422	20.0923	0.3402
21.049	0.521	21.049	0.3591	21.049	0.352	21.049	0.348	21.049	0.3453	21.049	0.3422	21.049	0.3398
22.0513	0.3887	22.0513	0.3591	22.0513	0.352	22.0513	0.348	22.0513	0.3453	22.0513	0.3422	22.0513	0.3398
23.1013	0.3887	23.1013	0.3591	23.1013	0.352	23.1013	0.348	23.1013	0.3453	23.1013	0.3422	23.1013	0.3398
24.2013	0.3887	24.2013	0.3591	24.2013	0.352	24.2013	0.348	24.2013	0.3453	24.2013	0.3422	24.2013	0.3398
25.3536	0.3465	25.3536	0.3405	25.3536	0.3398	25.3536	0.3398	25.3536	0.34	25.3536	0.3397	25.3536	0.3389
26.5609	0.3465	26.5609	0.3401	26.5609	0.3394	26.5609	0.339	26.5609	0.3387	26.5609	0.3384	26.5609	0.3378
27.8256	0.3465	27.8256	0.3401	27.8256	0.3394	27.8256	0.3389	27.8256	0.3385	27.8256	0.3378	27.8256	0.337
29.1505	0.3442	29.1505	0.3397	29.1505	0.3388	29.1505	0.3383	29.1505	0.3378	29.1505	0.3372	29.1505	0.3367
30.5386	0.3442	30.5386	0.3397	30.5386	0.3388	30.5386	0.3383	30.5386	0.3378	30.5386	0.3372	30.5386	0.3366
31.9927	0.3385	31.9927	0.3371	31.9927	0.3371	31.9927	0.337	31.9927	0.3369	31.9927	0.3366	31.9927	0.3363
33.516	0.3362	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.336	33.516	0.3358
35.1119	0.3356	35.1119	0.3356	35.1119	0.3356	35.1119	0.3355	35.1119	0.3355	35.1119	0.3354	35.1119	0.3353
36.7838	0.3351	36.7838	0.3351	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.3349
38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3345	38.5353	0.3345
40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342
42.2924	0.334	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3338
44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336
46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333
48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331
50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3329

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0291	0.1098	0.0261	0.1098	0.0245	0.1098	0.0231	0.1098	0.0223	0.1098	0.0216	0.1098	0.0208
0.115	0.0308	0.115	0.0261	0.115	0.0245	0.115	0.0235	0.115	0.0231	0.115	0.0225	0.115	0.0216
0.1204	0.0313	0.1204	0.0263	0.1204	0.0247	0.1204	0.0243	0.1204	0.0238	0.1204	0.0231	0.1204	0.0222
0.1262	0.0313	0.1262	0.027	0.1262	0.0257	0.1262	0.0247	0.1262	0.0243	0.1262	0.0235	0.1262	0.0225
0.1322	0.0313	0.1322	0.0271	0.1322	0.0258	0.1322	0.0248	0.1322	0.0244	0.1322	0.0236	0.1322	0.0228
0.1385	0.0313	0.1385	0.0277	0.1385	0.0266	0.1385	0.0256	0.1385	0.0246	0.1385	0.0237	0.1385	0.0229
0.1451	0.0316	0.1451	0.0295	0.1451	0.0282	0.1451	0.0271	0.1451	0.026	0.1451	0.0241	0.1451	0.0229
0.152	0.0321	0.152	0.03	0.152	0.0287	0.152	0.0275	0.152	0.0264	0.152	0.0244	0.152	0.0229
0.1592	0.0331	0.1592	0.0312	0.1592	0.0301	0.1592	0.029	0.1592	0.028	0.1592	0.0266	0.1592	0.0247
0.1668	0.0367	0.1668	0.0325	0.1668	0.0315	0.1668	0.0306	0.1668	0.0297	0.1668	0.0282	0.1668	0.0261
0.1748	0.0508	0.1748	0.0427	0.1748	0.0386	0.1748	0.0351	0.1748	0.0322	0.1748	0.0288	0.1748	0.0268
0.1831	0.0587	0.1831	0.0493	0.1831	0.0443	0.1831	0.0399	0.1831	0.0363	0.1831	0.0306	0.1831	0.0273
0.1918	0.0587	0.1918	0.0493	0.1918	0.0443	0.1918	0.0399	0.1918	0.0363	0.1918	0.0306	0.1918	0.0279
0.2009	0.0587	0.2009	0.0493	0.2009	0.0443	0.2009	0.0399	0.2009	0.0363	0.2009	0.0331	0.2009	0.0302
0.2105	0.0587	0.2105	0.0493	0.2105	0.0443	0.2105	0.0404	0.2105	0.0389	0.2105	0.0364	0.2105	0.0329
0.2205	0.0587	0.2205	0.0493	0.2205	0.0457	0.2205	0.0431	0.2205	0.041	0.2205	0.038	0.2205	0.0341
0.231	0.0587	0.231	0.0493	0.231	0.046	0.231	0.044	0.231	0.0422	0.231	0.0389	0.231	0.0357
0.242	0.0587	0.242	0.0509	0.242	0.0487	0.242	0.0466	0.242	0.0447	0.242	0.0413	0.242	0.0372
0.2535	0.065	0.2535	0.0574	0.2535	0.053	0.2535	0.049	0.2535	0.0455	0.2535	0.0413	0.2535	0.0388
0.2656	0.0733	0.2656	0.0587	0.2656	0.0535	0.2656	0.049	0.2656	0.0455	0.2656	0.0438	0.2656	0.0418
0.2783	0.0818	0.2783	0.06	0.2783	0.0535	0.2783	0.0509	0.2783	0.0496	0.2783	0.0471	0.2783	0.044
0.2915	0.0818	0.2915	0.062	0.2915	0.0583	0.2915	0.0549	0.2915	0.052	0.2915	0.0487	0.2915	0.0449
0.3054	0.0818	0.3054	0.0666	0.3054	0.0624	0.3054	0.0586	0.3054	0.0551	0.3054	0.05	0.3054	0.0464
0.3199	0.0818	0.3199	0.0705	0.3199	0.0662	0.3199	0.0624	0.3199	0.0595	0.3199	0.0545	0.3199	0.0485
0.3352	0.0876	0.3352	0.0771	0.3352	0.0711	0.3352	0.0669	0.3352	0.0636	0.3352	0.058	0.3352	0.0513
0.3511	0.0909	0.3511	0.0809	0.3511	0.0752	0.3511	0.0701	0.3511	0.0656	0.3511	0.058	0.3511	0.0513
0.3678	0.1218	0.3678	0.0952	0.3678	0.0823	0.3678	0.0721	0.3678	0.0656	0.3678	0.058	0.3678	0.0513
0.3853	0.1363	0.3853	0.1059	0.3853	0.0921	0.3853	0.081	0.3853	0.0722	0.3853	0.0592	0.3853	0.0513
0.4037	0.1363	0.4037	0.1059	0.4037	0.0921	0.4037	0.0824	0.4037	0.0764	0.4037	0.0665	0.4037	0.0575
0.4229	0.1363	0.4229	0.1059	0.4229	0.0921	0.4229	0.0855	0.4229	0.0804	0.4229	0.0715	0.4229	0.0617
0.4431	0.1363	0.4431	0.1059	0.4431	0.094	0.4431	0.0891	0.4431	0.0845	0.4431	0.0764	0.4431	0.0665
0.4642	0.1376	0.4642	0.1059	0.4642	0.0981	0.4642	0.0923	0.4642	0.0869	0.4642	0.0774	0.4642	0.0681
0.4863	0.1484	0.4863	0.1248	0.4863	0.1118	0.4863	0.1006	0.4863	0.091	0.4863	0.0833	0.4863	0.0742
0.5094	0.1825	0.5094	0.1398	0.5094	0.1233	0.5094	0.11	0.5094	0.0992	0.5094	0.0876	0.5094	0.0762

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.2221	0.5337	0.1614	0.5337	0.1351	0.5337	0.1155	0.5337	0.1031	0.5337	0.0876	0.5337	0.0762
0.5591	0.2221	0.5591	0.1614	0.5591	0.1351	0.5591	0.1155	0.5591	0.1031	0.5591	0.0896	0.5591	0.0765
0.5857	0.2221	0.5857	0.1614	0.5857	0.1351	0.5857	0.1155	0.5857	0.1037	0.5857	0.096	0.5857	0.0844
0.6136	0.2221	0.6136	0.1614	0.6136	0.1351	0.6136	0.1189	0.6136	0.1123	0.6136	0.1017	0.6136	0.0888
0.6428	0.2266	0.6428	0.1631	0.6428	0.1365	0.6428	0.1189	0.6428	0.1143	0.6428	0.1052	0.6428	0.0925
0.6734	0.2266	0.6734	0.1631	0.6734	0.1399	0.6734	0.1301	0.6734	0.1222	0.6734	0.1096	0.6734	0.0952
0.7055	0.2266	0.7055	0.1631	0.7055	0.1399	0.7055	0.1301	0.7055	0.1222	0.7055	0.1116	0.7055	0.0981
0.7391	0.2266	0.7391	0.1631	0.7391	0.143	0.7391	0.1345	0.7391	0.1261	0.7391	0.1118	0.7391	0.0981
0.7743	0.3193	0.7743	0.2152	0.7743	0.1824	0.7743	0.16	0.7743	0.144	0.7743	0.1231	0.7743	0.1049
0.8111	0.3193	0.8111	0.2152	0.8111	0.1824	0.8111	0.16	0.8111	0.144	0.8111	0.1231	0.8111	0.107
0.8497	0.3193	0.8497	0.2152	0.8497	0.1824	0.8497	0.1667	0.8497	0.154	0.8497	0.1353	0.8497	0.1176
0.8902	0.3193	0.8902	0.2152	0.8902	0.1916	0.8902	0.1759	0.8902	0.1631	0.8902	0.1433	0.8902	0.1231
0.9326	0.4908	0.9326	0.3016	0.9326	0.248	0.9326	0.2165	0.9326	0.1943	0.9326	0.165	0.9326	0.1395
0.977	0.4908	0.977	0.3016	0.977	0.248	0.977	0.2165	0.977	0.1943	0.977	0.1747	0.977	0.1534
1.0235	0.4908	1.0235	0.3016	1.0235	0.248	1.0235	0.2165	1.0235	0.1945	1.0235	0.1819	1.0235	0.1618
1.0723	0.4908	1.0723	0.3016	1.0723	0.2621	1.0723	0.2405	1.0723	0.2228	1.0723	0.1964	1.0723	0.1694
1.1233	0.5832	1.1233	0.3442	1.1233	0.2717	1.1233	0.2405	1.1233	0.2228	1.1233	0.1964	1.1233	0.1694
1.1768	0.5832	1.1768	0.383	1.1768	0.3194	1.1768	0.2821	1.1768	0.2518	1.1768	0.2159	1.1768	0.1892
1.2328	0.5832	1.2328	0.3885	1.2328	0.3512	1.2328	0.3199	1.2328	0.2945	1.2328	0.2544	1.2328	0.2149
1.2916	0.5832	1.2916	0.422	1.2916	0.3725	1.2916	0.3349	1.2916	0.3073	1.2916	0.2656	1.2916	0.2265
1.353	0.641	1.353	0.422	1.353	0.3725	1.353	0.3349	1.353	0.3156	1.353	0.2834	1.353	0.2456
1.4175	0.641	1.4175	0.422	1.4175	0.3743	1.4175	0.354	1.4175	0.3356	1.4175	0.3035	1.4175	0.2655
1.485	0.641	1.485	0.4469	1.485	0.4167	1.485	0.3896	1.485	0.3647	1.485	0.3228	1.485	0.2776
1.5557	0.641	1.5557	0.4762	1.5557	0.4448	1.5557	0.4175	1.5557	0.3928	1.5557	0.3511	1.5557	0.3012
1.6298	0.7619	1.6298	0.4978	1.6298	0.4567	1.6298	0.4269	1.6298	0.4034	1.6298	0.3639	1.6298	0.3171
1.7074	0.8123	1.7074	0.641	1.7074	0.5693	1.7074	0.5131	1.7074	0.4665	1.7074	0.3982	1.7074	0.3348
1.7887	0.9259	1.7887	0.7593	1.7887	0.678	1.7887	0.6117	1.7887	0.5548	1.7887	0.4723	1.7887	0.3909
1.8738	0.974	1.8738	0.7878	1.8738	0.708	1.8738	0.6465	1.8738	0.6002	1.8738	0.5234	1.8738	0.4347
1.963	1.1341	1.963	0.8565	1.963	0.7538	1.963	0.6879	1.963	0.6337	1.963	0.5452	1.963	0.4471
2.0565	1.2264	2.0565	0.8865	2.0565	0.7941	2.0565	0.7185	2.0565	0.6577	2.0565	0.5616	2.0565	0.4596
2.1544	1.2264	2.1544	0.8865	2.1544	0.7941	2.1544	0.7185	2.1544	0.6577	2.1544	0.5616	2.1544	0.4626
2.257	1.2264	2.257	0.8865	2.257	0.8031	2.257	0.7429	2.257	0.6869	2.257	0.5894	2.257	0.49
2.3645	1.9612	2.3645	1.0488	2.3645	0.8406	2.3645	0.7656	2.3645	0.7007	2.3645	0.5944	2.3645	0.5058
2.4771	2.3059	2.4771	1.2401	2.4771	0.9963	2.4771	0.8264	2.4771	0.721	2.4771	0.6253	2.4771	0.5241
2.595	2.9123	2.595	1.4466	2.595	1.0857	2.595	0.885	2.595	0.7616	2.595	0.6332	2.595	0.5408

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.9123	2.7186	1.4466	2.7186	1.0857	2.7186	0.885	2.7186	0.7616	2.7186	0.6332	2.7186	0.5408
2.848	2.9123	2.848	1.4466	2.848	1.0857	2.848	0.885	2.848	0.7616	2.848	0.6332	2.848	0.5408
2.9836	2.9123	2.9836	1.4466	2.9836	1.0857	2.9836	0.885	2.9836	0.7616	2.9836	0.6332	2.9836	0.5408
3.1257	2.9123	3.1257	1.4466	3.1257	1.0857	3.1257	0.885	3.1257	0.7616	3.1257	0.6332	3.1257	0.5408
3.2745	1.5957	3.2745	1.0453	3.2745	0.9516	3.2745	0.877	3.2745	0.7616	3.2745	0.6332	3.2745	0.5408
3.4305	1.5557	3.4305	1.0453	3.4305	0.9516	3.4305	0.877	3.4305	0.7616	3.4305	0.6332	3.4305	0.5408
3.5938	1.5557	3.5938	1.0453	3.5938	0.9516	3.5938	0.877	3.5938	0.7616	3.5938	0.6332	3.5938	0.5408
3.7649	1.5557	3.7649	1.0453	3.7649	0.9516	3.7649	0.877	3.7649	0.7616	3.7649	0.6332	3.7649	0.5408
3.9442	1.5557	3.9442	1.0453	3.9442	0.9516	3.9442	0.877	3.9442	0.7616	3.9442	0.6332	3.9442	0.5408
4.132	1.5557	4.132	1.0453	4.132	0.9516	4.132	0.877	4.132	0.7616	4.132	0.6332	4.132	0.5408
4.3288	1.5557	4.3288	1.0453	4.3288	0.9516	4.3288	0.877	4.3288	0.7616	4.3288	0.6332	4.3288	0.5408
4.5349	1.5557	4.5349	1.0453	4.5349	0.9516	4.5349	0.877	4.5349	0.7616	4.5349	0.6332	4.5349	0.5497
4.7508	1.5557	4.7508	1.0453	4.7508	0.9516	4.7508	0.877	4.7508	0.7616	4.7508	0.6485	4.7508	0.5929
4.977	1.5557	4.977	1.0453	4.977	0.9516	4.977	0.877	4.977	0.8145	4.977	0.7118	4.977	0.6356
5.214	1.5557	5.214	1.0774	5.214	0.9882	5.214	0.9135	5.214	0.8523	5.214	0.7561	5.214	0.6761
5.4623	1.9438	5.4623	1.1547	5.4623	1.0213	5.4623	0.9313	5.4623	0.8675	5.4623	0.7713	5.4623	0.7153
5.7224	2.3998	5.7224	1.3627	5.7224	1.1739	5.7224	1.0456	5.7224	0.9654	5.7224	0.8922	5.7224	0.7914
5.9948	2.3998	5.9948	1.5021	5.9948	1.3429	5.9948	1.2312	5.9948	1.1504	5.9948	1.0241	5.9948	0.8812
6.2803	2.3998	6.2803	1.5021	6.2803	1.3429	6.2803	1.2512	6.2803	1.1843	6.2803	1.0774	6.2803	0.9578
6.5793	2.3998	6.5793	1.5021	6.5793	1.3429	6.5793	1.2512	6.5793	1.1843	6.5793	1.0975	6.5793	1.0045
6.8926	3.1388	6.8926	1.9009	6.8926	1.6283	6.8926	1.4593	6.8926	1.3283	6.8926	1.142	6.8926	1.0496
7.2208	3.805	7.2208	2.1966	7.2208	1.9285	7.2208	1.7483	7.2208	1.606	7.2208	1.3871	7.2208	1.1403
7.5646	4.7167	7.5646	2.7844	7.5646	2.3279	7.5646	1.9882	7.5646	1.8385	7.5646	1.605	7.5646	1.3242
7.9248	5.9632	7.9248	3.6137	7.9248	2.9424	7.9248	2.4467	7.9248	2.1357	7.9248	1.7196	7.9248	1.5158
8.3022	5.9632	8.3022	3.6314	8.3022	2.9505	8.3022	2.4467	8.3022	2.1357	8.3022	1.7196	8.3022	1.5826
8.6975	5.9632	8.6975	3.6314	8.6975	2.9505	8.6975	2.4467	8.6975	2.1357	8.6975	1.8333	8.6975	1.5826
9.1116	6.0802	9.1116	3.994	9.1116	3.2398	9.1116	2.7398	9.1116	2.4034	9.1116	1.9297	9.1116	1.6805
9.5455	7.0171	9.5455	3.994	9.5455	3.2398	9.5455	2.7398	9.5455	2.4034	9.5455	1.9297	9.5455	1.7636
10	7.0171	10	3.994	10	3.2398	10	2.7398	10	2.4034	10	1.9297	10	1.7636
10.4762	7.0171	10.4762	3.994	10.4762	3.2398	10.4762	2.7398	10.4762	2.4034	10.4762	1.9297	10.4762	1.7636
10.975	7.0171	10.975	3.994	10.975	3.2398	10.975	2.7398	10.975	2.4034	10.975	1.9297	10.975	1.7636
11.4976	7.0171	11.4976	3.994	11.4976	3.2398	11.4976	2.7398	11.4976	2.4034	11.4976	1.9297	11.4976	1.7636
12.045	5.2219	12.045	3.6403	12.045	3.2162	12.045	2.7398	12.045	2.4034	12.045	1.9297	12.045	1.7187
12.6186	5.0673	12.6186	3.0551	12.6186	2.7236	12.6186	2.4671	12.6186	2.2578	12.6186	1.9297	12.6186	1.6337
13.2194	4.0804	13.2194	2.3646	13.2194	2.1777	13.2194	2.0501	13.2194	1.9348	13.2194	1.7387	13.2194	1.5139

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	2.9165	13.8489	2.0669	13.8489	1.847	13.8489	1.6801	13.8489	1.5651	13.8489	1.4188	13.8489	1.2854
14.5083	2.6881	14.5083	1.6507	14.5083	1.5024	14.5083	1.3808	14.5083	1.2797	14.5083	1.2024	14.5083	1.1256
15.1991	1.5581	15.1991	1.2904	15.1991	1.2517	15.1991	1.2013	15.1991	1.1519	15.1991	1.0646	15.1991	0.999
15.9228	1.5542	15.9228	1.2147	15.9228	1.1521	15.9228	1.1013	15.9228	1.0583	15.9228	0.9867	15.9228	0.9108
16.681	1.4175	16.681	1.0273	16.681	0.9864	16.681	0.9638	16.681	0.9391	16.681	0.889	16.681	0.8585
17.4753	1.4175	17.4753	1.0273	17.4753	0.9836	17.4753	0.9427	17.4753	0.9076	17.4753	0.8505	17.4753	0.8328
18.3074	1.1231	18.3074	0.9783	18.3074	0.923	18.3074	0.8869	18.3074	0.8621	18.3074	0.8332	18.3074	0.8176
19.1791	1.1231	19.1791	0.9783	19.1791	0.923	19.1791	0.8869	19.1791	0.8621	19.1791	0.8298	19.1791	0.8009
20.0923	0.8104	20.0923	0.8039	20.0923	0.8062	20.0923	0.8037	20.0923	0.7987	20.0923	0.7864	20.0923	0.7691
21.049	0.7585	21.049	0.7386	21.049	0.7381	21.049	0.7388	21.049	0.7391	21.049	0.738	21.049	0.7329
22.0513	0.7383	22.0513	0.7037	22.0513	0.6966	22.0513	0.7001	22.0513	0.7024	22.0513	0.7046	22.0513	0.7037
23.1013	0.7383	23.1013	0.7037	23.1013	0.6917	23.1013	0.685	23.1013	0.6858	23.1013	0.6855	23.1013	0.6829
24.2013	0.7383	24.2013	0.7037	24.2013	0.6917	24.2013	0.6843	24.2013	0.6792	24.2013	0.6724	24.2013	0.666
25.3536	0.657	25.3536	0.6609	25.3536	0.6609	25.3536	0.6593	25.3536	0.6571	25.3536	0.6528	25.3536	0.6477
26.5609	0.6463	26.5609	0.6367	26.5609	0.6334	26.5609	0.6316	26.5609	0.6306	26.5609	0.6294	26.5609	0.6281
27.8256	0.6035	27.8256	0.592	27.8256	0.5982	27.8256	0.6021	27.8256	0.6048	27.8256	0.6081	27.8256	0.6105
29.1505	0.6025	29.1505	0.5884	29.1505	0.5872	29.1505	0.5894	29.1505	0.5914	29.1505	0.5947	29.1505	0.5976
30.5386	0.6025	30.5386	0.5884	30.5386	0.5867	30.5386	0.5865	30.5386	0.5868	30.5386	0.5878	30.5386	0.5891
31.9927	0.5822	31.9927	0.5848	31.9927	0.5843	31.9927	0.5837	31.9927	0.5832	31.9927	0.5826	31.9927	0.5824
33.516	0.5739	33.516	0.5752	33.516	0.5756	33.516	0.5758	33.516	0.5759	33.516	0.5759	33.516	0.5759
35.1119	0.5693	35.1119	0.5693	35.1119	0.5694	35.1119	0.5695	35.1119	0.5695	35.1119	0.5697	35.1119	0.5698
36.7838	0.5638	36.7838	0.564	36.7838	0.564	36.7838	0.5641	36.7838	0.5641	36.7838	0.5642	36.7838	0.5643
38.5353	0.5589	38.5353	0.5591	38.5353	0.5591	38.5353	0.5592	38.5353	0.5592	38.5353	0.5593	38.5353	0.5594
40.3702	0.5545	40.3702	0.5547	40.3702	0.5547	40.3702	0.5547	40.3702	0.5548	40.3702	0.5548	40.3702	0.5549
42.2924	0.5506	42.2924	0.5506	42.2924	0.5507	42.2924	0.5507	42.2924	0.5507	42.2924	0.5508	42.2924	0.5509
44.3062	0.5469	44.3062	0.5469	44.3062	0.5469	44.3062	0.547	44.3062	0.547	44.3062	0.5471	44.3062	0.5472
46.4159	0.5434	46.4159	0.5435	46.4159	0.5435	46.4159	0.5436	46.4159	0.5436	46.4159	0.5436	46.4159	0.5438
48.626	0.5403	48.626	0.5403	48.626	0.5403	48.626	0.5404	48.626	0.5404	48.626	0.5404	48.626	0.5406
50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5374	50.9414	0.5376

ISSUED BY RPP-WTP PDC

MECHANICAL DATA SHEET
SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00004 5

Data Sheet No.
24590-PTF-MED-CNP-00004

R11105811

Project:	***RPP-WTP***	Description:	***Cesium Evaporator After-Condenser***
Project No:	***24590***	P&ID:	***24590-PTF-M6-CNP-00010, 24590-QL-POA-MEVV-00002-07-24*** 5
Site:	***Hanford***	Process Data: 5	***24590-PTF-MVC-CNP-00015*** 5
Process flow diagram:	***24590-PTF-M5-V17T-00014***	Manufacturer Name:	***Framatome ANP / Graham Corporation***

General Data

Quality Level	***Q (Note 1 & 7)*** 5	TEMA (Class/Type)		***B***
Seismic Category	***SC-I (Note 7)*** 5	Flow Type (Counter current, etc)		***N/A***
Design Code	***ASME VIII Div 1***	Heat Exchanger Duty	Btu/hr	***167,838***
Code Stamp	***Yes***	Heat Exchanger Area	ft^2	***14.9***
NB Registration	***Yes***	ΔT (LMTD/Corrected LMTD)	°F	***111***

Thermal/Hydraulic Data

		Shell Side		Tube Side	
Fluid Name		***In Steam***	***Out***	***In Cooling Water***	***Out***
Fluid Quantities: Total	lbm/hr	***200.4***		***15,000***	
Condensable Vapor (In/Out)		***156.7***	***3.4***	***N/A***	***N/A***
Liquid		***N/A***	***153.3***	***15,000***	***15,000***
Noncondensable		***43.7***	***43.7***	***N/A***	***N/A***
Temperature (In/Out)	°F	***248.9***	***120***	5 ***80 ****	5 ***92 ****
Specific Gravity		***N/A***	***N/A***	***1.000***	***0.999***
Viscosity	Cp	***N/A***	***N/A***	***2.209***	***1.924***
Molecular Weight		***18.02***	***18.02***	***N/A***	***N/A***
Molecular Weight, Noncondensable		***29***	***29***	***N/A***	***N/A***
Specific Heat	Btu/lbm-°F	***N/A***	***N/A***	***1.000***	***0.999***
Thermal Conductivity	Btu/hr-ft-°F	***N/A***	*	***0.350***	***0.356***
Latent Heat	Btu/lbm @ °F	***N/A***		***N/A***	
Inlet pressure	psia	***810.0 Torr***		5 ***84.7 ****	
Tube side Velocity	ft/s	***N/A***		***3.4***	
Pressure Drop (Allowed)	psi	***25 mmHg***		***0.8***	
Fouling Resistance (Min)	$hr\text{-}ft^2\text{-}°F/Btu$	***0.0020***		***0.0020***	

Mechanical Data

		Shell Side		Tube Side	
Design Pressure (Max/Min)	psig	***50***	***Full vacuum***	***100****	***Full vacuum****
Design Temperature (Max/Min)	°F	***378***	***40***	***150***	***40***
Corrosion Allowance	inch	***0.04***		***0.04***	
Erosion Allowance	inch	***N/A***		***N/A***	
Shell OD/ID	inch	***6 5/8 OD***		Overall Dimensions (H x W x L) inch	***18 x 11 x 69***
Total Number of Tubes		***19***		Tube OD inch	***0.750***

Material Data (Note 10) 5

Shell	***SA 312, SA 182 316L SS***	Shell Cover	***N/A***
Channel/Bonnet	***SA 312, SA 182, SA 403 316L SS***	Channel Cover	***N/A***
Tube	***SA 213 316L Seamless SS*** 5	Floating Head Cover	***N/A***
Stationary Tube Sheet	***SA 240 316L SS***	Floating Tube Sheet	***N/A***
Shell Side Gaskets	***N/A***	Tube Side Gaskets	***316 SS Spiral Wound, PTFE Filler***
Partition Seals	***N/A***	Baffles/Supports	***SA 240 316L SS***
Insulation	***N/A***	Forgings (Shell side)	***SA 182 F316L***
Bolting	***SA 193 B8M / SA 194 8M*** 5	Forgings (Channel)	***SA 182 F316L***

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00004

Data Sheet No.
24590-PTF-MED-CNP-00004

Construction Data *(To be determined by the supplier when not specified by the buyer)*

Cross Baffle Type	*	% Baffle Cut (Dia.)	*	Spacing (c/c) inch	*
Bypass Seal Arrangement	*	Longitudinal Seal Type	*	Expansion Joint Type	*
Inlet Nozzle ρV^2	*	Bundle Entrance ρV^2	*	Bundle Exit ρV^2	*
Tube Support Type	*	U-bend Support Type	*	Weight of Bundle lbf	*
Operating Weight lbf	*	Full of Water lbf	*	Weight of Shell lbf	*

Notes

**** To be determined / confirmed by Seller***

****** Not Used.*** 5

5

(1) Vendor will provide item at BNI quality level Q specification, which corresponds with vendor quality level QL-2.

(2) Equipment Cyclic Data is from document 24590-QL-POA-MEVV-00002-10-00002.

(3) Vendor Design information is from document 24590-QL-POA-MEVV-00002-10-00011.

(4) The physical design parameters shall be determined by the seller based on TEMA and HEI standards.

(5) Contents of this document are Dangerous Waste Permit Affecting. 5

(6) Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only. 5

(7) For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore conservative. 5

(8) Allowable nozzle loads shall be per SC-I stainless steel nozzle design loads of 24590-WTP-3PS-MV00-T0001. 5

(9) Design to include 7,001,950 normal process expansion cycles (24590-QL-MRA-MEVV-00002-T0001). 5

(10) 304SS (max. carbon 0.030%) originally specified; 316L SS used due to availability. 5

Safety screening / evaluation required? ☒Yes ☐No If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.

Rev	Description	By	Checked	EN&S	Approved	Date
5	Updated to incorporate 24590-WTP-M6N-M80T-00005 (Dangerous Waste Permit Affecting), DOE AEA note (6), reflect WSGM analysis, 24590-PTF-U0D-W16T-00001 changes, and update other data.	D. Tate	S. Thakkar	B. Ithall	J. Julyk	8/29/09
4	Incorporated Vendor Design Changes and Equipment Qualification data	R. Rickenbach	S. Thakkar	S. Woolfolk	J. Julyk	07/15/2008
3	Issued for Purchase. Updates Corrosion Allowance	J. Hickman	K Sadler	N/A	J. Julyk	09/29/2004
2	Issued for Purchase, incorporates updated vendor data	J. Hickman	K. Sadler	N/A	J. Julyk	08/11/2004
1	Issued for Purchase	J. Hickman	E. Le	N/A	J. Julyk	02/12/2004
0	Issued for Purchase	M. Pratt	J. Hickman	N/A	S. Kirk	07/24/2002

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification

Component Tag Number	24590-PTF-ME-CNP-HX-00004	Safety Classification	☒ SC ☐ SS ☐ APC ☐ SDC ☐ SDS ☐ RRC Note 12 5
Manufacturer / Supplier	GRAHAM CORPORATION / AREVA NP, INC.		
Requisition Number	24590-QL-POA-MEVV-00002		
Model	NOTE 1	Seismic Category	☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV Note 12 5
Description (Include descriptive text [e.g., location, elevation])	CESIUM EVAPORATOR AFTER-CONDENSER, ROOM P-0430, ELEVATION 77'-0".		
Safety Function(s)	Prevent post seismic disruption of H2 vessel purge air pathways, spread of contamination into C3 areas from PVP blowback. 5		

Seismic Safety Function	☒ Yes ☐ No	Room Number(s):	P-0430
Maintenance Accessible	☒ Yes ☐ No	Method of Maintenance Access:	☐ Remote ☒ Hands On ☐ None
Seismic Operability Requirements: 5	☐ During Seismic Event 5	☐ After Seismic Event	
ITS Equipment Type:	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical

Equipment Environmental Qualification (EEQ)

Environment ☒ Mild ☐ Harsh	Hi Rad Service ☐ Yes ☒ No	Design Life (yrs) ☐ 40 ☒ Other ____
Contamination Class: C3		Note 13 5
Radiation Class: R3		

Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	95	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal Low Temperature (°F)	59	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal High Relative Humidity (%RH)	100	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Relative Humidity (%RH)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal High Pressure (in.-w.g.)	0	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Pressure (in.-w.g.)	-0.4	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Radiation Dose Rate (mR/hr)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Vibration Magnitude (g)	N/A	N/A	N/A	N/A 5	NOTE 1
Vibration Frequency (Hz)	N/A	N/A	N/A	N/A 5	NOTE 1
Additional Normal Information:	See Note 2 for pressure units.				

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Abnormal					
Abnormal High Temperature (°F)	5 115	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 5	NOTE 1
Abnormal Low Temperature (°F)	5 Note 10 40	8	hr/yr	24590-PTF-U0D-W16T-00001, Notes 8 & 10 5	NOTE 1
Abnormal High Relative Humidity (%RH)	100	24	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Relative Humidity (%RH)	4	22	hr/yr	24590-PTF-U0D-W16T-00001, Note 11 5	NOTE 1
Abnormal High Pressure (in.-w.g.)	4	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Pressure (in.-w.g.)	-7.3	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Radiation Dose Rate (mR/hr)	10, Note 5	0	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Wet Sprinkler System Present	YES	2	5 hr	24590-PTF-U0D-W16T-00001	NOTE 1
Additional Abnormal Information	See Note 2 for pressure units.				
Design Basis Events (DBE)					
DBE High Temperature (°F)	125	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8 & 11 5	NOTE 1
DBE Low Temperature (°F)	40	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
DBE High Relative Humidity (%RH)	100	482	5 hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Relative Humidity (%RH)	5 8	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE High Pressure (in.-w.g.)	4	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Pressure (in.-w.g.)	-7.3	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Radiation Dose Rate (mR/hr)	10, Note 5	0	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Flood Height (ft)	1.58	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Submergence (ft)	0, Note 6	5 N/A	5 N/A	5 24590-QL-POA-MEVV-00002-07-17	NOTE 1
Chemical/Spray Exposure	YES, Note 9	12.5	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Additional DBE Information	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	2M, 5M, 19M SODIUM HYDROXIDE 5 0.5M NITRIC ACID 1M SODIUM PERMANGANATE

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	SEE VENDOR SUBMITAL 24590-QL-POA-MEVV-00002-07-17
Mounting Method (bolts, welds, etc.)	ANCHOR BOLTS, CNP-SKID-00002, 24590-PTF-DD-S13T-00167
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks.	24590-WTP-3PS-SS90-T0001	001 5	N/A
Specified Seismic Load (BUYER)	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectre (ISRS) 5	24590-PTF-S0C-S15T-00057 5	00A 5	Calculation is not included in MR, see attached figures 16, 17, 22, 23 and 144 per CCN 185267. 5
Design Seismic Load (SELLER	5	5	5	Note 1 5
Qualification Method (SELLER)	5	5	5	Note 1 5
Qualification Report Number (SELLER)	5	5	5	Note 1 5
Submittal Number (BUYER)	TBD 5	TBD 5	TBD 5	None 5

Notes and Additional Information

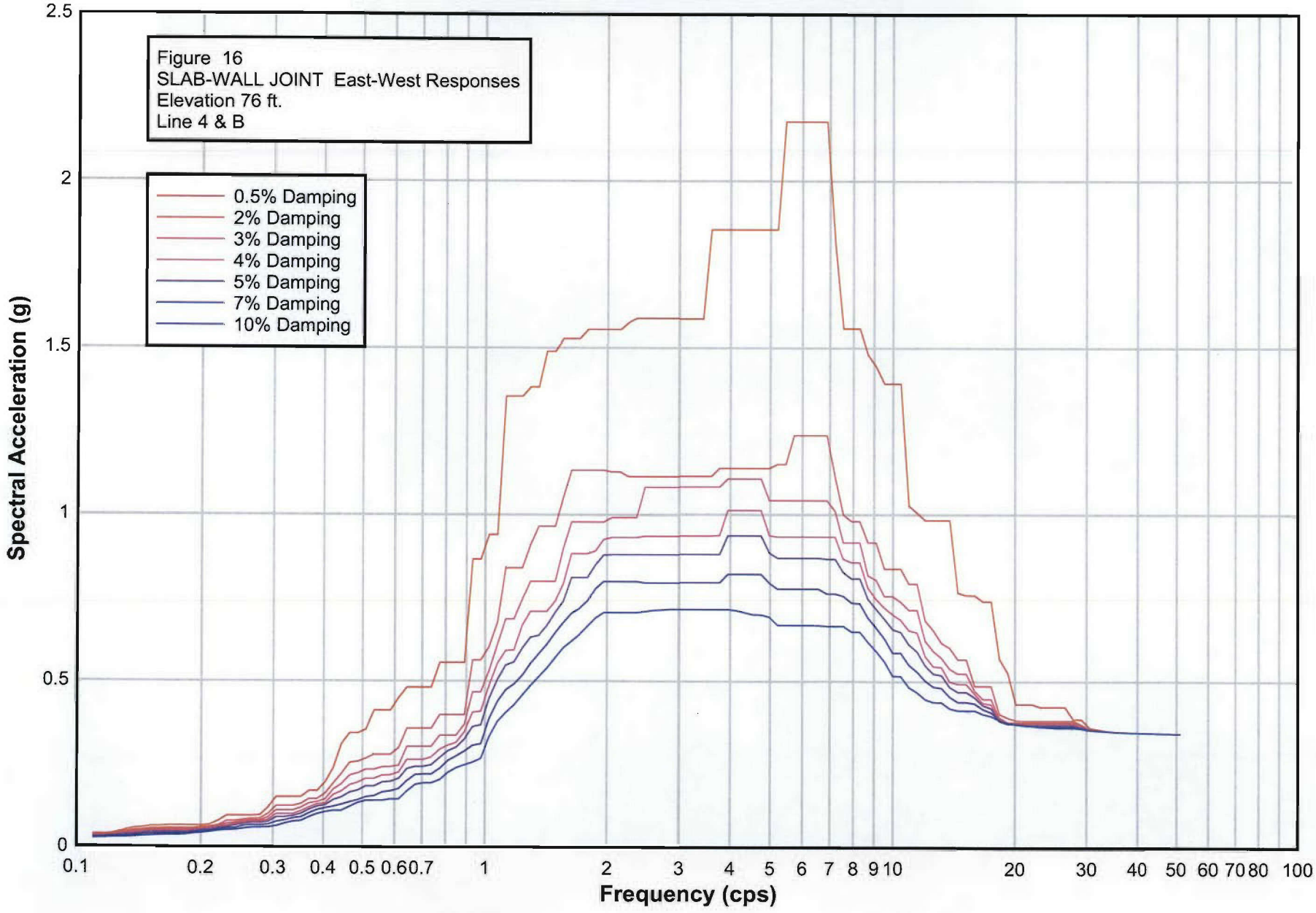
1. Data to be provided by seller through the submittal process as required on the G-321-E form.
2. Where pressure is given in inches of water column (in.-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in.-w.g.)
3. deleted. 5
4. The equipment qualification will be documented in accordance with the requirements in Appendix D of Engineering Specification for Environmental Qualification of Mechanical Equipment, document number 24590-WTP-3PS-G000-T0015 for the passive and active safety functions.
5. Abnormal and DBE Radiation dose rates are set equal to normal and do not contribute to the total integrated dose (TID).
6. Submergence depth is the difference between the lowest point on the equipment and the flood depth above the floor. The submergence depth is set to zero if the lowest section of the equipment is above the flood depth.
7. Environmental data from datasheet 24590-PTF-U0D-W16T-00001 is for room environment only.
8. For application of AISC N690, 5 abnormal temperatures shall be applied as Normal Operation Temperature, T_O, with seismic effects, E_S. The Design basis event temperatures shall be applied as a Thermal Load generated by a postulated accident, T_A, without seismic effects, E_s. 5
9. See DBE Chemical Exposure Details. 5
10. Abnormal minimum temperature is set equal to the normal minimum temperature (59F) for the purposes of seismic 5 analysis. A DBE seismic event coincident with an extreme low abnormal temperature is not a credible scenario. [The probability of an abnormal minimum temperature is estimated as follows: temperatures <40 F occur 31% of the year (average historical weather data, 0.31 probability); a loss of heating is assumed to occur 8 hrs/yr (0.001 probability); combined probability is 0.31 x 0.001 = 0.00031 (3.1E-4). The combination of this event with a seismic DBE (4 E-04 probability) is not credible (<1 E-06 probability).]
11. Parameter value used on data sheet has been previously established and determined to provide more conservative 5 constraint than values derived from 24590-PTF-U0D-W16T-00001.
12. For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore 5 conservative.
13. Facility design life is 40 years. Seller will determine equipment design life and required maintenance / replacement 5 intervals to maintain qualification of equipment components subject to wear or aging.

REFERENCES

1. 24590-WTP-PSAR-ESH-01-002-02, Rev. 04E, Preliminary Documented Safety Analysis to Support Construction 5 Authorization; PT Facility Specific Information.
2. deleted. 5
3. 24590-PTF-M6-CNP-00010, Rev. 2, P&ID - PTF Cesium Nitric Acid Recovery Process System Rectifier and 5 Condensers.
4. 24590-PTF-U0D-W16T-00001, Rev. 0, PTF Room Environment Datasheet [5 Including DCNs: 24590-PTF-U0N-W16T-00001, 24590-PTF-U0N-W16T-00003, & 24590-PTF-U0N-W16T-00004].
5. 24590-WTP-DB-ENG-01-001, Rev. 1N, Basis Of Design. 5
6. 24590-QL-POA-MEVV-00002-07-00092, Rev. 00B, DRAWING - AFTERCONDENSER (MODEL 6 X 4' BEM). 5
7. 24590-PTF-M6X-CNP-00037 Rev. 002, MS LINE LIST FOR P&ID 24590-PTF-M6-CNP-00010, REV. 2 5

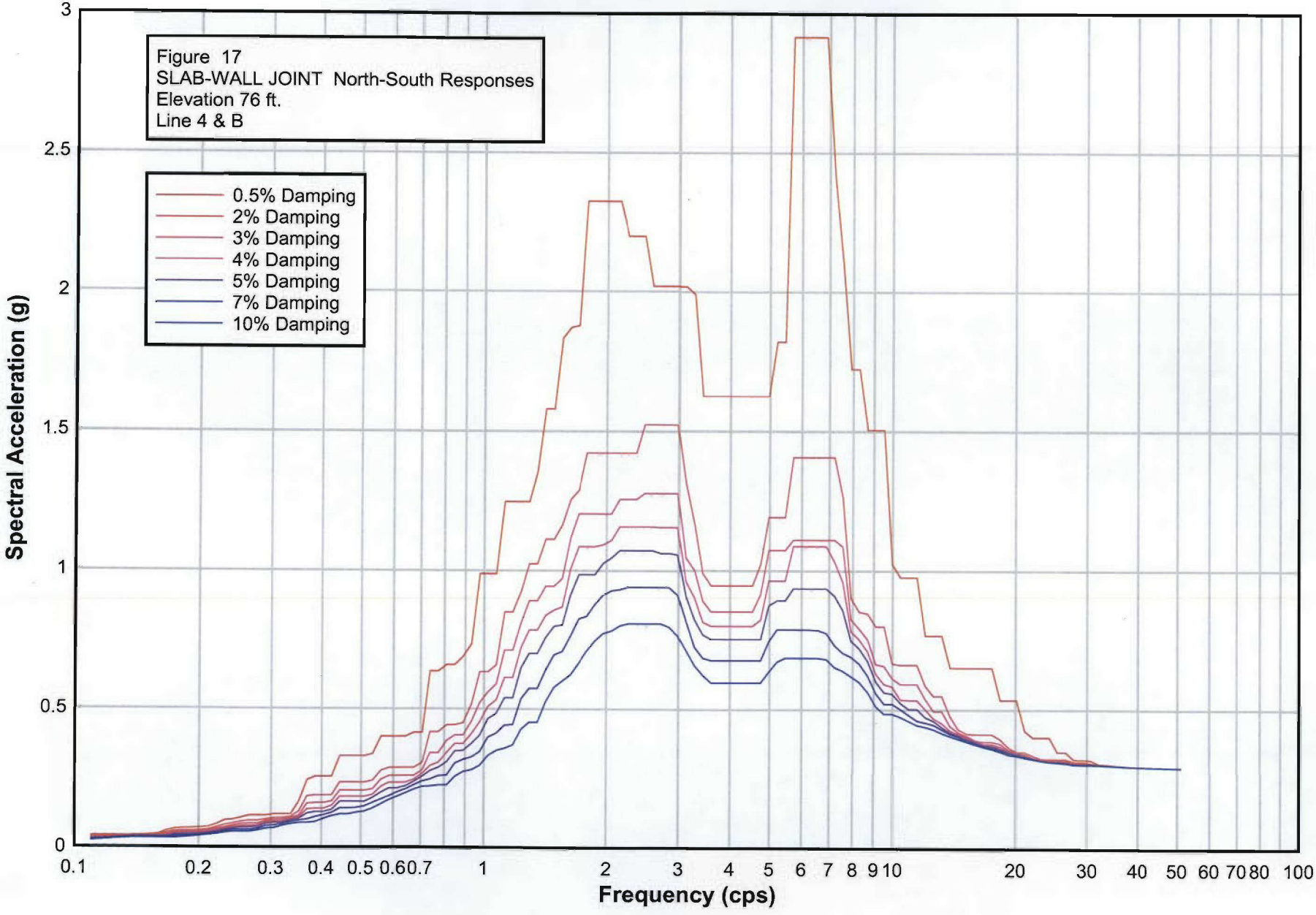
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 5



RPP-WTP Pretreatment Facility ISRS

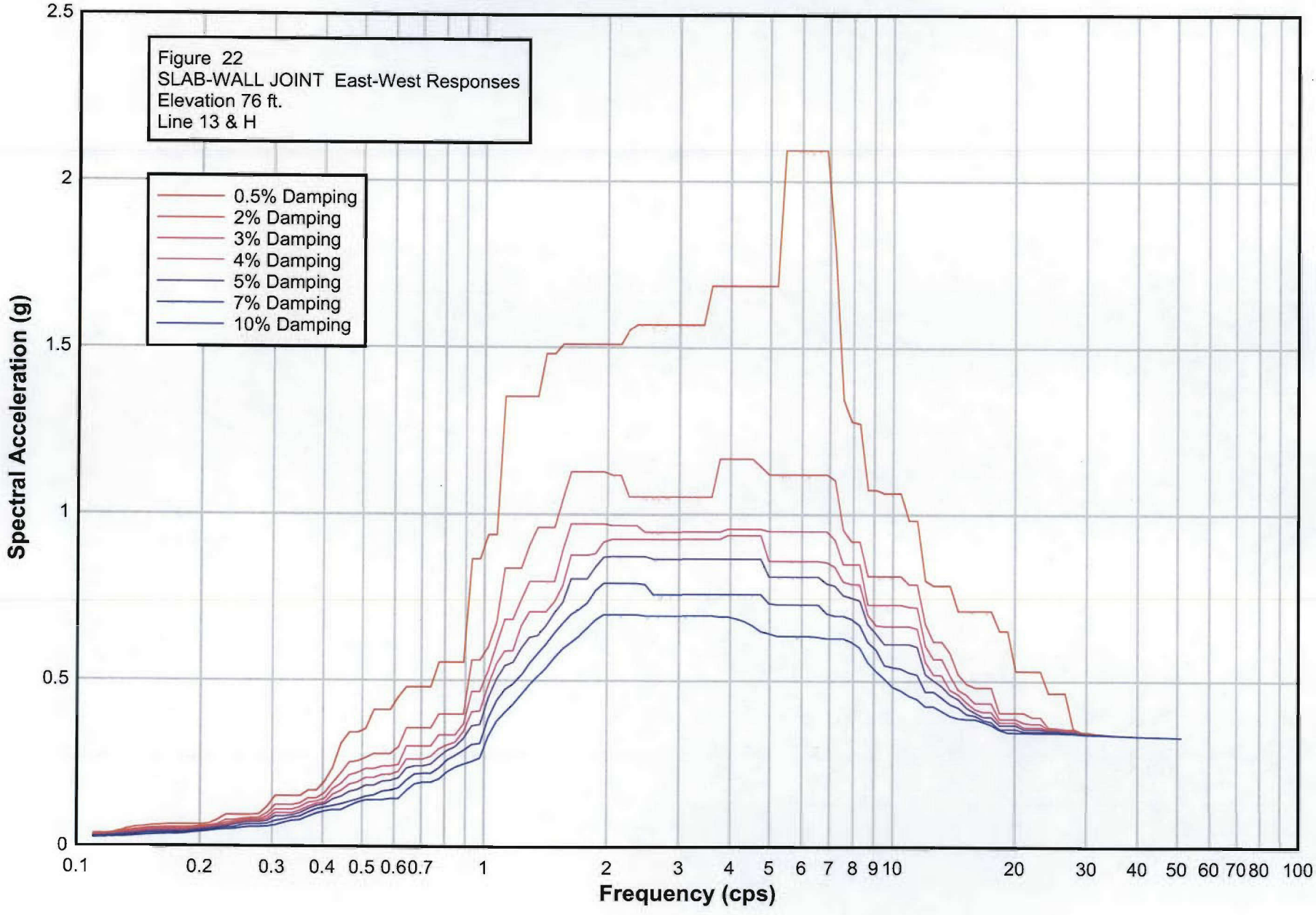
Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 5



RPP-WTP Pretreatment Facility ISRS

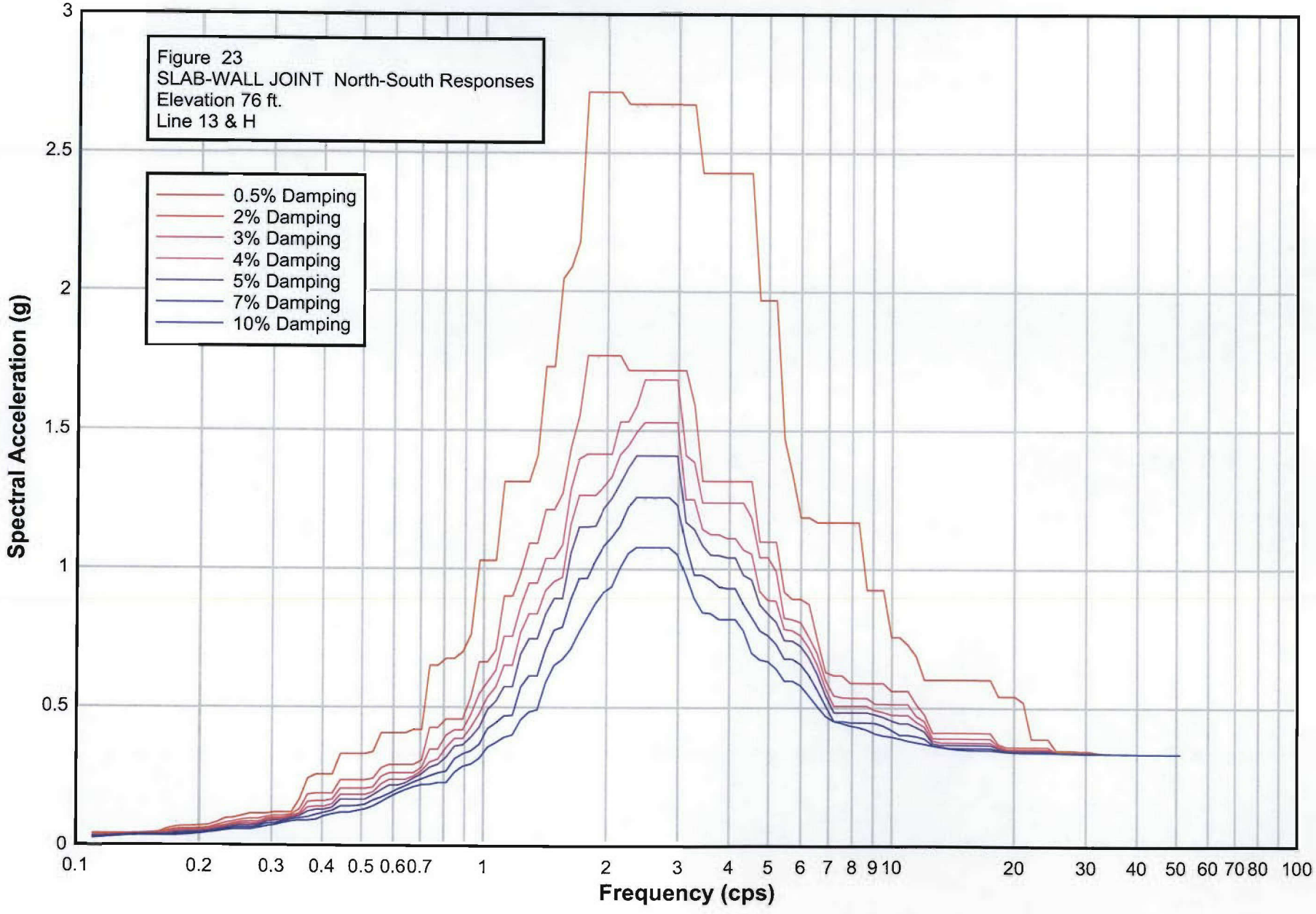
5

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



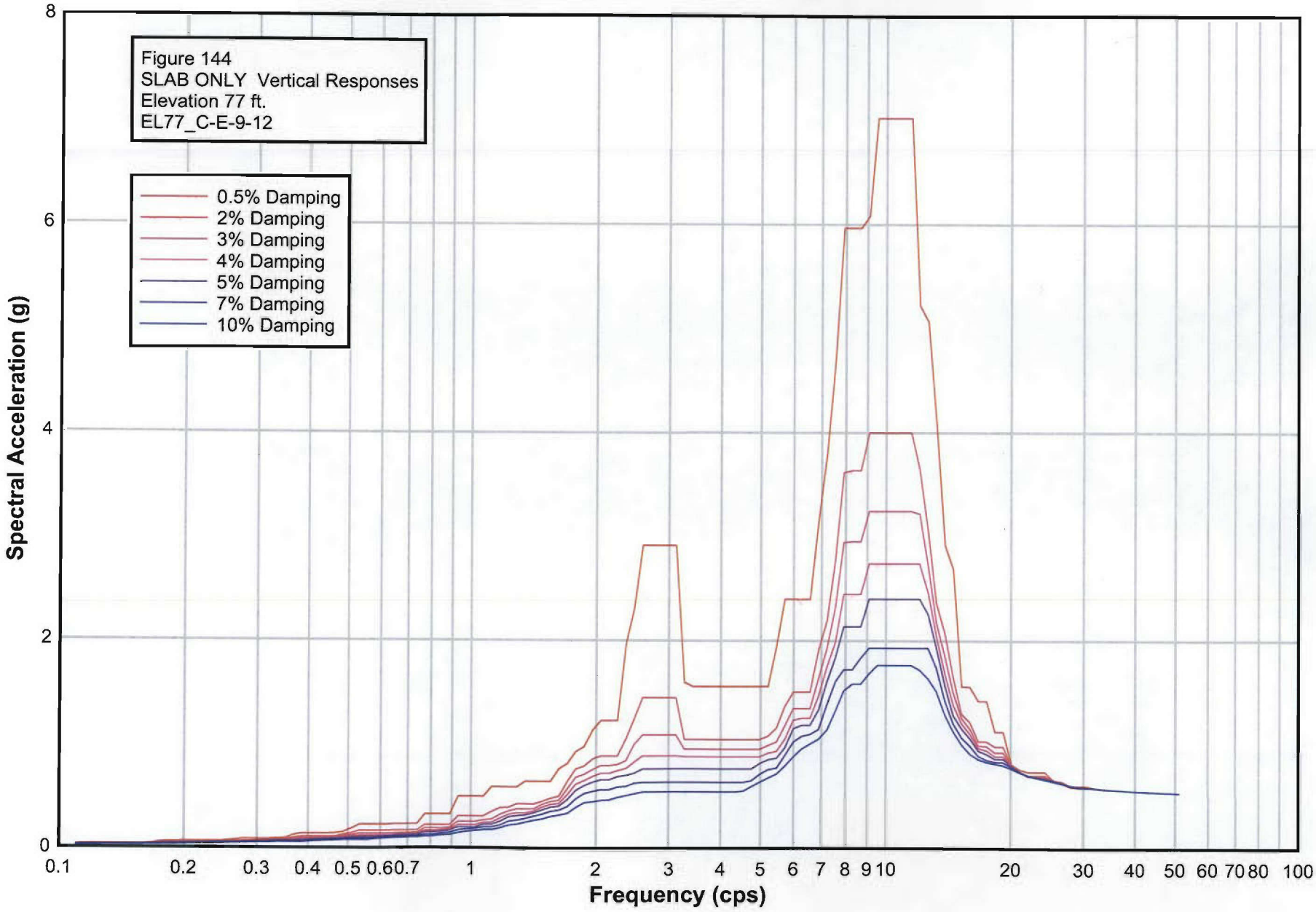
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 5



RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0331	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0398	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.056	0.1385	0.0489	0.1385	0.0449	0.1385	0.0414	0.1385	0.0384	0.1385	0.0345	0.1385	0.0304
0.1451	0.0582	0.1451	0.051	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0617	0.152	0.0547	0.152	0.0507	0.152	0.0473	0.152	0.0442	0.152	0.0392	0.152	0.0339
0.1592	0.0621	0.1592	0.0547	0.1592	0.0507	0.1592	0.0473	0.1592	0.0442	0.1592	0.0398	0.1592	0.0353
0.1668	0.0641	0.1668	0.0561	0.1668	0.0518	0.1668	0.0482	0.1668	0.0452	0.1668	0.0404	0.1668	0.0358
0.1748	0.0641	0.1748	0.0561	0.1748	0.0518	0.1748	0.0482	0.1748	0.0452	0.1748	0.0404	0.1748	0.0358
0.1831	0.0641	0.1831	0.0561	0.1831	0.0518	0.1831	0.0482	0.1831	0.0452	0.1831	0.0404	0.1831	0.037
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0496	0.1918	0.0478	0.1918	0.0446	0.1918	0.0405
0.2009	0.0642	0.2009	0.0584	0.2009	0.0559	0.2009	0.0536	0.2009	0.0514	0.2009	0.0475	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0526	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0595	0.2205	0.0573	0.2205	0.0533	0.2205	0.0485
0.231	0.0934	0.231	0.0774	0.231	0.0694	0.231	0.0631	0.231	0.0598	0.231	0.0556	0.231	0.0504
0.242	0.0934	0.242	0.0774	0.242	0.0722	0.242	0.0678	0.242	0.0638	0.242	0.0567	0.242	0.0513
0.2535	0.0934	0.2535	0.0818	0.2535	0.0771	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0554
0.2656	0.0934	0.2656	0.084	0.2656	0.0795	0.2656	0.0755	0.2656	0.0718	0.2656	0.0654	0.2656	0.0576
0.2783	0.0953	0.2783	0.0846	0.2783	0.0795	0.2783	0.0755	0.2783	0.0718	0.2783	0.0654	0.2783	0.0583
0.2915	0.1187	0.2915	0.0988	0.2915	0.0891	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0596
0.3054	0.1504	0.3054	0.1235	0.3054	0.1098	0.3054	0.0986	0.3054	0.0895	0.3054	0.0759	0.3054	0.0634
0.3199	0.1504	0.3199	0.1235	0.3199	0.1098	0.3199	0.0986	0.3199	0.0895	0.3199	0.0803	0.3199	0.0708
0.3352	0.1504	0.3352	0.1235	0.3352	0.1098	0.3352	0.0986	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1504	0.3511	0.1293	0.3511	0.1176	0.3511	0.1073	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.1683	0.3678	0.144	0.3678	0.1305	0.3678	0.1188	0.3678	0.1122	0.3678	0.1019	0.3678	0.0901
0.3853	0.1683	0.3853	0.144	0.3853	0.1348	0.3853	0.1282	0.3853	0.1222	0.3853	0.1119	0.3853	0.0995
0.4037	0.1943	0.4037	0.1602	0.4037	0.1429	0.4037	0.1309	0.4037	0.1262	0.4037	0.1173	0.4037	0.1059
0.4229	0.2369	0.4229	0.1909	0.4229	0.1723	0.4229	0.156	0.4229	0.1418	0.4229	0.1222	0.4229	0.1097
0.4431	0.3093	0.4431	0.2196	0.4431	0.1883	0.4431	0.1672	0.4431	0.1497	0.4431	0.1277	0.4431	0.1101
0.4642	0.3423	0.4642	0.2533	0.4642	0.2146	0.4642	0.186	0.4642	0.1645	0.4642	0.1352	0.4642	0.122
0.4863	0.3423	0.4863	0.2566	0.4863	0.2214	0.4863	0.1933	0.4863	0.1706	0.4863	0.1417	0.4863	0.1333
0.5094	0.353	0.5094	0.266	0.5094	0.2329	0.5094	0.2058	0.5094	0.1835	0.5094	0.1506	0.5094	0.1402

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.4107	0.5337	0.2781	0.5337	0.2329	0.5337	0.2058	0.5337	0.1835	0.5337	0.1543	0.5337	0.1408
0.5591	0.4107	0.5591	0.2781	0.5591	0.2405	0.5591	0.2157	0.5591	0.1952	0.5591	0.1655	0.5591	0.1408
0.5857	0.4107	0.5857	0.2781	0.5857	0.241	0.5857	0.2165	0.5857	0.1977	0.5857	0.1688	0.5857	0.1449
0.6136	0.4487	0.6136	0.2979	0.6136	0.2453	0.6136	0.2243	0.6136	0.2059	0.6136	0.1759	0.6136	0.1449
0.6428	0.48	0.6428	0.3562	0.6428	0.3018	0.6428	0.2625	0.6428	0.236	0.6428	0.2002	0.6428	0.1694
0.6734	0.48	0.6734	0.3562	0.6734	0.3018	0.6734	0.2625	0.6734	0.2428	0.6734	0.218	0.6734	0.1886
0.7055	0.48	0.7055	0.3562	0.7055	0.3018	0.7055	0.2625	0.7055	0.2428	0.7055	0.2198	0.7055	0.1933
0.7391	0.48	0.7391	0.3562	0.7391	0.3018	0.7391	0.27	0.7391	0.247	0.7391	0.2198	0.7391	0.1933
0.7743	0.5542	0.7743	0.3977	0.7743	0.3353	0.7743	0.2937	0.7743	0.2698	0.7743	0.2368	0.7743	0.2034
0.8111	0.5542	0.8111	0.3977	0.8111	0.3353	0.8111	0.3056	0.8111	0.2895	0.8111	0.2605	0.8111	0.2253
0.8497	0.5542	0.8497	0.3977	0.8497	0.3353	0.8497	0.3138	0.8497	0.3004	0.8497	0.2743	0.8497	0.2392
0.8902	0.5542	0.8902	0.3977	0.8902	0.3682	0.8902	0.3455	0.8902	0.3247	0.8902	0.2891	0.8902	0.2477
0.9326	0.8662	0.9326	0.5625	0.9326	0.4663	0.9326	0.4051	0.9326	0.3625	0.9326	0.3066	0.9326	0.2561
0.977	0.8662	0.977	0.5625	0.977	0.4663	0.977	0.4085	0.977	0.3679	0.977	0.311	0.977	0.2675
1.0235	0.9397	1.0235	0.6023	1.0235	0.5301	1.0235	0.485	1.0235	0.4471	1.0235	0.3868	1.0235	0.3327
1.0723	0.9397	1.0723	0.6755	1.0723	0.6093	1.0723	0.5524	1.0723	0.5049	1.0723	0.4387	1.0723	0.3788
1.1233	1.3542	1.1233	0.8403	1.1233	0.6861	1.1233	0.5909	1.1233	0.5475	1.1233	0.4739	1.1233	0.4054
1.1768	1.3542	1.1768	0.8403	1.1768	0.6861	1.1768	0.593	1.1768	0.5568	1.1768	0.4913	1.1768	0.4287
1.2328	1.3542	1.2328	0.8403	1.2328	0.7451	1.2328	0.6666	1.2328	0.5988	1.2328	0.5173	1.2328	0.4581
1.2916	1.3816	1.2916	0.9092	1.2916	0.8003	1.2916	0.709	1.2916	0.632	1.2916	0.5529	1.2916	0.4868
1.353	1.3816	1.353	0.9646	1.353	0.8003	1.353	0.709	1.353	0.6372	1.353	0.5822	1.353	0.5131
1.4175	1.4891	1.4175	0.9646	1.4175	0.8003	1.4175	0.709	1.4175	0.6669	1.4175	0.6106	1.4175	0.5387
1.485	1.4891	1.485	0.9646	1.485	0.8003	1.485	0.74	1.485	0.707	1.485	0.6462	1.485	0.5713
1.5557	1.5256	1.5557	1.0523	1.5557	0.8995	1.5557	0.7933	1.5557	0.7403	1.5557	0.6763	1.5557	0.6006
1.6298	1.5256	1.6298	1.1325	1.6298	0.9776	1.6298	0.8831	1.6298	0.8122	1.6298	0.704	1.6298	0.6204
1.7074	1.5256	1.7074	1.1325	1.7074	0.9776	1.7074	0.8831	1.7074	0.8122	1.7074	0.7191	1.7074	0.6405
1.7887	1.5537	1.7887	1.1325	1.7887	0.9776	1.7887	0.8831	1.7887	0.8122	1.7887	0.7414	1.7887	0.6653
1.8738	1.5537	1.8738	1.1325	1.8738	0.9776	1.8738	0.8911	1.8738	0.8509	1.8738	0.7792	1.8738	0.6908
1.963	1.5537	1.963	1.1325	1.963	0.9776	1.963	0.9255	1.963	0.8796	1.963	0.8012	1.963	0.7066
2.0565	1.5537	2.0565	1.1279	2.0565	0.991	2.0565	0.9319	2.0565	0.8812	2.0565	0.8012	2.0565	0.7066
2.1544	1.5537	2.1544	1.1279	2.1544	0.991	2.1544	0.9319	2.1544	0.8812	2.1544	0.8012	2.1544	0.7066
2.257	1.5743	2.257	1.1134	2.257	0.991	2.257	0.9319	2.257	0.8812	2.257	0.8012	2.257	0.7066
2.3645	1.5864	2.3645	1.1134	2.3645	0.991	2.3645	0.9319	2.3645	0.8812	2.3645	0.8012	2.3645	0.7066
2.4771	1.5864	2.4771	1.1134	2.4771	1.0817	2.4771	0.936	2.4771	0.8812	2.4771	0.7969	2.4771	0.71
2.595	1.5864	2.595	1.1134	2.595	1.0817	2.595	0.936	2.595	0.8812	2.595	0.7969	2.595	0.7136

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.5864	2.7186	1.1134	2.7186	1.0817	2.7186	0.936	2.7186	0.8812	2.7186	0.7969	2.7186	0.7147
2.848	1.5864	2.848	1.1134	2.848	1.0817	2.848	0.936	2.848	0.8812	2.848	0.7969	2.848	0.7165
2.9836	1.5864	2.9836	1.1134	2.9836	1.0817	2.9836	0.936	2.9836	0.8812	2.9836	0.7969	2.9836	0.7168
3.1257	1.5864	3.1257	1.1134	3.1257	1.0817	3.1257	0.936	3.1257	0.8812	3.1257	0.7969	3.1257	0.7168
3.2745	1.5864	3.2745	1.1134	3.2745	1.0817	3.2745	0.936	3.2745	0.8812	3.2745	0.7969	3.2745	0.7168
3.4305	1.5864	3.4305	1.1134	3.4305	1.0817	3.4305	0.936	3.4305	0.8812	3.4305	0.7969	3.4305	0.7168
3.5938	1.8535	3.5938	1.1134	3.5938	1.0817	3.5938	0.936	3.5938	0.8812	3.5938	0.7969	3.5938	0.7168
3.7649	1.8535	3.7649	1.1379	3.7649	1.0817	3.7649	0.9372	3.7649	0.8812	3.7649	0.7969	3.7649	0.7168
3.9442	1.8535	3.9442	1.1379	3.9442	1.1062	3.9442	1.0119	3.9442	0.9368	3.9442	0.822	3.9442	0.7168
4.132	1.8535	4.132	1.1379	4.132	1.1062	4.132	1.0119	4.132	0.9368	4.132	0.822	4.132	0.7133
4.3288	1.8535	4.3288	1.1379	4.3288	1.1062	4.3288	1.0119	4.3288	0.9368	4.3288	0.822	4.3288	0.7073
4.5349	1.8535	4.5349	1.1379	4.5349	1.1062	4.5349	1.0119	4.5349	0.9368	4.5349	0.822	4.5349	0.7011
4.7508	1.8535	4.7508	1.1379	4.7508	1.1062	4.7508	1.0119	4.7508	0.9368	4.7508	0.822	4.7508	0.7005
4.977	1.8535	4.977	1.1379	4.977	1.0415	4.977	0.9371	4.977	0.8856	4.977	0.7959	4.977	0.6942
5.214	1.8535	5.214	1.15	5.214	1.0415	5.214	0.9333	5.214	0.8702	5.214	0.7781	5.214	0.6697
5.4623	2.1772	5.4623	1.15	5.4623	1.0415	5.4623	0.9333	5.4623	0.8702	5.4623	0.7781	5.4623	0.6697
5.7224	2.1772	5.7224	1.2364	5.7224	1.0415	5.7224	0.9333	5.7224	0.8702	5.7224	0.7781	5.7224	0.6697
5.9948	2.1772	5.9948	1.2364	5.9948	1.0415	5.9948	0.9333	5.9948	0.8702	5.9948	0.7781	5.9948	0.6697
6.2803	2.1772	6.2803	1.2364	6.2803	1.0415	6.2803	0.9333	6.2803	0.8702	6.2803	0.7781	6.2803	0.6697
6.5793	2.1772	6.5793	1.2364	6.5793	1.0415	6.5793	0.9333	6.5793	0.8702	6.5793	0.7781	6.5793	0.6692
6.8926	2.1772	6.8926	1.2364	6.8926	1.0415	6.8926	0.9333	6.8926	0.868	6.8926	0.7639	6.8926	0.6672
7.2208	1.8137	7.2208	1.111	7.2208	1.0099	7.2208	0.9333	7.2208	0.868	7.2208	0.7639	7.2208	0.6672
7.5646	1.5583	7.5646	1	7.5646	0.9162	7.5646	0.8668	7.5646	0.8278	7.5646	0.7569	7.5646	0.6672
7.9248	1.5583	7.9248	0.9797	7.9248	0.9162	7.9248	0.8567	7.9248	0.8091	7.9248	0.7367	7.9248	0.6498
8.3022	1.5583	8.3022	0.9797	8.3022	0.9162	8.3022	0.8567	8.3022	0.8091	8.3022	0.7348	8.3022	0.6498
8.6975	1.4793	8.6975	0.9161	8.6975	0.8178	8.6975	0.7806	8.6975	0.7481	8.6975	0.6917	8.6975	0.6191
9.1116	1.4446	9.1116	0.9161	9.1116	0.8046	9.1116	0.747	9.1116	0.7178	9.1116	0.6619	9.1116	0.5921
9.5455	1.3932	9.5455	0.8381	9.5455	0.7557	9.5455	0.7218	9.5455	0.6885	9.5455	0.6299	9.5455	0.5611
10	1.3932	10	0.8381	10	0.7557	10	0.7016	10	0.6574	10	0.5866	10	0.5174
10.4762	1.3932	10.4762	0.8381	10.4762	0.7387	10.4762	0.6854	10.4762	0.6486	10.4762	0.5866	10.4762	0.5168
10.975	1.0262	10.975	0.7928	10.975	0.715	10.975	0.6537	10.975	0.6116	10.975	0.5505	10.975	0.4833
11.4976	1.0052	11.4976	0.7928	11.4976	0.715	11.4976	0.6468	11.4976	0.5901	11.4976	0.5294	11.4976	0.4672
12.045	0.9828	12.045	0.6834	12.045	0.6222	12.045	0.576	12.045	0.5483	12.045	0.5027	12.045	0.4467
12.6186	0.9828	12.6186	0.6539	12.6186	0.5915	12.6186	0.5447	12.6186	0.5232	12.6186	0.4843	12.6186	0.4381
13.2194	0.9828	13.2194	0.6159	13.2194	0.5704	13.2194	0.5426	13.2194	0.5185	13.2194	0.48	13.2194	0.4372

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.9828	13.8489	0.6008	13.8489	0.5377	13.8489	0.4983	13.8489	0.4828	13.8489	0.4541	13.8489	0.4191
14.5083	0.7664	14.5083	0.5661	14.5083	0.5231	14.5083	0.4917	14.5083	0.4685	14.5083	0.4378	14.5083	0.4132
15.1991	0.7585	15.1991	0.5661	15.1991	0.5231	15.1991	0.4917	15.1991	0.4685	15.1991	0.4378	15.1991	0.4132
15.9228	0.7585	15.9228	0.486	15.9228	0.4712	15.9228	0.4619	15.9228	0.4519	15.9228	0.4336	15.9228	0.4132
16.681	0.7406	16.681	0.486	16.681	0.4464	16.681	0.4345	16.681	0.4286	16.681	0.4167	16.681	0.4021
17.4753	0.7406	17.4753	0.486	17.4753	0.4464	17.4753	0.4302	17.4753	0.4198	17.4753	0.4072	17.4753	0.3961
18.3074	0.5678	18.3074	0.4016	18.3074	0.3905	18.3074	0.3859	18.3074	0.3808	18.3074	0.3844	18.3074	0.384
19.1791	0.5264	19.1791	0.3903	19.1791	0.3769	19.1791	0.3738	19.1791	0.3725	19.1791	0.3745	19.1791	0.3756
20.0923	0.4312	20.0923	0.3818	20.0923	0.3769	20.0923	0.3738	20.0923	0.3724	20.0923	0.3716	20.0923	0.3713
21.049	0.4312	21.049	0.3813	21.049	0.3769	21.049	0.3729	21.049	0.3697	21.049	0.3688	21.049	0.3684
22.0513	0.4312	22.0513	0.3813	22.0513	0.3769	22.0513	0.3729	22.0513	0.3697	22.0513	0.3674	22.0513	0.3663
23.1013	0.4224	23.1013	0.3813	23.1013	0.3769	23.1013	0.3729	23.1013	0.3697	23.1013	0.3657	23.1013	0.3645
24.2013	0.4224	24.2013	0.3813	24.2013	0.3769	24.2013	0.3729	24.2013	0.3697	24.2013	0.3652	24.2013	0.3626
25.3536	0.4224	25.3536	0.3813	25.3536	0.3769	25.3536	0.3729	25.3536	0.3697	25.3536	0.3652	25.3536	0.3614
26.5609	0.4224	26.5609	0.3813	26.5609	0.3769	26.5609	0.3729	26.5609	0.3697	26.5609	0.3652	26.5609	0.3614
27.8256	0.3851	27.8256	0.3813	27.8256	0.3769	27.8256	0.3729	27.8256	0.3697	27.8256	0.3652	27.8256	0.3612
29.1505	0.3851	29.1505	0.37	29.1505	0.3667	29.1505	0.3645	29.1505	0.363	29.1505	0.3606	29.1505	0.3584
30.5386	0.3591	30.5386	0.3537	30.5386	0.3541	30.5386	0.3547	30.5386	0.355	30.5386	0.355	30.5386	0.3546
31.9927	0.355	31.9927	0.3527	31.9927	0.3524	31.9927	0.3523	31.9927	0.3522	31.9927	0.352	31.9927	0.3518
33.516	0.3506	33.516	0.3507	33.516	0.3506	33.516	0.3505	33.516	0.3504	33.516	0.3503	33.516	0.3501
35.1119	0.3483	35.1119	0.3484	35.1119	0.3485	35.1119	0.3485	35.1119	0.3486	35.1119	0.3486	35.1119	0.3486
36.7838	0.3471	36.7838	0.3472	36.7838	0.3472	36.7838	0.3473	36.7838	0.3473	36.7838	0.3473	36.7838	0.3474
38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3464	38.5353	0.3464	38.5353	0.3464
40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3456	40.3702	0.3456	40.3702	0.3456
42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3449
44.3062	0.3441	44.3062	0.3441	44.3062	0.3441	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442
46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3436	46.4159	0.3436
48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343
50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3425

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0321	0.1098	0.0303	0.1098	0.0271	0.1098	0.0235
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0321	0.115	0.0303	0.115	0.0271	0.115	0.0257
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0321	0.1204	0.031	0.1204	0.0296	0.1204	0.0278
0.1262	0.0405	0.1262	0.0365	0.1262	0.0352	0.1262	0.0342	0.1262	0.0333	0.1262	0.0316	0.1262	0.0298
0.1322	0.0405	0.1322	0.0382	0.1322	0.0369	0.1322	0.0358	0.1322	0.0348	0.1322	0.0333	0.1322	0.0317
0.1385	0.0411	0.1385	0.0391	0.1385	0.0381	0.1385	0.0372	0.1385	0.0363	0.1385	0.0348	0.1385	0.0329
0.1451	0.0417	0.1451	0.0398	0.1451	0.0387	0.1451	0.0378	0.1451	0.0369	0.1451	0.0353	0.1451	0.0334
0.152	0.044	0.152	0.0402	0.152	0.0387	0.152	0.0378	0.152	0.0369	0.152	0.0353	0.152	0.0334
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.0378	0.1592	0.0369	0.1592	0.0353	0.1592	0.0334
0.1668	0.0584	0.1668	0.0506	0.1668	0.0463	0.1668	0.0426	0.1668	0.0395	0.1668	0.0353	0.1668	0.0334
0.1748	0.0644	0.1748	0.0566	0.1748	0.0522	0.1748	0.0484	0.1748	0.045	0.1748	0.0394	0.1748	0.0334
0.1831	0.0668	0.1831	0.0583	0.1831	0.0541	0.1831	0.0504	0.1831	0.047	0.1831	0.0415	0.1831	0.0356
0.1918	0.0678	0.1918	0.0585	0.1918	0.0543	0.1918	0.0507	0.1918	0.0474	0.1918	0.0418	0.1918	0.0382
0.2009	0.0697	0.2009	0.0596	0.2009	0.0543	0.2009	0.0513	0.2009	0.0485	0.2009	0.0436	0.2009	0.0411
0.2105	0.0722	0.2105	0.0619	0.2105	0.058	0.2105	0.0546	0.2105	0.0516	0.2105	0.0482	0.2105	0.0443
0.2205	0.0819	0.2205	0.071	0.2205	0.0652	0.2205	0.0601	0.2205	0.0573	0.2205	0.0529	0.2205	0.0476
0.231	0.096	0.231	0.0793	0.231	0.0704	0.231	0.0666	0.231	0.0632	0.231	0.0574	0.231	0.0529
0.242	0.0983	0.242	0.0845	0.242	0.0775	0.242	0.0718	0.242	0.0681	0.242	0.0621	0.242	0.0558
0.2535	0.1059	0.2535	0.0913	0.2535	0.0832	0.2535	0.0762	0.2535	0.0701	0.2535	0.0621	0.2535	0.0558
0.2656	0.1141	0.2656	0.0948	0.2656	0.0844	0.2656	0.0762	0.2656	0.0701	0.2656	0.0621	0.2656	0.0558
0.2783	0.1141	0.2783	0.0948	0.2783	0.0844	0.2783	0.078	0.2783	0.0739	0.2783	0.0675	0.2783	0.0605
0.2915	0.1141	0.2915	0.1004	0.2915	0.0942	0.2915	0.0888	0.2915	0.0839	0.2915	0.0759	0.2915	0.0673
0.3054	0.1177	0.3054	0.1054	0.3054	0.0985	0.3054	0.0924	0.3054	0.0871	0.3054	0.0783	0.3054	0.0694
0.3199	0.1177	0.3199	0.1054	0.3199	0.0985	0.3199	0.0924	0.3199	0.0889	0.3199	0.0837	0.3199	0.0776
0.3352	0.1177	0.3352	0.1094	0.3352	0.1051	0.3352	0.1012	0.3352	0.0975	0.3352	0.0913	0.3352	0.0842
0.3511	0.1652	0.3511	0.1285	0.3511	0.1129	0.3511	0.107	0.3511	0.103	0.3511	0.0961	0.3511	0.0879
0.3678	0.2416	0.3678	0.1833	0.3678	0.1566	0.3678	0.1365	0.3678	0.1213	0.3678	0.1003	0.3678	0.0879
0.3853	0.255	0.3853	0.187	0.3853	0.1595	0.3853	0.1386	0.3853	0.1268	0.3853	0.1091	0.3853	0.091
0.4037	0.255	0.4037	0.187	0.4037	0.1595	0.4037	0.1386	0.4037	0.1271	0.4037	0.1152	0.4037	0.1029
0.4229	0.255	0.4229	0.187	0.4229	0.1649	0.4229	0.1484	0.4229	0.1344	0.4229	0.1234	0.4229	0.1122
0.4431	0.329	0.4431	0.2338	0.4431	0.2038	0.4431	0.1815	0.4431	0.1644	0.4431	0.1404	0.4431	0.1188
0.4642	0.329	0.4642	0.2338	0.4642	0.2038	0.4642	0.1815	0.4642	0.1644	0.4642	0.1404	0.4642	0.1188
0.4863	0.329	0.4863	0.2338	0.4863	0.2038	0.4863	0.1815	0.4863	0.1644	0.4863	0.1424	0.4863	0.125
0.5094	0.329	0.5094	0.2338	0.5094	0.2038	0.5094	0.1815	0.5094	0.1644	0.5094	0.1479	0.5094	0.1295

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.3366	0.5337	0.2402	0.5337	0.2091	0.5337	0.1893	0.5337	0.1789	0.5337	0.1611	0.5337	0.1403
0.5591	0.3994	0.5591	0.2757	0.5591	0.2433	0.5591	0.2174	0.5591	0.1976	0.5591	0.173	0.5591	0.1559
0.5857	0.3994	0.5857	0.286	0.5857	0.257	0.5857	0.2329	0.5857	0.2125	0.5857	0.1854	0.5857	0.1716
0.6136	0.3994	0.6136	0.286	0.6136	0.257	0.6136	0.2329	0.6136	0.2125	0.6136	0.1986	0.6136	0.1834
0.6428	0.3994	0.6428	0.286	0.6428	0.257	0.6428	0.2329	0.6428	0.22	0.6428	0.2091	0.6428	0.1953
0.6734	0.4133	0.6734	0.286	0.6734	0.2573	0.6734	0.2433	0.6734	0.2362	0.6734	0.2239	0.6734	0.2086
0.7055	0.4133	0.7055	0.3041	0.7055	0.2763	0.7055	0.2647	0.7055	0.2547	0.7055	0.2378	0.7055	0.2184
0.7391	0.6352	0.7391	0.4157	0.7391	0.3392	0.7391	0.2923	0.7391	0.2745	0.7391	0.2448	0.7391	0.2198
0.7743	0.6352	0.7743	0.4157	0.7743	0.3392	0.7743	0.3048	0.7743	0.2868	0.7743	0.257	0.7743	0.2238
0.8111	0.6585	0.8111	0.4403	0.8111	0.3839	0.8111	0.3407	0.8111	0.3071	0.8111	0.2598	0.8111	0.2238
0.8497	0.6585	0.8497	0.4417	0.8497	0.4046	0.8497	0.3736	0.8497	0.3467	0.8497	0.3033	0.8497	0.2554
0.8902	0.6889	0.8902	0.4489	0.8902	0.4046	0.8902	0.3736	0.8902	0.3493	0.8902	0.3172	0.8902	0.2735
0.9326	0.7344	0.9326	0.5165	0.9326	0.454	0.9326	0.4087	0.9326	0.3743	0.9326	0.3257	0.9326	0.2797
0.977	0.988	0.977	0.6326	0.977	0.5215	0.977	0.4519	0.977	0.4046	0.977	0.3452	0.977	0.2961
1.0235	0.988	1.0235	0.6326	1.0235	0.56	1.0235	0.5076	1.0235	0.464	1.0235	0.3976	1.0235	0.3315
1.0723	0.988	1.0723	0.6582	1.0723	0.5892	1.0723	0.5317	1.0723	0.4833	1.0723	0.4119	1.0723	0.35
1.1233	1.2454	1.1233	0.849	1.1233	0.7113	1.1233	0.6128	1.1233	0.5401	1.1233	0.4417	1.1233	0.3579
1.1768	1.2454	1.1768	0.849	1.1768	0.7113	1.1768	0.6128	1.1768	0.5401	1.1768	0.4439	1.1768	0.3706
1.2328	1.2454	1.2328	0.9242	1.2328	0.8109	1.2328	0.7212	1.2328	0.6482	1.2328	0.5371	1.2328	0.4267
1.2916	1.2454	1.2916	1.0234	1.2916	0.889	1.2916	0.7839	1.2916	0.6998	1.2916	0.5744	1.2916	0.4525
1.353	1.3539	1.353	1.0234	1.353	0.889	1.353	0.7839	1.353	0.6998	1.353	0.5744	1.353	0.4525
1.4175	1.5778	1.4175	1.1114	1.4175	0.9435	1.4175	0.8371	1.4175	0.7571	1.4175	0.6404	1.4175	0.526
1.485	1.5778	1.485	1.1114	1.485	0.9435	1.485	0.8563	1.485	0.7981	1.485	0.6954	1.485	0.5786
1.5557	1.831	1.5557	1.163	1.5557	0.9714	1.5557	0.8673	1.5557	0.8026	1.5557	0.7075	1.5557	0.6018
1.6298	1.8691	1.6298	1.2535	1.6298	1.1171	1.6298	1.0068	1.6298	0.9124	1.6298	0.764	1.6298	0.6239
1.7074	1.8765	1.7074	1.2869	1.7074	1.2033	1.7074	1.0857	1.7074	0.9852	1.7074	0.825	1.7074	0.6665
1.7887	2.3239	1.7887	1.4211	1.7887	1.2033	1.7887	1.0857	1.7887	0.9852	1.7887	0.8339	1.7887	0.7098
1.8738	2.3239	1.8738	1.4211	1.8738	1.2033	1.8738	1.0857	1.8738	0.9852	1.8738	0.8769	1.8738	0.7461
1.963	2.3239	1.963	1.4211	1.963	1.2033	1.963	1.0919	1.963	1.0261	1.963	0.9107	1.963	0.7725
2.0565	2.3239	2.0565	1.4211	2.0565	1.2033	2.0565	1.108	2.0565	1.0451	2.0565	0.9279	2.0565	0.7815
2.1544	2.3239	2.1544	1.4211	2.1544	1.2547	2.1544	1.157	2.1544	1.0723	2.1544	0.9317	2.1544	0.8
2.257	2.1988	2.257	1.4211	2.257	1.2547	2.257	1.157	2.257	1.0723	2.257	0.9409	2.257	0.8088
2.3645	2.1988	2.3645	1.4211	2.3645	1.2547	2.3645	1.157	2.3645	1.0723	2.3645	0.9409	2.3645	0.8088
2.4771	2.1988	2.4771	1.5228	2.4771	1.2767	2.4771	1.157	2.4771	1.0723	2.4771	0.9409	2.4771	0.8088
2.595	2.0184	2.595	1.5228	2.595	1.2767	2.595	1.157	2.595	1.0723	2.595	0.9409	2.595	0.8088

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.0184	2.7186	1.5228	2.7186	1.2767	2.7186	1.1545	2.7186	1.0625	2.7186	0.9409	2.7186	0.8088
2.848	2.0184	2.848	1.5228	2.848	1.2767	2.848	1.1545	2.848	1.0625	2.848	0.9399	2.848	0.7962
2.9836	2.0184	2.9836	1.5228	2.9836	1.2767	2.9836	1.1545	2.9836	1.0577	2.9836	0.9132	2.9836	0.7656
3.1257	2.0184	3.1257	1.3112	3.1257	1.0446	3.1257	0.9606	3.1257	0.9074	3.1257	0.8181	3.1257	0.713
3.2745	1.9901	3.2745	1.1665	3.2745	1.0008	3.2745	0.9022	3.2745	0.8233	3.2745	0.724	3.2745	0.6592
3.4305	1.6248	3.4305	0.9896	3.4305	0.8906	3.4305	0.8152	3.4305	0.7692	3.4305	0.6853	3.4305	0.6237
3.5938	1.6248	3.5938	0.9457	3.5938	0.8524	3.5938	0.8006	3.5938	0.7536	3.5938	0.6771	3.5938	0.5975
3.7649	1.6248	3.7649	0.9457	3.7649	0.8524	3.7649	0.8006	3.7649	0.7536	3.7649	0.6771	3.7649	0.5975
3.9442	1.6248	3.9442	0.9457	3.9442	0.8524	3.9442	0.8006	3.9442	0.7536	3.9442	0.6771	3.9442	0.5975
4.132	1.6248	4.132	0.9457	4.132	0.8524	4.132	0.8006	4.132	0.7536	4.132	0.6771	4.132	0.5975
4.3288	1.6248	4.3288	0.9457	4.3288	0.8524	4.3288	0.8006	4.3288	0.7536	4.3288	0.6771	4.3288	0.5975
4.5349	1.6248	4.5349	0.9457	4.5349	0.8524	4.5349	0.8006	4.5349	0.7536	4.5349	0.6771	4.5349	0.5975
4.7508	1.6248	4.7508	1.023	4.7508	0.9155	4.7508	0.8228	4.7508	0.7536	4.7508	0.6771	4.7508	0.5975
4.977	1.6248	4.977	1.191	4.977	1.0728	4.977	0.9637	4.977	0.875	4.977	0.745	4.977	0.6365
5.214	1.8207	5.214	1.191	5.214	1.0728	5.214	0.9637	5.214	0.8921	5.214	0.7878	5.214	0.6715
5.4623	1.8207	5.4623	1.191	5.4623	1.0728	5.4623	0.9637	5.4623	0.8921	5.4623	0.7878	5.4623	0.6865
5.7224	2.9149	5.7224	1.406	5.7224	1.1098	5.7224	1.0876	5.7224	0.9363	5.7224	0.7878	5.7224	0.6865
5.9948	2.9149	5.9948	1.406	5.9948	1.1098	5.9948	1.0876	5.9948	0.9363	5.9948	0.7878	5.9948	0.6865
6.2803	2.9149	6.2803	1.406	6.2803	1.1098	6.2803	1.0876	6.2803	0.9363	6.2803	0.7878	6.2803	0.6865
6.5793	2.9149	6.5793	1.406	6.5793	1.1098	6.5793	1.0876	6.5793	0.9363	6.5793	0.7865	6.5793	0.6865
6.8926	2.9149	6.8926	1.406	6.8926	1.1098	6.8926	1.0876	6.8926	0.9363	6.8926	0.7764	6.8926	0.6824
7.2208	2.4166	7.2208	1.406	7.2208	1.1098	7.2208	1.0322	7.2208	0.91	7.2208	0.7328	7.2208	0.6531
7.5646	2.1048	7.5646	1.2631	7.5646	1.0869	7.5646	0.9603	7.5646	0.8589	7.5646	0.7046	7.5646	0.6405
7.9248	1.7239	7.9248	0.9022	7.9248	0.8254	7.9248	0.7828	7.9248	0.7487	7.9248	0.69	7.9248	0.6204
8.3022	1.7239	8.3022	0.8525	8.3022	0.7912	8.3022	0.7524	8.3022	0.7205	8.3022	0.6659	8.3022	0.5997
8.6975	1.504	8.6975	0.8462	8.6975	0.7536	8.6975	0.7096	8.6975	0.6756	8.6975	0.623	8.6975	0.5646
9.1116	1.504	9.1116	0.8004	9.1116	0.6637	9.1116	0.629	9.1116	0.6017	9.1116	0.5591	9.1116	0.5122
9.5455	1.504	9.5455	0.8004	9.5455	0.6572	9.5455	0.5918	9.5455	0.5627	9.5455	0.5217	9.5455	0.4858
10	1.0253	10	0.666	10	0.6127	10	0.583	10	0.5582	10	0.5217	10	0.4858
10.4762	0.9769	10.4762	0.6615	10.4762	0.5918	10.4762	0.5361	10.4762	0.5247	10.4762	0.5026	10.4762	0.4744
10.975	0.9769	10.975	0.6615	10.975	0.5918	10.975	0.534	10.975	0.5032	10.975	0.4818	10.975	0.4602
11.4976	0.9769	11.4976	0.6615	11.4976	0.5918	11.4976	0.534	11.4976	0.5032	11.4976	0.462	11.4976	0.4453
12.045	0.767	12.045	0.5857	12.045	0.5386	12.045	0.5021	12.045	0.4738	12.045	0.4546	12.045	0.4387
12.6186	0.767	12.6186	0.5489	12.6186	0.495	12.6186	0.4679	12.6186	0.4603	12.6186	0.4466	12.6186	0.4298
13.2194	0.767	13.2194	0.5489	13.2194	0.495	13.2194	0.451	13.2194	0.4374	13.2194	0.429	13.2194	0.4161

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6514	13.8489	0.4765	13.8489	0.4405	13.8489	0.4243	13.8489	0.419	13.8489	0.4135	13.8489	0.4051
14.5083	0.6514	14.5083	0.4285	14.5083	0.4183	14.5083	0.4123	14.5083	0.4084	14.5083	0.4025	14.5083	0.3951
15.1991	0.6514	15.1991	0.4129	15.1991	0.4055	15.1991	0.4006	15.1991	0.3964	15.1991	0.391	15.1991	0.3853
15.9228	0.6514	15.9228	0.4115	15.9228	0.3896	15.9228	0.3881	15.9228	0.3858	15.9228	0.3814	15.9228	0.3762
16.681	0.6514	16.681	0.4115	16.681	0.3838	16.681	0.3759	16.681	0.3725	16.681	0.3708	16.681	0.3672
17.4753	0.6514	17.4753	0.4115	17.4753	0.3838	17.4753	0.3759	17.4753	0.3708	17.4753	0.3648	17.4753	0.3594
18.3074	0.5354	18.3074	0.3939	18.3074	0.3776	18.3074	0.3669	18.3074	0.3599	18.3074	0.3548	18.3074	0.3499
19.1791	0.5354	19.1791	0.3649	19.1791	0.3569	19.1791	0.3525	19.1791	0.3497	19.1791	0.3451	19.1791	0.3398
20.0923	0.5354	20.0923	0.3485	20.0923	0.3462	20.0923	0.3439	20.0923	0.3419	20.0923	0.3384	20.0923	0.3345
21.049	0.4241	21.049	0.3474	21.049	0.3402	21.049	0.3366	21.049	0.3343	21.049	0.3315	21.049	0.3287
22.0513	0.4	22.0513	0.3347	22.0513	0.3262	22.0513	0.3257	22.0513	0.3254	22.0513	0.3244	22.0513	0.323
23.1013	0.4	23.1013	0.3234	23.1013	0.32	23.1013	0.3187	23.1013	0.3182	23.1013	0.3181	23.1013	0.3178
24.2013	0.4	24.2013	0.3226	24.2013	0.3166	24.2013	0.3146	24.2013	0.3137	24.2013	0.3135	24.2013	0.3139
25.3536	0.3478	25.3536	0.3226	25.3536	0.3166	25.3536	0.3146	25.3536	0.3137	25.3536	0.3126	25.3536	0.3115
26.5609	0.3478	26.5609	0.3226	26.5609	0.3166	26.5609	0.3135	26.5609	0.3116	26.5609	0.3097	26.5609	0.3087
27.8256	0.3208	27.8256	0.3129	27.8256	0.3089	27.8256	0.3065	27.8256	0.305	27.8256	0.304	27.8256	0.3052
29.1505	0.3199	29.1505	0.3129	29.1505	0.3089	29.1505	0.3065	29.1505	0.305	29.1505	0.3036	29.1505	0.3035
30.5386	0.3182	30.5386	0.308	30.5386	0.3061	30.5386	0.3051	30.5386	0.3044	30.5386	0.3036	30.5386	0.3031
31.9927	0.3051	31.9927	0.3042	31.9927	0.304	31.9927	0.3036	31.9927	0.3033	31.9927	0.3028	31.9927	0.3023
33.516	0.3029	33.516	0.3021	33.516	0.3019	33.516	0.3018	33.516	0.3016	33.516	0.3014	33.516	0.3011
35.1119	0.3005	35.1119	0.3004	35.1119	0.3004	35.1119	0.3003	35.1119	0.3002	35.1119	0.3	35.1119	0.2998
36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2988	36.7838	0.2988	36.7838	0.2987
38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2976
40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2966
42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958
44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295
46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943
48.626	0.2936	48.626	0.2936	48.626	0.2936	48.626	0.2937	48.626	0.2937	48.626	0.2937	48.626	0.2937
50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.2931

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0332	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0397	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.0559	0.1385	0.0488	0.1385	0.0448	0.1385	0.0414	0.1385	0.0384	0.1385	0.0344	0.1385	0.0304
0.1451	0.058	0.1451	0.0509	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0615	0.152	0.0545	0.152	0.0506	0.152	0.0472	0.152	0.0441	0.152	0.0391	0.152	0.0338
0.1592	0.0621	0.1592	0.0545	0.1592	0.0506	0.1592	0.0472	0.1592	0.0442	0.1592	0.0397	0.1592	0.0352
0.1668	0.064	0.1668	0.056	0.1668	0.0518	0.1668	0.0482	0.1668	0.0451	0.1668	0.0404	0.1668	0.0357
0.1748	0.064	0.1748	0.056	0.1748	0.0518	0.1748	0.0482	0.1748	0.0451	0.1748	0.0404	0.1748	0.0357
0.1831	0.064	0.1831	0.056	0.1831	0.0518	0.1831	0.0482	0.1831	0.0451	0.1831	0.0404	0.1831	0.0369
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0495	0.1918	0.0478	0.1918	0.0446	0.1918	0.0404
0.2009	0.0642	0.2009	0.0583	0.2009	0.0558	0.2009	0.0535	0.2009	0.0514	0.2009	0.0474	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0525	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0596	0.2205	0.0573	0.2205	0.0533	0.2205	0.0484
0.231	0.0935	0.231	0.0775	0.231	0.0695	0.231	0.0631	0.231	0.0599	0.231	0.0556	0.231	0.0504
0.242	0.0935	0.242	0.0775	0.242	0.0723	0.242	0.0679	0.242	0.0638	0.242	0.0567	0.242	0.0514
0.2535	0.0935	0.2535	0.0818	0.2535	0.0772	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0555
0.2656	0.0935	0.2656	0.084	0.2656	0.0796	0.2656	0.0756	0.2656	0.0719	0.2656	0.0655	0.2656	0.0577
0.2783	0.0955	0.2783	0.0848	0.2783	0.0796	0.2783	0.0756	0.2783	0.0719	0.2783	0.0655	0.2783	0.0582
0.2915	0.1189	0.2915	0.0989	0.2915	0.0892	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0594
0.3054	0.1507	0.3054	0.1237	0.3054	0.1099	0.3054	0.0987	0.3054	0.0896	0.3054	0.076	0.3054	0.0634
0.3199	0.1507	0.3199	0.1237	0.3199	0.1099	0.3199	0.0987	0.3199	0.0896	0.3199	0.0803	0.3199	0.0708
0.3352	0.1507	0.3352	0.1237	0.3352	0.1099	0.3352	0.0987	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1507	0.3511	0.129	0.3511	0.1173	0.3511	0.1071	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.168	0.3678	0.1439	0.3678	0.1304	0.3678	0.1187	0.3678	0.1121	0.3678	0.1018	0.3678	0.0898
0.3853	0.168	0.3853	0.1439	0.3853	0.1347	0.3853	0.128	0.3853	0.1219	0.3853	0.1116	0.3853	0.0992
0.4037	0.1945	0.4037	0.1602	0.4037	0.1429	0.4037	0.1308	0.4037	0.126	0.4037	0.1171	0.4037	0.1057
0.4229	0.2372	0.4229	0.1909	0.4229	0.1723	0.4229	0.1559	0.4229	0.1417	0.4229	0.122	0.4229	0.1096
0.4431	0.3089	0.4431	0.2194	0.4431	0.1882	0.4431	0.1671	0.4431	0.1497	0.4431	0.1276	0.4431	0.11
0.4642	0.3419	0.4642	0.2528	0.4642	0.2142	0.4642	0.1857	0.4642	0.1641	0.4642	0.1349	0.4642	0.1216
0.4863	0.3419	0.4863	0.2563	0.4863	0.2211	0.4863	0.193	0.4863	0.1703	0.4863	0.1414	0.4863	0.1328
0.5094	0.353	0.5094	0.2661	0.5094	0.233	0.5094	0.2059	0.5094	0.1835	0.5094	0.1502	0.5094	0.1397

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.5337	0.4106	0.5337	0.2779	0.5337	0.233	0.5337	0.2059	0.5337	0.1835	0.5337	0.1544	0.5337	0.1404
0.5591	0.4106	0.5591	0.2779	0.5591	0.2404	0.5591	0.2154	0.5591	0.1953	0.5591	0.1658	0.5591	0.1404
0.5857	0.4106	0.5857	0.2779	0.5857	0.241	0.5857	0.2165	0.5857	0.1978	0.5857	0.1688	0.5857	0.1445
0.6136	0.4488	0.6136	0.2977	0.6136	0.2451	0.6136	0.2241	0.6136	0.2057	0.6136	0.1756	0.6136	0.1445
0.6428	0.4791	0.6428	0.3556	0.6428	0.3014	0.6428	0.2618	0.6428	0.2352	0.6428	0.1994	0.6428	0.1686
0.6734	0.4791	0.6734	0.3556	0.6734	0.3014	0.6734	0.2618	0.6734	0.2421	0.6734	0.2173	0.6734	0.188
0.7055	0.4791	0.7055	0.3556	0.7055	0.3014	0.7055	0.2618	0.7055	0.2421	0.7055	0.2195	0.7055	0.1931
0.7391	0.4791	0.7391	0.3556	0.7391	0.3014	0.7391	0.2701	0.7391	0.2472	0.7391	0.2195	0.7391	0.1931
0.7743	0.5541	0.7743	0.3973	0.7743	0.3347	0.7743	0.2931	0.7743	0.2689	0.7743	0.2358	0.7743	0.2025
0.8111	0.5541	0.8111	0.3973	0.8111	0.3347	0.8111	0.3047	0.8111	0.2886	0.8111	0.2598	0.8111	0.2246
0.8497	0.5541	0.8497	0.3973	0.8497	0.3347	0.8497	0.3132	0.8497	0.2998	0.8497	0.2736	0.8497	0.2386
0.8902	0.5541	0.8902	0.3973	0.8902	0.3675	0.8902	0.345	0.8902	0.3244	0.8902	0.2889	0.8902	0.2477
0.9326	0.8648	0.9326	0.5613	0.9326	0.4653	0.9326	0.4044	0.9326	0.3621	0.9326	0.3063	0.9326	0.256
0.977	0.8648	0.977	0.5613	0.977	0.4653	0.977	0.4068	0.977	0.3663	0.977	0.3097	0.977	0.2664
1.0235	0.9377	1.0235	0.6004	1.0235	0.529	1.0235	0.4839	1.0235	0.4459	1.0235	0.3855	1.0235	0.3313
1.0723	0.9377	1.0723	0.6734	1.0723	0.6074	1.0723	0.5507	1.0723	0.5031	1.0723	0.4376	1.0723	0.3769
1.1233	1.3513	1.1233	0.8372	1.1233	0.6837	1.1233	0.5879	1.1233	0.5445	1.1233	0.4714	1.1233	0.403
1.1768	1.3513	1.1768	0.8372	1.1768	0.6837	1.1768	0.5898	1.1768	0.5538	1.1768	0.4886	1.1768	0.4271
1.2328	1.3513	1.2328	0.8372	1.2328	0.7428	1.2328	0.6644	1.2328	0.5968	1.2328	0.5156	1.2328	0.4567
1.2916	1.3513	1.2916	0.9066	1.2916	0.7979	1.2916	0.7068	1.2916	0.63	1.2916	0.5518	1.2916	0.4861
1.353	1.3513	1.353	0.9591	1.353	0.7979	1.353	0.7068	1.353	0.6351	1.353	0.5804	1.353	0.5117
1.4175	1.4799	1.4175	0.9591	1.4175	0.7979	1.4175	0.7068	1.4175	0.665	1.4175	0.609	1.4175	0.5377
1.485	1.4799	1.485	0.9591	1.485	0.7979	1.485	0.7368	1.485	0.7041	1.485	0.6435	1.485	0.5691
1.5557	1.5088	1.5557	1.0439	1.5557	0.892	1.5557	0.7863	1.5557	0.7357	1.5557	0.6723	1.5557	0.5965
1.6298	1.5088	1.6298	1.1255	1.6298	0.9707	1.6298	0.8769	1.6298	0.8063	1.6298	0.699	1.6298	0.6152
1.7074	1.5088	1.7074	1.1255	1.7074	0.9707	1.7074	0.8769	1.7074	0.8063	1.7074	0.7147	1.7074	0.6346
1.7887	1.5088	1.7887	1.1255	1.7887	0.9707	1.7887	0.8769	1.7887	0.8063	1.7887	0.7339	1.7887	0.6585
1.8738	1.5088	1.8738	1.1255	1.8738	0.9707	1.8738	0.882	1.8738	0.8424	1.8738	0.7711	1.8738	0.6831
1.963	1.5088	1.963	1.1255	1.963	0.9707	1.963	0.9172	1.963	0.8715	1.963	0.7938	1.963	0.6992
2.0565	1.5088	2.0565	1.1158	2.0565	0.9661	2.0565	0.9247	2.0565	0.8739	2.0565	0.7938	2.0565	0.6992
2.1544	1.5088	2.1544	1.1158	2.1544	0.9661	2.1544	0.9247	2.1544	0.8739	2.1544	0.7938	2.1544	0.6992
2.257	1.5515	2.257	1.0506	2.257	0.9661	2.257	0.9247	2.257	0.8739	2.257	0.7938	2.257	0.6992
2.3645	1.569	2.3645	1.0506	2.3645	0.9661	2.3645	0.9247	2.3645	0.8739	2.3645	0.7938	2.3645	0.6992
2.4771	1.569	2.4771	1.0506	2.4771	0.9467	2.4771	0.9247	2.4771	0.8739	2.4771	0.7899	2.4771	0.6957
2.595	1.569	2.595	1.0506	2.595	0.9467	2.595	0.9247	2.595	0.8664	2.595	0.7597	2.595	0.6957

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.569	2.7186	1.0506	2.7186	0.9467	2.7186	0.9247	2.7186	0.8664	2.7186	0.7597	2.7186	0.6957
2.848	1.569	2.848	1.0506	2.848	0.9467	2.848	0.9247	2.848	0.8664	2.848	0.7597	2.848	0.6957
2.9836	1.569	2.9836	1.0506	2.9836	0.9467	2.9836	0.9247	2.9836	0.8664	2.9836	0.7597	2.9836	0.6957
3.1257	1.569	3.1257	1.0506	3.1257	0.9467	3.1257	0.9247	3.1257	0.8664	3.1257	0.7597	3.1257	0.6957
3.2745	1.569	3.2745	1.0506	3.2745	0.9467	3.2745	0.9247	3.2745	0.8664	3.2745	0.7597	3.2745	0.6957
3.4305	1.569	3.4305	1.0506	3.4305	0.9467	3.4305	0.9247	3.4305	0.8664	3.4305	0.7597	3.4305	0.6957
3.5938	1.6861	3.5938	1.0506	3.5938	0.9467	3.5938	0.9247	3.5938	0.8664	3.5938	0.7597	3.5938	0.6957
3.7649	1.6861	3.7649	1.1653	3.7649	0.9467	3.7649	0.9247	3.7649	0.8664	3.7649	0.7597	3.7649	0.6927
3.9442	1.6861	3.9442	1.1653	3.9442	0.955	3.9442	0.9362	3.9442	0.8664	3.9442	0.7597	3.9442	0.6927
4.132	1.6861	4.132	1.1653	4.132	0.955	4.132	0.9362	4.132	0.8664	4.132	0.7597	4.132	0.6862
4.3288	1.6861	4.3288	1.1653	4.3288	0.955	4.3288	0.9362	4.3288	0.8664	4.3288	0.7597	4.3288	0.6787
4.5349	1.6861	4.5349	1.1653	4.5349	0.955	4.5349	0.9362	4.5349	0.8664	4.5349	0.7597	4.5349	0.6657
4.7508	1.6861	4.7508	1.1423	4.7508	0.955	4.7508	0.9362	4.7508	0.8664	4.7508	0.7597	4.7508	0.6479
4.977	1.6861	4.977	1.1193	4.977	0.9483	4.977	0.8597	4.977	0.8132	4.977	0.7328	4.977	0.642
5.214	1.6861	5.214	1.1193	5.214	0.9483	5.214	0.8597	5.214	0.8132	5.214	0.7297	5.214	0.6348
5.4623	2.0932	5.4623	1.1193	5.4623	0.9483	5.4623	0.8597	5.4623	0.8132	5.4623	0.7297	5.4623	0.6348
5.7224	2.0932	5.7224	1.1193	5.7224	0.9483	5.7224	0.8597	5.7224	0.8132	5.7224	0.7297	5.7224	0.6348
5.9948	2.0932	5.9948	1.1193	5.9948	0.9483	5.9948	0.8597	5.9948	0.8132	5.9948	0.7297	5.9948	0.6348
6.2803	2.0932	6.2803	1.1193	6.2803	0.9483	6.2803	0.8597	6.2803	0.8132	6.2803	0.7297	6.2803	0.6348
6.5793	2.0932	6.5793	1.1193	6.5793	0.9483	6.5793	0.8597	6.5793	0.8132	6.5793	0.7297	6.5793	0.6316
6.8926	2.0932	6.8926	1.1193	6.8926	0.9483	6.8926	0.8564	6.8926	0.793	6.8926	0.7028	6.8926	0.6276
7.2208	1.7932	7.2208	1.1022	7.2208	0.9239	7.2208	0.8428	7.2208	0.7865	7.2208	0.6959	7.2208	0.6276
7.5646	1.3461	7.5646	0.9535	7.5646	0.851	7.5646	0.7985	7.5646	0.758	7.5646	0.6959	7.5646	0.6276
7.9248	1.2781	7.9248	0.9188	7.9248	0.851	7.9248	0.7913	7.9248	0.7507	7.9248	0.6862	7.9248	0.6173
8.3022	1.2719	8.3022	0.9188	8.3022	0.851	8.3022	0.7909	8.3022	0.7422	8.3022	0.6675	8.3022	0.6003
8.6975	1.0732	8.6975	0.8155	8.6975	0.7297	8.6975	0.6993	8.6975	0.6707	8.6975	0.6168	8.6975	0.5555
9.1116	1.0732	9.1116	0.8155	9.1116	0.7297	9.1116	0.6674	9.1116	0.6426	9.1116	0.594	9.1116	0.5293
9.5455	1.0632	9.5455	0.8155	9.5455	0.7297	9.5455	0.665	9.5455	0.6109	9.5455	0.548	9.5455	0.5075
10	1.0632	10	0.8155	10	0.7297	10	0.665	10	0.6109	10	0.5416	10	0.4824
10.4762	1.0632	10.4762	0.8155	10.4762	0.7297	10.4762	0.665	10.4762	0.6109	10.4762	0.5374	10.4762	0.4716
10.975	0.9814	10.975	0.7906	10.975	0.7235	10.975	0.665	10.975	0.6109	10.975	0.5256	10.975	0.4557
11.4976	0.9814	11.4976	0.7906	11.4976	0.7215	11.4976	0.6575	11.4976	0.603	11.4976	0.5189	11.4976	0.4453
12.045	0.8026	12.045	0.6724	12.045	0.6069	12.045	0.558	12.045	0.5202	12.045	0.4674	12.045	0.4231
12.6186	0.7876	12.6186	0.6185	12.6186	0.566	12.6186	0.5184	12.6186	0.5012	12.6186	0.4674	12.6186	0.4231
13.2194	0.7876	13.2194	0.6185	13.2194	0.566	13.2194	0.5166	13.2194	0.4839	13.2194	0.4493	13.2194	0.4086

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.7876	13.8489	0.5849	13.8489	0.5168	13.8489	0.473	13.8489	0.458	13.8489	0.43	13.8489	0.3946
14.5083	0.7113	14.5083	0.5199	14.5083	0.4734	14.5083	0.4593	14.5083	0.4453	14.5083	0.4196	14.5083	0.3874
15.1991	0.7113	15.1991	0.4913	15.1991	0.4581	15.1991	0.4351	15.1991	0.4191	15.1991	0.3992	15.1991	0.3844
15.9228	0.7113	15.9228	0.4804	15.9228	0.433	15.9228	0.4151	15.9228	0.4052	15.9228	0.3955	15.9228	0.3844
16.681	0.7113	16.681	0.4804	16.681	0.433	16.681	0.4067	16.681	0.3923	16.681	0.3827	16.681	0.3771
17.4753	0.7113	17.4753	0.4804	17.4753	0.433	17.4753	0.4067	17.4753	0.3916	17.4753	0.3767	17.4753	0.3679
18.3074	0.6514	18.3074	0.4041	18.3074	0.3855	18.3074	0.3753	18.3074	0.367	18.3074	0.3555	18.3074	0.3535
19.1791	0.6514	19.1791	0.4041	19.1791	0.3855	19.1791	0.3753	19.1791	0.367	19.1791	0.3553	19.1791	0.3456
20.0923	0.5299	20.0923	0.4041	20.0923	0.3855	20.0923	0.3753	20.0923	0.367	20.0923	0.3553	20.0923	0.3452
21.049	0.5299	21.049	0.4041	21.049	0.3747	21.049	0.3613	21.049	0.3553	21.049	0.3481	21.049	0.3452
22.0513	0.5299	22.0513	0.3915	22.0513	0.3712	22.0513	0.3613	22.0513	0.3553	22.0513	0.3481	22.0513	0.3444
23.1013	0.5299	23.1013	0.3915	23.1013	0.3712	23.1013	0.3613	23.1013	0.3553	23.1013	0.3481	23.1013	0.3443
24.2013	0.4644	24.2013	0.3604	24.2013	0.357	24.2013	0.354	24.2013	0.3517	24.2013	0.348	24.2013	0.3443
25.3536	0.4644	25.3536	0.359	25.3536	0.3564	25.3536	0.354	25.3536	0.3517	25.3536	0.348	25.3536	0.3443
26.5609	0.4644	26.5609	0.3553	26.5609	0.3521	26.5609	0.3495	26.5609	0.3474	26.5609	0.3447	26.5609	0.3427
27.8256	0.3574	27.8256	0.3553	27.8256	0.3521	27.8256	0.3495	27.8256	0.3474	27.8256	0.3447	27.8256	0.3422
29.1505	0.3464	29.1505	0.3425	29.1505	0.3411	29.1505	0.3414	29.1505	0.3414	29.1505	0.341	29.1505	0.34
30.5386	0.3447	30.5386	0.3414	30.5386	0.3407	30.5386	0.3401	30.5386	0.3398	30.5386	0.3394	30.5386	0.3388
31.9927	0.3401	31.9927	0.3414	31.9927	0.3407	31.9927	0.3401	31.9927	0.3396	31.9927	0.3389	31.9927	0.3381
33.516	0.3388	33.516	0.3387	33.516	0.3386	33.516	0.3384	33.516	0.3381	33.516	0.3377	33.516	0.3372
35.1119	0.3367	35.1119	0.3367	35.1119	0.3367	35.1119	0.3366	35.1119	0.3365	35.1119	0.3364	35.1119	0.3361
36.7838	0.3355	36.7838	0.3355	36.7838	0.3354	36.7838	0.3354	36.7838	0.3354	36.7838	0.3353	36.7838	0.3352
38.5353	0.3346	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3344	38.5353	0.3343
40.3702	0.3338	40.3702	0.3338	40.3702	0.3338	40.3702	0.3337	40.3702	0.3337	40.3702	0.3337	40.3702	0.3336
42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.333	42.2924	0.333
44.3062	0.3325	44.3062	0.3325	44.3062	0.3325	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324
46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319
48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314
50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0322	0.1098	0.0303	0.1098	0.0272	0.1098	0.0237
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0322	0.115	0.0303	0.115	0.0273	0.115	0.0262
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0322	0.1204	0.0311	0.1204	0.0299	0.1204	0.0284
0.1262	0.0405	0.1262	0.0365	0.1262	0.0353	0.1262	0.0344	0.1262	0.0336	0.1262	0.032	0.1262	0.0302
0.1322	0.0405	0.1322	0.0383	0.1322	0.0371	0.1322	0.0361	0.1322	0.0351	0.1322	0.0337	0.1322	0.0321
0.1385	0.0413	0.1385	0.0394	0.1385	0.0384	0.1385	0.0375	0.1385	0.0366	0.1385	0.0351	0.1385	0.0332
0.1451	0.0418	0.1451	0.04	0.1451	0.0389	0.1451	0.038	0.1451	0.0371	0.1451	0.0355	0.1451	0.0336
0.152	0.0439	0.152	0.0401	0.152	0.0389	0.152	0.038	0.152	0.0371	0.152	0.0355	0.152	0.0336
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.038	0.1592	0.0371	0.1592	0.0355	0.1592	0.0336
0.1668	0.0585	0.1668	0.0506	0.1668	0.0463	0.1668	0.0427	0.1668	0.0396	0.1668	0.0355	0.1668	0.0336
0.1748	0.0645	0.1748	0.0567	0.1748	0.0523	0.1748	0.0485	0.1748	0.0451	0.1748	0.0395	0.1748	0.0336
0.1831	0.0669	0.1831	0.0583	0.1831	0.0542	0.1831	0.0505	0.1831	0.0472	0.1831	0.0416	0.1831	0.0355
0.1918	0.0679	0.1918	0.0586	0.1918	0.0544	0.1918	0.0508	0.1918	0.0476	0.1918	0.0419	0.1918	0.0382
0.2009	0.0698	0.2009	0.0597	0.2009	0.0545	0.2009	0.0516	0.2009	0.049	0.2009	0.0443	0.2009	0.0414
0.2105	0.0723	0.2105	0.0622	0.2105	0.0584	0.2105	0.055	0.2105	0.0518	0.2105	0.0484	0.2105	0.045
0.2205	0.082	0.2205	0.0711	0.2205	0.0653	0.2205	0.0602	0.2205	0.0577	0.2205	0.0535	0.2205	0.0484
0.231	0.0961	0.231	0.0794	0.231	0.0704	0.231	0.0665	0.231	0.0631	0.231	0.0585	0.231	0.0537
0.242	0.0988	0.242	0.0847	0.242	0.0776	0.242	0.0728	0.242	0.069	0.242	0.0628	0.242	0.0563
0.2535	0.1063	0.2535	0.0917	0.2535	0.0836	0.2535	0.0767	0.2535	0.0707	0.2535	0.0628	0.2535	0.0563
0.2656	0.1141	0.2656	0.0947	0.2656	0.0842	0.2656	0.0767	0.2656	0.0707	0.2656	0.0628	0.2656	0.0563
0.2783	0.1141	0.2783	0.0947	0.2783	0.0842	0.2783	0.0782	0.2783	0.0745	0.2783	0.0685	0.2783	0.0622
0.2915	0.1141	0.2915	0.1015	0.2915	0.0954	0.2915	0.09	0.2915	0.0852	0.2915	0.0773	0.2915	0.0688
0.3054	0.1186	0.3054	0.1064	0.3054	0.0994	0.3054	0.0934	0.3054	0.0881	0.3054	0.0794	0.3054	0.0724
0.3199	0.1186	0.3199	0.1064	0.3199	0.0994	0.3199	0.0935	0.3199	0.0908	0.3199	0.0861	0.3199	0.0806
0.3352	0.1186	0.3352	0.1112	0.3352	0.107	0.3352	0.1032	0.3352	0.0998	0.3352	0.0939	0.3352	0.0869
0.3511	0.1662	0.3511	0.1299	0.3511	0.1149	0.3511	0.109	0.3511	0.1051	0.3511	0.0982	0.3511	0.0901
0.3678	0.2421	0.3678	0.1836	0.3678	0.1568	0.3678	0.137	0.3678	0.1222	0.3678	0.1018	0.3678	0.0901
0.3853	0.2561	0.3853	0.1879	0.3853	0.1604	0.3853	0.14	0.3853	0.1286	0.3853	0.1111	0.3853	0.0931
0.4037	0.2561	0.4037	0.1879	0.4037	0.1604	0.4037	0.14	0.4037	0.1295	0.4037	0.1181	0.4037	0.1058
0.4229	0.2561	0.4229	0.1879	0.4229	0.1659	0.4229	0.1491	0.4229	0.1363	0.4229	0.1255	0.4229	0.1134
0.4431	0.3305	0.4431	0.236	0.4431	0.2057	0.4431	0.183	0.4431	0.1656	0.4431	0.1411	0.4431	0.1189
0.4642	0.3305	0.4642	0.236	0.4642	0.2057	0.4642	0.183	0.4642	0.1656	0.4642	0.1411	0.4642	0.1191
0.4863	0.3305	0.4863	0.236	0.4863	0.2057	0.4863	0.183	0.4863	0.1656	0.4863	0.1434	0.4863	0.1257
0.5094	0.3305	0.5094	0.236	0.5094	0.2057	0.5094	0.183	0.5094	0.1656	0.5094	0.1478	0.5094	0.1307

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.3378	0.5337	0.2419	0.5337	0.2105	0.5337	0.192	0.5337	0.1816	0.5337	0.1635	0.5337	0.142
0.5591	0.4058	0.5591	0.2801	0.5591	0.2478	0.5591	0.2214	0.5591	0.2006	0.5591	0.1739	0.5591	0.1574
0.5857	0.4058	0.5857	0.2915	0.5857	0.2621	0.5857	0.2377	0.5857	0.2172	0.5857	0.1878	0.5857	0.1747
0.6136	0.4058	0.6136	0.2915	0.6136	0.2621	0.6136	0.2377	0.6136	0.2172	0.6136	0.2028	0.6136	0.1889
0.6428	0.4058	0.6428	0.2915	0.6428	0.2621	0.6428	0.2377	0.6428	0.2257	0.6428	0.2153	0.6428	0.201
0.6734	0.4176	0.6734	0.2915	0.6734	0.2621	0.6734	0.2496	0.6734	0.2424	0.6734	0.229	0.6734	0.2118
0.7055	0.4176	0.7055	0.3079	0.7055	0.2812	0.7055	0.2691	0.7055	0.2585	0.7055	0.2404	0.7055	0.2196
0.7391	0.6488	0.7391	0.4251	0.7391	0.3472	0.7391	0.3008	0.7391	0.2825	0.7391	0.2517	0.7391	0.2204
0.7743	0.6488	0.7743	0.4251	0.7743	0.3472	0.7743	0.3112	0.7743	0.2928	0.7743	0.2621	0.7743	0.2275
0.8111	0.6742	0.8111	0.456	0.8111	0.398	0.8111	0.3532	0.8111	0.3182	0.8111	0.2686	0.8111	0.2275
0.8497	0.6742	0.8497	0.456	0.8497	0.4173	0.8497	0.3854	0.8497	0.3578	0.8497	0.3131	0.8497	0.2643
0.8902	0.6985	0.8902	0.456	0.8902	0.4173	0.8902	0.3854	0.8902	0.3632	0.8902	0.3306	0.8902	0.2863
0.9326	0.7612	0.9326	0.5383	0.9326	0.474	0.9326	0.427	0.9326	0.3916	0.9326	0.3416	0.9326	0.2945
0.977	1.0292	0.977	0.6621	0.977	0.5476	0.977	0.4756	0.977	0.4268	0.977	0.3654	0.977	0.3149
1.0235	1.0292	1.0235	0.6621	1.0235	0.5897	1.0235	0.5355	1.0235	0.4903	1.0235	0.4219	1.0235	0.3545
1.0723	1.0292	1.0723	0.7033	1.0723	0.6314	1.0723	0.5714	1.0723	0.5209	1.0723	0.4434	1.0723	0.372
1.1233	1.3137	1.1233	0.8999	1.1233	0.7545	1.1233	0.6502	1.1233	0.5729	1.1233	0.4678	1.1233	0.3909
1.1768	1.3137	1.1768	0.8999	1.1768	0.7545	1.1768	0.6502	1.1768	0.5729	1.1768	0.4701	1.1768	0.3999
1.2328	1.3137	1.2328	0.9857	1.2328	0.8645	1.2328	0.7685	1.2328	0.691	1.2328	0.5723	1.2328	0.4547
1.2916	1.3137	1.2916	1.0916	1.2916	0.9479	1.2916	0.8357	1.2916	0.746	1.2916	0.6124	1.2916	0.4829
1.353	1.4089	1.353	1.0916	1.353	0.9479	1.353	0.8357	1.353	0.746	1.353	0.6124	1.353	0.4909
1.4175	1.729	1.4175	1.213	1.4175	1.0369	1.4175	0.9214	1.4175	0.8354	1.4175	0.709	1.4175	0.5885
1.485	1.729	1.485	1.213	1.485	1.0369	1.485	0.9542	1.485	0.8918	1.485	0.778	1.485	0.6506
1.5557	2.0447	1.5557	1.2726	1.5557	1.0865	1.5557	0.9691	1.5557	0.8918	1.5557	0.789	1.5557	0.6724
1.6298	2.0861	1.6298	1.4394	1.6298	1.2876	1.6298	1.162	1.6298	1.057	1.6298	0.8882	1.6298	0.7096
1.7074	2.1771	1.7074	1.5528	1.7074	1.397	1.7074	1.2648	1.7074	1.1508	1.7074	0.9654	1.7074	0.7705
1.7887	2.7163	1.7887	1.7697	1.7887	1.4137	1.7887	1.2648	1.7887	1.1508	1.7887	0.9665	1.7887	0.8229
1.8738	2.7163	1.8738	1.7697	1.8738	1.4137	1.8738	1.2648	1.8738	1.1545	1.8738	1.0307	1.8738	0.8752
1.963	2.7163	1.963	1.7697	1.963	1.4137	1.963	1.296	1.963	1.2176	1.963	1.0825	1.963	0.9154
2.0565	2.7163	2.0565	1.7697	2.0565	1.4137	2.0565	1.332	2.0565	1.2549	2.0565	1.1146	2.0565	0.9373
2.1544	2.7163	2.1544	1.7697	2.1544	1.5305	2.1544	1.4116	2.1544	1.3081	2.1544	1.1549	2.1544	1.0039
2.257	2.6722	2.257	1.7165	2.257	1.5315	2.257	1.4444	2.257	1.3645	2.257	1.2229	2.257	1.0568
2.3645	2.6722	2.3645	1.7165	2.3645	1.5867	2.3645	1.4923	2.3645	1.409	2.3645	1.2586	2.3645	1.0784
2.4771	2.6722	2.4771	1.7165	2.4771	1.6824	2.4771	1.5289	2.4771	1.409	2.4771	1.2586	2.4771	1.0784
2.595	2.6722	2.595	1.7165	2.595	1.6824	2.595	1.5289	2.595	1.409	2.595	1.2586	2.595	1.0784

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.6722	2.7186	1.7165	2.7186	1.6824	2.7186	1.5289	2.7186	1.409	2.7186	1.2586	2.7186	1.0784
2.848	2.6722	2.848	1.7165	2.848	1.6824	2.848	1.5289	2.848	1.409	2.848	1.2586	2.848	1.0784
2.9836	2.6722	2.9836	1.7165	2.9836	1.6824	2.9836	1.5289	2.9836	1.4086	2.9836	1.2312	2.9836	1.0531
3.1257	2.6722	3.1257	1.7165	3.1257	1.4081	3.1257	1.249	3.1257	1.1684	3.1257	1.0862	3.1257	0.9782
3.2745	2.6722	3.2745	1.5912	3.2745	1.3838	3.2745	1.249	3.2745	1.1419	3.2745	0.9784	3.2745	0.8937
3.4305	2.4258	3.4305	1.3157	3.4305	1.2378	3.4305	1.1421	3.4305	1.0837	3.4305	0.977	3.4305	0.843
3.5938	2.4258	3.5938	1.3154	3.5938	1.2378	3.5938	1.1238	3.5938	1.0502	3.5938	0.961	3.5938	0.8401
3.7649	2.4258	3.7649	1.3154	3.7649	1.2378	3.7649	1.1238	3.7649	1.0494	3.7649	0.9359	3.7649	0.8192
3.9442	2.4258	3.9442	1.3154	3.9442	1.2378	3.9442	1.1098	3.9442	1.0413	3.9442	0.9304	3.9442	0.8192
4.132	2.4258	4.132	1.3154	4.132	1.2378	4.132	1.1098	4.132	1.0413	4.132	0.9304	4.132	0.8192
4.3288	2.4258	4.3288	1.3154	4.3288	1.2378	4.3288	1.069	4.3288	0.9785	4.3288	0.8739	4.3288	0.7783
4.5349	2.4258	4.5349	1.3154	4.5349	1.1837	4.5349	1.0539	4.5349	0.9618	4.5349	0.8274	4.5349	0.6979
4.7508	1.9701	4.7508	1.0977	4.7508	1.0417	4.7508	0.9199	4.7508	0.872	4.7508	0.7786	4.7508	0.6734
4.977	1.9701	4.977	1.0977	4.977	1.0417	4.977	0.8879	4.977	0.839	4.977	0.7604	4.977	0.6667
5.214	1.9701	5.214	1.0977	5.214	0.9918	5.214	0.8856	5.214	0.8097	5.214	0.7297	5.214	0.6413
5.4623	1.4677	5.4623	0.9173	5.4623	0.8237	5.4623	0.7835	5.4623	0.7434	5.4623	0.6763	5.4623	0.5975
5.7224	1.3373	5.7224	0.8915	5.7224	0.8183	5.7224	0.7788	5.7224	0.7416	5.7224	0.6761	5.7224	0.5967
5.9948	1.186	5.9948	0.8915	5.9948	0.8073	5.9948	0.7595	5.9948	0.7218	5.9948	0.6568	5.9948	0.5793
6.2803	1.186	6.2803	0.8742	6.2803	0.7554	6.2803	0.7165	6.2803	0.6807	6.2803	0.6166	6.2803	0.5424
6.5793	1.1682	6.5793	0.7476	6.5793	0.6961	6.5793	0.6558	6.5793	0.6206	6.5793	0.564	6.5793	0.5054
6.8926	1.1682	6.8926	0.6278	6.8926	0.5979	6.8926	0.5695	6.8926	0.5433	6.8926	0.5064	6.8926	0.4688
7.2208	1.1682	7.2208	0.6161	7.2208	0.5433	7.2208	0.5063	7.2208	0.4825	7.2208	0.4512	7.2208	0.4513
7.5646	1.1682	7.5646	0.6161	7.5646	0.5366	7.5646	0.5063	7.5646	0.4825	7.5646	0.4512	7.5646	0.4437
7.9248	1.1682	7.9248	0.5885	7.9248	0.535	7.9248	0.5063	7.9248	0.4825	7.9248	0.4463	7.9248	0.4346
8.3022	1.1682	8.3022	0.5885	8.3022	0.535	8.3022	0.5063	8.3022	0.4825	8.3022	0.4463	8.3022	0.4294
8.6975	0.9253	8.6975	0.5885	8.6975	0.535	8.6975	0.5063	8.6975	0.4825	8.6975	0.4463	8.6975	0.4203
9.1116	0.9253	9.1116	0.5885	9.1116	0.5144	9.1116	0.4908	9.1116	0.4754	9.1116	0.4448	9.1116	0.4063
9.5455	0.9253	9.5455	0.5885	9.5455	0.5144	9.5455	0.4844	9.5455	0.4667	9.5455	0.4352	9.5455	0.3996
10	0.7548	10	0.5609	10	0.5124	10	0.4745	10	0.4536	10	0.4198	10	0.3951
10.4762	0.7548	10.4762	0.5609	10.4762	0.5124	10.4762	0.4741	10.4762	0.444	10.4762	0.4021	10.4762	0.3892
10.975	0.7267	10.975	0.5609	10.975	0.5124	10.975	0.4741	10.975	0.444	10.975	0.4021	10.975	0.3809
11.4976	0.6866	11.4976	0.5132	11.4976	0.4705	11.4976	0.4496	11.4976	0.4297	11.4976	0.3972	11.4976	0.3755
12.045	0.6015	12.045	0.4763	12.045	0.4518	12.045	0.4317	12.045	0.415	12.045	0.3892	12.045	0.3696
12.6186	0.6015	12.6186	0.41	12.6186	0.3905	12.6186	0.381	12.6186	0.372	12.6186	0.3644	12.6186	0.3629
13.2194	0.6015	13.2194	0.41	13.2194	0.3885	13.2194	0.3742	13.2194	0.365	13.2194	0.3591	13.2194	0.3578

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6015	13.8489	0.41	13.8489	0.3885	13.8489	0.3742	13.8489	0.365	13.8489	0.3547	13.8489	0.3535
14.5083	0.6015	14.5083	0.41	14.5083	0.3885	14.5083	0.3742	14.5083	0.365	14.5083	0.3547	14.5083	0.3503
15.1991	0.6015	15.1991	0.41	15.1991	0.3885	15.1991	0.3742	15.1991	0.365	15.1991	0.3547	15.1991	0.3482
15.9228	0.6015	15.9228	0.41	15.9228	0.3885	15.9228	0.3742	15.9228	0.365	15.9228	0.3547	15.9228	0.3479
16.681	0.6015	16.681	0.41	16.681	0.3885	16.681	0.3742	16.681	0.365	16.681	0.3547	16.681	0.3479
17.4753	0.6015	17.4753	0.41	17.4753	0.3885	17.4753	0.3742	17.4753	0.365	17.4753	0.3547	17.4753	0.3479
18.3074	0.5419	18.3074	0.3695	18.3074	0.363	18.3074	0.3584	18.3074	0.3547	18.3074	0.3494	18.3074	0.3448
19.1791	0.5419	19.1791	0.3591	19.1791	0.352	19.1791	0.348	19.1791	0.3453	19.1791	0.3436	19.1791	0.3423
20.0923	0.5419	20.0923	0.3591	20.0923	0.352	20.0923	0.348	20.0923	0.3453	20.0923	0.3422	20.0923	0.3402
21.049	0.521	21.049	0.3591	21.049	0.352	21.049	0.348	21.049	0.3453	21.049	0.3422	21.049	0.3398
22.0513	0.3887	22.0513	0.3591	22.0513	0.352	22.0513	0.348	22.0513	0.3453	22.0513	0.3422	22.0513	0.3398
23.1013	0.3887	23.1013	0.3591	23.1013	0.352	23.1013	0.348	23.1013	0.3453	23.1013	0.3422	23.1013	0.3398
24.2013	0.3887	24.2013	0.3591	24.2013	0.352	24.2013	0.348	24.2013	0.3453	24.2013	0.3422	24.2013	0.3398
25.3536	0.3465	25.3536	0.3405	25.3536	0.3398	25.3536	0.3398	25.3536	0.34	25.3536	0.3397	25.3536	0.3389
26.5609	0.3465	26.5609	0.3401	26.5609	0.3394	26.5609	0.339	26.5609	0.3387	26.5609	0.3384	26.5609	0.3378
27.8256	0.3465	27.8256	0.3401	27.8256	0.3394	27.8256	0.3389	27.8256	0.3385	27.8256	0.3378	27.8256	0.337
29.1505	0.3442	29.1505	0.3397	29.1505	0.3388	29.1505	0.3383	29.1505	0.3378	29.1505	0.3372	29.1505	0.3367
30.5386	0.3442	30.5386	0.3397	30.5386	0.3388	30.5386	0.3383	30.5386	0.3378	30.5386	0.3372	30.5386	0.3366
31.9927	0.3385	31.9927	0.3371	31.9927	0.3371	31.9927	0.337	31.9927	0.3369	31.9927	0.3366	31.9927	0.3363
33.516	0.3362	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.336	33.516	0.3358
35.1119	0.3356	35.1119	0.3356	35.1119	0.3356	35.1119	0.3355	35.1119	0.3355	35.1119	0.3354	35.1119	0.3353
36.7838	0.3351	36.7838	0.3351	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.3349
38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3345	38.5353	0.3345
40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342
42.2924	0.334	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3338
44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336
46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333
48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331
50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3329

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0291	0.1098	0.0261	0.1098	0.0245	0.1098	0.0231	0.1098	0.0223	0.1098	0.0216	0.1098	0.0208
0.115	0.0308	0.115	0.0261	0.115	0.0245	0.115	0.0235	0.115	0.0231	0.115	0.0225	0.115	0.0216
0.1204	0.0313	0.1204	0.0263	0.1204	0.0247	0.1204	0.0243	0.1204	0.0238	0.1204	0.0231	0.1204	0.0222
0.1262	0.0313	0.1262	0.027	0.1262	0.0257	0.1262	0.0247	0.1262	0.0243	0.1262	0.0235	0.1262	0.0225
0.1322	0.0313	0.1322	0.0271	0.1322	0.0258	0.1322	0.0248	0.1322	0.0244	0.1322	0.0236	0.1322	0.0228
0.1385	0.0313	0.1385	0.0277	0.1385	0.0266	0.1385	0.0256	0.1385	0.0246	0.1385	0.0237	0.1385	0.0229
0.1451	0.0316	0.1451	0.0295	0.1451	0.0282	0.1451	0.0271	0.1451	0.026	0.1451	0.0241	0.1451	0.0229
0.152	0.0321	0.152	0.03	0.152	0.0287	0.152	0.0275	0.152	0.0264	0.152	0.0244	0.152	0.0229
0.1592	0.0331	0.1592	0.0312	0.1592	0.0301	0.1592	0.029	0.1592	0.028	0.1592	0.0266	0.1592	0.0247
0.1668	0.0367	0.1668	0.0325	0.1668	0.0315	0.1668	0.0306	0.1668	0.0297	0.1668	0.0282	0.1668	0.0261
0.1748	0.0508	0.1748	0.0427	0.1748	0.0386	0.1748	0.0351	0.1748	0.0322	0.1748	0.0288	0.1748	0.0268
0.1831	0.0587	0.1831	0.0493	0.1831	0.0443	0.1831	0.0399	0.1831	0.0363	0.1831	0.0306	0.1831	0.0273
0.1918	0.0587	0.1918	0.0493	0.1918	0.0443	0.1918	0.0399	0.1918	0.0363	0.1918	0.0306	0.1918	0.0279
0.2009	0.0587	0.2009	0.0493	0.2009	0.0443	0.2009	0.0399	0.2009	0.0363	0.2009	0.0331	0.2009	0.0302
0.2105	0.0587	0.2105	0.0493	0.2105	0.0443	0.2105	0.0404	0.2105	0.0389	0.2105	0.0364	0.2105	0.0329
0.2205	0.0587	0.2205	0.0493	0.2205	0.0457	0.2205	0.0431	0.2205	0.041	0.2205	0.038	0.2205	0.0341
0.231	0.0587	0.231	0.0493	0.231	0.046	0.231	0.044	0.231	0.0422	0.231	0.0389	0.231	0.0357
0.242	0.0587	0.242	0.0509	0.242	0.0487	0.242	0.0466	0.242	0.0447	0.242	0.0413	0.242	0.0372
0.2535	0.065	0.2535	0.0574	0.2535	0.053	0.2535	0.049	0.2535	0.0455	0.2535	0.0413	0.2535	0.0388
0.2656	0.0733	0.2656	0.0587	0.2656	0.0535	0.2656	0.049	0.2656	0.0455	0.2656	0.0438	0.2656	0.0418
0.2783	0.0818	0.2783	0.06	0.2783	0.0535	0.2783	0.0509	0.2783	0.0496	0.2783	0.0471	0.2783	0.044
0.2915	0.0818	0.2915	0.062	0.2915	0.0583	0.2915	0.0549	0.2915	0.052	0.2915	0.0487	0.2915	0.0449
0.3054	0.0818	0.3054	0.0666	0.3054	0.0624	0.3054	0.0586	0.3054	0.0551	0.3054	0.05	0.3054	0.0464
0.3199	0.0818	0.3199	0.0705	0.3199	0.0662	0.3199	0.0624	0.3199	0.0595	0.3199	0.0545	0.3199	0.0485
0.3352	0.0876	0.3352	0.0771	0.3352	0.0711	0.3352	0.0669	0.3352	0.0636	0.3352	0.058	0.3352	0.0513
0.3511	0.0909	0.3511	0.0809	0.3511	0.0752	0.3511	0.0701	0.3511	0.0656	0.3511	0.058	0.3511	0.0513
0.3678	0.1218	0.3678	0.0952	0.3678	0.0823	0.3678	0.0721	0.3678	0.0656	0.3678	0.058	0.3678	0.0513
0.3853	0.1363	0.3853	0.1059	0.3853	0.0921	0.3853	0.081	0.3853	0.0722	0.3853	0.0592	0.3853	0.0513
0.4037	0.1363	0.4037	0.1059	0.4037	0.0921	0.4037	0.0824	0.4037	0.0764	0.4037	0.0665	0.4037	0.0575
0.4229	0.1363	0.4229	0.1059	0.4229	0.0921	0.4229	0.0855	0.4229	0.0804	0.4229	0.0715	0.4229	0.0617
0.4431	0.1363	0.4431	0.1059	0.4431	0.094	0.4431	0.0891	0.4431	0.0845	0.4431	0.0764	0.4431	0.0665
0.4642	0.1376	0.4642	0.1059	0.4642	0.0981	0.4642	0.0923	0.4642	0.0869	0.4642	0.0774	0.4642	0.0681
0.4863	0.1484	0.4863	0.1248	0.4863	0.1118	0.4863	0.1006	0.4863	0.091	0.4863	0.0833	0.4863	0.0742
0.5094	0.1825	0.5094	0.1398	0.5094	0.1233	0.5094	0.11	0.5094	0.0992	0.5094	0.0876	0.5094	0.0762

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.2221	0.5337	0.1614	0.5337	0.1351	0.5337	0.1155	0.5337	0.1031	0.5337	0.0876	0.5337	0.0762
0.5591	0.2221	0.5591	0.1614	0.5591	0.1351	0.5591	0.1155	0.5591	0.1031	0.5591	0.0896	0.5591	0.0765
0.5857	0.2221	0.5857	0.1614	0.5857	0.1351	0.5857	0.1155	0.5857	0.1037	0.5857	0.096	0.5857	0.0844
0.6136	0.2221	0.6136	0.1614	0.6136	0.1351	0.6136	0.1189	0.6136	0.1123	0.6136	0.1017	0.6136	0.0888
0.6428	0.2266	0.6428	0.1631	0.6428	0.1365	0.6428	0.1189	0.6428	0.1143	0.6428	0.1052	0.6428	0.0925
0.6734	0.2266	0.6734	0.1631	0.6734	0.1399	0.6734	0.1301	0.6734	0.1222	0.6734	0.1096	0.6734	0.0952
0.7055	0.2266	0.7055	0.1631	0.7055	0.1399	0.7055	0.1301	0.7055	0.1222	0.7055	0.1116	0.7055	0.0981
0.7391	0.2266	0.7391	0.1631	0.7391	0.143	0.7391	0.1345	0.7391	0.1261	0.7391	0.1118	0.7391	0.0981
0.7743	0.3193	0.7743	0.2152	0.7743	0.1824	0.7743	0.16	0.7743	0.144	0.7743	0.1231	0.7743	0.1049
0.8111	0.3193	0.8111	0.2152	0.8111	0.1824	0.8111	0.16	0.8111	0.144	0.8111	0.1231	0.8111	0.107
0.8497	0.3193	0.8497	0.2152	0.8497	0.1824	0.8497	0.1667	0.8497	0.154	0.8497	0.1353	0.8497	0.1176
0.8902	0.3193	0.8902	0.2152	0.8902	0.1916	0.8902	0.1759	0.8902	0.1631	0.8902	0.1433	0.8902	0.1231
0.9326	0.4908	0.9326	0.3016	0.9326	0.248	0.9326	0.2165	0.9326	0.1943	0.9326	0.165	0.9326	0.1395
0.977	0.4908	0.977	0.3016	0.977	0.248	0.977	0.2165	0.977	0.1943	0.977	0.1747	0.977	0.1534
1.0235	0.4908	1.0235	0.3016	1.0235	0.248	1.0235	0.2165	1.0235	0.1945	1.0235	0.1819	1.0235	0.1618
1.0723	0.4908	1.0723	0.3016	1.0723	0.2621	1.0723	0.2405	1.0723	0.2228	1.0723	0.1964	1.0723	0.1694
1.1233	0.5832	1.1233	0.3442	1.1233	0.2717	1.1233	0.2405	1.1233	0.2228	1.1233	0.1964	1.1233	0.1694
1.1768	0.5832	1.1768	0.383	1.1768	0.3194	1.1768	0.2821	1.1768	0.2518	1.1768	0.2159	1.1768	0.1892
1.2328	0.5832	1.2328	0.3885	1.2328	0.3512	1.2328	0.3199	1.2328	0.2945	1.2328	0.2544	1.2328	0.2149
1.2916	0.5832	1.2916	0.422	1.2916	0.3725	1.2916	0.3349	1.2916	0.3073	1.2916	0.2656	1.2916	0.2265
1.353	0.641	1.353	0.422	1.353	0.3725	1.353	0.3349	1.353	0.3156	1.353	0.2834	1.353	0.2456
1.4175	0.641	1.4175	0.422	1.4175	0.3743	1.4175	0.354	1.4175	0.3356	1.4175	0.3035	1.4175	0.2655
1.485	0.641	1.485	0.4469	1.485	0.4167	1.485	0.3896	1.485	0.3647	1.485	0.3228	1.485	0.2776
1.5557	0.641	1.5557	0.4762	1.5557	0.4448	1.5557	0.4175	1.5557	0.3928	1.5557	0.3511	1.5557	0.3012
1.6298	0.7619	1.6298	0.4978	1.6298	0.4567	1.6298	0.4269	1.6298	0.4034	1.6298	0.3639	1.6298	0.3171
1.7074	0.8123	1.7074	0.641	1.7074	0.5693	1.7074	0.5131	1.7074	0.4665	1.7074	0.3982	1.7074	0.3348
1.7887	0.9259	1.7887	0.7593	1.7887	0.678	1.7887	0.6117	1.7887	0.5548	1.7887	0.4723	1.7887	0.3909
1.8738	0.974	1.8738	0.7878	1.8738	0.708	1.8738	0.6465	1.8738	0.6002	1.8738	0.5234	1.8738	0.4347
1.963	1.1341	1.963	0.8565	1.963	0.7538	1.963	0.6879	1.963	0.6337	1.963	0.5452	1.963	0.4471
2.0565	1.2264	2.0565	0.8865	2.0565	0.7941	2.0565	0.7185	2.0565	0.6577	2.0565	0.5616	2.0565	0.4596
2.1544	1.2264	2.1544	0.8865	2.1544	0.7941	2.1544	0.7185	2.1544	0.6577	2.1544	0.5616	2.1544	0.4626
2.257	1.2264	2.257	0.8865	2.257	0.8031	2.257	0.7429	2.257	0.6869	2.257	0.5894	2.257	0.49
2.3645	1.9612	2.3645	1.0488	2.3645	0.8406	2.3645	0.7656	2.3645	0.7007	2.3645	0.5944	2.3645	0.5058
2.4771	2.3059	2.4771	1.2401	2.4771	0.9963	2.4771	0.8264	2.4771	0.721	2.4771	0.6253	2.4771	0.5241
2.595	2.9123	2.595	1.4466	2.595	1.0857	2.595	0.885	2.595	0.7616	2.595	0.6332	2.595	0.5408

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.9123	2.7186	1.4466	2.7186	1.0857	2.7186	0.885	2.7186	0.7616	2.7186	0.6332	2.7186	0.5408
2.848	2.9123	2.848	1.4466	2.848	1.0857	2.848	0.885	2.848	0.7616	2.848	0.6332	2.848	0.5408
2.9836	2.9123	2.9836	1.4466	2.9836	1.0857	2.9836	0.885	2.9836	0.7616	2.9836	0.6332	2.9836	0.5408
3.1257	2.9123	3.1257	1.4466	3.1257	1.0857	3.1257	0.885	3.1257	0.7616	3.1257	0.6332	3.1257	0.5408
3.2745	1.5957	3.2745	1.0453	3.2745	0.9516	3.2745	0.877	3.2745	0.7616	3.2745	0.6332	3.2745	0.5408
3.4305	1.5557	3.4305	1.0453	3.4305	0.9516	3.4305	0.877	3.4305	0.7616	3.4305	0.6332	3.4305	0.5408
3.5938	1.5557	3.5938	1.0453	3.5938	0.9516	3.5938	0.877	3.5938	0.7616	3.5938	0.6332	3.5938	0.5408
3.7649	1.5557	3.7649	1.0453	3.7649	0.9516	3.7649	0.877	3.7649	0.7616	3.7649	0.6332	3.7649	0.5408
3.9442	1.5557	3.9442	1.0453	3.9442	0.9516	3.9442	0.877	3.9442	0.7616	3.9442	0.6332	3.9442	0.5408
4.132	1.5557	4.132	1.0453	4.132	0.9516	4.132	0.877	4.132	0.7616	4.132	0.6332	4.132	0.5408
4.3288	1.5557	4.3288	1.0453	4.3288	0.9516	4.3288	0.877	4.3288	0.7616	4.3288	0.6332	4.3288	0.5408
4.5349	1.5557	4.5349	1.0453	4.5349	0.9516	4.5349	0.877	4.5349	0.7616	4.5349	0.6332	4.5349	0.5497
4.7508	1.5557	4.7508	1.0453	4.7508	0.9516	4.7508	0.877	4.7508	0.7616	4.7508	0.6485	4.7508	0.5929
4.977	1.5557	4.977	1.0453	4.977	0.9516	4.977	0.877	4.977	0.8145	4.977	0.7118	4.977	0.6356
5.214	1.5557	5.214	1.0774	5.214	0.9882	5.214	0.9135	5.214	0.8523	5.214	0.7561	5.214	0.6761
5.4623	1.9438	5.4623	1.1547	5.4623	1.0213	5.4623	0.9313	5.4623	0.8675	5.4623	0.7713	5.4623	0.7153
5.7224	2.3998	5.7224	1.3627	5.7224	1.1739	5.7224	1.0456	5.7224	0.9654	5.7224	0.8922	5.7224	0.7914
5.9948	2.3998	5.9948	1.5021	5.9948	1.3429	5.9948	1.2312	5.9948	1.1504	5.9948	1.0241	5.9948	0.8812
6.2803	2.3998	6.2803	1.5021	6.2803	1.3429	6.2803	1.2512	6.2803	1.1843	6.2803	1.0774	6.2803	0.9578
6.5793	2.3998	6.5793	1.5021	6.5793	1.3429	6.5793	1.2512	6.5793	1.1843	6.5793	1.0975	6.5793	1.0045
6.8926	3.1388	6.8926	1.9009	6.8926	1.6283	6.8926	1.4593	6.8926	1.3283	6.8926	1.142	6.8926	1.0496
7.2208	3.805	7.2208	2.1966	7.2208	1.9285	7.2208	1.7483	7.2208	1.606	7.2208	1.3871	7.2208	1.1403
7.5646	4.7167	7.5646	2.7844	7.5646	2.3279	7.5646	1.9882	7.5646	1.8385	7.5646	1.605	7.5646	1.3242
7.9248	5.9632	7.9248	3.6137	7.9248	2.9424	7.9248	2.4467	7.9248	2.1357	7.9248	1.7196	7.9248	1.5158
8.3022	5.9632	8.3022	3.6314	8.3022	2.9505	8.3022	2.4467	8.3022	2.1357	8.3022	1.7196	8.3022	1.5826
8.6975	5.9632	8.6975	3.6314	8.6975	2.9505	8.6975	2.4467	8.6975	2.1357	8.6975	1.8333	8.6975	1.5826
9.1116	6.0802	9.1116	3.994	9.1116	3.2398	9.1116	2.7398	9.1116	2.4034	9.1116	1.9297	9.1116	1.6805
9.5455	7.0171	9.5455	3.994	9.5455	3.2398	9.5455	2.7398	9.5455	2.4034	9.5455	1.9297	9.5455	1.7636
10	7.0171	10	3.994	10	3.2398	10	2.7398	10	2.4034	10	1.9297	10	1.7636
10.4762	7.0171	10.4762	3.994	10.4762	3.2398	10.4762	2.7398	10.4762	2.4034	10.4762	1.9297	10.4762	1.7636
10.975	7.0171	10.975	3.994	10.975	3.2398	10.975	2.7398	10.975	2.4034	10.975	1.9297	10.975	1.7636
11.4976	7.0171	11.4976	3.994	11.4976	3.2398	11.4976	2.7398	11.4976	2.4034	11.4976	1.9297	11.4976	1.7636
12.045	5.2219	12.045	3.6403	12.045	3.2162	12.045	2.7398	12.045	2.4034	12.045	1.9297	12.045	1.7187
12.6186	5.0673	12.6186	3.0551	12.6186	2.7236	12.6186	2.4671	12.6186	2.2578	12.6186	1.9297	12.6186	1.6337
13.2194	4.0804	13.2194	2.3646	13.2194	2.1777	13.2194	2.0501	13.2194	1.9348	13.2194	1.7387	13.2194	1.5139

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	2.9165	13.8489	2.0669	13.8489	1.847	13.8489	1.6801	13.8489	1.5651	13.8489	1.4188	13.8489	1.2854
14.5083	2.6881	14.5083	1.6507	14.5083	1.5024	14.5083	1.3808	14.5083	1.2797	14.5083	1.2024	14.5083	1.1256
15.1991	1.5581	15.1991	1.2904	15.1991	1.2517	15.1991	1.2013	15.1991	1.1519	15.1991	1.0646	15.1991	0.999
15.9228	1.5542	15.9228	1.2147	15.9228	1.1521	15.9228	1.1013	15.9228	1.0583	15.9228	0.9867	15.9228	0.9108
16.681	1.4175	16.681	1.0273	16.681	0.9864	16.681	0.9638	16.681	0.9391	16.681	0.889	16.681	0.8585
17.4753	1.4175	17.4753	1.0273	17.4753	0.9836	17.4753	0.9427	17.4753	0.9076	17.4753	0.8505	17.4753	0.8328
18.3074	1.1231	18.3074	0.9783	18.3074	0.923	18.3074	0.8869	18.3074	0.8621	18.3074	0.8332	18.3074	0.8176
19.1791	1.1231	19.1791	0.9783	19.1791	0.923	19.1791	0.8869	19.1791	0.8621	19.1791	0.8298	19.1791	0.8009
20.0923	0.8104	20.0923	0.8039	20.0923	0.8062	20.0923	0.8037	20.0923	0.7987	20.0923	0.7864	20.0923	0.7691
21.049	0.7585	21.049	0.7386	21.049	0.7381	21.049	0.7388	21.049	0.7391	21.049	0.738	21.049	0.7329
22.0513	0.7383	22.0513	0.7037	22.0513	0.6966	22.0513	0.7001	22.0513	0.7024	22.0513	0.7046	22.0513	0.7037
23.1013	0.7383	23.1013	0.7037	23.1013	0.6917	23.1013	0.685	23.1013	0.6858	23.1013	0.6855	23.1013	0.6829
24.2013	0.7383	24.2013	0.7037	24.2013	0.6917	24.2013	0.6843	24.2013	0.6792	24.2013	0.6724	24.2013	0.666
25.3536	0.657	25.3536	0.6609	25.3536	0.6609	25.3536	0.6593	25.3536	0.6571	25.3536	0.6528	25.3536	0.6477
26.5609	0.6463	26.5609	0.6367	26.5609	0.6334	26.5609	0.6316	26.5609	0.6306	26.5609	0.6294	26.5609	0.6281
27.8256	0.6035	27.8256	0.592	27.8256	0.5982	27.8256	0.6021	27.8256	0.6048	27.8256	0.6081	27.8256	0.6105
29.1505	0.6025	29.1505	0.5884	29.1505	0.5872	29.1505	0.5894	29.1505	0.5914	29.1505	0.5947	29.1505	0.5976
30.5386	0.6025	30.5386	0.5884	30.5386	0.5867	30.5386	0.5865	30.5386	0.5868	30.5386	0.5878	30.5386	0.5891
31.9927	0.5822	31.9927	0.5848	31.9927	0.5843	31.9927	0.5837	31.9927	0.5832	31.9927	0.5826	31.9927	0.5824
33.516	0.5739	33.516	0.5752	33.516	0.5756	33.516	0.5758	33.516	0.5759	33.516	0.5759	33.516	0.5759
35.1119	0.5693	35.1119	0.5693	35.1119	0.5694	35.1119	0.5695	35.1119	0.5695	35.1119	0.5697	35.1119	0.5698
36.7838	0.5638	36.7838	0.564	36.7838	0.564	36.7838	0.5641	36.7838	0.5641	36.7838	0.5642	36.7838	0.5643
38.5353	0.5589	38.5353	0.5591	38.5353	0.5591	38.5353	0.5592	38.5353	0.5592	38.5353	0.5593	38.5353	0.5594
40.3702	0.5545	40.3702	0.5547	40.3702	0.5547	40.3702	0.5547	40.3702	0.5548	40.3702	0.5548	40.3702	0.5549
42.2924	0.5506	42.2924	0.5506	42.2924	0.5507	42.2924	0.5507	42.2924	0.5507	42.2924	0.5508	42.2924	0.5509
44.3062	0.5469	44.3062	0.5469	44.3062	0.5469	44.3062	0.547	44.3062	0.547	44.3062	0.5471	44.3062	0.5472
46.4159	0.5434	46.4159	0.5435	46.4159	0.5435	46.4159	0.5436	46.4159	0.5436	46.4159	0.5436	46.4159	0.5438
48.626	0.5403	48.626	0.5403	48.626	0.5403	48.626	0.5404	48.626	0.5404	48.626	0.5404	48.626	0.5406
50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5374	50.9414	0.5376

ISSUED BY RPP-WTP PDC

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00001 4

Data Sheet No.
24590-PTF-MED-CNP-00005

R11105812

Project:	***RPP-WTP***	Description:	***Cesium Evaporator Concentrate Reboiler***
Project No:	***24590***	P&ID:	***24590-PTF-M6-CNP-00008,*** ***24590-QL-POA-MEVV-00002-07-21*** 4
Site:	***Hanford***	Process Data: 4	***24590-PTF-MVC-CNP-00015*** 4
Process flow diagram:	***24590-PTF-M5-V17T-00014***	Manufacturer Name:	***Framatome ANP / Northwest Copper Works, Inc.***

General Data

Quality Level	***Q (Note 4 & 10)*** 4	TEMA (Class/Type)	***B***	
Seismic Category	***SC-I (Note 10)*** 4	Flow Type (Counter current, etc)	*	
Design Code	***ASME VIII Div 1***	Heat Exchanger Duty Btu/hr	***5,750,000***	
Code Stamp	***Yes***	Heat Exchanger Area ft^2	***675***	
NB Registration	***Yes***	ΔT (LMTD/Corrected LMTD) °F	***72.8***	*

Thermal/Hydraulic Data

	Shell Side		Tube Side	
Fluid Name	***In Steam Out***		***In Waste Feed Recirculation Out***	
Fluid Quantities: Total lbm/hr	***5,890***		***2,370,000***	
Condensable Vapor (In/Out)	*	*	*	*
Liquid	*	*	*	***2,397,500***
Noncondensable	*	*	*	*
Temperature (In/Out) °F	**** 221*** 4	**** 206*** 4	*	*
Specific Gravity	*	*	*	***1.37***
Viscosity Cp	*	*	*	***2.5*** 4
Molecular Weight	*	*	*	*
Molecular Weight, Noncondensable	*	*	*	*
Specific Heat Btu/lbm-°F	*	*	*	***0.83***
Thermal Conductivity Btu/hr-ft-°F	*	*	*	***0.32***
Latent Heat Btu/lbm @ °F	*	*	*	*
Inlet pressure psia	4 ***13.5***		*	
Tube side Velocity ft/s	*		***6.86***	
Pressure Drop (Allowed) psi	*		***3.7***	
Fouling Resistance (Min) $hr\text{-}ft^2\text{-}°F/Btu$	***0.0015***		***0.004***	

Mechanical Data

	Shell Side		Tube Side	
Design Pressure (Max/Min) psig	***50***	***Full vacuum***	***50***	***Full vacuum***
Design Temperature (Max/Min) °F	***275***	**** 40*** 4	***230***	***40***
Corrosion Allowance inch	***0.04***		***0.04***	
Erosion Allowance inch	***N/A***			
Shell OD/ID inch	***33 ID***		Overall Dimensions (H x W x L) inch	***33 x 33 x 149***
Total Number of Tubes	***222***		Tube OD inch	***1.5***

Material Data

Shell	***SA 240 316 SS (max. carbon 0.030%)***	Shell Cover	***SA 240 316 SS (max. carbon 0.030%)***
Channel/Bonnet	***SB575 (Hastelloy) UNS N06022***	Channel Cover	***SA 240 316 SS (max. carbon 0.030%)***
Tube	***SB622 (Hastelloy) UNS N06022 SMLS***	Floating Head Cover	***N/A***
Stationary Tube Sheet	***SB575 (Hastelloy) UNS N06022***	Floating Tube Sheet	***N/A***
Shell Side Gaskets	***N/A***	Tube Side Gaskets	***N/A***
Partition Seals	***N/A***	Baffles/Supports	***SA 240 316 SS (Max Carbon 0.030%)***
Insulation	***None***	Forgings (Shell side)	4 ***SA 182 F316 (Max Carbon 0.030%)***
Bolting	***N/A***	Forgings (Channel)	***SB564 (Hastelloy) UNS N06022***

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00001

Data Sheet No.
24590-PTF-MED-CNP-00005

Construction Data *(To be determined by the supplier when not specified by the buyer)*

Cross Baffle Type	*	% Baffle Cut (Dia.)	*	Spacing (c/c) inch	*
Bypass Seal Arrangement	*	Longitudinal Seal Type	*	Expansion Joint Type	*
Inlet Nozzle ρV^2	*	Bundle Entrance ρV^2	*	Bundle Exit ρV^2	*
Tube Support Type	*	U-bend Support Type	*	Weight of Bundle lbf	*
Operating Weight lbf	*	Full of Water lbf	*	Weight of Shell lbf	*

Notes

**** To be determined / confirmed by Seller***

(1) All welds are continuous to avoid crevices, weld surface finish is descaled as laid.
(2) All welded construction on both tube and shell side.
(3) Tubes welded to the tubesheets with full strength welds. 4
(4) Vendor will provide item at BNI quality level Q specification, which corresponds with vendor quality level QL-2.
(5) Equipment Cyclic Data is from document 24590-QL-POA-MEVV-00002-10-00002.
(6) Vendor Design information is from document 24590-QL-POA-MEVV-00002-10-00011.
(7) The physical design parameters shall be determined by the seller based on TEMA and HEI standards.
(8) Contents of this document are Dangerous Waste Permit Affecting. 4
(9) Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only. 4
(10) For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore conservative. 4

Safety screening / evaluation required? ☒Yes ☐No If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.

Rev	Description	By	Checked	EN&S	Approved	Date
4	Updated to incorporate 24590-WTP-M6N-M80T-00001 (Dangerous Waste Permit Affecting & DOE AEA note), WSGM analysis, 24590-PTF-U0D-W16T-00001 changes, and update other data.	D. Tate	S. Thakkar	B. Hall	J. Julyk	8/24/09
3	Incorporated Vendor Design Changes and Equipment Qualification data	R. Rickenbach	S. Thakkar	S. Woolfolk	J. Julyk	07/15/2008
2	Issued for Purchase, incorporates updated vendor data	J. Hickman	K. Sadle	N/A	J. Julyk	08/11/2004
1	Issued for Purchase	J. Hickman	E. Le	N/A	J. Julyk	02/12/2004
0	Issued for Purchase	M. Pratt	J. Hickman	N/A	S. Kirk	07/24/2002

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification

Component Tag Number	24590-PTF-ME-CNP-HX-00001	Safety Classification	☒ SC ☐ SS ☐ APC ☐ SDC ☐ SDS ☐ RRC Note 13
Manufacturer / Supplier	Northwest Copperworks Inc. / AREVA NP, Inc.		
Requisition Number	24590-QL-POA-MEVV-00002		
Model	N/A	Seismic Category	☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV Note 13
Description (Include descriptive text [e.g., location, elevation])	CESIUM EVAPORATOR CONCENTRATE REBOILER, Room P-0123, Elevation 0' 0"		
Safety Function(s)	Prevent spills of large quantities of high activity process liquid into the Hot Cell. Prevent evaporator piping rupture and sudden air intrusion, resulting in burp, or waste carryover to the Cs evaporator nitric acid rectifier. Prevent process fluids from leaking into the steam condensate systems, and causing a direct radiation hazard in occupied areas.		

Seismic Safety Function	☒ Yes ☐ No	Room Number(s):	P-0123
Maintenance Accessible	☒ Yes ☐ No	Method of Maintenance Access:	☒ Remote ☐ Hands On ☐ None
Seismic Operability Requirements:	☐ During Seismic Event	☐ After Seismic Event	
ITS Equipment Type:	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical

Equipment Environmental Qualification (EEQ)

Environment ☒ Mild ☐ Harsh	Hi Rad Service ☒ Yes ☐ No	Design Life (yrs) ☐ 40 ☒ Other _____ Note 14
Contamination Class: C5		
Radiation Class: R5		

Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	113	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal Low Temperature (°F)	59	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal High Relative Humidity (%RH)	100	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Relative Humidity (%RH)	5	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal High Pressure (in.-w.g.)	0	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Pressure (in.-w.g.)	-1.4	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Radiation Dose Rate (mR/hr)	2.2 x 10^8 Note 10	40	yrs	Note 10	NOTE 1
Vibration Magnitude (g)	N/A	N/A	N/A	N/A	NOTE 1
Vibration Frequency (Hz)	N/A	N/A	N/A	N/A	NOTE 1
Additional Normal Information:	See Note 2 for pressure units.				

4

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Abnormal					
Abnormal High Temperature (°F)	4 131	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 4	NOTE 1
Abnormal Low Temperature (°F)	4 Note 11 40	8	hr/yr	24590-PTF-U0D-W16T-00001, Notes 8 & 11 4	NOTE 1
Abnormal High Relative Humidity (%RH)	100	24	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Relative Humidity (%RH)	2.0	22	hr/yr	24590-PTF-U0D-W16T-00001, Note 12 4	NOTE 1
Abnormal High Pressure (in.-w.g.)	4	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Pressure (in.-w.g.)	-7.3	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Radiation Dose Rate (mR/hr)	4 Note 5&10	0	hr/yr	N/A 4	NOTE 1
Wet Sprinkler System Present	NO	N/A	N/A	24590-PTF-U0D-W16T-00001	NOTE 1
Additional Abnormal Information	See Note 2 for pressure units.				
Design Basis Events (DBE)					
DBE High Temperature (°F)	4 141	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8 4	NOTE 1
DBE Low Temperature (°F)	40	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
DBE High Relative Humidity (%RH)	100	482	4 hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Relative Humidity (%RH)	2.0	1000	hrs	24590-PTF-U0D-W16T-00001, Note 12 4	NOTE 1
DBE High Pressure (in.-w.g.)	4	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Pressure (in.-w.g.)	-7.3	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Radiation Dose Rate (mR/hr)	4 Note 5&10	0	hrs	N/A 4	NOTE 1
Flood Height (ft)	2.08	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Submergence (ft)	0 NOTE 6	4 N/A	4 N/A	4 24590-QL-POA-MEVV-00002-07-02	NOTE 1
Chemical/Spray Exposure	YES, Note 9	4 1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Additional DBE Information	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	0.1M, 0.25M, 2M Sodium Hydroxide 4 2M Nitric Acid Recovered Nitric Acid Anti-foaming Agent 4

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	Note 1
Mounting Method (bolts, welds, etc.)	Welded to Building Structure, See dwg. 24590-QL-POA-MEVV-00002-07-00097.
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification of Seismic Catergory I/II Equipment and Tanks.	24590-WTP-3PS-SS90-T0001	001 4	None
Specified Seismic Load (BUYER)	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectre (ISRS) 4	24590-PTF-S0C-S15T-00057 4	00A 4	Calculation is not included in MR, see attached figures 67, 68 and 69 per CCN 185267. 4
Design Seismic Load (SELLER	4	4	4	Note 1 4
Qualification Method (SELLER)	4	4	4	Note 1 4
Qualification Report Number (SELLER)	4	4	4	Note 1 4
Submittal Number (BUYER)	TBD 4	TBD 4	TBD 4	None 4

Notes and Additional Information

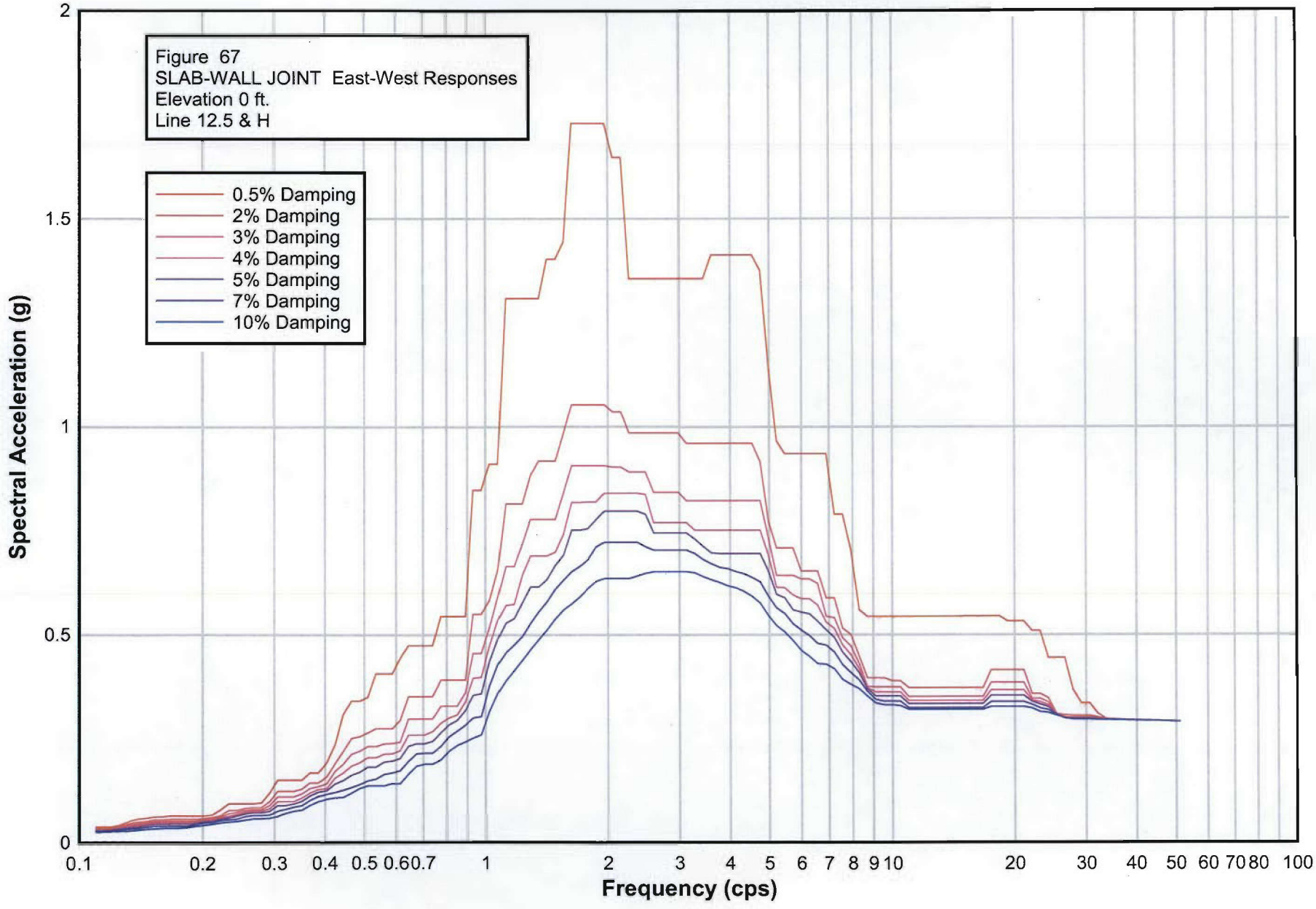
1. Data to be provided by seller through the submittal process as required on the G-321-E form.
2. Where pressure is given in inches of water column (in.-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in.-w.g.)
3. deleted. 4
4. The equipment qualification will be documented in accordance with the requirements in Appendix D of Engineering Specification for Environmental Qualification of Mechanical Equipment, document number 24590-WTP-3PS-G000-T0015. for the passive and active safety functions.
5. Abnormal and DBE radiation dose rates are set equal to normal and do not contribute to the total integrated dose. 4
6. Submergence depth is the difference between the lowest point on the equipment and the flood depth above the floor. The submergence depth is set to zero if the lowest section of the equipment is above the flood depth.
7. Environmental data from calculation 24590-PTF-U0D-W16T-00001 is for room environment only.
8. For application of AISC N690, 4 abnormal temperatures shall be applied as Normal Operation Temperature, T_O, with seismic effects, E_S. The Design basis event temperatures shall be applied as a Thermal Load generated by a postulated accident, T_A, without seismic effects, E_s. 4
9. See DBE Chemical Exposure Details. 4
10. This contact dose rate is preliminary (CCN 167203; Notes - General), and is subject to confirmation prior to shipment. 4
11. Abnormal minimum temperature is set equal to the normal minimum temperature (59F) for the purposes of seismic 4 analysis. A DBE seismic event coincident with an extreme low abnormal temperature is not a credible scenario. [The probability of an abnormal minimum temperature is estimated as follows: temperatures <40 F occur 31% of the year (average historical weather data, 0.31 probability); a loss of heating is assumed to occur 8 hrs/yr (0.001 probability); combined probability is 0.31 x 0.001 = 0.00031 (3.1E-4). The combination of this event with a seismic DBE (4 E-04 probability) is not credible (<1 E-06 probability).]
12. Parameter value used on data sheet has been previously established and determined to provide more conservative 4 constraint than values derived from 24590-PTF-U0D-W16T-00001.
13. For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore 4 conservative.
14. Facility design life is 40 years. Seller will determine equipment design life and required maintenance / replacement 4 intervals to maintain qualification of equipment components subject to wear or aging.

REFERENCES

1. 24590-WTP-PSAR-ESH-01-002-02, Rev. 04E, Preliminary Documented Safety Analysis to Support Construction 4 Authorization; PT Facility Specific Information.
2. deleted. 4
3. 24590-PTF-M6-CNP-00008, Rev. 2, P&ID - PTF Cesium Nitric Acid Recovery Process System Evaporator Vessel. 4
4. 24590-PTF-U0D-W16T-00001, Rev. 0, PTF Room Environment Datasheet [Including DCNs: 24590-PTF-U0N-W16T-4 00001, 24590-PTF-U0N-W16T-00003, & 24590-PTF-U0N-W16T-00004].
5. 24590-WTP-DB-ENG-01-001, Rev. 1N, Basis Of Design. 4
6. 24590-QL-POA-MEVV-00002-07-06, Rev. 00B, 30% DESIGN - DRAWING - CNP REBOILER VESSEL 4
7. CCN 167203; PTF RADIATION DOSE RATES.
8. 24590-PTF-M6X-CNP-00012 Rev. 002, MS LINE LIST FOR P&ID 24590-PTF-M6-CNP-00008, REV. 2 4

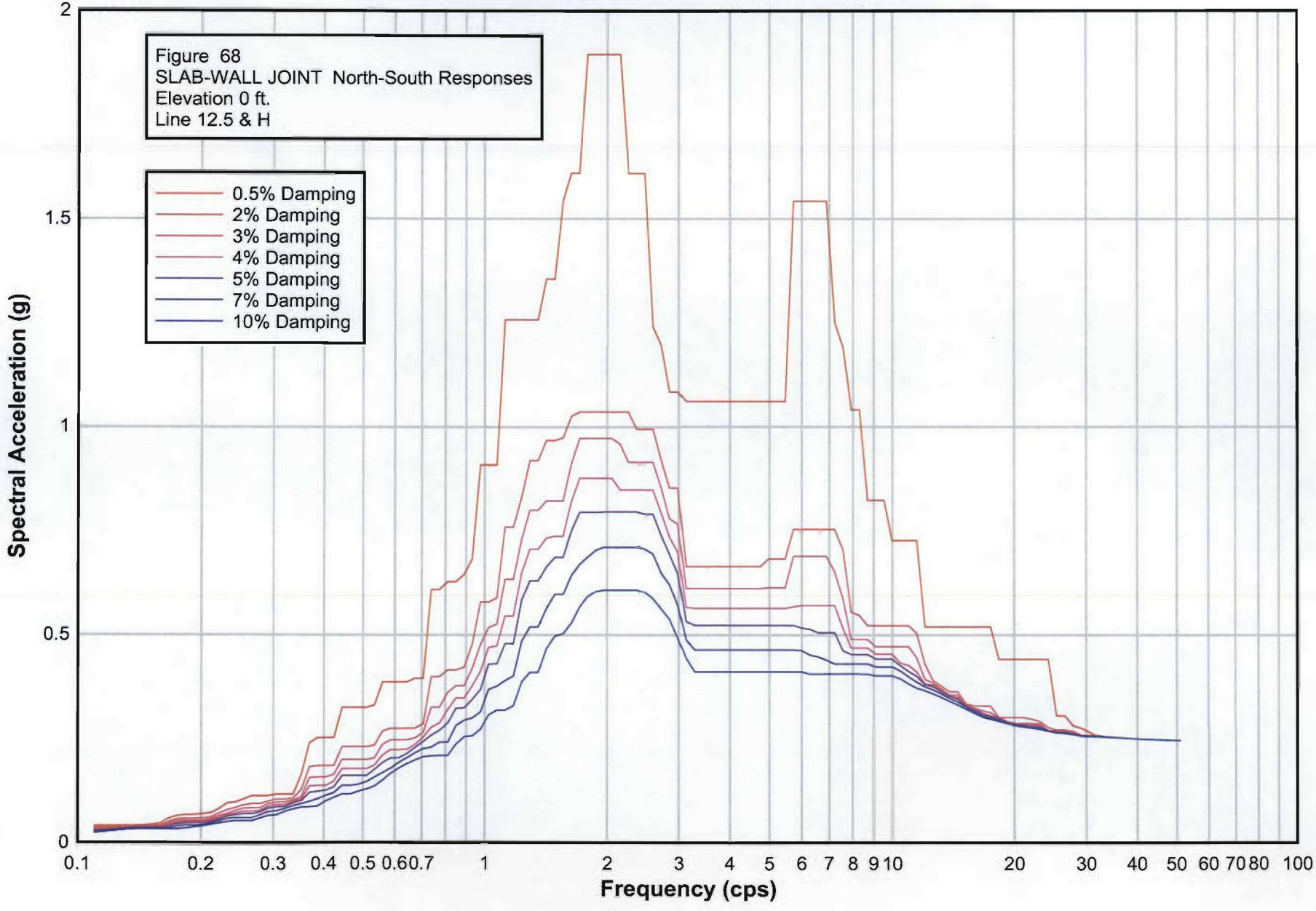
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



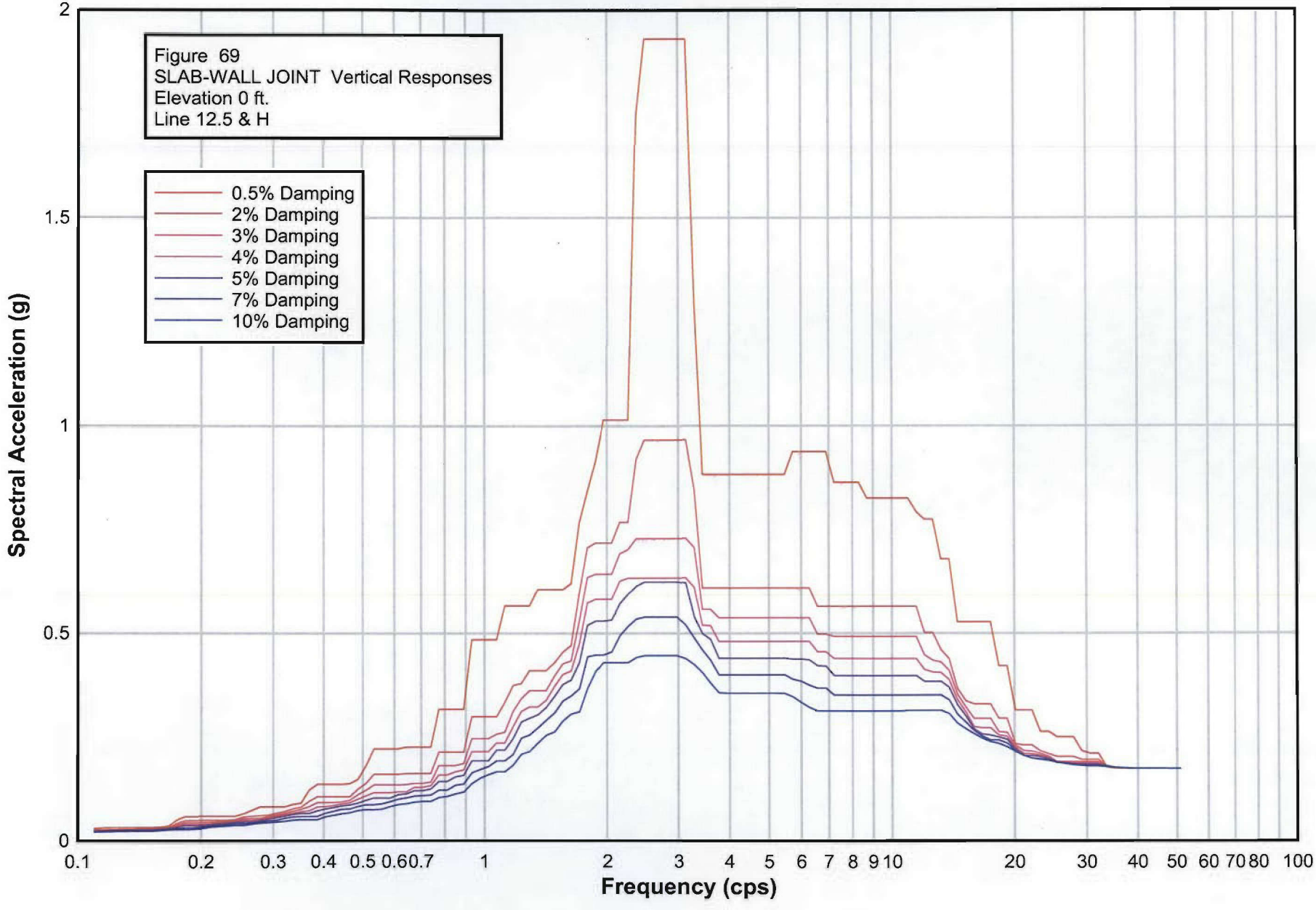
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 4



△4 RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



PTWW067.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 67 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0345	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0345	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0259
0.1204	0.0375	0.1204	0.0345	0.1204	0.0331	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0268
0.1262	0.0431	0.1262	0.0397	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0277
0.1322	0.0505	0.1322	0.0451	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0327	0.1322	0.0281
0.1385	0.0561	0.1385	0.049	0.1385	0.045	0.1385	0.0415	0.1385	0.0384	0.1385	0.0344	0.1385	0.0303
0.1451	0.0582	0.1451	0.0509	0.1451	0.0474	0.1451	0.0444	0.1451	0.0417	0.1451	0.0373	0.1451	0.0324
0.152	0.0617	0.152	0.0546	0.152	0.0507	0.152	0.0472	0.152	0.0442	0.152	0.0392	0.152	0.0336
0.1592	0.0619	0.1592	0.0546	0.1592	0.0507	0.1592	0.0472	0.1592	0.0442	0.1592	0.0394	0.1592	0.0347
0.1668	0.0639	0.1668	0.056	0.1668	0.0516	0.1668	0.0479	0.1668	0.0448	0.1668	0.04	0.1668	0.0352
0.1748	0.0639	0.1748	0.056	0.1748	0.0516	0.1748	0.0479	0.1748	0.0448	0.1748	0.04	0.1748	0.0352
0.1831	0.0639	0.1831	0.056	0.1831	0.0516	0.1831	0.0479	0.1831	0.0448	0.1831	0.04	0.1831	0.0364
0.1918	0.064	0.1918	0.056	0.1918	0.0516	0.1918	0.0491	0.1918	0.0473	0.1918	0.0442	0.1918	0.0401
0.2009	0.0641	0.2009	0.0581	0.2009	0.0556	0.2009	0.0533	0.2009	0.0511	0.2009	0.0472	0.2009	0.0422
0.2105	0.0664	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0525	0.2105	0.049	0.2105	0.0448
0.2205	0.078	0.2205	0.0645	0.2205	0.0618	0.2205	0.0594	0.2205	0.0571	0.2205	0.0531	0.2205	0.0482
0.231	0.0931	0.231	0.0772	0.231	0.0692	0.231	0.0628	0.231	0.0596	0.231	0.0553	0.231	0.0502
0.242	0.0931	0.242	0.0772	0.242	0.072	0.242	0.0676	0.242	0.0636	0.242	0.0564	0.242	0.051
0.2535	0.0931	0.2535	0.0817	0.2535	0.077	0.2535	0.0728	0.2535	0.069	0.2535	0.0625	0.2535	0.0547
0.2656	0.0931	0.2656	0.0839	0.2656	0.0794	0.2656	0.0753	0.2656	0.0716	0.2656	0.065	0.2656	0.0571
0.2783	0.0955	0.2783	0.0842	0.2783	0.0794	0.2783	0.0753	0.2783	0.0716	0.2783	0.065	0.2783	0.0574
0.2915	0.1183	0.2915	0.0982	0.2915	0.0885	0.2915	0.081	0.2915	0.075	0.2915	0.0664	0.2915	0.0586
0.3054	0.1496	0.3054	0.1228	0.3054	0.1092	0.3054	0.0981	0.3054	0.089	0.3054	0.0756	0.3054	0.063
0.3199	0.1496	0.3199	0.1228	0.3199	0.1092	0.3199	0.0981	0.3199	0.089	0.3199	0.0797	0.3199	0.07
0.3352	0.1496	0.3352	0.1228	0.3352	0.1092	0.3352	0.0981	0.3352	0.0927	0.3352	0.0852	0.3352	0.0755
0.3511	0.1496	0.3511	0.1285	0.3511	0.1168	0.3511	0.1065	0.3511	0.0994	0.3511	0.0891	0.3511	0.0782
0.3678	0.1677	0.3678	0.1435	0.3678	0.13	0.3678	0.1183	0.3678	0.112	0.3678	0.1014	0.3678	0.0894
0.3853	0.1677	0.3853	0.1435	0.3853	0.134	0.3853	0.1273	0.3853	0.1213	0.3853	0.1109	0.3853	0.0986
0.4037	0.1925	0.4037	0.1587	0.4037	0.1415	0.4037	0.1298	0.4037	0.1251	0.4037	0.1163	0.4037	0.1044
0.4229	0.2358	0.4229	0.1897	0.4229	0.1713	0.4229	0.1551	0.4229	0.1411	0.4229	0.1206	0.4229	0.1079
0.4431	0.3083	0.4431	0.219	0.4431	0.1881	0.4431	0.167	0.4431	0.1495	0.4431	0.1263	0.4431	0.1088
0.4642	0.3407	0.4642	0.2508	0.4642	0.2123	0.4642	0.1837	0.4642	0.1622	0.4642	0.1328	0.4642	0.1192
0.4863	0.3407	0.4863	0.2548	0.4863	0.2198	0.4863	0.1918	0.4863	0.1692	0.4863	0.1398	0.4863	0.1303
0.5094	0.3496	0.5094	0.2641	0.5094	0.2311	0.5094	0.2042	0.5094	0.182	0.5094	0.1485	0.5094	0.1369

PTWW067.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 67 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.4063	0.5337	0.2745	0.5337	0.2311	0.5337	0.2042	0.5337	0.182	0.5337	0.1529	0.5337	0.1371
0.5591	0.4063	0.5591	0.2745	0.5591	0.2378	0.5591	0.213	0.5591	0.194	0.5591	0.1646	0.5591	0.1371
0.5857	0.4063	0.5857	0.2745	0.5857	0.2385	0.5857	0.2142	0.5857	0.1966	0.5857	0.1681	0.5857	0.1425
0.6136	0.4438	0.6136	0.2944	0.6136	0.2421	0.6136	0.2213	0.6136	0.2032	0.6136	0.1733	0.6136	0.1425
0.6428	0.4742	0.6428	0.3514	0.6428	0.2975	0.6428	0.2588	0.6428	0.2323	0.6428	0.1964	0.6428	0.1655
0.6734	0.4742	0.6734	0.3514	0.6734	0.2975	0.6734	0.2588	0.6734	0.2383	0.6734	0.2137	0.6734	0.1844
0.7055	0.4742	0.7055	0.3514	0.7055	0.2975	0.7055	0.2588	0.7055	0.2383	0.7055	0.2155	0.7055	0.1892
0.7391	0.4742	0.7391	0.3514	0.7391	0.2975	0.7391	0.2667	0.7391	0.2438	0.7391	0.2155	0.7391	0.1892
0.7743	0.5449	0.7743	0.3911	0.7743	0.3284	0.7743	0.2875	0.7743	0.2646	0.7743	0.2323	0.7743	0.1993
0.8111	0.5449	0.8111	0.3911	0.8111	0.3284	0.8111	0.2996	0.8111	0.2837	0.8111	0.2551	0.8111	0.2205
0.8497	0.5449	0.8497	0.3911	0.8497	0.3284	0.8497	0.3072	0.8497	0.2942	0.8497	0.2684	0.8497	0.2339
0.8902	0.5449	0.8902	0.3911	0.8902	0.3604	0.8902	0.3382	0.8902	0.318	0.8902	0.2831	0.8902	0.2427
0.9326	0.8469	0.9326	0.5495	0.9326	0.4554	0.9326	0.3957	0.9326	0.3545	0.9326	0.3003	0.9326	0.2517
0.977	0.8469	0.977	0.5495	0.977	0.4554	0.977	0.3975	0.977	0.3585	0.977	0.3036	0.977	0.2596
1.0235	0.9107	1.0235	0.5826	1.0235	0.5168	1.0235	0.4731	1.0235	0.4362	1.0235	0.3776	1.0235	0.3164
1.0723	0.9107	1.0723	0.6542	1.0723	0.5901	1.0723	0.535	1.0723	0.4906	1.0723	0.4288	1.0723	0.36
1.1233	1.3081	1.1233	0.8142	1.1233	0.6641	1.1233	0.5708	1.1233	0.5287	1.1233	0.4575	1.1233	0.3904
1.1768	1.3081	1.1768	0.8142	1.1768	0.6641	1.1768	0.5735	1.1768	0.5393	1.1768	0.4764	1.1768	0.4143
1.2328	1.3081	1.2328	0.8142	1.2328	0.7174	1.2328	0.6427	1.2328	0.577	1.2328	0.4965	1.2328	0.439
1.2916	1.3081	1.2916	0.8822	1.2916	0.7774	1.2916	0.6895	1.2916	0.6157	1.2916	0.5283	1.2916	0.4653
1.353	1.3081	1.353	0.9165	1.353	0.7774	1.353	0.6895	1.353	0.6157	1.353	0.5556	1.353	0.4889
1.4175	1.4021	1.4175	0.9165	1.4175	0.7774	1.4175	0.6895	1.4175	0.6326	1.4175	0.5795	1.4175	0.5119
1.485	1.4021	1.485	0.9165	1.485	0.7774	1.485	0.6984	1.485	0.6672	1.485	0.6099	1.485	0.539
1.5557	1.4438	1.5557	0.9843	1.5557	0.8409	1.5557	0.7415	1.5557	0.6919	1.5557	0.6323	1.5557	0.5603
1.6298	1.729	1.6298	1.0527	1.6298	0.9055	1.6298	0.8177	1.6298	0.7518	1.6298	0.6519	1.6298	0.5748
1.7074	1.729	1.7074	1.0527	1.7074	0.9055	1.7074	0.8177	1.7074	0.7518	1.7074	0.6652	1.7074	0.5915
1.7887	1.729	1.7887	1.0527	1.7887	0.9055	1.7887	0.8185	1.7887	0.7553	1.7887	0.6808	1.7887	0.6117
1.8738	1.729	1.8738	1.0527	1.8738	0.9055	1.8738	0.8185	1.8738	0.7765	1.8738	0.7113	1.8738	0.6287
1.963	1.729	1.963	1.0527	1.963	0.9055	1.963	0.8397	1.963	0.7973	1.963	0.7229	1.963	0.6359
2.0565	1.6472	2.0565	1.0359	2.0565	0.902	2.0565	0.8397	2.0565	0.7973	2.0565	0.7229	2.0565	0.6359
2.1544	1.6472	2.1544	1.0359	2.1544	0.902	2.1544	0.8397	2.1544	0.7973	2.1544	0.7229	2.1544	0.6359
2.257	1.3558	2.257	0.9839	2.257	0.8903	2.257	0.8397	2.257	0.7973	2.257	0.7229	2.257	0.6361
2.3645	1.3558	2.3645	0.9839	2.3645	0.8903	2.3645	0.8397	2.3645	0.7973	2.3645	0.7229	2.3645	0.6418
2.4771	1.3558	2.4771	0.9839	2.4771	0.8903	2.4771	0.8363	2.4771	0.7896	2.4771	0.7121	2.4771	0.6484
2.595	1.3558	2.595	0.9839	2.595	0.8416	2.595	0.7692	2.595	0.745	2.595	0.7036	2.595	0.6522

PTWW067.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 67 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.3558	2.7186	0.9839	2.7186	0.8416	2.7186	0.7692	2.7186	0.745	2.7186	0.7036	2.7186	0.6522
2.848	1.3558	2.848	0.9839	2.848	0.8416	2.848	0.7692	2.848	0.745	2.848	0.7036	2.848	0.6522
2.9836	1.3558	2.9836	0.9839	2.9836	0.8416	2.9836	0.7692	2.9836	0.745	2.9836	0.7036	2.9836	0.6522
3.1257	1.3558	3.1257	0.9586	3.1257	0.8211	3.1257	0.7692	3.1257	0.745	3.1257	0.7036	3.1257	0.6522
3.2745	1.3558	3.2745	0.9586	3.2745	0.8211	3.2745	0.751	3.2745	0.7299	3.2745	0.6954	3.2745	0.6492
3.4305	1.3558	3.4305	0.9586	3.4305	0.8211	3.4305	0.751	3.4305	0.7126	3.4305	0.681	3.4305	0.6403
3.5938	1.4127	3.5938	0.9586	3.5938	0.8211	3.5938	0.751	3.5938	0.6971	3.5938	0.671	3.5938	0.6329
3.7649	1.4127	3.7649	0.9586	3.7649	0.8211	3.7649	0.751	3.7649	0.6954	3.7649	0.6626	3.7649	0.6263
3.9442	1.4127	3.9442	0.9586	3.9442	0.8211	3.9442	0.751	3.9442	0.6954	3.9442	0.659	3.9442	0.6182
4.132	1.4127	4.132	0.9586	4.132	0.8211	4.132	0.751	4.132	0.6954	4.132	0.6519	4.132	0.6132
4.3288	1.4127	4.3288	0.9586	4.3288	0.8211	4.3288	0.751	4.3288	0.6954	4.3288	0.6467	4.3288	0.6045
4.5349	1.4127	4.5349	0.9586	4.5349	0.8211	4.5349	0.751	4.5349	0.6954	4.5349	0.6383	4.5349	0.5926
4.7508	1.376	4.7508	0.9153	4.7508	0.8211	4.7508	0.751	4.7508	0.6954	4.7508	0.6271	4.7508	0.5766
4.977	1.1452	4.977	0.7722	4.977	0.7324	4.977	0.6911	4.977	0.6525	4.977	0.5927	4.977	0.5466
5.214	0.9648	5.214	0.7082	5.214	0.6425	5.214	0.6138	5.214	0.5972	5.214	0.5647	5.214	0.5221
5.4623	0.9342	5.4623	0.7082	5.4623	0.6425	5.4623	0.6129	5.4623	0.5893	5.4623	0.5516	5.4623	0.5074
5.7224	0.9342	5.7224	0.7082	5.7224	0.6425	5.7224	0.5954	5.7224	0.5597	5.7224	0.5268	5.7224	0.486
5.9948	0.9342	5.9948	0.6534	5.9948	0.6337	5.9948	0.5864	5.9948	0.5544	5.9948	0.5117	5.9948	0.4626
6.2803	0.9342	6.2803	0.6534	6.2803	0.6337	6.2803	0.5864	6.2803	0.5504	6.2803	0.4978	6.2803	0.448
6.5793	0.9342	6.5793	0.6534	6.5793	0.6231	6.5793	0.5714	6.5793	0.5325	6.5793	0.4789	6.5793	0.4308
6.8926	0.9342	6.8926	0.5885	6.8926	0.5443	6.8926	0.5297	6.8926	0.5115	6.8926	0.4747	6.8926	0.4289
7.2208	0.7892	7.2208	0.5885	7.2208	0.5404	7.2208	0.5146	7.2208	0.4932	7.2208	0.4582	7.2208	0.4179
7.5646	0.7892	7.5646	0.515	7.5646	0.4923	7.5646	0.4748	7.5646	0.4577	7.5646	0.4273	7.5646	0.3917
7.9248	0.7038	7.9248	0.5002	7.9248	0.4721	7.9248	0.4509	7.9248	0.4342	7.9248	0.4082	7.9248	0.3799
8.3022	0.5601	8.3022	0.4481	8.3022	0.4293	8.3022	0.4172	8.3022	0.4072	8.3022	0.3901	8.3022	0.3692
8.6975	0.5437	8.6975	0.3949	8.6975	0.3739	8.6975	0.371	8.6975	0.3686	8.6975	0.3626	8.6975	0.3516
9.1116	0.5437	9.1116	0.3949	9.1116	0.3729	9.1116	0.3608	9.1116	0.3515	9.1116	0.3431	9.1116	0.3349
9.5455	0.5437	9.5455	0.3949	9.5455	0.3729	9.5455	0.3608	9.5455	0.3515	9.5455	0.3389	9.5455	0.3303
10	0.5437	10	0.3883	10	0.3729	10	0.3608	10	0.3515	10	0.3389	10	0.3303
10.4762	0.5437	10.4762	0.3883	10.4762	0.3729	10.4762	0.3608	10.4762	0.3515	10.4762	0.3389	10.4762	0.3284
10.975	0.5437	10.975	0.3711	10.975	0.3496	10.975	0.3401	10.975	0.3328	10.975	0.3231	10.975	0.3197
11.4976	0.5437	11.4976	0.3711	11.4976	0.3496	11.4976	0.3401	11.4976	0.3328	11.4976	0.3231	11.4976	0.3197
12.045	0.5437	12.045	0.3711	12.045	0.3496	12.045	0.3401	12.045	0.3328	12.045	0.3231	12.045	0.3197
12.6186	0.5437	12.6186	0.3711	12.6186	0.3496	12.6186	0.3401	12.6186	0.3328	12.6186	0.3231	12.6186	0.3197
13.2194	0.5437	13.2194	0.3711	13.2194	0.3496	13.2194	0.3401	13.2194	0.3328	13.2194	0.3231	13.2194	0.3197

PTWW067.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 67 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.5437	13.8489	0.3711	13.8489	0.3496	13.8489	0.3401	13.8489	0.3328	13.8489	0.3231	13.8489	0.3197
14.5083	0.5437	14.5083	0.3711	14.5083	0.3496	14.5083	0.3401	14.5083	0.3328	14.5083	0.3231	14.5083	0.3197
15.1991	0.5451	15.1991	0.3711	15.1991	0.3496	15.1991	0.3401	15.1991	0.3328	15.1991	0.3231	15.1991	0.3197
15.9228	0.5451	15.9228	0.3711	15.9228	0.3496	15.9228	0.3401	15.9228	0.3328	15.9228	0.3231	15.9228	0.3197
16.681	0.5451	16.681	0.3711	16.681	0.3496	16.681	0.3401	16.681	0.3328	16.681	0.3231	16.681	0.3197
17.4753	0.5451	17.4753	0.4145	17.4753	0.384	17.4753	0.3654	17.4753	0.3531	17.4753	0.338	17.4753	0.3258
18.3074	0.5451	18.3074	0.4145	18.3074	0.384	18.3074	0.3654	18.3074	0.3531	18.3074	0.338	18.3074	0.3258
19.1791	0.5325	19.1791	0.4145	19.1791	0.384	19.1791	0.3654	19.1791	0.3531	19.1791	0.338	19.1791	0.3258
20.0923	0.5325	20.0923	0.4145	20.0923	0.384	20.0923	0.3654	20.0923	0.3531	20.0923	0.338	20.0923	0.3258
21.049	0.5325	21.049	0.4145	21.049	0.384	21.049	0.3654	21.049	0.3531	21.049	0.338	21.049	0.3258
22.0513	0.5093	22.0513	0.357	22.0513	0.345	22.0513	0.3404	22.0513	0.3377	22.0513	0.3309	22.0513	0.3223
23.1013	0.5093	23.1013	0.357	23.1013	0.345	23.1013	0.3371	23.1013	0.3312	23.1013	0.3223	23.1013	0.3135
24.2013	0.4442	24.2013	0.3461	24.2013	0.3355	24.2013	0.3293	24.2013	0.3248	24.2013	0.3182	24.2013	0.3115
25.3536	0.4442	25.3536	0.3079	25.3536	0.3069	25.3536	0.307	25.3536	0.3072	25.3536	0.3068	25.3536	0.3051
26.5609	0.4442	26.5609	0.3048	26.5609	0.2996	26.5609	0.2979	26.5609	0.2979	26.5609	0.2986	26.5609	0.2992
27.8256	0.3666	27.8256	0.3037	27.8256	0.2996	27.8256	0.2979	27.8256	0.297	27.8256	0.296	27.8256	0.2956
29.1505	0.3342	29.1505	0.3037	29.1505	0.2996	29.1505	0.2979	29.1505	0.297	29.1505	0.296	29.1505	0.2951
30.5386	0.3342	30.5386	0.3037	30.5386	0.2996	30.5386	0.2979	30.5386	0.297	30.5386	0.296	30.5386	0.2951
31.9927	0.3088	31.9927	0.2994	31.9927	0.2977	31.9927	0.2968	31.9927	0.2961	31.9927	0.2952	31.9927	0.2943
33.516	0.2961	33.516	0.2957	33.516	0.2953	33.516	0.295	33.516	0.2948	33.516	0.2945	33.516	0.2942
35.1119	0.2952	35.1119	0.2948	35.1119	0.2947	35.1119	0.2946	35.1119	0.2944	35.1119	0.2942	35.1119	0.2939
36.7838	0.2943	36.7838	0.2943	36.7838	0.2942	36.7838	0.2941	36.7838	0.294	36.7838	0.2938	36.7838	0.2936
38.5353	0.2938	38.5353	0.2937	38.5353	0.2936	38.5353	0.2936	38.5353	0.2935	38.5353	0.2934	38.5353	0.2932
40.3702	0.2932	40.3702	0.2931	40.3702	0.2931	40.3702	0.293	40.3702	0.293	40.3702	0.2929	40.3702	0.2928
42.2924	0.2925	42.2924	0.2926	42.2924	0.2925	42.2924	0.2925	42.2924	0.2925	42.2924	0.2924	42.2924	0.2923
44.3062	0.2922	44.3062	0.2921	44.3062	0.2921	44.3062	0.2921	44.3062	0.292	44.3062	0.292	44.3062	0.2919
46.4159	0.2917	46.4159	0.2916	46.4159	0.2916	46.4159	0.2916	46.4159	0.2916	46.4159	0.2916	46.4159	0.2916
48.626	0.2913	48.626	0.2912	48.626	0.2912	48.626	0.2912	48.626	0.2912	48.626	0.2912	48.626	0.2912
50.9414	0.2907	50.9414	0.2908	50.9414	0.2908	50.9414	0.2908	50.9414	0.2908	50.9414	0.2908	50.9414	0.2909

PTWW068.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 68 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0404	0.1098	0.0365	0.1098	0.0342	0.1098	0.0321	0.1098	0.0302	0.1098	0.0271	0.1098	0.0235
0.115	0.0404	0.115	0.0365	0.115	0.0342	0.115	0.0321	0.115	0.0302	0.115	0.0271	0.115	0.0253
0.1204	0.0404	0.1204	0.0365	0.1204	0.0342	0.1204	0.0321	0.1204	0.0306	0.1204	0.0293	0.1204	0.0274
0.1262	0.0404	0.1262	0.0365	0.1262	0.0349	0.1262	0.034	0.1262	0.033	0.1262	0.0313	0.1262	0.0292
0.1322	0.0404	0.1322	0.038	0.1322	0.0368	0.1322	0.0356	0.1322	0.0346	0.1322	0.0328	0.1322	0.0312
0.1385	0.0409	0.1385	0.0389	0.1385	0.0377	0.1385	0.0368	0.1385	0.0359	0.1385	0.0344	0.1385	0.0325
0.1451	0.0414	0.1451	0.0395	0.1451	0.0384	0.1451	0.0375	0.1451	0.0366	0.1451	0.035	0.1451	0.033
0.152	0.0438	0.152	0.04	0.152	0.0384	0.152	0.0375	0.152	0.0366	0.152	0.035	0.152	0.033
0.1592	0.0461	0.1592	0.0415	0.1592	0.0394	0.1592	0.0375	0.1592	0.0366	0.1592	0.035	0.1592	0.033
0.1668	0.0583	0.1668	0.0505	0.1668	0.0462	0.1668	0.0425	0.1668	0.0394	0.1668	0.035	0.1668	0.033
0.1748	0.0643	0.1748	0.0565	0.1748	0.0521	0.1748	0.0482	0.1748	0.0448	0.1748	0.0392	0.1748	0.033
0.1831	0.0666	0.1831	0.0582	0.1831	0.0541	0.1831	0.0503	0.1831	0.047	0.1831	0.0413	0.1831	0.0351
0.1918	0.0676	0.1918	0.0584	0.1918	0.0541	0.1918	0.0505	0.1918	0.0472	0.1918	0.0415	0.1918	0.0376
0.2009	0.0695	0.2009	0.0594	0.2009	0.0541	0.2009	0.0509	0.2009	0.0481	0.2009	0.0431	0.2009	0.0405
0.2105	0.0719	0.2105	0.0616	0.2105	0.0578	0.2105	0.0543	0.2105	0.051	0.2105	0.0476	0.2105	0.0438
0.2205	0.0815	0.2205	0.0705	0.2205	0.0647	0.2205	0.0596	0.2205	0.0568	0.2205	0.0524	0.2205	0.0475
0.231	0.0953	0.231	0.0787	0.231	0.0702	0.231	0.0666	0.231	0.0632	0.231	0.0575	0.231	0.0509
0.242	0.0977	0.242	0.084	0.242	0.0771	0.242	0.071	0.242	0.0669	0.242	0.06	0.242	0.0529
0.2535	0.1051	0.2535	0.0906	0.2535	0.0825	0.2535	0.0755	0.2535	0.0694	0.2535	0.06	0.2535	0.0529
0.2656	0.1133	0.2656	0.094	0.2656	0.0837	0.2656	0.0755	0.2656	0.0694	0.2656	0.06	0.2656	0.0529
0.2783	0.1133	0.2783	0.094	0.2783	0.0837	0.2783	0.0776	0.2783	0.0736	0.2783	0.0666	0.2783	0.0591
0.2915	0.1133	0.2915	0.0994	0.2915	0.093	0.2915	0.0874	0.2915	0.0826	0.2915	0.0745	0.2915	0.0653
0.3054	0.1163	0.3054	0.104	0.3054	0.0971	0.3054	0.0909	0.3054	0.0855	0.3054	0.0765	0.3054	0.067
0.3199	0.1163	0.3199	0.104	0.3199	0.0971	0.3199	0.0909	0.3199	0.0864	0.3199	0.0812	0.3199	0.0747
0.3352	0.1163	0.3352	0.1068	0.3352	0.1025	0.3352	0.0986	0.3352	0.095	0.3352	0.0886	0.3352	0.0809
0.3511	0.1636	0.3511	0.1274	0.3511	0.1102	0.3511	0.1045	0.3511	0.1004	0.3511	0.0933	0.3511	0.0851
0.3678	0.2398	0.3678	0.1821	0.3678	0.1557	0.3678	0.1356	0.3678	0.1202	0.3678	0.0985	0.3678	0.0858
0.3853	0.2521	0.3853	0.185	0.3853	0.1576	0.3853	0.137	0.3853	0.123	0.3853	0.1052	0.3853	0.0881
0.4037	0.2521	0.4037	0.185	0.4037	0.1576	0.4037	0.137	0.4037	0.1254	0.4037	0.1131	0.4037	0.0996
0.4229	0.2521	0.4229	0.185	0.4229	0.1633	0.4229	0.1471	0.4229	0.1332	0.4229	0.1199	0.4229	0.1082
0.4431	0.3248	0.4431	0.2299	0.4431	0.1995	0.4431	0.1774	0.4431	0.1605	0.4431	0.137	0.4431	0.1162
0.4642	0.3248	0.4642	0.2299	0.4642	0.1995	0.4642	0.1774	0.4642	0.1605	0.4642	0.137	0.4642	0.1162
0.4863	0.3248	0.4863	0.2299	0.4863	0.1995	0.4863	0.1774	0.4863	0.1605	0.4863	0.1398	0.4863	0.123
0.5094	0.3248	0.5094	0.2299	0.5094	0.1995	0.5094	0.1774	0.5094	0.1605	0.5094	0.1461	0.5094	0.1281

PTWW068.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 68 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.3307	0.5337	0.2342	0.5337	0.2031	0.5337	0.1861	0.5337	0.1756	0.5337	0.1572	0.5337	0.1357
0.5591	0.3864	0.5591	0.2681	0.5591	0.2359	0.5591	0.2104	0.5591	0.1922	0.5591	0.1683	0.5591	0.1505
0.5857	0.3864	0.5857	0.2751	0.5857	0.2466	0.5857	0.223	0.5857	0.2031	0.5857	0.1791	0.5857	0.1667
0.6136	0.3864	0.6136	0.2751	0.6136	0.2466	0.6136	0.223	0.6136	0.2035	0.6136	0.193	0.6136	0.1795
0.6428	0.3864	0.6428	0.2751	0.6428	0.2466	0.6428	0.2234	0.6428	0.2139	0.6428	0.2039	0.6428	0.1896
0.6734	0.3953	0.6734	0.2751	0.6734	0.251	0.6734	0.2354	0.6734	0.2284	0.6734	0.2154	0.6734	0.1984
0.7055	0.3953	0.7055	0.2852	0.7055	0.2641	0.7055	0.2526	0.7055	0.2425	0.7055	0.2254	0.7055	0.2061
0.7391	0.6097	0.7391	0.3987	0.7391	0.3252	0.7391	0.2766	0.7391	0.2575	0.7391	0.2289	0.7391	0.208
0.7743	0.6097	0.7743	0.3987	0.7743	0.3252	0.7743	0.2869	0.7743	0.2696	0.7743	0.2409	0.7743	0.2089
0.8111	0.6283	0.8111	0.4148	0.8111	0.3607	0.8111	0.3191	0.8111	0.2867	0.8111	0.2409	0.8111	0.2089
0.8497	0.6283	0.8497	0.4148	0.8497	0.3768	0.8497	0.3473	0.8497	0.3221	0.8497	0.2809	0.8497	0.2363
0.8902	0.6457	0.8902	0.4214	0.8902	0.3768	0.8902	0.3473	0.8902	0.3236	0.8902	0.2939	0.8902	0.2537
0.9326	0.6829	0.9326	0.4768	0.9326	0.4187	0.9326	0.376	0.9326	0.344	0.9326	0.299	0.9326	0.2562
0.977	0.9086	0.977	0.5785	0.977	0.4758	0.977	0.4112	0.977	0.3674	0.977	0.3135	0.977	0.2721
1.0235	0.9086	1.0235	0.5785	1.0235	0.517	1.0235	0.4689	1.0235	0.429	1.0235	0.368	1.0235	0.3069
1.0723	0.9086	1.0723	0.5886	1.0723	0.5252	1.0723	0.4728	1.0723	0.4295	1.0723	0.3754	1.0723	0.318
1.1233	1.2562	1.1233	0.759	1.1233	0.6339	1.1233	0.5449	1.1233	0.4784	1.1233	0.3889	1.1233	0.318
1.1768	1.2562	1.1768	0.759	1.1768	0.6339	1.1768	0.5449	1.1768	0.4784	1.1768	0.4006	1.1768	0.3289
1.2328	1.2562	1.2328	0.8302	1.2328	0.7291	1.2328	0.6491	1.2328	0.5837	1.2328	0.4845	1.2328	0.3864
1.2916	1.2562	1.2916	0.9189	1.2916	0.7993	1.2916	0.7058	1.2916	0.6308	1.2916	0.5188	1.2916	0.4097
1.353	1.2562	1.353	0.9189	1.353	0.7993	1.353	0.7058	1.353	0.6308	1.353	0.5188	1.353	0.4097
1.4175	1.3538	1.4175	0.9674	1.4175	0.8219	1.4175	0.7323	1.4175	0.6639	1.4175	0.5631	1.4175	0.4667
1.485	1.3538	1.485	0.9674	1.485	0.8219	1.485	0.7371	1.485	0.6874	1.485	0.5977	1.485	0.4967
1.5557	1.5417	1.5557	0.9739	1.5557	0.8219	1.5557	0.7371	1.5557	0.6874	1.5557	0.5977	1.5557	0.5028
1.6298	1.6087	1.6298	1.0257	1.6298	0.9121	1.6298	0.8203	1.6298	0.7505	1.6298	0.6443	1.6298	0.5288
1.7074	1.6087	1.7074	1.0361	1.7074	0.9722	1.7074	0.8761	1.7074	0.795	1.7074	0.6704	1.7074	0.5676
1.7887	1.8947	1.7887	1.0361	1.7887	0.9722	1.7887	0.8761	1.7887	0.795	1.7887	0.6869	1.7887	0.5915
1.8738	1.8947	1.8738	1.0361	1.8738	0.9722	1.8738	0.8761	1.8738	0.795	1.8738	0.7041	1.8738	0.6047
1.963	1.8947	1.963	1.0361	1.963	0.9722	1.963	0.8761	1.963	0.7962	1.963	0.7116	1.963	0.6087
2.0565	1.8947	2.0565	1.0361	2.0565	0.9722	2.0565	0.8761	2.0565	0.7962	2.0565	0.7116	2.0565	0.6087
2.1544	1.8947	2.1544	1.0361	2.1544	0.9581	2.1544	0.8481	2.1544	0.7962	2.1544	0.7116	2.1544	0.6087
2.257	1.6082	2.257	1.0361	2.257	0.9149	2.257	0.8481	2.257	0.7962	2.257	0.7116	2.257	0.6087
2.3645	1.6082	2.3645	0.9942	2.3645	0.9149	2.3645	0.8481	2.3645	0.7962	2.3645	0.7116	2.3645	0.6087
2.4771	1.6082	2.4771	0.9942	2.4771	0.9149	2.4771	0.8481	2.4771	0.7904	2.4771	0.7069	2.4771	0.6029
2.595	1.2397	2.595	0.9942	2.595	0.9149	2.595	0.8481	2.595	0.7904	2.595	0.6952	2.595	0.5873

PTWW068.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 68 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.1953	2.7186	0.9202	2.7186	0.8531	2.7186	0.7931	2.7186	0.7395	2.7186	0.6495	2.7186	0.562
2.848	1.0844	2.848	0.8533	2.848	0.7801	2.848	0.7362	2.848	0.6948	2.848	0.6221	2.848	0.5376
2.9836	1.0844	2.9836	0.8533	2.9836	0.7663	2.9836	0.6995	2.9836	0.6477	2.9836	0.5712	2.9836	0.4918
3.1257	1.0608	3.1257	0.664	3.1257	0.6109	3.1257	0.5659	3.1257	0.5322	3.1257	0.4875	3.1257	0.4434
3.2745	1.0608	3.2745	0.664	3.2745	0.6109	3.2745	0.5637	3.2745	0.523	3.2745	0.464	3.2745	0.411
3.4305	1.0608	3.4305	0.664	3.4305	0.6109	3.4305	0.5637	3.4305	0.523	3.4305	0.464	3.4305	0.411
3.5938	1.0608	3.5938	0.664	3.5938	0.6109	3.5938	0.5637	3.5938	0.523	3.5938	0.464	3.5938	0.411
3.7649	1.0608	3.7649	0.664	3.7649	0.6109	3.7649	0.5637	3.7649	0.523	3.7649	0.464	3.7649	0.411
3.9442	1.0608	3.9442	0.664	3.9442	0.6109	3.9442	0.5637	3.9442	0.523	3.9442	0.464	3.9442	0.411
4.132	1.0608	4.132	0.664	4.132	0.6109	4.132	0.5637	4.132	0.523	4.132	0.464	4.132	0.411
4.3288	1.0608	4.3288	0.664	4.3288	0.6109	4.3288	0.5637	4.3288	0.523	4.3288	0.464	4.3288	0.411
4.5349	1.0608	4.5349	0.664	4.5349	0.6109	4.5349	0.5637	4.5349	0.523	4.5349	0.464	4.5349	0.411
4.7508	1.0608	4.7508	0.664	4.7508	0.6109	4.7508	0.5637	4.7508	0.523	4.7508	0.464	4.7508	0.411
4.977	1.0608	4.977	0.6825	4.977	0.6131	4.977	0.5637	4.977	0.523	4.977	0.464	4.977	0.411
5.214	1.0608	5.214	0.6825	5.214	0.6131	5.214	0.5637	5.214	0.523	5.214	0.464	5.214	0.411
5.4623	1.0608	5.4623	0.6825	5.4623	0.6131	5.4623	0.5637	5.4623	0.523	5.4623	0.464	5.4623	0.411
5.7224	1.5414	5.7224	0.7528	5.7224	0.6883	5.7224	0.5675	5.7224	0.523	5.7224	0.464	5.7224	0.411
5.9948	1.5414	5.9948	0.7528	5.9948	0.6883	5.9948	0.5707	5.9948	0.5166	5.9948	0.4624	5.9948	0.411
6.2803	1.5414	6.2803	0.7528	6.2803	0.6883	6.2803	0.5707	6.2803	0.5135	6.2803	0.4514	6.2803	0.4057
6.5793	1.5414	6.5793	0.7528	6.5793	0.6883	6.5793	0.5707	6.5793	0.5057	6.5793	0.4473	6.5793	0.4057
6.8926	1.5414	6.8926	0.7528	6.8926	0.6883	6.8926	0.5707	6.8926	0.5057	6.8926	0.4393	6.8926	0.4057
7.2208	1.2507	7.2208	0.7528	7.2208	0.6517	7.2208	0.5707	7.2208	0.5057	7.2208	0.43	7.2208	0.4057
7.5646	1.1914	7.5646	0.7042	7.5646	0.5868	7.5646	0.5157	7.5646	0.4615	7.5646	0.43	7.5646	0.4057
7.9248	1.0406	7.9248	0.5548	7.9248	0.4886	7.9248	0.4685	7.9248	0.4529	7.9248	0.43	7.9248	0.4057
8.3022	1.0406	8.3022	0.547	8.3022	0.4886	8.3022	0.4685	8.3022	0.4529	8.3022	0.43	8.3022	0.4057
8.6975	0.8232	8.6975	0.5221	8.6975	0.4886	8.6975	0.4685	8.6975	0.4529	8.6975	0.43	8.6975	0.4054
9.1116	0.8232	9.1116	0.5221	9.1116	0.4715	9.1116	0.4536	9.1116	0.442	9.1116	0.4229	9.1116	0.4013
9.5455	0.8232	9.5455	0.5221	9.5455	0.4715	9.5455	0.4536	9.5455	0.442	9.5455	0.4229	9.5455	0.4013
10	0.7266	10	0.5221	10	0.4715	10	0.4536	10	0.442	10	0.4229	10	0.4013
10.4762	0.7266	10.4762	0.5221	10.4762	0.4715	10.4762	0.4318	10.4762	0.4256	10.4762	0.4126	10.4762	0.3942
10.975	0.7266	10.975	0.5221	10.975	0.4715	10.975	0.4261	10.975	0.412	10.975	0.3988	10.975	0.3816
11.4976	0.7266	11.4976	0.5041	11.4976	0.4445	11.4976	0.4109	11.4976	0.4001	11.4976	0.3859	11.4976	0.3714
12.045	0.5193	12.045	0.4288	12.045	0.3925	12.045	0.3815	12.045	0.3795	12.045	0.3743	12.045	0.3648
12.6186	0.5193	12.6186	0.3891	12.6186	0.3839	12.6186	0.3789	12.6186	0.3746	12.6186	0.367	12.6186	0.3574
13.2194	0.5193	13.2194	0.3754	13.2194	0.3691	13.2194	0.3654	13.2194	0.3624	13.2194	0.3568	13.2194	0.3489

PTWW068.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 68 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.5193	13.8489	0.3622	13.8489	0.3539	13.8489	0.3531	13.8489	0.3514	13.8489	0.3468	13.8489	0.3398
14.5083	0.5193	14.5083	0.3622	14.5083	0.3539	14.5083	0.3479	14.5083	0.3436	14.5083	0.3374	14.5083	0.3305
15.1991	0.5193	15.1991	0.3331	15.1991	0.3298	15.1991	0.3285	15.1991	0.3274	15.1991	0.3248	15.1991	0.3203
15.9228	0.5193	15.9228	0.3275	15.9228	0.323	15.9228	0.3212	15.9228	0.3191	15.9228	0.3152	15.9228	0.3107
16.681	0.5193	16.681	0.3275	16.681	0.3163	16.681	0.3108	16.681	0.3078	16.681	0.304	16.681	0.301
17.4753	0.5193	17.4753	0.3271	17.4753	0.3111	17.4753	0.3037	17.4753	0.3025	17.4753	0.2998	17.4753	0.2959
18.3074	0.4409	18.3074	0.3004	18.3074	0.3011	18.3074	0.2998	18.3074	0.2981	18.3074	0.2949	18.3074	0.2912
19.1791	0.4409	19.1791	0.2999	19.1791	0.2901	19.1791	0.2881	19.1791	0.2874	19.1791	0.2867	19.1791	0.2854
20.0923	0.4409	20.0923	0.2999	20.0923	0.286	20.0923	0.2839	20.0923	0.2824	20.0923	0.2815	20.0923	0.2811
21.049	0.4409	21.049	0.2999	21.049	0.286	21.049	0.2839	21.049	0.2824	21.049	0.2803	21.049	0.2784
22.0513	0.4409	22.0513	0.2961	22.0513	0.2857	22.0513	0.2819	22.0513	0.279	22.0513	0.2775	22.0513	0.2758
23.1013	0.4409	23.1013	0.2902	23.1013	0.2857	23.1013	0.2819	23.1013	0.279	23.1013	0.2756	23.1013	0.2728
24.2013	0.4409	24.2013	0.2763	24.2013	0.2687	24.2013	0.2687	24.2013	0.2692	24.2013	0.2691	24.2013	0.2684
25.3536	0.304	25.3536	0.271	25.3536	0.2687	25.3536	0.267	25.3536	0.2657	25.3536	0.264	25.3536	0.2647
26.5609	0.304	26.5609	0.271	26.5609	0.2687	26.5609	0.267	26.5609	0.2657	26.5609	0.264	26.5609	0.2628
27.8256	0.2808	27.8256	0.2679	27.8256	0.2658	27.8256	0.2641	27.8256	0.2629	27.8256	0.2613	27.8256	0.2603
29.1505	0.2754	29.1505	0.2584	29.1505	0.2573	29.1505	0.2565	29.1505	0.2559	29.1505	0.2561	29.1505	0.2571
30.5386	0.2652	30.5386	0.2584	30.5386	0.2573	30.5386	0.2565	30.5386	0.2559	30.5386	0.2553	30.5386	0.2556
31.9927	0.2557	31.9927	0.2584	31.9927	0.2573	31.9927	0.2565	31.9927	0.2559	31.9927	0.2553	31.9927	0.2549
33.516	0.2539	33.516	0.2548	33.516	0.2549	33.516	0.2548	33.516	0.2546	33.516	0.2543	33.516	0.2539
35.1119	0.2533	35.1119	0.2532	35.1119	0.2531	35.1119	0.2531	35.1119	0.253	35.1119	0.2529	35.1119	0.2527
36.7838	0.252	36.7838	0.2519	36.7838	0.2518	36.7838	0.2518	36.7838	0.2518	36.7838	0.2517	36.7838	0.2516
38.5353	0.2507	38.5353	0.2507	38.5353	0.2506	38.5353	0.2506	38.5353	0.2506	38.5353	0.2506	38.5353	0.2505
40.3702	0.2496	40.3702	0.2496	40.3702	0.2496	40.3702	0.2496	40.3702	0.2496	40.3702	0.2496	40.3702	0.2495
42.2924	0.2486	42.2924	0.2487	42.2924	0.2487	42.2924	0.2487	42.2924	0.2487	42.2924	0.2487	42.2924	0.2487
44.3062	0.2478	44.3062	0.2479	44.3062	0.2479	44.3062	0.2479	44.3062	0.2479	44.3062	0.2479	44.3062	0.2479
46.4159	0.2472	46.4159	0.2471	46.4159	0.2471	46.4159	0.2471	46.4159	0.2471	46.4159	0.2471	46.4159	0.2472
48.626	0.2464	48.626	0.2464	48.626	0.2464	48.626	0.2464	48.626	0.2464	48.626	0.2465	48.626	0.2465
50.9414	0.2458	50.9414	0.2458	50.9414	0.2458	50.9414	0.2458	50.9414	0.2458	50.9414	0.2458	50.9414	0.2458

PTWW069.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 69 ~ SLAB-WALL JOINT Vertical Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0291	0.1098	0.026	0.1098	0.0244	0.1098	0.0229	0.1098	0.022	0.1098	0.0212	0.1098	0.0203
0.115	0.0308	0.115	0.026	0.115	0.0244	0.115	0.0233	0.115	0.0229	0.115	0.022	0.115	0.021
0.1204	0.0313	0.1204	0.0262	0.1204	0.0245	0.1204	0.024	0.1204	0.0235	0.1204	0.0226	0.1204	0.0215
0.1262	0.0313	0.1262	0.0269	0.1262	0.0257	0.1262	0.0245	0.1262	0.0239	0.1262	0.023	0.1262	0.022
0.1322	0.0313	0.1322	0.0271	0.1322	0.0258	0.1322	0.0247	0.1322	0.0242	0.1322	0.0233	0.1322	0.0223
0.1385	0.0313	0.1385	0.0277	0.1385	0.0265	0.1385	0.0254	0.1385	0.0245	0.1385	0.0234	0.1385	0.0224
0.1451	0.0316	0.1451	0.0294	0.1451	0.0282	0.1451	0.027	0.1451	0.0259	0.1451	0.0239	0.1451	0.0224
0.152	0.032	0.152	0.0298	0.152	0.0285	0.152	0.0272	0.152	0.0261	0.152	0.024	0.152	0.0224
0.1592	0.033	0.1592	0.031	0.1592	0.0298	0.1592	0.0287	0.1592	0.0277	0.1592	0.026	0.1592	0.0241
0.1668	0.0367	0.1668	0.0323	0.1668	0.0312	0.1668	0.0302	0.1668	0.0292	0.1668	0.0276	0.1668	0.0256
0.1748	0.0507	0.1748	0.0427	0.1748	0.0385	0.1748	0.035	0.1748	0.0321	0.1748	0.0284	0.1748	0.0264
0.1831	0.0585	0.1831	0.0492	0.1831	0.0441	0.1831	0.0399	0.1831	0.0362	0.1831	0.0306	0.1831	0.0266
0.1918	0.0585	0.1918	0.0492	0.1918	0.0441	0.1918	0.0399	0.1918	0.0362	0.1918	0.0306	0.1918	0.0267
0.2009	0.0585	0.2009	0.0492	0.2009	0.0441	0.2009	0.0399	0.2009	0.0362	0.2009	0.0323	0.2009	0.0293
0.2105	0.0585	0.2105	0.0492	0.2105	0.0441	0.2105	0.0399	0.2105	0.0384	0.2105	0.0357	0.2105	0.0322
0.2205	0.0585	0.2205	0.0492	0.2205	0.0453	0.2205	0.0426	0.2205	0.0406	0.2205	0.0376	0.2205	0.0337
0.231	0.0585	0.231	0.0492	0.231	0.0457	0.231	0.0438	0.231	0.0419	0.231	0.0386	0.231	0.0352
0.242	0.0585	0.242	0.0509	0.242	0.0485	0.242	0.0463	0.242	0.0444	0.242	0.041	0.242	0.0368
0.2535	0.0648	0.2535	0.0572	0.2535	0.0528	0.2535	0.0488	0.2535	0.0453	0.2535	0.041	0.2535	0.0369
0.2656	0.0731	0.2656	0.0585	0.2656	0.0534	0.2656	0.0489	0.2656	0.0453	0.2656	0.0423	0.2656	0.0399
0.2783	0.0816	0.2783	0.0598	0.2783	0.0534	0.2783	0.0499	0.2783	0.0483	0.2783	0.0456	0.2783	0.0422
0.2915	0.0816	0.2915	0.0617	0.2915	0.058	0.2915	0.0546	0.2915	0.0516	0.2915	0.0476	0.2915	0.0433
0.3054	0.0816	0.3054	0.0662	0.3054	0.062	0.3054	0.0583	0.3054	0.0548	0.3054	0.0488	0.3054	0.0448
0.3199	0.0816	0.3199	0.0701	0.3199	0.0659	0.3199	0.0622	0.3199	0.0588	0.3199	0.0531	0.3199	0.0466
0.3352	0.0871	0.3352	0.0766	0.3352	0.0706	0.3352	0.0658	0.3352	0.0623	0.3352	0.0564	0.3352	0.0493
0.3511	0.0905	0.3511	0.0805	0.3511	0.0747	0.3511	0.0697	0.3511	0.0652	0.3511	0.0576	0.3511	0.0499
0.3678	0.1216	0.3678	0.095	0.3678	0.0821	0.3678	0.0719	0.3678	0.0652	0.3678	0.0576	0.3678	0.0499
0.3853	0.136	0.3853	0.1056	0.3853	0.0917	0.3853	0.0806	0.3853	0.0716	0.3853	0.0583	0.3853	0.0502
0.4037	0.136	0.4037	0.1056	0.4037	0.0917	0.4037	0.082	0.4037	0.076	0.4037	0.066	0.4037	0.0569
0.4229	0.136	0.4229	0.1056	0.4229	0.0917	0.4229	0.0848	0.4229	0.0796	0.4229	0.0707	0.4229	0.0608
0.4431	0.136	0.4431	0.1056	0.4431	0.0932	0.4431	0.0884	0.4431	0.0838	0.4431	0.0753	0.4431	0.0648
0.4642	0.1372	0.4642	0.1056	0.4642	0.0972	0.4642	0.0913	0.4642	0.0857	0.4642	0.076	0.4642	0.0667
0.4863	0.1479	0.4863	0.1238	0.4863	0.1107	0.4863	0.0995	0.4863	0.0901	0.4863	0.082	0.4863	0.0724
0.5094	0.1808	0.5094	0.138	0.5094	0.1214	0.5094	0.108	0.5094	0.0971	0.5094	0.086	0.5094	0.0743

PTWW069.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 69 ~ SLAB-WALL JOINT Vertical Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.2215	0.5337	0.1602	0.5337	0.134	0.5337	0.1151	0.5337	0.1024	0.5337	0.086	0.5337	0.0743
0.5591	0.2215	0.5591	0.1602	0.5591	0.134	0.5591	0.1151	0.5591	0.1024	0.5591	0.0883	0.5591	0.0753
0.5857	0.2215	0.5857	0.1602	0.5857	0.134	0.5857	0.1151	0.5857	0.1024	0.5857	0.0936	0.5857	0.0818
0.6136	0.2215	0.6136	0.1602	0.6136	0.134	0.6136	0.1174	0.6136	0.1107	0.6136	0.0999	0.6136	0.087
0.6428	0.2254	0.6428	0.1616	0.6428	0.1351	0.6428	0.1174	0.6428	0.1126	0.6428	0.1027	0.6428	0.0891
0.6734	0.2254	0.6734	0.1616	0.6734	0.1377	0.6734	0.128	0.6734	0.12	0.6734	0.1074	0.6734	0.0928
0.7055	0.2254	0.7055	0.1616	0.7055	0.1377	0.7055	0.128	0.7055	0.12	0.7055	0.1085	0.7055	0.0941
0.7391	0.2254	0.7391	0.1616	0.7391	0.1406	0.7391	0.1322	0.7391	0.124	0.7391	0.1093	0.7391	0.0941
0.7743	0.3163	0.7743	0.2131	0.7743	0.1804	0.7743	0.1581	0.7743	0.1421	0.7743	0.1213	0.7743	0.1033
0.8111	0.3163	0.8111	0.2131	0.8111	0.1804	0.8111	0.1581	0.8111	0.1421	0.8111	0.1213	0.8111	0.1061
0.8497	0.3163	0.8497	0.2131	0.8497	0.1804	0.8497	0.1652	0.8497	0.1528	0.8497	0.133	0.8497	0.112
0.8902	0.3163	0.8902	0.2131	0.8902	0.1853	0.8902	0.1697	0.8902	0.1566	0.8902	0.1359	0.8902	0.1165
0.9326	0.484	0.9326	0.298	0.9326	0.2451	0.9326	0.2142	0.9326	0.192	0.9326	0.1628	0.9326	0.1368
0.977	0.484	0.977	0.298	0.977	0.2451	0.977	0.2142	0.977	0.192	0.977	0.171	0.977	0.1499
1.0235	0.484	1.0235	0.298	1.0235	0.2451	1.0235	0.2142	1.0235	0.192	1.0235	0.1778	1.0235	0.1585
1.0723	0.484	1.0723	0.298	1.0723	0.2559	1.0723	0.2349	1.0723	0.2176	1.0723	0.192	1.0723	0.1655
1.1233	0.5659	1.1233	0.3327	1.1233	0.2611	1.1233	0.2349	1.1233	0.2176	1.1233	0.192	1.1233	0.1655
1.1768	0.5659	1.1768	0.3734	1.1768	0.3107	1.1768	0.2745	1.1768	0.2456	1.1768	0.2074	1.1768	0.1815
1.2328	0.5659	1.2328	0.3781	1.2328	0.3415	1.2328	0.3111	1.2328	0.2859	1.2328	0.2468	1.2328	0.2079
1.2916	0.5659	1.2916	0.4096	1.2916	0.3613	1.2916	0.3217	1.2916	0.295	1.2916	0.2542	1.2916	0.2144
1.353	0.606	1.353	0.4096	1.353	0.3613	1.353	0.3217	1.353	0.3029	1.353	0.2717	1.353	0.2351
1.4175	0.606	1.4175	0.4096	1.4175	0.3613	1.4175	0.3377	1.4175	0.3207	1.4175	0.2902	1.4175	0.2539
1.485	0.606	1.485	0.4286	1.485	0.3968	1.485	0.3711	1.485	0.3474	1.485	0.3076	1.485	0.2621
1.5557	0.606	1.5557	0.4538	1.5557	0.4256	1.5557	0.3998	1.5557	0.376	1.5557	0.3362	1.5557	0.2882
1.6298	0.6201	1.6298	0.4702	1.6298	0.4327	1.6298	0.4085	1.6298	0.3867	1.6298	0.3489	1.6298	0.305
1.7074	0.7664	1.7074	0.5977	1.7074	0.5296	1.7074	0.4741	1.7074	0.4291	1.7074	0.366	1.7074	0.3106
1.7887	0.8419	1.7887	0.7066	1.7887	0.6349	1.7887	0.5728	1.7887	0.5188	1.7887	0.4429	1.7887	0.3669
1.8738	0.9152	1.8738	0.7176	1.8738	0.6431	1.8738	0.5814	1.8738	0.5294	1.8738	0.4475	1.8738	0.4084
1.963	1.0139	1.963	0.7176	1.963	0.6431	1.963	0.5814	1.963	0.5294	1.963	0.4475	1.963	0.4288
2.0565	1.0139	2.0565	0.7176	2.0565	0.6431	2.0565	0.5814	2.0565	0.5321	2.0565	0.4546	2.0565	0.4288
2.1544	1.0139	2.1544	0.7675	2.1544	0.6919	2.1544	0.6262	2.1544	0.5712	2.1544	0.4936	2.1544	0.4288
2.257	1.0139	2.257	0.7675	2.257	0.7019	2.257	0.6331	2.257	0.5937	2.257	0.5162	2.257	0.4288
2.3645	1.7456	2.3645	0.9182	2.3645	0.7282	2.3645	0.6331	2.3645	0.6139	2.3645	0.5343	2.3645	0.4415
2.4771	1.9301	2.4771	0.9654	2.4771	0.7282	2.4771	0.6331	2.4771	0.6241	2.4771	0.539	2.4771	0.4459
2.595	1.9301	2.595	0.9654	2.595	0.7282	2.595	0.6331	2.595	0.6241	2.595	0.539	2.595	0.4459

PTWW069.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 69 ~ SLAB-WALL JOINT Vertical Responses ~ Elevation 0 ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.9301	2.7186	0.9654	2.7186	0.7282	2.7186	0.6331	2.7186	0.6241	2.7186	0.539	2.7186	0.4459
2.848	1.9301	2.848	0.9654	2.848	0.7282	2.848	0.6331	2.848	0.6241	2.848	0.539	2.848	0.4459
2.9836	1.9301	2.9836	0.9654	2.9836	0.7282	2.9836	0.6331	2.9836	0.6241	2.9836	0.539	2.9836	0.4459
3.1257	1.9301	3.1257	0.9654	3.1257	0.7282	3.1257	0.6331	3.1257	0.6216	3.1257	0.5193	3.1257	0.4386
3.2745	1.2997	3.2745	0.8451	3.2745	0.7062	3.2745	0.6101	3.2745	0.5396	3.2745	0.4883	3.2745	0.4241
3.4305	0.8816	3.4305	0.6085	3.4305	0.5572	3.4305	0.5192	3.4305	0.4993	3.4305	0.4591	3.4305	0.4047
3.5938	0.8816	3.5938	0.6085	3.5938	0.5572	3.5938	0.5178	3.5938	0.485	3.5938	0.4343	3.5938	0.3795
3.7649	0.8816	3.7649	0.6085	3.7649	0.537	3.7649	0.4797	3.7649	0.4392	3.7649	0.3992	3.7649	0.3563
3.9442	0.8816	3.9442	0.6085	3.9442	0.537	3.9442	0.4797	3.9442	0.4392	3.9442	0.3992	3.9442	0.3549
4.132	0.8816	4.132	0.6085	4.132	0.537	4.132	0.4797	4.132	0.4392	4.132	0.3992	4.132	0.3549
4.3288	0.8816	4.3288	0.6085	4.3288	0.537	4.3288	0.4797	4.3288	0.4392	4.3288	0.3992	4.3288	0.3549
4.5349	0.8816	4.5349	0.6085	4.5349	0.537	4.5349	0.4797	4.5349	0.4392	4.5349	0.3992	4.5349	0.3549
4.7508	0.8816	4.7508	0.6085	4.7508	0.537	4.7508	0.4797	4.7508	0.4392	4.7508	0.3992	4.7508	0.3549
4.977	0.8816	4.977	0.6085	4.977	0.537	4.977	0.4797	4.977	0.4392	4.977	0.3992	4.977	0.3549
5.214	0.8816	5.214	0.6085	5.214	0.537	5.214	0.4797	5.214	0.4392	5.214	0.3992	5.214	0.3549
5.4623	0.8816	5.4623	0.6085	5.4623	0.537	5.4623	0.4797	5.4623	0.4392	5.4623	0.3992	5.4623	0.3544
5.7224	0.9367	5.7224	0.6085	5.7224	0.537	5.7224	0.4797	5.7224	0.4372	5.7224	0.3886	5.7224	0.3467
5.9948	0.9367	5.9948	0.6085	5.9948	0.537	5.9948	0.4797	5.9948	0.4372	5.9948	0.3838	5.9948	0.333
6.2803	0.9367	6.2803	0.6085	6.2803	0.537	6.2803	0.4797	6.2803	0.4347	6.2803	0.374	6.2803	0.3208
6.5793	0.9367	6.5793	0.5643	6.5793	0.497	6.5793	0.4542	6.5793	0.4208	6.5793	0.3672	6.5793	0.3119
6.8926	0.9367	6.8926	0.5643	6.8926	0.497	6.8926	0.4542	6.8926	0.4196	6.8926	0.367	6.8926	0.3119
7.2208	0.8625	7.2208	0.5643	7.2208	0.4917	7.2208	0.438	7.2208	0.3971	7.2208	0.3503	7.2208	0.3119
7.5646	0.8625	7.5646	0.5643	7.5646	0.4917	7.5646	0.438	7.5646	0.3971	7.5646	0.3503	7.5646	0.3119
7.9248	0.8625	7.9248	0.5643	7.9248	0.4917	7.9248	0.438	7.9248	0.3971	7.9248	0.3503	7.9248	0.3119
8.3022	0.8625	8.3022	0.5643	8.3022	0.4917	8.3022	0.438	8.3022	0.3971	8.3022	0.3503	8.3022	0.3119
8.6975	0.8242	8.6975	0.5643	8.6975	0.4917	8.6975	0.438	8.6975	0.3971	8.6975	0.3503	8.6975	0.3119
9.1116	0.8242	9.1116	0.5643	9.1116	0.4917	9.1116	0.438	9.1116	0.3971	9.1116	0.3503	9.1116	0.3119
9.5455	0.8242	9.5455	0.5643	9.5455	0.4917	9.5455	0.438	9.5455	0.3971	9.5455	0.3503	9.5455	0.3119
10	0.8242	10	0.5643	10	0.4917	10	0.438	10	0.3971	10	0.3503	10	0.3119
10.4762	0.8242	10.4762	0.5643	10.4762	0.4917	10.4762	0.438	10.4762	0.3971	10.4762	0.3503	10.4762	0.3119
10.975	0.8242	10.975	0.5643	10.975	0.4917	10.975	0.438	10.975	0.3971	10.975	0.3503	10.975	0.3139
11.4976	0.7918	11.4976	0.5643	11.4976	0.4917	11.4976	0.438	11.4976	0.3971	11.4976	0.3503	11.4976	0.3139
12.045	0.7734	12.045	0.5006	12.045	0.4466	12.045	0.412	12.045	0.3834	12.045	0.3503	12.045	0.3139
12.6186	0.7734	12.6186	0.5006	12.6186	0.4336	12.6186	0.4051	12.6186	0.3834	12.6186	0.3503	12.6186	0.3139
13.2194	0.6782	13.2194	0.4597	13.2194	0.4293	13.2194	0.4043	13.2194	0.3834	13.2194	0.3503	13.2194	0.3139

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6782	13.8489	0.4375	13.8489	0.409	13.8489	0.3871	13.8489	0.3686	13.8489	0.3382	13.8489	0.3058
14.5083	0.5267	14.5083	0.366	14.5083	0.3521	14.5083	0.3392	14.5083	0.3264	14.5083	0.304	14.5083	0.2823
15.1991	0.5267	15.1991	0.3357	15.1991	0.3207	15.1991	0.309	15.1991	0.2994	15.1991	0.2843	15.1991	0.269
15.9228	0.5267	15.9228	0.3286	15.9228	0.2938	15.9228	0.274	15.9228	0.2684	15.9228	0.2644	15.9228	0.257
16.681	0.5267	16.681	0.3286	16.681	0.2938	16.681	0.2709	16.681	0.2558	16.681	0.2514	16.681	0.2462
17.4753	0.5267	17.4753	0.3286	17.4753	0.2938	17.4753	0.2709	17.4753	0.254	17.4753	0.2418	17.4753	0.2381
18.3074	0.4209	18.3074	0.2945	18.3074	0.2618	18.3074	0.2537	18.3074	0.2492	18.3074	0.2418	18.3074	0.2338
19.1791	0.4209	19.1791	0.2945	19.1791	0.2602	19.1791	0.2506	19.1791	0.2437	19.1791	0.2343	19.1791	0.2259
20.0923	0.3142	20.0923	0.2326	20.0923	0.2294	20.0923	0.2247	20.0923	0.2201	20.0923	0.2173	20.0923	0.215
21.049	0.3142	21.049	0.2303	21.049	0.2169	21.049	0.2099	21.049	0.2049	21.049	0.2052	21.049	0.2054
22.0513	0.3142	22.0513	0.2303	22.0513	0.215	22.0513	0.2093	22.0513	0.2049	22.0513	0.1986	22.0513	0.199
23.1013	0.263	23.1013	0.2161	23.1013	0.2103	23.1013	0.2057	23.1013	0.2021	23.1013	0.1969	23.1013	0.1962
24.2013	0.263	24.2013	0.2089	24.2013	0.2031	24.2013	0.1999	24.2013	0.1977	24.2013	0.1951	24.2013	0.1934
25.3536	0.2498	25.3536	0.2025	25.3536	0.1905	25.3536	0.1891	25.3536	0.1883	25.3536	0.1893	25.3536	0.1894
26.5609	0.2498	26.5609	0.2025	26.5609	0.1905	26.5609	0.1884	26.5609	0.1874	26.5609	0.1865	26.5609	0.1862
27.8256	0.2498	27.8256	0.2025	27.8256	0.1905	27.8256	0.1871	27.8256	0.1848	27.8256	0.1838	27.8256	0.1835
29.1505	0.2169	29.1505	0.1959	29.1505	0.1905	29.1505	0.1871	29.1505	0.1848	29.1505	0.1821	29.1505	0.1814
30.5386	0.2107	30.5386	0.1959	30.5386	0.1905	30.5386	0.1871	30.5386	0.1848	30.5386	0.1821	30.5386	0.1802
31.9927	0.2107	31.9927	0.1959	31.9927	0.1905	31.9927	0.1871	31.9927	0.1848	31.9927	0.1821	31.9927	0.1801
33.516	0.1779	33.516	0.1801	33.516	0.1804	33.516	0.1804	33.516	0.1802	33.516	0.1795	33.516	0.1786
35.1119	0.1753	35.1119	0.1759	35.1119	0.1763	35.1119	0.1766	35.1119	0.1768	35.1119	0.177	35.1119	0.1769
36.7838	0.1746	36.7838	0.1749	36.7838	0.1751	36.7838	0.1752	36.7838	0.1753	36.7838	0.1755	36.7838	0.1757
38.5353	0.1742	38.5353	0.1743	38.5353	0.1744	38.5353	0.1745	38.5353	0.1746	38.5353	0.1747	38.5353	0.1748
40.3702	0.1742	40.3702	0.1742	40.3702	0.1742	40.3702	0.1741	40.3702	0.1741	40.3702	0.1742	40.3702	0.1743
42.2924	0.1742	42.2924	0.1741	42.2924	0.1741	42.2924	0.1741	42.2924	0.1741	42.2924	0.1741	42.2924	0.1741
44.3062	0.174	44.3062	0.174	44.3062	0.174	44.3062	0.174	44.3062	0.174	44.3062	0.174	44.3062	0.174
46.4159	0.1739	46.4159	0.1739	46.4159	0.1739	46.4159	0.1739	46.4159	0.1739	46.4159	0.1739	46.4159	0.1739
48.626	0.1738	48.626	0.1738	48.626	0.1738	48.626	0.1738	48.626	0.1738	48.626	0.1738	48.626	0.1738
50.9414	0.1736	50.9414	0.1736	50.9414	0.1736	50.9414	0.1736	50.9414	0.1736	50.9414	0.1736	50.9414	0.1736

ISSUED BY RPP-WTP PDC

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00003 3

Data Sheet No.
24590-PTF-MED-CNP-00010

R11105813

Project:	***RPP-WTP***	Description:	***Cesium Evaporator Inter-Condenser***
Project No:	***24590***	P&ID:	***24590-PTF-M6-CNP-00010, 24590-QL-POA-MEVV-00002-07-24*** 3
Site:	***Hanford***	Process Data: 3	***24590-PTF-MVC-CNP-00015*** 3
Process flow diagram:	***24590-PTF-M5-V17T-00014***	Manufacturer Name:	***Framatome ANP / Graham Corporation.***

General Data

Quality Level	***Q (Note 1 & 7)*** 3	TEMA (Class/Type)	***B***
Seismic Category	***SC-I (Note 7)*** 3	Flow Type (Counter current, etc)	***N/A***
Design Code	***ASME VIII Div 1***	Heat Exchanger Duty Btu/hr	***436,064***
Code Stamp	***Yes***	Heat Exchanger Area ft^2	***50.7***
NB Registration	***Yes***	ΔT (LMTD/Corrected LMTD) °F	***59.8***

Thermal/Hydraulic Data

	Shell Side		Tube Side	
Fluid Name	***In Steam Out***		***In Cooling Water Out***	
Fluid Quantities: Total lbm/hr	***448.3***		***32,500***	
Condensable Vapor (In/Out)	***404.6***	***6.4***	***N/A***	***N/A***
Liquid	***N/A***	***398.2***	***32,500***	***32,500***
Noncondensable	***43.7***	***43.7***	***N/A***	***N/A***
Temperature (In/Out) °F	***226***	***90***	3 ***80.0 ****	3 ***92.0 ****
Specific Gravity	***N/A***	***N/A***	***1.000***	***0.998***
Viscosity Cp	***N/A***	***N/A***	***2.209***	***1.875***
Molecular Weight	***18.02***	***18.02***	***N/A***	***N/A***
Molecular Weight, Noncondensable	***29***	***29***	***N/A***	***N/A***
Specific Heat Btu/lbm-°F	***N/A***	***N/A***	***1.000***	***0.999***
Thermal Conductivity Btu/hr-ft-°F	***N/A***	***N/A***	***0.350***	***0.357***
Latent Heat Btu/lbm @ °F	***N/A***		***N/A***	
Inlet pressure psia	***200 Torr***		3 ***84.7 ****	
Tube side Velocity ft/s	***N/A***		***3.2***	
Pressure Drop (Allowed) psi	***10 mmHg***		***1.2***	
Fouling Resistance (Min) $hr\text{-}ft^2\text{-}°F/Btu$	***0.0020***		***0.0020***	

Mechanical Data

	Shell Side		Tube Side	
Design Pressure (Max/Min) psig	***50***	***Full vacuum****	3 ***100***	***Full vacuum****
Design Temperature (Max/Min) °F	***378***	***40***	***150***	***40***
Corrosion Allowance inch	***0.04***		***0.04***	
Erosion Allowance inch	***N/A***		***N/A***	
Shell OD/ID inch	***8 5/8" O.D.***		Overall Dimensions (H x W x L) inch	***20 x 13 1/2 x 95 1/8***
Total Number of Tubes	***43***		Tube OD inch	***0.750***

Material Data (Note 9) 3

Shell	***SA 312, SA 182 316L SS***	Shell Cover	***N/A***
Channel/Bonnet	***SA 312, SA 182, SA 403 316L SS***	Channel Cover	***N/A***
Tube	***SA 213 316 Seamless SS*** 3	Floating Head Cover	***N/A***
Stationary Tube Sheet	***SA 240 316L SS***	Floating Tube Sheet	***N/A***
Shell Side Gaskets	***N/A***	Tube Side Gaskets	***316 SS Spiral Wound, PTFE Filler***
Partition Seals	***N/A***	Baffles/Supports	***SA 240 316L SS***
Insulation	***N/A***	Forgings (Shell side)	***SA 182 F316L***
Bolting	***SA 193 B8M / SA 194 8M*** 3	Forgings (Channel)	***SA 182 316L***

MECHANICAL DATA SHEET

SHELL AND TUBE HEAT EXCHANGER

PLANT ITEM No.
24590-PTF-ME-CNP-HX-00003

Data Sheet No.
24590-PTF-MED-CNP-00010

Construction Data *(To be determined by the supplier when not specified by the buyer)*

Cross Baffle Type	*	% Baffle Cut (Dia.)	*	Spacing (c/c) inch	*
Bypass Seal Arrangement	*	Longitudinal Seal Type	*	Expansion Joint Type	*
Inlet Nozzle ρV^2	*	Bundle Entrance ρV^2	*	Bundle Exit ρV^2	*
Tube Support Type	*	U-bend Support Type	*	Weight of Bundle lbf	*
Operating Weight lbf	*	Full of Water lbf	*	Weight of Shell lbf	*

Notes

**** To be determined / confirmed by Seller***
****** Not Used.*** 3

3

(1) Vendor will provide item at BNI quality level Q specification, which corresponds with vendor quality level QL-2.
(2) Equipment Cyclic Data is from document 24590-QL-POA-MEVV-00002-10-00002.
(3) Vendor Design information is from document 24590-QL-POA-MEVV-00002-10-00011.
(4) The physical design parameters shall be determined by the seller based on TEMA and HEI standards.
(5) Contents of this document are Dangerous Waste Permit Affecting. 3
(6) Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 3 ***(AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.***
(7) For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and 3 ***therefore conservative.***
(8) Allowable nozzle loads shall be per SC-I stainless steel nozzle design loads of 24590-WTP-3PS-MV00-T0001. 3
(9) 304SS (max. carbon 0.030%) originally specified; 316L SS used due to availability. 3

Safety screening / evaluation required? ☒Yes ☐No If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.

Rev	Description	By	Checked	EN&S	Approved	Date
3	Updated to incorporate 24590-WTP-M6N-M80T-00005 (Dangerous Waste Permit Affecting), DOE AEA note (6), reflect WSGM analysis, 24590-PTF-U0D-W16T-00001 changes, and update other data.	D. Tate	S. Thakkar	S. Hall 8.14.11	J. Julyk	8/24/09
2	Incorporated Vendor Design Information and Equipment Qualification Data.	R. Rickenbach	S. Thakkar	S. Woolfolk	J. Julyk	07/15/2008
1	Issued for Purchase. Incorporates updated vendor data.	J. Hickman	K. Sadler	N/A	J. Julyk	08/11/2004
0	Issued for Purchase	J. Hickman	E. Le	N/A	J. Julyk	12/18/2003

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification

Component Tag Number	24590-PTF-ME-CNP-HX-00003	Safety Classification	☒ SC ☐ SS ☐ APC ☐ SDC ☐ SDS ☐ RRC Note 12 3
Manufacturer / Supplier	GRAHAM CORPORATION / FRAMATOME ANP, INC.		
Requisition Number	24590-QL-POA-MEVV-00002		
Model	N/A	Seismic Category	☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV Note 12 3
Description (Include descriptive text [e.g., location, elevation])	CESIUM EVAPORATOR INTER-CONDENSER, ROOM P-0430, ELEVATION 77'-0".		
Safety Function(s)	Prevent post seismic disruption of H2 vessel purge air pathways, spread of contamination into C3 areas from PVP blowback. 3		

Seismic Safety Function	☒ Yes ☐ No	Room Number(s):	P-0430
Maintenance Accessible	☒ Yes ☐ No	Method of Maintenance Access:	☐ Remote ☒ Hands On ☐ None
Seismic Operability Requirements: 3	☐ During Seismic Event 3 ☐ After Seismic Event		
ITS Equipment Type:	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical

Equipment Environmental Qualification (EEQ)

Environment ☒ Mild ☐ Harsh	Hi Rad Service ☐ Yes ☒ No	Design Life (yrs) ☐ 40 ☒ Other ____
Contamination Class: C3		Note 13 3
Radiation Class: R3		

Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	95	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal Low Temperature (°F)	59	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
Normal High Relative Humidity (%RH)	100	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Relative Humidity (%RH)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal High Pressure (in.-w.g.)	0	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Low Pressure (in.-w.g.)	-0.4	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Normal Radiation Dose Rate (mR/hr)	10	40	yrs	24590-PTF-U0D-W16T-00001	NOTE 1
Vibration Magnitude (g)	N/A	N/A	N/A	N/A 3	NOTE 1
Vibration Frequency (Hz)	N/A	N/A	N/A	N/A 3	NOTE 1
Additional Normal Information:	See Note 2 for pressure units.				

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Abnormal					
Abnormal High Temperature (°F)	3 115	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 3	NOTE 1
Abnormal Low Temperature (°F)	3 Note 10 40	8	hr/yr	24590-PTF-U0D-W16T-00001, Notes 8 & 10 3	NOTE 1
Abnormal High Relative Humidity (%RH)	100	24	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Relative Humidity (%RH)	4	22	hr/yr	24590-PTF-U0D-W16T-00001, Note 11 3	NOTE 1
Abnormal High Pressure (in.-w.g.)	4	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Low Pressure (in.-w.g.)	-7.3	8	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Abnormal Radiation Dose Rate (mR/hr)	10, Note 5	0	hr/yr	24590-PTF-U0D-W16T-00001	NOTE 1
Wet Sprinkler System Present	Yes	2	3 hr	24590-PTF-U0D-W16T-00001	NOTE 1
Additional Abnormal Information	See Note 2 for pressure units.				
Design Basis Events (DBE)					
DBE High Temperature (°F)	125	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8 & 11 3	NOTE 1
DBE Low Temperature (°F)	40	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8	NOTE 1
DBE High Relative Humidity (%RH)	100	482	3 hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Relative Humidity (%RH)	3 8	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE High Pressure (in.-w.g.)	4	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Low Pressure (in.-w.g.)	-7.3	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
DBE Radiation Dose Rate (mR/hr)	10, Note 5	0	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Flood Height (ft)	1.58	1000	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Submergence (ft)	0, Note 6	1000 3	hrs	3 24590-QL-POA-MEVV-00002-07-17	NOTE 1
Chemical/Spray Exposure	YES, Note 9	12.5	hrs	24590-PTF-U0D-W16T-00001	NOTE 1
Additional DBE Information	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	2M, 5M, 19M SODIUM HYDROXIDE 3 0.5M NITRIC ACID 3 1M SODIUM PERMANGANATE

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	SEE VENDOR SUBMITAL 24590-QL-POA-MEVV-00002-07-17
Mounting Method (bolts, welds, etc.)	CNP-SKID-00002, BOLTED, 24590-PTF-DD-S13T-00167
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks.	24590-WTP-3PS-SS90-T0001	001 3	N/A
Specified Seismic Load (BUYER)	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectre (ISRS) 3	24590-PTF-S0C-S15T-00057 3	00A 3	Calculation is not included in MR, see attached figures 16, 17, 22, 23 and 144 per CCN 185267. 3
Design Seismic Load (SELLER	3	3	3	Note 1 3
Qualification Method (SELLER)	3	3	3	Note 1 3
Qualification Report Number (SELLER)	3	3	3	Note 1 3
Submittal Number (BUYER)	TBD 3	TBD 3	TBD 3	None 3

Notes and Additional Information

Notes:

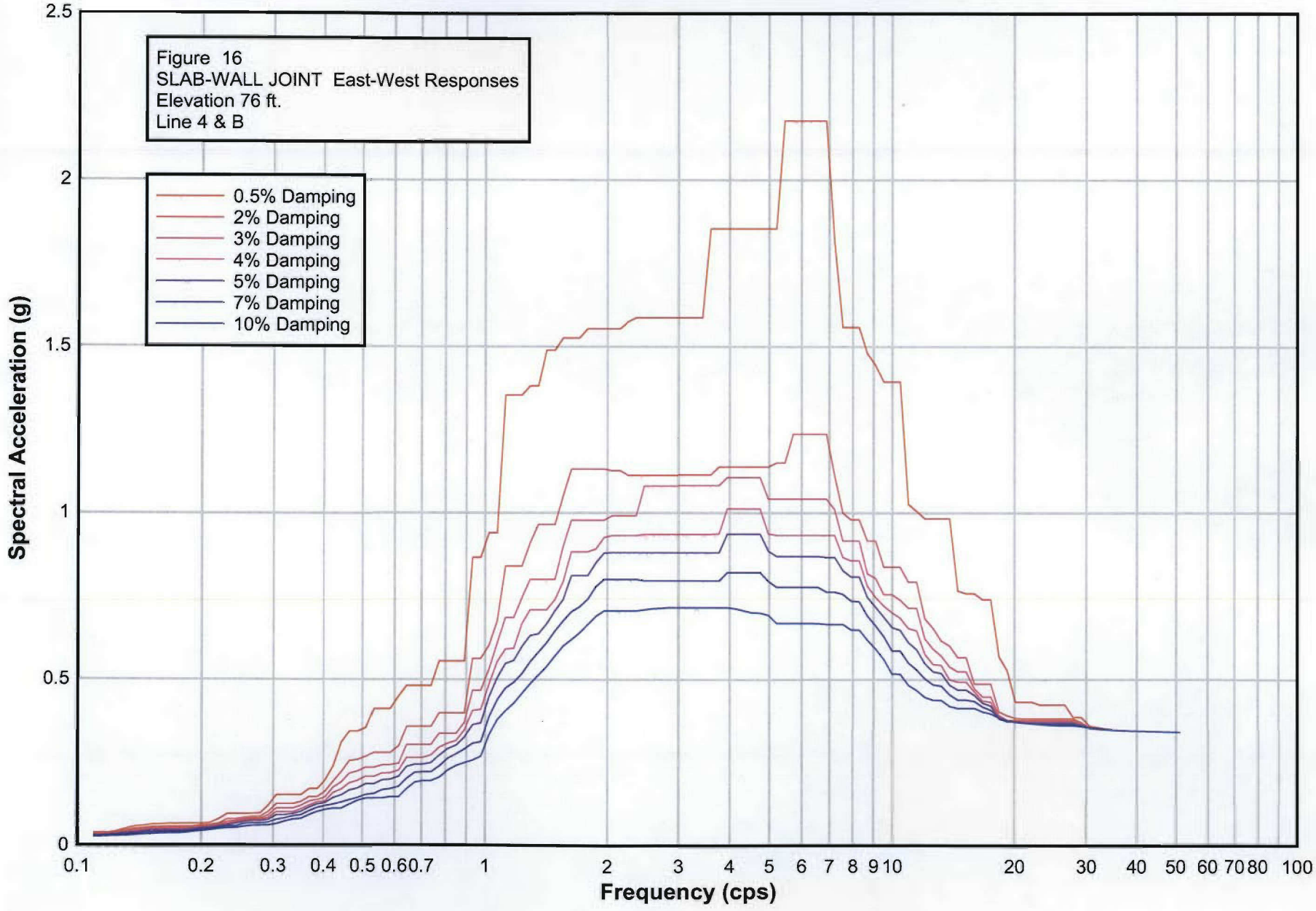
1. Data to be provided by seller through the submittal process as required on the G-321-E form.
2. Where pressure is given in inches of water column (in.-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in.-w.g.)
3. deleted. 3
4. The equipment qualification will be documented in accordance with the requirements in Appendix D of Engineering Specification for Environmental Qualification of Mechanical Equipment, document number 24590-WTP-3PS-G000-T0015. for the passive and active safety functions.
5. Abnormal and DBE radiation dose rates are set equal to normal and do not contribute to the total integrated dose. 3
6. Submergence depth is the difference between the lowest point on the equipment and the flood depth above the floor. The submergence depth is set to zero if the lowest section of the equipment is above the flood depth.
7. Environmental data from calculation 24590-PTF-U0D-W16T-00001 is for room environment only.
8. For application of AISC N690, 3 abnormal temperatures shall be applied as Normal Operation Temperature, T_O, with seismic effects, E_S. The Design basis event temperatures shall be applied as a Thermal Load generated by a postulated accident, T_A, without seismic effects, E_s. 3
9. See DBE Chemical Exposure Details. 3
10. Abnormal minimum temperature is set equal to the normal minimum temperature (59F) for the purposes of seismic 3 analysis. A DBE seismic event coincident with an extreme low abnormal temperature is not a credible scenario. [The probability of an abnormal minimum temperature is estimated as follows: temperatures <40 F occur 31% of the year (average historical weather data, 0.31 probability); a loss of heating is assumed to occur 8 hrs/yr (0.001 probability); combined probability is 0.31 x 0.001 = 0.00031 (3.1E-4). The combination of this event with a seismic DBE (4 E-04 probability) is not credible (<1 E-06 probability).]
11. Parameter value used on data sheet has been previously established and determined to provide more conservative 3 constraint than values derived from 24590-PTF-U0D-W16T-00001.
12. For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore 3 conservative.
13. Facility design life is 40 years. Seller will determine equipment design life and required maintenance / replacement 3 intervals to maintain qualification of equipment components subject to wear or aging.

References:

1. 24590-WTP-PSAR-ESH-01-002-02, Rev. 04E, Preliminary Documented Safety Analysis to Support Construction 3 Authorization; PT Facility Specific Information.
2. deleted. 3
3. 24590-PTF-M6-CNP-00010, Rev. 2, P&ID - PTF Cesium Nitric Acid Recovery Process System Rectifier and 3 Condensers.
4. 24590-PTF-U0D-W16T-00001, Rev. 0, PTF Room Environment Datasheet [Including DCNs: 24590-PTF-U0N-W16T-3 00001, 24590-PTF-U0N-W16T-00003, & 24590-PTF-U0N-W16T-00004].
5. 24590-WTP-DB-ENG-01-001, Rev. 1N, Basis Of Design.
6. 24590-QL-POA-MEVV-00002-07-00091, Rev. 00B, DRAWING - INTERCONDENSER MODEL 8 X 6' BEM 3
7. 24590-PTF-M6X-CNP-00037 Rev. 002, MS LINE LIST FOR P&ID 24590-PTF-M6-CNP-00010, REV. 2 3

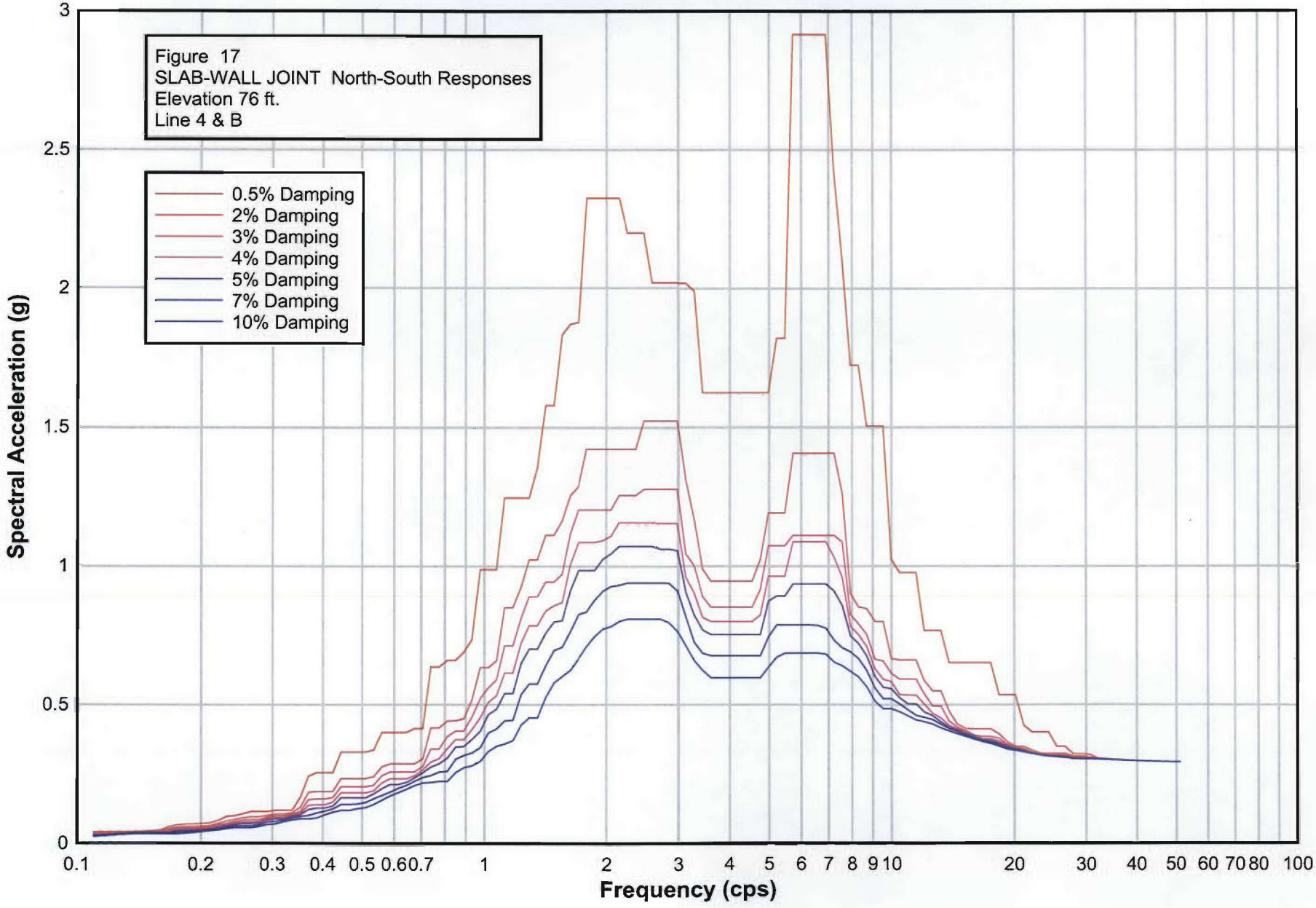
RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A 3



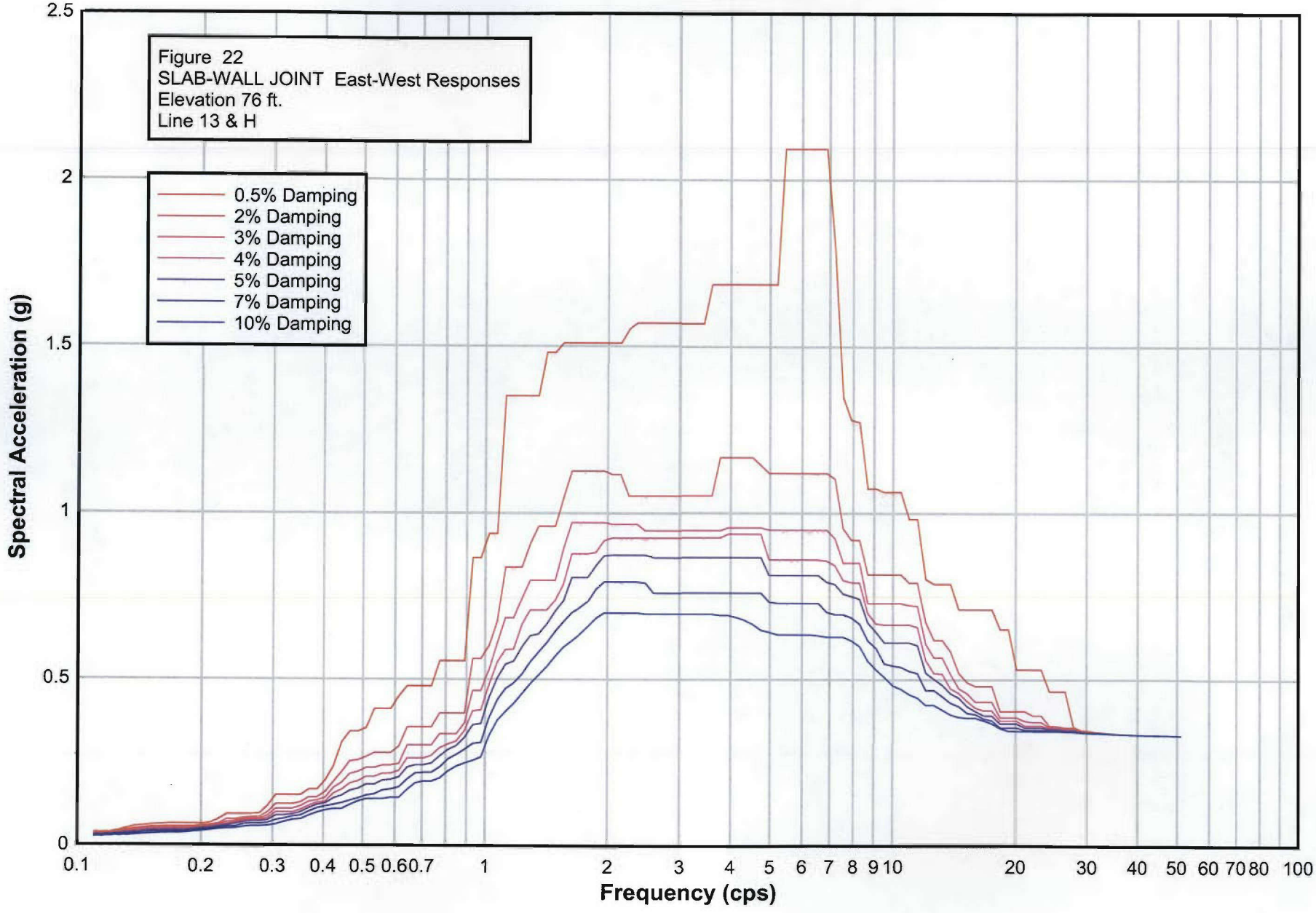
3 RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



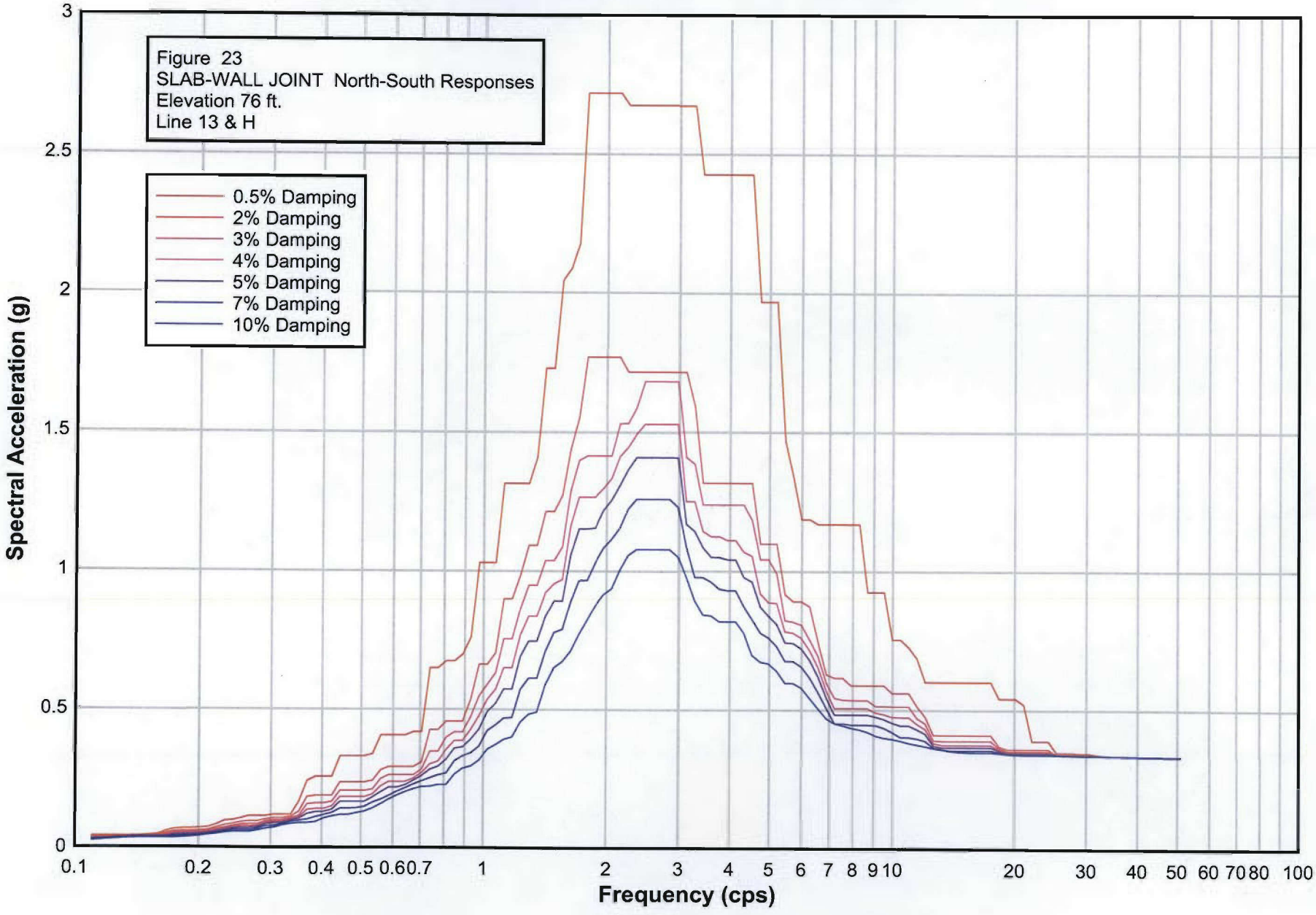
3 RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



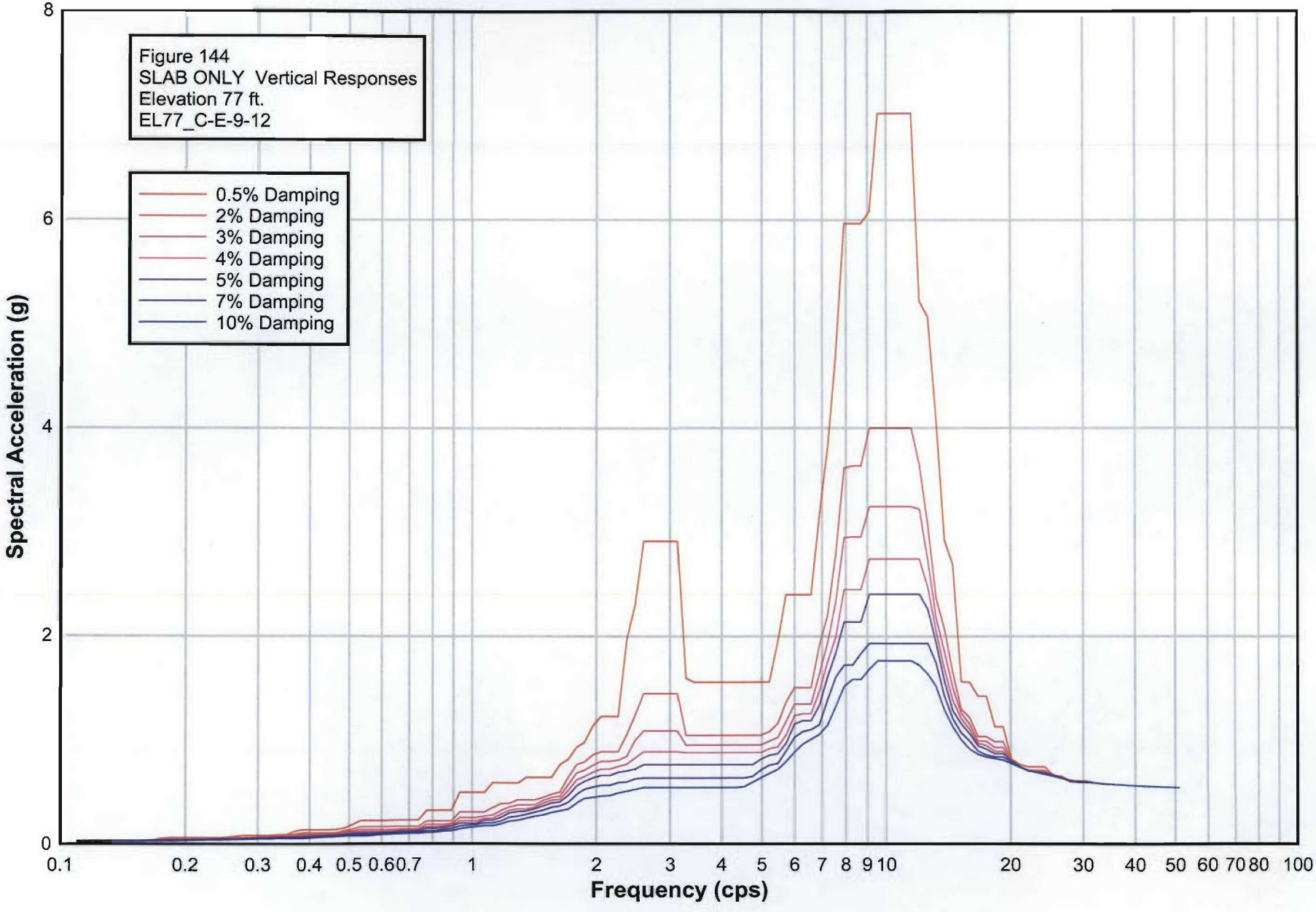
3 RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



3 RPP-WTP Pretreatment Facility ISRS

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0331	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0398	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.056	0.1385	0.0489	0.1385	0.0449	0.1385	0.0414	0.1385	0.0384	0.1385	0.0345	0.1385	0.0304
0.1451	0.0582	0.1451	0.051	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0617	0.152	0.0547	0.152	0.0507	0.152	0.0473	0.152	0.0442	0.152	0.0392	0.152	0.0339
0.1592	0.0621	0.1592	0.0547	0.1592	0.0507	0.1592	0.0473	0.1592	0.0442	0.1592	0.0398	0.1592	0.0353
0.1668	0.0641	0.1668	0.0561	0.1668	0.0518	0.1668	0.0482	0.1668	0.0452	0.1668	0.0404	0.1668	0.0358
0.1748	0.0641	0.1748	0.0561	0.1748	0.0518	0.1748	0.0482	0.1748	0.0452	0.1748	0.0404	0.1748	0.0358
0.1831	0.0641	0.1831	0.0561	0.1831	0.0518	0.1831	0.0482	0.1831	0.0452	0.1831	0.0404	0.1831	0.037
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0496	0.1918	0.0478	0.1918	0.0446	0.1918	0.0405
0.2009	0.0642	0.2009	0.0584	0.2009	0.0559	0.2009	0.0536	0.2009	0.0514	0.2009	0.0475	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0526	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0595	0.2205	0.0573	0.2205	0.0533	0.2205	0.0485
0.231	0.0934	0.231	0.0774	0.231	0.0694	0.231	0.0631	0.231	0.0598	0.231	0.0556	0.231	0.0504
0.242	0.0934	0.242	0.0774	0.242	0.0722	0.242	0.0678	0.242	0.0638	0.242	0.0567	0.242	0.0513
0.2535	0.0934	0.2535	0.0818	0.2535	0.0771	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0554
0.2656	0.0934	0.2656	0.084	0.2656	0.0795	0.2656	0.0755	0.2656	0.0718	0.2656	0.0654	0.2656	0.0576
0.2783	0.0953	0.2783	0.0846	0.2783	0.0795	0.2783	0.0755	0.2783	0.0718	0.2783	0.0654	0.2783	0.0583
0.2915	0.1187	0.2915	0.0988	0.2915	0.0891	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0596
0.3054	0.1504	0.3054	0.1235	0.3054	0.1098	0.3054	0.0986	0.3054	0.0895	0.3054	0.0759	0.3054	0.0634
0.3199	0.1504	0.3199	0.1235	0.3199	0.1098	0.3199	0.0986	0.3199	0.0895	0.3199	0.0803	0.3199	0.0708
0.3352	0.1504	0.3352	0.1235	0.3352	0.1098	0.3352	0.0986	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1504	0.3511	0.1293	0.3511	0.1176	0.3511	0.1073	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.1683	0.3678	0.144	0.3678	0.1305	0.3678	0.1188	0.3678	0.1122	0.3678	0.1019	0.3678	0.0901
0.3853	0.1683	0.3853	0.144	0.3853	0.1348	0.3853	0.1282	0.3853	0.1222	0.3853	0.1119	0.3853	0.0995
0.4037	0.1943	0.4037	0.1602	0.4037	0.1429	0.4037	0.1309	0.4037	0.1262	0.4037	0.1173	0.4037	0.1059
0.4229	0.2369	0.4229	0.1909	0.4229	0.1723	0.4229	0.156	0.4229	0.1418	0.4229	0.1222	0.4229	0.1097
0.4431	0.3093	0.4431	0.2196	0.4431	0.1883	0.4431	0.1672	0.4431	0.1497	0.4431	0.1277	0.4431	0.1101
0.4642	0.3423	0.4642	0.2533	0.4642	0.2146	0.4642	0.186	0.4642	0.1645	0.4642	0.1352	0.4642	0.122
0.4863	0.3423	0.4863	0.2566	0.4863	0.2214	0.4863	0.1933	0.4863	0.1706	0.4863	0.1417	0.4863	0.1333
0.5094	0.353	0.5094	0.266	0.5094	0.2329	0.5094	0.2058	0.5094	0.1835	0.5094	0.1506	0.5094	0.1402

PTWW016.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 16 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.4107	0.5337	0.2781	0.5337	0.2329	0.5337	0.2058	0.5337	0.1835	0.5337	0.1543	0.5337	0.1408
0.5591	0.4107	0.5591	0.2781	0.5591	0.2405	0.5591	0.2157	0.5591	0.1952	0.5591	0.1655	0.5591	0.1408
0.5857	0.4107	0.5857	0.2781	0.5857	0.241	0.5857	0.2165	0.5857	0.1977	0.5857	0.1688	0.5857	0.1449
0.6136	0.4487	0.6136	0.2979	0.6136	0.2453	0.6136	0.2243	0.6136	0.2059	0.6136	0.1759	0.6136	0.1449
0.6428	0.48	0.6428	0.3562	0.6428	0.3018	0.6428	0.2625	0.6428	0.236	0.6428	0.2002	0.6428	0.1694
0.6734	0.48	0.6734	0.3562	0.6734	0.3018	0.6734	0.2625	0.6734	0.2428	0.6734	0.218	0.6734	0.1886
0.7055	0.48	0.7055	0.3562	0.7055	0.3018	0.7055	0.2625	0.7055	0.2428	0.7055	0.2198	0.7055	0.1933
0.7391	0.48	0.7391	0.3562	0.7391	0.3018	0.7391	0.27	0.7391	0.247	0.7391	0.2198	0.7391	0.1933
0.7743	0.5542	0.7743	0.3977	0.7743	0.3353	0.7743	0.2937	0.7743	0.2698	0.7743	0.2368	0.7743	0.2034
0.8111	0.5542	0.8111	0.3977	0.8111	0.3353	0.8111	0.3056	0.8111	0.2895	0.8111	0.2605	0.8111	0.2253
0.8497	0.5542	0.8497	0.3977	0.8497	0.3353	0.8497	0.3138	0.8497	0.3004	0.8497	0.2743	0.8497	0.2392
0.8902	0.5542	0.8902	0.3977	0.8902	0.3682	0.8902	0.3455	0.8902	0.3247	0.8902	0.2891	0.8902	0.2477
0.9326	0.8662	0.9326	0.5625	0.9326	0.4663	0.9326	0.4051	0.9326	0.3625	0.9326	0.3066	0.9326	0.2561
0.977	0.8662	0.977	0.5625	0.977	0.4663	0.977	0.4085	0.977	0.3679	0.977	0.311	0.977	0.2675
1.0235	0.9397	1.0235	0.6023	1.0235	0.5301	1.0235	0.485	1.0235	0.4471	1.0235	0.3868	1.0235	0.3327
1.0723	0.9397	1.0723	0.6755	1.0723	0.6093	1.0723	0.5524	1.0723	0.5049	1.0723	0.4387	1.0723	0.3788
1.1233	1.3542	1.1233	0.8403	1.1233	0.6861	1.1233	0.5909	1.1233	0.5475	1.1233	0.4739	1.1233	0.4054
1.1768	1.3542	1.1768	0.8403	1.1768	0.6861	1.1768	0.593	1.1768	0.5568	1.1768	0.4913	1.1768	0.4287
1.2328	1.3542	1.2328	0.8403	1.2328	0.7451	1.2328	0.6666	1.2328	0.5988	1.2328	0.5173	1.2328	0.4581
1.2916	1.3816	1.2916	0.9092	1.2916	0.8003	1.2916	0.709	1.2916	0.632	1.2916	0.5529	1.2916	0.4868
1.353	1.3816	1.353	0.9646	1.353	0.8003	1.353	0.709	1.353	0.6372	1.353	0.5822	1.353	0.5131
1.4175	1.4891	1.4175	0.9646	1.4175	0.8003	1.4175	0.709	1.4175	0.6669	1.4175	0.6106	1.4175	0.5387
1.485	1.4891	1.485	0.9646	1.485	0.8003	1.485	0.74	1.485	0.707	1.485	0.6462	1.485	0.5713
1.5557	1.5256	1.5557	1.0523	1.5557	0.8995	1.5557	0.7933	1.5557	0.7403	1.5557	0.6763	1.5557	0.6006
1.6298	1.5256	1.6298	1.1325	1.6298	0.9776	1.6298	0.8831	1.6298	0.8122	1.6298	0.704	1.6298	0.6204
1.7074	1.5256	1.7074	1.1325	1.7074	0.9776	1.7074	0.8831	1.7074	0.8122	1.7074	0.7191	1.7074	0.6405
1.7887	1.5537	1.7887	1.1325	1.7887	0.9776	1.7887	0.8831	1.7887	0.8122	1.7887	0.7414	1.7887	0.6653
1.8738	1.5537	1.8738	1.1325	1.8738	0.9776	1.8738	0.8911	1.8738	0.8509	1.8738	0.7792	1.8738	0.6908
1.963	1.5537	1.963	1.1325	1.963	0.9776	1.963	0.9255	1.963	0.8796	1.963	0.8012	1.963	0.7066
2.0565	1.5537	2.0565	1.1279	2.0565	0.991	2.0565	0.9319	2.0565	0.8812	2.0565	0.8012	2.0565	0.7066
2.1544	1.5537	2.1544	1.1279	2.1544	0.991	2.1544	0.9319	2.1544	0.8812	2.1544	0.8012	2.1544	0.7066
2.257	1.5743	2.257	1.1134	2.257	0.991	2.257	0.9319	2.257	0.8812	2.257	0.8012	2.257	0.7066
2.3645	1.5864	2.3645	1.1134	2.3645	0.991	2.3645	0.9319	2.3645	0.8812	2.3645	0.8012	2.3645	0.7066
2.4771	1.5864	2.4771	1.1134	2.4771	1.0817	2.4771	0.936	2.4771	0.8812	2.4771	0.7969	2.4771	0.71
2.595	1.5864	2.595	1.1134	2.595	1.0817	2.595	0.936	2.595	0.8812	2.595	0.7969	2.595	0.7136

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.5864	2.7186	1.1134	2.7186	1.0817	2.7186	0.936	2.7186	0.8812	2.7186	0.7969	2.7186	0.7147
2.848	1.5864	2.848	1.1134	2.848	1.0817	2.848	0.936	2.848	0.8812	2.848	0.7969	2.848	0.7165
2.9836	1.5864	2.9836	1.1134	2.9836	1.0817	2.9836	0.936	2.9836	0.8812	2.9836	0.7969	2.9836	0.7168
3.1257	1.5864	3.1257	1.1134	3.1257	1.0817	3.1257	0.936	3.1257	0.8812	3.1257	0.7969	3.1257	0.7168
3.2745	1.5864	3.2745	1.1134	3.2745	1.0817	3.2745	0.936	3.2745	0.8812	3.2745	0.7969	3.2745	0.7168
3.4305	1.5864	3.4305	1.1134	3.4305	1.0817	3.4305	0.936	3.4305	0.8812	3.4305	0.7969	3.4305	0.7168
3.5938	1.8535	3.5938	1.1134	3.5938	1.0817	3.5938	0.936	3.5938	0.8812	3.5938	0.7969	3.5938	0.7168
3.7649	1.8535	3.7649	1.1379	3.7649	1.0817	3.7649	0.9372	3.7649	0.8812	3.7649	0.7969	3.7649	0.7168
3.9442	1.8535	3.9442	1.1379	3.9442	1.1062	3.9442	1.0119	3.9442	0.9368	3.9442	0.822	3.9442	0.7168
4.132	1.8535	4.132	1.1379	4.132	1.1062	4.132	1.0119	4.132	0.9368	4.132	0.822	4.132	0.7133
4.3288	1.8535	4.3288	1.1379	4.3288	1.1062	4.3288	1.0119	4.3288	0.9368	4.3288	0.822	4.3288	0.7073
4.5349	1.8535	4.5349	1.1379	4.5349	1.1062	4.5349	1.0119	4.5349	0.9368	4.5349	0.822	4.5349	0.7011
4.7508	1.8535	4.7508	1.1379	4.7508	1.1062	4.7508	1.0119	4.7508	0.9368	4.7508	0.822	4.7508	0.7005
4.977	1.8535	4.977	1.1379	4.977	1.0415	4.977	0.9371	4.977	0.8856	4.977	0.7959	4.977	0.6942
5.214	1.8535	5.214	1.15	5.214	1.0415	5.214	0.9333	5.214	0.8702	5.214	0.7781	5.214	0.6697
5.4623	2.1772	5.4623	1.15	5.4623	1.0415	5.4623	0.9333	5.4623	0.8702	5.4623	0.7781	5.4623	0.6697
5.7224	2.1772	5.7224	1.2364	5.7224	1.0415	5.7224	0.9333	5.7224	0.8702	5.7224	0.7781	5.7224	0.6697
5.9948	2.1772	5.9948	1.2364	5.9948	1.0415	5.9948	0.9333	5.9948	0.8702	5.9948	0.7781	5.9948	0.6697
6.2803	2.1772	6.2803	1.2364	6.2803	1.0415	6.2803	0.9333	6.2803	0.8702	6.2803	0.7781	6.2803	0.6697
6.5793	2.1772	6.5793	1.2364	6.5793	1.0415	6.5793	0.9333	6.5793	0.8702	6.5793	0.7781	6.5793	0.6692
6.8926	2.1772	6.8926	1.2364	6.8926	1.0415	6.8926	0.9333	6.8926	0.868	6.8926	0.7639	6.8926	0.6672
7.2208	1.8137	7.2208	1.111	7.2208	1.0099	7.2208	0.9333	7.2208	0.868	7.2208	0.7639	7.2208	0.6672
7.5646	1.5583	7.5646	1	7.5646	0.9162	7.5646	0.8668	7.5646	0.8278	7.5646	0.7569	7.5646	0.6672
7.9248	1.5583	7.9248	0.9797	7.9248	0.9162	7.9248	0.8567	7.9248	0.8091	7.9248	0.7367	7.9248	0.6498
8.3022	1.5583	8.3022	0.9797	8.3022	0.9162	8.3022	0.8567	8.3022	0.8091	8.3022	0.7348	8.3022	0.6498
8.6975	1.4793	8.6975	0.9161	8.6975	0.8178	8.6975	0.7806	8.6975	0.7481	8.6975	0.6917	8.6975	0.6191
9.1116	1.4446	9.1116	0.9161	9.1116	0.8046	9.1116	0.747	9.1116	0.7178	9.1116	0.6619	9.1116	0.5921
9.5455	1.3932	9.5455	0.8381	9.5455	0.7557	9.5455	0.7218	9.5455	0.6885	9.5455	0.6299	9.5455	0.5611
10	1.3932	10	0.8381	10	0.7557	10	0.7016	10	0.6574	10	0.5866	10	0.5174
10.4762	1.3932	10.4762	0.8381	10.4762	0.7387	10.4762	0.6854	10.4762	0.6486	10.4762	0.5866	10.4762	0.5168
10.975	1.0262	10.975	0.7928	10.975	0.715	10.975	0.6537	10.975	0.6116	10.975	0.5505	10.975	0.4833
11.4976	1.0052	11.4976	0.7928	11.4976	0.715	11.4976	0.6468	11.4976	0.5901	11.4976	0.5294	11.4976	0.4672
12.045	0.9828	12.045	0.6834	12.045	0.6222	12.045	0.576	12.045	0.5483	12.045	0.5027	12.045	0.4467
12.6186	0.9828	12.6186	0.6539	12.6186	0.5915	12.6186	0.5447	12.6186	0.5232	12.6186	0.4843	12.6186	0.4381
13.2194	0.9828	13.2194	0.6159	13.2194	0.5704	13.2194	0.5426	13.2194	0.5185	13.2194	0.48	13.2194	0.4372

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.9828	13.8489	0.6008	13.8489	0.5377	13.8489	0.4983	13.8489	0.4828	13.8489	0.4541	13.8489	0.4191
14.5083	0.7664	14.5083	0.5661	14.5083	0.5231	14.5083	0.4917	14.5083	0.4685	14.5083	0.4378	14.5083	0.4132
15.1991	0.7585	15.1991	0.5661	15.1991	0.5231	15.1991	0.4917	15.1991	0.4685	15.1991	0.4378	15.1991	0.4132
15.9228	0.7585	15.9228	0.486	15.9228	0.4712	15.9228	0.4619	15.9228	0.4519	15.9228	0.4336	15.9228	0.4132
16.681	0.7406	16.681	0.486	16.681	0.4464	16.681	0.4345	16.681	0.4286	16.681	0.4167	16.681	0.4021
17.4753	0.7406	17.4753	0.486	17.4753	0.4464	17.4753	0.4302	17.4753	0.4198	17.4753	0.4072	17.4753	0.3961
18.3074	0.5678	18.3074	0.4016	18.3074	0.3905	18.3074	0.3859	18.3074	0.3808	18.3074	0.3844	18.3074	0.384
19.1791	0.5264	19.1791	0.3903	19.1791	0.3769	19.1791	0.3738	19.1791	0.3725	19.1791	0.3745	19.1791	0.3756
20.0923	0.4312	20.0923	0.3818	20.0923	0.3769	20.0923	0.3738	20.0923	0.3724	20.0923	0.3716	20.0923	0.3713
21.049	0.4312	21.049	0.3813	21.049	0.3769	21.049	0.3729	21.049	0.3697	21.049	0.3688	21.049	0.3684
22.0513	0.4312	22.0513	0.3813	22.0513	0.3769	22.0513	0.3729	22.0513	0.3697	22.0513	0.3674	22.0513	0.3663
23.1013	0.4224	23.1013	0.3813	23.1013	0.3769	23.1013	0.3729	23.1013	0.3697	23.1013	0.3657	23.1013	0.3645
24.2013	0.4224	24.2013	0.3813	24.2013	0.3769	24.2013	0.3729	24.2013	0.3697	24.2013	0.3652	24.2013	0.3626
25.3536	0.4224	25.3536	0.3813	25.3536	0.3769	25.3536	0.3729	25.3536	0.3697	25.3536	0.3652	25.3536	0.3614
26.5609	0.4224	26.5609	0.3813	26.5609	0.3769	26.5609	0.3729	26.5609	0.3697	26.5609	0.3652	26.5609	0.3614
27.8256	0.3851	27.8256	0.3813	27.8256	0.3769	27.8256	0.3729	27.8256	0.3697	27.8256	0.3652	27.8256	0.3612
29.1505	0.3851	29.1505	0.37	29.1505	0.3667	29.1505	0.3645	29.1505	0.363	29.1505	0.3606	29.1505	0.3584
30.5386	0.3591	30.5386	0.3537	30.5386	0.3541	30.5386	0.3547	30.5386	0.355	30.5386	0.355	30.5386	0.3546
31.9927	0.355	31.9927	0.3527	31.9927	0.3524	31.9927	0.3523	31.9927	0.3522	31.9927	0.352	31.9927	0.3518
33.516	0.3506	33.516	0.3507	33.516	0.3506	33.516	0.3505	33.516	0.3504	33.516	0.3503	33.516	0.3501
35.1119	0.3483	35.1119	0.3484	35.1119	0.3485	35.1119	0.3485	35.1119	0.3486	35.1119	0.3486	35.1119	0.3486
36.7838	0.3471	36.7838	0.3472	36.7838	0.3472	36.7838	0.3473	36.7838	0.3473	36.7838	0.3473	36.7838	0.3474
38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3463	38.5353	0.3464	38.5353	0.3464	38.5353	0.3464
40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3455	40.3702	0.3456	40.3702	0.3456	40.3702	0.3456
42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3448	42.2924	0.3449
44.3062	0.3441	44.3062	0.3441	44.3062	0.3441	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442	44.3062	0.3442
46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3435	46.4159	0.3436	46.4159	0.3436
48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343	48.626	0.343
50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3424	50.9414	0.3425

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0321	0.1098	0.0303	0.1098	0.0271	0.1098	0.0235
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0321	0.115	0.0303	0.115	0.0271	0.115	0.0257
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0321	0.1204	0.031	0.1204	0.0296	0.1204	0.0278
0.1262	0.0405	0.1262	0.0365	0.1262	0.0352	0.1262	0.0342	0.1262	0.0333	0.1262	0.0316	0.1262	0.0298
0.1322	0.0405	0.1322	0.0382	0.1322	0.0369	0.1322	0.0358	0.1322	0.0348	0.1322	0.0333	0.1322	0.0317
0.1385	0.0411	0.1385	0.0391	0.1385	0.0381	0.1385	0.0372	0.1385	0.0363	0.1385	0.0348	0.1385	0.0329
0.1451	0.0417	0.1451	0.0398	0.1451	0.0387	0.1451	0.0378	0.1451	0.0369	0.1451	0.0353	0.1451	0.0334
0.152	0.044	0.152	0.0402	0.152	0.0387	0.152	0.0378	0.152	0.0369	0.152	0.0353	0.152	0.0334
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.0378	0.1592	0.0369	0.1592	0.0353	0.1592	0.0334
0.1668	0.0584	0.1668	0.0506	0.1668	0.0463	0.1668	0.0426	0.1668	0.0395	0.1668	0.0353	0.1668	0.0334
0.1748	0.0644	0.1748	0.0566	0.1748	0.0522	0.1748	0.0484	0.1748	0.045	0.1748	0.0394	0.1748	0.0334
0.1831	0.0668	0.1831	0.0583	0.1831	0.0541	0.1831	0.0504	0.1831	0.047	0.1831	0.0415	0.1831	0.0356
0.1918	0.0678	0.1918	0.0585	0.1918	0.0543	0.1918	0.0507	0.1918	0.0474	0.1918	0.0418	0.1918	0.0382
0.2009	0.0697	0.2009	0.0596	0.2009	0.0543	0.2009	0.0513	0.2009	0.0485	0.2009	0.0436	0.2009	0.0411
0.2105	0.0722	0.2105	0.0619	0.2105	0.058	0.2105	0.0546	0.2105	0.0516	0.2105	0.0482	0.2105	0.0443
0.2205	0.0819	0.2205	0.071	0.2205	0.0652	0.2205	0.0601	0.2205	0.0573	0.2205	0.0529	0.2205	0.0476
0.231	0.096	0.231	0.0793	0.231	0.0704	0.231	0.0666	0.231	0.0632	0.231	0.0574	0.231	0.0529
0.242	0.0983	0.242	0.0845	0.242	0.0775	0.242	0.0718	0.242	0.0681	0.242	0.0621	0.242	0.0558
0.2535	0.1059	0.2535	0.0913	0.2535	0.0832	0.2535	0.0762	0.2535	0.0701	0.2535	0.0621	0.2535	0.0558
0.2656	0.1141	0.2656	0.0948	0.2656	0.0844	0.2656	0.0762	0.2656	0.0701	0.2656	0.0621	0.2656	0.0558
0.2783	0.1141	0.2783	0.0948	0.2783	0.0844	0.2783	0.078	0.2783	0.0739	0.2783	0.0675	0.2783	0.0605
0.2915	0.1141	0.2915	0.1004	0.2915	0.0942	0.2915	0.0888	0.2915	0.0839	0.2915	0.0759	0.2915	0.0673
0.3054	0.1177	0.3054	0.1054	0.3054	0.0985	0.3054	0.0924	0.3054	0.0871	0.3054	0.0783	0.3054	0.0694
0.3199	0.1177	0.3199	0.1054	0.3199	0.0985	0.3199	0.0924	0.3199	0.0889	0.3199	0.0837	0.3199	0.0776
0.3352	0.1177	0.3352	0.1094	0.3352	0.1051	0.3352	0.1012	0.3352	0.0975	0.3352	0.0913	0.3352	0.0842
0.3511	0.1652	0.3511	0.1285	0.3511	0.1129	0.3511	0.107	0.3511	0.103	0.3511	0.0961	0.3511	0.0879
0.3678	0.2416	0.3678	0.1833	0.3678	0.1566	0.3678	0.1365	0.3678	0.1213	0.3678	0.1003	0.3678	0.0879
0.3853	0.255	0.3853	0.187	0.3853	0.1595	0.3853	0.1386	0.3853	0.1268	0.3853	0.1091	0.3853	0.091
0.4037	0.255	0.4037	0.187	0.4037	0.1595	0.4037	0.1386	0.4037	0.1271	0.4037	0.1152	0.4037	0.1029
0.4229	0.255	0.4229	0.187	0.4229	0.1649	0.4229	0.1484	0.4229	0.1344	0.4229	0.1234	0.4229	0.1122
0.4431	0.329	0.4431	0.2338	0.4431	0.2038	0.4431	0.1815	0.4431	0.1644	0.4431	0.1404	0.4431	0.1188
0.4642	0.329	0.4642	0.2338	0.4642	0.2038	0.4642	0.1815	0.4642	0.1644	0.4642	0.1404	0.4642	0.1188
0.4863	0.329	0.4863	0.2338	0.4863	0.2038	0.4863	0.1815	0.4863	0.1644	0.4863	0.1424	0.4863	0.125
0.5094	0.329	0.5094	0.2338	0.5094	0.2038	0.5094	0.1815	0.5094	0.1644	0.5094	0.1479	0.5094	0.1295

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.3366	0.5337	0.2402	0.5337	0.2091	0.5337	0.1893	0.5337	0.1789	0.5337	0.1611	0.5337	0.1403
0.5591	0.3994	0.5591	0.2757	0.5591	0.2433	0.5591	0.2174	0.5591	0.1976	0.5591	0.173	0.5591	0.1559
0.5857	0.3994	0.5857	0.286	0.5857	0.257	0.5857	0.2329	0.5857	0.2125	0.5857	0.1854	0.5857	0.1716
0.6136	0.3994	0.6136	0.286	0.6136	0.257	0.6136	0.2329	0.6136	0.2125	0.6136	0.1986	0.6136	0.1834
0.6428	0.3994	0.6428	0.286	0.6428	0.257	0.6428	0.2329	0.6428	0.22	0.6428	0.2091	0.6428	0.1953
0.6734	0.4133	0.6734	0.286	0.6734	0.2573	0.6734	0.2433	0.6734	0.2362	0.6734	0.2239	0.6734	0.2086
0.7055	0.4133	0.7055	0.3041	0.7055	0.2763	0.7055	0.2647	0.7055	0.2547	0.7055	0.2378	0.7055	0.2184
0.7391	0.6352	0.7391	0.4157	0.7391	0.3392	0.7391	0.2923	0.7391	0.2745	0.7391	0.2448	0.7391	0.2198
0.7743	0.6352	0.7743	0.4157	0.7743	0.3392	0.7743	0.3048	0.7743	0.2868	0.7743	0.257	0.7743	0.2238
0.8111	0.6585	0.8111	0.4403	0.8111	0.3839	0.8111	0.3407	0.8111	0.3071	0.8111	0.2598	0.8111	0.2238
0.8497	0.6585	0.8497	0.4417	0.8497	0.4046	0.8497	0.3736	0.8497	0.3467	0.8497	0.3033	0.8497	0.2554
0.8902	0.6889	0.8902	0.4489	0.8902	0.4046	0.8902	0.3736	0.8902	0.3493	0.8902	0.3172	0.8902	0.2735
0.9326	0.7344	0.9326	0.5165	0.9326	0.454	0.9326	0.4087	0.9326	0.3743	0.9326	0.3257	0.9326	0.2797
0.977	0.988	0.977	0.6326	0.977	0.5215	0.977	0.4519	0.977	0.4046	0.977	0.3452	0.977	0.2961
1.0235	0.988	1.0235	0.6326	1.0235	0.56	1.0235	0.5076	1.0235	0.464	1.0235	0.3976	1.0235	0.3315
1.0723	0.988	1.0723	0.6582	1.0723	0.5892	1.0723	0.5317	1.0723	0.4833	1.0723	0.4119	1.0723	0.35
1.1233	1.2454	1.1233	0.849	1.1233	0.7113	1.1233	0.6128	1.1233	0.5401	1.1233	0.4417	1.1233	0.3579
1.1768	1.2454	1.1768	0.849	1.1768	0.7113	1.1768	0.6128	1.1768	0.5401	1.1768	0.4439	1.1768	0.3706
1.2328	1.2454	1.2328	0.9242	1.2328	0.8109	1.2328	0.7212	1.2328	0.6482	1.2328	0.5371	1.2328	0.4267
1.2916	1.2454	1.2916	1.0234	1.2916	0.889	1.2916	0.7839	1.2916	0.6998	1.2916	0.5744	1.2916	0.4525
1.353	1.3539	1.353	1.0234	1.353	0.889	1.353	0.7839	1.353	0.6998	1.353	0.5744	1.353	0.4525
1.4175	1.5778	1.4175	1.1114	1.4175	0.9435	1.4175	0.8371	1.4175	0.7571	1.4175	0.6404	1.4175	0.526
1.485	1.5778	1.485	1.1114	1.485	0.9435	1.485	0.8563	1.485	0.7981	1.485	0.6954	1.485	0.5786
1.5557	1.831	1.5557	1.163	1.5557	0.9714	1.5557	0.8673	1.5557	0.8026	1.5557	0.7075	1.5557	0.6018
1.6298	1.8691	1.6298	1.2535	1.6298	1.1171	1.6298	1.0068	1.6298	0.9124	1.6298	0.764	1.6298	0.6239
1.7074	1.8765	1.7074	1.2869	1.7074	1.2033	1.7074	1.0857	1.7074	0.9852	1.7074	0.825	1.7074	0.6665
1.7887	2.3239	1.7887	1.4211	1.7887	1.2033	1.7887	1.0857	1.7887	0.9852	1.7887	0.8339	1.7887	0.7098
1.8738	2.3239	1.8738	1.4211	1.8738	1.2033	1.8738	1.0857	1.8738	0.9852	1.8738	0.8769	1.8738	0.7461
1.963	2.3239	1.963	1.4211	1.963	1.2033	1.963	1.0919	1.963	1.0261	1.963	0.9107	1.963	0.7725
2.0565	2.3239	2.0565	1.4211	2.0565	1.2033	2.0565	1.108	2.0565	1.0451	2.0565	0.9279	2.0565	0.7815
2.1544	2.3239	2.1544	1.4211	2.1544	1.2547	2.1544	1.157	2.1544	1.0723	2.1544	0.9317	2.1544	0.8
2.257	2.1988	2.257	1.4211	2.257	1.2547	2.257	1.157	2.257	1.0723	2.257	0.9409	2.257	0.8088
2.3645	2.1988	2.3645	1.4211	2.3645	1.2547	2.3645	1.157	2.3645	1.0723	2.3645	0.9409	2.3645	0.8088
2.4771	2.1988	2.4771	1.5228	2.4771	1.2767	2.4771	1.157	2.4771	1.0723	2.4771	0.9409	2.4771	0.8088
2.595	2.0184	2.595	1.5228	2.595	1.2767	2.595	1.157	2.595	1.0723	2.595	0.9409	2.595	0.8088

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.0184	2.7186	1.5228	2.7186	1.2767	2.7186	1.1545	2.7186	1.0625	2.7186	0.9409	2.7186	0.8088
2.848	2.0184	2.848	1.5228	2.848	1.2767	2.848	1.1545	2.848	1.0625	2.848	0.9399	2.848	0.7962
2.9836	2.0184	2.9836	1.5228	2.9836	1.2767	2.9836	1.1545	2.9836	1.0577	2.9836	0.9132	2.9836	0.7656
3.1257	2.0184	3.1257	1.3112	3.1257	1.0446	3.1257	0.9606	3.1257	0.9074	3.1257	0.8181	3.1257	0.713
3.2745	1.9901	3.2745	1.1665	3.2745	1.0008	3.2745	0.9022	3.2745	0.8233	3.2745	0.724	3.2745	0.6592
3.4305	1.6248	3.4305	0.9896	3.4305	0.8906	3.4305	0.8152	3.4305	0.7692	3.4305	0.6853	3.4305	0.6237
3.5938	1.6248	3.5938	0.9457	3.5938	0.8524	3.5938	0.8006	3.5938	0.7536	3.5938	0.6771	3.5938	0.5975
3.7649	1.6248	3.7649	0.9457	3.7649	0.8524	3.7649	0.8006	3.7649	0.7536	3.7649	0.6771	3.7649	0.5975
3.9442	1.6248	3.9442	0.9457	3.9442	0.8524	3.9442	0.8006	3.9442	0.7536	3.9442	0.6771	3.9442	0.5975
4.132	1.6248	4.132	0.9457	4.132	0.8524	4.132	0.8006	4.132	0.7536	4.132	0.6771	4.132	0.5975
4.3288	1.6248	4.3288	0.9457	4.3288	0.8524	4.3288	0.8006	4.3288	0.7536	4.3288	0.6771	4.3288	0.5975
4.5349	1.6248	4.5349	0.9457	4.5349	0.8524	4.5349	0.8006	4.5349	0.7536	4.5349	0.6771	4.5349	0.5975
4.7508	1.6248	4.7508	1.023	4.7508	0.9155	4.7508	0.8228	4.7508	0.7536	4.7508	0.6771	4.7508	0.5975
4.977	1.6248	4.977	1.191	4.977	1.0728	4.977	0.9637	4.977	0.875	4.977	0.745	4.977	0.6365
5.214	1.8207	5.214	1.191	5.214	1.0728	5.214	0.9637	5.214	0.8921	5.214	0.7878	5.214	0.6715
5.4623	1.8207	5.4623	1.191	5.4623	1.0728	5.4623	0.9637	5.4623	0.8921	5.4623	0.7878	5.4623	0.6865
5.7224	2.9149	5.7224	1.406	5.7224	1.1098	5.7224	1.0876	5.7224	0.9363	5.7224	0.7878	5.7224	0.6865
5.9948	2.9149	5.9948	1.406	5.9948	1.1098	5.9948	1.0876	5.9948	0.9363	5.9948	0.7878	5.9948	0.6865
6.2803	2.9149	6.2803	1.406	6.2803	1.1098	6.2803	1.0876	6.2803	0.9363	6.2803	0.7878	6.2803	0.6865
6.5793	2.9149	6.5793	1.406	6.5793	1.1098	6.5793	1.0876	6.5793	0.9363	6.5793	0.7865	6.5793	0.6865
6.8926	2.9149	6.8926	1.406	6.8926	1.1098	6.8926	1.0876	6.8926	0.9363	6.8926	0.7764	6.8926	0.6824
7.2208	2.4166	7.2208	1.406	7.2208	1.1098	7.2208	1.0322	7.2208	0.91	7.2208	0.7328	7.2208	0.6531
7.5646	2.1048	7.5646	1.2631	7.5646	1.0869	7.5646	0.9603	7.5646	0.8589	7.5646	0.7046	7.5646	0.6405
7.9248	1.7239	7.9248	0.9022	7.9248	0.8254	7.9248	0.7828	7.9248	0.7487	7.9248	0.69	7.9248	0.6204
8.3022	1.7239	8.3022	0.8525	8.3022	0.7912	8.3022	0.7524	8.3022	0.7205	8.3022	0.6659	8.3022	0.5997
8.6975	1.504	8.6975	0.8462	8.6975	0.7536	8.6975	0.7096	8.6975	0.6756	8.6975	0.623	8.6975	0.5646
9.1116	1.504	9.1116	0.8004	9.1116	0.6637	9.1116	0.629	9.1116	0.6017	9.1116	0.5591	9.1116	0.5122
9.5455	1.504	9.5455	0.8004	9.5455	0.6572	9.5455	0.5918	9.5455	0.5627	9.5455	0.5217	9.5455	0.4858
10	1.0253	10	0.666	10	0.6127	10	0.583	10	0.5582	10	0.5217	10	0.4858
10.4762	0.9769	10.4762	0.6615	10.4762	0.5918	10.4762	0.5361	10.4762	0.5247	10.4762	0.5026	10.4762	0.4744
10.975	0.9769	10.975	0.6615	10.975	0.5918	10.975	0.534	10.975	0.5032	10.975	0.4818	10.975	0.4602
11.4976	0.9769	11.4976	0.6615	11.4976	0.5918	11.4976	0.534	11.4976	0.5032	11.4976	0.462	11.4976	0.4453
12.045	0.767	12.045	0.5857	12.045	0.5386	12.045	0.5021	12.045	0.4738	12.045	0.4546	12.045	0.4387
12.6186	0.767	12.6186	0.5489	12.6186	0.495	12.6186	0.4679	12.6186	0.4603	12.6186	0.4466	12.6186	0.4298
13.2194	0.767	13.2194	0.5489	13.2194	0.495	13.2194	0.451	13.2194	0.4374	13.2194	0.429	13.2194	0.4161

PTWW017.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 17 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 4 B

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6514	13.8489	0.4765	13.8489	0.4405	13.8489	0.4243	13.8489	0.419	13.8489	0.4135	13.8489	0.4051
14.5083	0.6514	14.5083	0.4285	14.5083	0.4183	14.5083	0.4123	14.5083	0.4084	14.5083	0.4025	14.5083	0.3951
15.1991	0.6514	15.1991	0.4129	15.1991	0.4055	15.1991	0.4006	15.1991	0.3964	15.1991	0.391	15.1991	0.3853
15.9228	0.6514	15.9228	0.4115	15.9228	0.3896	15.9228	0.3881	15.9228	0.3858	15.9228	0.3814	15.9228	0.3762
16.681	0.6514	16.681	0.4115	16.681	0.3838	16.681	0.3759	16.681	0.3725	16.681	0.3708	16.681	0.3672
17.4753	0.6514	17.4753	0.4115	17.4753	0.3838	17.4753	0.3759	17.4753	0.3708	17.4753	0.3648	17.4753	0.3594
18.3074	0.5354	18.3074	0.3939	18.3074	0.3776	18.3074	0.3669	18.3074	0.3599	18.3074	0.3548	18.3074	0.3499
19.1791	0.5354	19.1791	0.3649	19.1791	0.3569	19.1791	0.3525	19.1791	0.3497	19.1791	0.3451	19.1791	0.3398
20.0923	0.5354	20.0923	0.3485	20.0923	0.3462	20.0923	0.3439	20.0923	0.3419	20.0923	0.3384	20.0923	0.3345
21.049	0.4241	21.049	0.3474	21.049	0.3402	21.049	0.3366	21.049	0.3343	21.049	0.3315	21.049	0.3287
22.0513	0.4	22.0513	0.3347	22.0513	0.3262	22.0513	0.3257	22.0513	0.3254	22.0513	0.3244	22.0513	0.323
23.1013	0.4	23.1013	0.3234	23.1013	0.32	23.1013	0.3187	23.1013	0.3182	23.1013	0.3181	23.1013	0.3178
24.2013	0.4	24.2013	0.3226	24.2013	0.3166	24.2013	0.3146	24.2013	0.3137	24.2013	0.3135	24.2013	0.3139
25.3536	0.3478	25.3536	0.3226	25.3536	0.3166	25.3536	0.3146	25.3536	0.3137	25.3536	0.3126	25.3536	0.3115
26.5609	0.3478	26.5609	0.3226	26.5609	0.3166	26.5609	0.3135	26.5609	0.3116	26.5609	0.3097	26.5609	0.3087
27.8256	0.3208	27.8256	0.3129	27.8256	0.3089	27.8256	0.3065	27.8256	0.305	27.8256	0.304	27.8256	0.3052
29.1505	0.3199	29.1505	0.3129	29.1505	0.3089	29.1505	0.3065	29.1505	0.305	29.1505	0.3036	29.1505	0.3035
30.5386	0.3182	30.5386	0.308	30.5386	0.3061	30.5386	0.3051	30.5386	0.3044	30.5386	0.3036	30.5386	0.3031
31.9927	0.3051	31.9927	0.3042	31.9927	0.304	31.9927	0.3036	31.9927	0.3033	31.9927	0.3028	31.9927	0.3023
33.516	0.3029	33.516	0.3021	33.516	0.3019	33.516	0.3018	33.516	0.3016	33.516	0.3014	33.516	0.3011
35.1119	0.3005	35.1119	0.3004	35.1119	0.3004	35.1119	0.3003	35.1119	0.3002	35.1119	0.3	35.1119	0.2998
36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2989	36.7838	0.2988	36.7838	0.2988	36.7838	0.2987
38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2977	38.5353	0.2976
40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2967	40.3702	0.2966
42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958	42.2924	0.2958
44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295	44.3062	0.295
46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943	46.4159	0.2943
48.626	0.2936	48.626	0.2936	48.626	0.2936	48.626	0.2937	48.626	0.2937	48.626	0.2937	48.626	0.2937
50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.293	50.9414	0.2931

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0332	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0397	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.0559	0.1385	0.0488	0.1385	0.0448	0.1385	0.0414	0.1385	0.0384	0.1385	0.0344	0.1385	0.0304
0.1451	0.058	0.1451	0.0509	0.1451	0.0475	0.1451	0.0446	0.1451	0.0419	0.1451	0.0375	0.1451	0.0326
0.152	0.0615	0.152	0.0545	0.152	0.0506	0.152	0.0472	0.152	0.0441	0.152	0.0391	0.152	0.0338
0.1592	0.0621	0.1592	0.0545	0.1592	0.0506	0.1592	0.0472	0.1592	0.0442	0.1592	0.0397	0.1592	0.0352
0.1668	0.064	0.1668	0.056	0.1668	0.0518	0.1668	0.0482	0.1668	0.0451	0.1668	0.0404	0.1668	0.0357
0.1748	0.064	0.1748	0.056	0.1748	0.0518	0.1748	0.0482	0.1748	0.0451	0.1748	0.0404	0.1748	0.0357
0.1831	0.064	0.1831	0.056	0.1831	0.0518	0.1831	0.0482	0.1831	0.0451	0.1831	0.0404	0.1831	0.0369
0.1918	0.0642	0.1918	0.0562	0.1918	0.0518	0.1918	0.0495	0.1918	0.0478	0.1918	0.0446	0.1918	0.0404
0.2009	0.0642	0.2009	0.0583	0.2009	0.0558	0.2009	0.0535	0.2009	0.0514	0.2009	0.0474	0.2009	0.0425
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0525	0.2105	0.049	0.2105	0.0448
0.2205	0.0781	0.2205	0.0647	0.2205	0.062	0.2205	0.0596	0.2205	0.0573	0.2205	0.0533	0.2205	0.0484
0.231	0.0935	0.231	0.0775	0.231	0.0695	0.231	0.0631	0.231	0.0599	0.231	0.0556	0.231	0.0504
0.242	0.0935	0.242	0.0775	0.242	0.0723	0.242	0.0679	0.242	0.0638	0.242	0.0567	0.242	0.0514
0.2535	0.0935	0.2535	0.0818	0.2535	0.0772	0.2535	0.073	0.2535	0.0693	0.2535	0.063	0.2535	0.0555
0.2656	0.0935	0.2656	0.084	0.2656	0.0796	0.2656	0.0756	0.2656	0.0719	0.2656	0.0655	0.2656	0.0577
0.2783	0.0955	0.2783	0.0848	0.2783	0.0796	0.2783	0.0756	0.2783	0.0719	0.2783	0.0655	0.2783	0.0582
0.2915	0.1189	0.2915	0.0989	0.2915	0.0892	0.2915	0.0815	0.2915	0.0755	0.2915	0.0671	0.2915	0.0594
0.3054	0.1507	0.3054	0.1237	0.3054	0.1099	0.3054	0.0987	0.3054	0.0896	0.3054	0.076	0.3054	0.0634
0.3199	0.1507	0.3199	0.1237	0.3199	0.1099	0.3199	0.0987	0.3199	0.0896	0.3199	0.0803	0.3199	0.0708
0.3352	0.1507	0.3352	0.1237	0.3352	0.1099	0.3352	0.0987	0.3352	0.0933	0.3352	0.0859	0.3352	0.0765
0.3511	0.1507	0.3511	0.129	0.3511	0.1173	0.3511	0.1071	0.3511	0.0998	0.3511	0.0896	0.3511	0.0788
0.3678	0.168	0.3678	0.1439	0.3678	0.1304	0.3678	0.1187	0.3678	0.1121	0.3678	0.1018	0.3678	0.0898
0.3853	0.168	0.3853	0.1439	0.3853	0.1347	0.3853	0.128	0.3853	0.1219	0.3853	0.1116	0.3853	0.0992
0.4037	0.1945	0.4037	0.1602	0.4037	0.1429	0.4037	0.1308	0.4037	0.126	0.4037	0.1171	0.4037	0.1057
0.4229	0.2372	0.4229	0.1909	0.4229	0.1723	0.4229	0.1559	0.4229	0.1417	0.4229	0.122	0.4229	0.1096
0.4431	0.3089	0.4431	0.2194	0.4431	0.1882	0.4431	0.1671	0.4431	0.1497	0.4431	0.1276	0.4431	0.11
0.4642	0.3419	0.4642	0.2528	0.4642	0.2142	0.4642	0.1857	0.4642	0.1641	0.4642	0.1349	0.4642	0.1216
0.4863	0.3419	0.4863	0.2563	0.4863	0.2211	0.4863	0.193	0.4863	0.1703	0.4863	0.1414	0.4863	0.1328
0.5094	0.353	0.5094	0.2661	0.5094	0.233	0.5094	0.2059	0.5094	0.1835	0.5094	0.1502	0.5094	0.1397

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.4106	0.5337	0.2779	0.5337	0.233	0.5337	0.2059	0.5337	0.1835	0.5337	0.1544	0.5337	0.1404
0.5591	0.4106	0.5591	0.2779	0.5591	0.2404	0.5591	0.2154	0.5591	0.1953	0.5591	0.1658	0.5591	0.1404
0.5857	0.4106	0.5857	0.2779	0.5857	0.241	0.5857	0.2165	0.5857	0.1978	0.5857	0.1688	0.5857	0.1445
0.6136	0.4488	0.6136	0.2977	0.6136	0.2451	0.6136	0.2241	0.6136	0.2057	0.6136	0.1756	0.6136	0.1445
0.6428	0.4791	0.6428	0.3556	0.6428	0.3014	0.6428	0.2618	0.6428	0.2352	0.6428	0.1994	0.6428	0.1686
0.6734	0.4791	0.6734	0.3556	0.6734	0.3014	0.6734	0.2618	0.6734	0.2421	0.6734	0.2173	0.6734	0.188
0.7055	0.4791	0.7055	0.3556	0.7055	0.3014	0.7055	0.2618	0.7055	0.2421	0.7055	0.2195	0.7055	0.1931
0.7391	0.4791	0.7391	0.3556	0.7391	0.3014	0.7391	0.2701	0.7391	0.2472	0.7391	0.2195	0.7391	0.1931
0.7743	0.5541	0.7743	0.3973	0.7743	0.3347	0.7743	0.2931	0.7743	0.2689	0.7743	0.2358	0.7743	0.2025
0.8111	0.5541	0.8111	0.3973	0.8111	0.3347	0.8111	0.3047	0.8111	0.2886	0.8111	0.2598	0.8111	0.2246
0.8497	0.5541	0.8497	0.3973	0.8497	0.3347	0.8497	0.3132	0.8497	0.2998	0.8497	0.2736	0.8497	0.2386
0.8902	0.5541	0.8902	0.3973	0.8902	0.3675	0.8902	0.345	0.8902	0.3244	0.8902	0.2889	0.8902	0.2477
0.9326	0.8648	0.9326	0.5613	0.9326	0.4653	0.9326	0.4044	0.9326	0.3621	0.9326	0.3063	0.9326	0.256
0.977	0.8648	0.977	0.5613	0.977	0.4653	0.977	0.4068	0.977	0.3663	0.977	0.3097	0.977	0.2664
1.0235	0.9377	1.0235	0.6004	1.0235	0.529	1.0235	0.4839	1.0235	0.4459	1.0235	0.3855	1.0235	0.3313
1.0723	0.9377	1.0723	0.6734	1.0723	0.6074	1.0723	0.5507	1.0723	0.5031	1.0723	0.4376	1.0723	0.3769
1.1233	1.3513	1.1233	0.8372	1.1233	0.6837	1.1233	0.5879	1.1233	0.5445	1.1233	0.4714	1.1233	0.403
1.1768	1.3513	1.1768	0.8372	1.1768	0.6837	1.1768	0.5898	1.1768	0.5538	1.1768	0.4886	1.1768	0.4271
1.2328	1.3513	1.2328	0.8372	1.2328	0.7428	1.2328	0.6644	1.2328	0.5968	1.2328	0.5156	1.2328	0.4567
1.2916	1.3513	1.2916	0.9066	1.2916	0.7979	1.2916	0.7068	1.2916	0.63	1.2916	0.5518	1.2916	0.4861
1.353	1.3513	1.353	0.9591	1.353	0.7979	1.353	0.7068	1.353	0.6351	1.353	0.5804	1.353	0.5117
1.4175	1.4799	1.4175	0.9591	1.4175	0.7979	1.4175	0.7068	1.4175	0.665	1.4175	0.609	1.4175	0.5377
1.485	1.4799	1.485	0.9591	1.485	0.7979	1.485	0.7368	1.485	0.7041	1.485	0.6435	1.485	0.5691
1.5557	1.5088	1.5557	1.0439	1.5557	0.892	1.5557	0.7863	1.5557	0.7357	1.5557	0.6723	1.5557	0.5965
1.6298	1.5088	1.6298	1.1255	1.6298	0.9707	1.6298	0.8769	1.6298	0.8063	1.6298	0.699	1.6298	0.6152
1.7074	1.5088	1.7074	1.1255	1.7074	0.9707	1.7074	0.8769	1.7074	0.8063	1.7074	0.7147	1.7074	0.6346
1.7887	1.5088	1.7887	1.1255	1.7887	0.9707	1.7887	0.8769	1.7887	0.8063	1.7887	0.7339	1.7887	0.6585
1.8738	1.5088	1.8738	1.1255	1.8738	0.9707	1.8738	0.882	1.8738	0.8424	1.8738	0.7711	1.8738	0.6831
1.963	1.5088	1.963	1.1255	1.963	0.9707	1.963	0.9172	1.963	0.8715	1.963	0.7938	1.963	0.6992
2.0565	1.5088	2.0565	1.1158	2.0565	0.9661	2.0565	0.9247	2.0565	0.8739	2.0565	0.7938	2.0565	0.6992
2.1544	1.5088	2.1544	1.1158	2.1544	0.9661	2.1544	0.9247	2.1544	0.8739	2.1544	0.7938	2.1544	0.6992
2.257	1.5515	2.257	1.0506	2.257	0.9661	2.257	0.9247	2.257	0.8739	2.257	0.7938	2.257	0.6992
2.3645	1.569	2.3645	1.0506	2.3645	0.9661	2.3645	0.9247	2.3645	0.8739	2.3645	0.7938	2.3645	0.6992
2.4771	1.569	2.4771	1.0506	2.4771	0.9467	2.4771	0.9247	2.4771	0.8739	2.4771	0.7899	2.4771	0.6957
2.595	1.569	2.595	1.0506	2.595	0.9467	2.595	0.9247	2.595	0.8664	2.595	0.7597	2.595	0.6957

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.569	2.7186	1.0506	2.7186	0.9467	2.7186	0.9247	2.7186	0.8664	2.7186	0.7597	2.7186	0.6957
2.848	1.569	2.848	1.0506	2.848	0.9467	2.848	0.9247	2.848	0.8664	2.848	0.7597	2.848	0.6957
2.9836	1.569	2.9836	1.0506	2.9836	0.9467	2.9836	0.9247	2.9836	0.8664	2.9836	0.7597	2.9836	0.6957
3.1257	1.569	3.1257	1.0506	3.1257	0.9467	3.1257	0.9247	3.1257	0.8664	3.1257	0.7597	3.1257	0.6957
3.2745	1.569	3.2745	1.0506	3.2745	0.9467	3.2745	0.9247	3.2745	0.8664	3.2745	0.7597	3.2745	0.6957
3.4305	1.569	3.4305	1.0506	3.4305	0.9467	3.4305	0.9247	3.4305	0.8664	3.4305	0.7597	3.4305	0.6957
3.5938	1.6861	3.5938	1.0506	3.5938	0.9467	3.5938	0.9247	3.5938	0.8664	3.5938	0.7597	3.5938	0.6957
3.7649	1.6861	3.7649	1.1653	3.7649	0.9467	3.7649	0.9247	3.7649	0.8664	3.7649	0.7597	3.7649	0.6927
3.9442	1.6861	3.9442	1.1653	3.9442	0.955	3.9442	0.9362	3.9442	0.8664	3.9442	0.7597	3.9442	0.6927
4.132	1.6861	4.132	1.1653	4.132	0.955	4.132	0.9362	4.132	0.8664	4.132	0.7597	4.132	0.6862
4.3288	1.6861	4.3288	1.1653	4.3288	0.955	4.3288	0.9362	4.3288	0.8664	4.3288	0.7597	4.3288	0.6787
4.5349	1.6861	4.5349	1.1653	4.5349	0.955	4.5349	0.9362	4.5349	0.8664	4.5349	0.7597	4.5349	0.6657
4.7508	1.6861	4.7508	1.1423	4.7508	0.955	4.7508	0.9362	4.7508	0.8664	4.7508	0.7597	4.7508	0.6479
4.977	1.6861	4.977	1.1193	4.977	0.9483	4.977	0.8597	4.977	0.8132	4.977	0.7328	4.977	0.642
5.214	1.6861	5.214	1.1193	5.214	0.9483	5.214	0.8597	5.214	0.8132	5.214	0.7297	5.214	0.6348
5.4623	2.0932	5.4623	1.1193	5.4623	0.9483	5.4623	0.8597	5.4623	0.8132	5.4623	0.7297	5.4623	0.6348
5.7224	2.0932	5.7224	1.1193	5.7224	0.9483	5.7224	0.8597	5.7224	0.8132	5.7224	0.7297	5.7224	0.6348
5.9948	2.0932	5.9948	1.1193	5.9948	0.9483	5.9948	0.8597	5.9948	0.8132	5.9948	0.7297	5.9948	0.6348
6.2803	2.0932	6.2803	1.1193	6.2803	0.9483	6.2803	0.8597	6.2803	0.8132	6.2803	0.7297	6.2803	0.6348
6.5793	2.0932	6.5793	1.1193	6.5793	0.9483	6.5793	0.8597	6.5793	0.8132	6.5793	0.7297	6.5793	0.6316
6.8926	2.0932	6.8926	1.1193	6.8926	0.9483	6.8926	0.8564	6.8926	0.793	6.8926	0.7028	6.8926	0.6276
7.2208	1.7932	7.2208	1.1022	7.2208	0.9239	7.2208	0.8428	7.2208	0.7865	7.2208	0.6959	7.2208	0.6276
7.5646	1.3461	7.5646	0.9535	7.5646	0.851	7.5646	0.7985	7.5646	0.758	7.5646	0.6959	7.5646	0.6276
7.9248	1.2781	7.9248	0.9188	7.9248	0.851	7.9248	0.7913	7.9248	0.7507	7.9248	0.6862	7.9248	0.6173
8.3022	1.2719	8.3022	0.9188	8.3022	0.851	8.3022	0.7909	8.3022	0.7422	8.3022	0.6675	8.3022	0.6003
8.6975	1.0732	8.6975	0.8155	8.6975	0.7297	8.6975	0.6993	8.6975	0.6707	8.6975	0.6168	8.6975	0.5555
9.1116	1.0732	9.1116	0.8155	9.1116	0.7297	9.1116	0.6674	9.1116	0.6426	9.1116	0.594	9.1116	0.5293
9.5455	1.0632	9.5455	0.8155	9.5455	0.7297	9.5455	0.665	9.5455	0.6109	9.5455	0.548	9.5455	0.5075
10	1.0632	10	0.8155	10	0.7297	10	0.665	10	0.6109	10	0.5416	10	0.4824
10.4762	1.0632	10.4762	0.8155	10.4762	0.7297	10.4762	0.665	10.4762	0.6109	10.4762	0.5374	10.4762	0.4716
10.975	0.9814	10.975	0.7906	10.975	0.7235	10.975	0.665	10.975	0.6109	10.975	0.5256	10.975	0.4557
11.4976	0.9814	11.4976	0.7906	11.4976	0.7215	11.4976	0.6575	11.4976	0.603	11.4976	0.5189	11.4976	0.4453
12.045	0.8026	12.045	0.6724	12.045	0.6069	12.045	0.558	12.045	0.5202	12.045	0.4674	12.045	0.4231
12.6186	0.7876	12.6186	0.6185	12.6186	0.566	12.6186	0.5184	12.6186	0.5012	12.6186	0.4674	12.6186	0.4231
13.2194	0.7876	13.2194	0.6185	13.2194	0.566	13.2194	0.5166	13.2194	0.4839	13.2194	0.4493	13.2194	0.4086

PTWW022.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 22 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.7876	13.8489	0.5849	13.8489	0.5168	13.8489	0.473	13.8489	0.458	13.8489	0.43	13.8489	0.3946
14.5083	0.7113	14.5083	0.5199	14.5083	0.4734	14.5083	0.4593	14.5083	0.4453	14.5083	0.4196	14.5083	0.3874
15.1991	0.7113	15.1991	0.4913	15.1991	0.4581	15.1991	0.4351	15.1991	0.4191	15.1991	0.3992	15.1991	0.3844
15.9228	0.7113	15.9228	0.4804	15.9228	0.433	15.9228	0.4151	15.9228	0.4052	15.9228	0.3955	15.9228	0.3844
16.681	0.7113	16.681	0.4804	16.681	0.433	16.681	0.4067	16.681	0.3923	16.681	0.3827	16.681	0.3771
17.4753	0.7113	17.4753	0.4804	17.4753	0.433	17.4753	0.4067	17.4753	0.3916	17.4753	0.3767	17.4753	0.3679
18.3074	0.6514	18.3074	0.4041	18.3074	0.3855	18.3074	0.3753	18.3074	0.367	18.3074	0.3555	18.3074	0.3535
19.1791	0.6514	19.1791	0.4041	19.1791	0.3855	19.1791	0.3753	19.1791	0.367	19.1791	0.3553	19.1791	0.3456
20.0923	0.5299	20.0923	0.4041	20.0923	0.3855	20.0923	0.3753	20.0923	0.367	20.0923	0.3553	20.0923	0.3452
21.049	0.5299	21.049	0.4041	21.049	0.3747	21.049	0.3613	21.049	0.3553	21.049	0.3481	21.049	0.3452
22.0513	0.5299	22.0513	0.3915	22.0513	0.3712	22.0513	0.3613	22.0513	0.3553	22.0513	0.3481	22.0513	0.3444
23.1013	0.5299	23.1013	0.3915	23.1013	0.3712	23.1013	0.3613	23.1013	0.3553	23.1013	0.3481	23.1013	0.3443
24.2013	0.4644	24.2013	0.3604	24.2013	0.357	24.2013	0.354	24.2013	0.3517	24.2013	0.348	24.2013	0.3443
25.3536	0.4644	25.3536	0.359	25.3536	0.3564	25.3536	0.354	25.3536	0.3517	25.3536	0.348	25.3536	0.3443
26.5609	0.4644	26.5609	0.3553	26.5609	0.3521	26.5609	0.3495	26.5609	0.3474	26.5609	0.3447	26.5609	0.3427
27.8256	0.3574	27.8256	0.3553	27.8256	0.3521	27.8256	0.3495	27.8256	0.3474	27.8256	0.3447	27.8256	0.3422
29.1505	0.3464	29.1505	0.3425	29.1505	0.3411	29.1505	0.3414	29.1505	0.3414	29.1505	0.341	29.1505	0.34
30.5386	0.3447	30.5386	0.3414	30.5386	0.3407	30.5386	0.3401	30.5386	0.3398	30.5386	0.3394	30.5386	0.3388
31.9927	0.3401	31.9927	0.3414	31.9927	0.3407	31.9927	0.3401	31.9927	0.3396	31.9927	0.3389	31.9927	0.3381
33.516	0.3388	33.516	0.3387	33.516	0.3386	33.516	0.3384	33.516	0.3381	33.516	0.3377	33.516	0.3372
35.1119	0.3367	35.1119	0.3367	35.1119	0.3367	35.1119	0.3366	35.1119	0.3365	35.1119	0.3364	35.1119	0.3361
36.7838	0.3355	36.7838	0.3355	36.7838	0.3354	36.7838	0.3354	36.7838	0.3354	36.7838	0.3353	36.7838	0.3352
38.5353	0.3346	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3345	38.5353	0.3344	38.5353	0.3343
40.3702	0.3338	40.3702	0.3338	40.3702	0.3338	40.3702	0.3337	40.3702	0.3337	40.3702	0.3337	40.3702	0.3336
42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.3331	42.2924	0.333	42.2924	0.333
44.3062	0.3325	44.3062	0.3325	44.3062	0.3325	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324	44.3062	0.3324
46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319	46.4159	0.3319
48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314	48.626	0.3314
50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309	50.9414	0.3309

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Damping Freq.	0.50% Accel.	Freq.	2% Accel.	Freq.	3% Accel.	Freq.	4% Accel.	Freq.	5% Accel.	Freq.	7% Accel.	Freq.	10% Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0322	0.1098	0.0303	0.1098	0.0272	0.1098	0.0237
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0322	0.115	0.0303	0.115	0.0273	0.115	0.0262
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0322	0.1204	0.0311	0.1204	0.0299	0.1204	0.0284
0.1262	0.0405	0.1262	0.0365	0.1262	0.0353	0.1262	0.0344	0.1262	0.0336	0.1262	0.032	0.1262	0.0302
0.1322	0.0405	0.1322	0.0383	0.1322	0.0371	0.1322	0.0361	0.1322	0.0351	0.1322	0.0337	0.1322	0.0321
0.1385	0.0413	0.1385	0.0394	0.1385	0.0384	0.1385	0.0375	0.1385	0.0366	0.1385	0.0351	0.1385	0.0332
0.1451	0.0418	0.1451	0.04	0.1451	0.0389	0.1451	0.038	0.1451	0.0371	0.1451	0.0355	0.1451	0.0336
0.152	0.0439	0.152	0.0401	0.152	0.0389	0.152	0.038	0.152	0.0371	0.152	0.0355	0.152	0.0336
0.1592	0.0462	0.1592	0.0417	0.1592	0.0396	0.1592	0.038	0.1592	0.0371	0.1592	0.0355	0.1592	0.0336
0.1668	0.0585	0.1668	0.0506	0.1668	0.0463	0.1668	0.0427	0.1668	0.0396	0.1668	0.0355	0.1668	0.0336
0.1748	0.0645	0.1748	0.0567	0.1748	0.0523	0.1748	0.0485	0.1748	0.0451	0.1748	0.0395	0.1748	0.0336
0.1831	0.0669	0.1831	0.0583	0.1831	0.0542	0.1831	0.0505	0.1831	0.0472	0.1831	0.0416	0.1831	0.0355
0.1918	0.0679	0.1918	0.0586	0.1918	0.0544	0.1918	0.0508	0.1918	0.0476	0.1918	0.0419	0.1918	0.0382
0.2009	0.0698	0.2009	0.0597	0.2009	0.0545	0.2009	0.0516	0.2009	0.049	0.2009	0.0443	0.2009	0.0414
0.2105	0.0723	0.2105	0.0622	0.2105	0.0584	0.2105	0.055	0.2105	0.0518	0.2105	0.0484	0.2105	0.045
0.2205	0.082	0.2205	0.0711	0.2205	0.0653	0.2205	0.0602	0.2205	0.0577	0.2205	0.0535	0.2205	0.0484
0.231	0.0961	0.231	0.0794	0.231	0.0704	0.231	0.0665	0.231	0.0631	0.231	0.0585	0.231	0.0537
0.242	0.0988	0.242	0.0847	0.242	0.0776	0.242	0.0728	0.242	0.069	0.242	0.0628	0.242	0.0563
0.2535	0.1063	0.2535	0.0917	0.2535	0.0836	0.2535	0.0767	0.2535	0.0707	0.2535	0.0628	0.2535	0.0563
0.2656	0.1141	0.2656	0.0947	0.2656	0.0842	0.2656	0.0767	0.2656	0.0707	0.2656	0.0628	0.2656	0.0563
0.2783	0.1141	0.2783	0.0947	0.2783	0.0842	0.2783	0.0782	0.2783	0.0745	0.2783	0.0685	0.2783	0.0622
0.2915	0.1141	0.2915	0.1015	0.2915	0.0954	0.2915	0.09	0.2915	0.0852	0.2915	0.0773	0.2915	0.0688
0.3054	0.1186	0.3054	0.1064	0.3054	0.0994	0.3054	0.0934	0.3054	0.0881	0.3054	0.0794	0.3054	0.0724
0.3199	0.1186	0.3199	0.1064	0.3199	0.0994	0.3199	0.0935	0.3199	0.0908	0.3199	0.0861	0.3199	0.0806
0.3352	0.1186	0.3352	0.1112	0.3352	0.107	0.3352	0.1032	0.3352	0.0998	0.3352	0.0939	0.3352	0.0869
0.3511	0.1662	0.3511	0.1299	0.3511	0.1149	0.3511	0.109	0.3511	0.1051	0.3511	0.0982	0.3511	0.0901
0.3678	0.2421	0.3678	0.1836	0.3678	0.1568	0.3678	0.137	0.3678	0.1222	0.3678	0.1018	0.3678	0.0901
0.3853	0.2561	0.3853	0.1879	0.3853	0.1604	0.3853	0.14	0.3853	0.1286	0.3853	0.1111	0.3853	0.0931
0.4037	0.2561	0.4037	0.1879	0.4037	0.1604	0.4037	0.14	0.4037	0.1295	0.4037	0.1181	0.4037	0.1058
0.4229	0.2561	0.4229	0.1879	0.4229	0.1659	0.4229	0.1491	0.4229	0.1363	0.4229	0.1255	0.4229	0.1134
0.4431	0.3305	0.4431	0.236	0.4431	0.2057	0.4431	0.183	0.4431	0.1656	0.4431	0.1411	0.4431	0.1189
0.4642	0.3305	0.4642	0.236	0.4642	0.2057	0.4642	0.183	0.4642	0.1656	0.4642	0.1411	0.4642	0.1191
0.4863	0.3305	0.4863	0.236	0.4863	0.2057	0.4863	0.183	0.4863	0.1656	0.4863	0.1434	0.4863	0.1257
0.5094	0.3305	0.5094	0.236	0.5094	0.2057	0.5094	0.183	0.5094	0.1656	0.5094	0.1478	0.5094	0.1307

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Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.3378	0.5337	0.2419	0.5337	0.2105	0.5337	0.192	0.5337	0.1816	0.5337	0.1635	0.5337	0.142
0.5591	0.4058	0.5591	0.2801	0.5591	0.2478	0.5591	0.2214	0.5591	0.2006	0.5591	0.1739	0.5591	0.1574
0.5857	0.4058	0.5857	0.2915	0.5857	0.2621	0.5857	0.2377	0.5857	0.2172	0.5857	0.1878	0.5857	0.1747
0.6136	0.4058	0.6136	0.2915	0.6136	0.2621	0.6136	0.2377	0.6136	0.2172	0.6136	0.2028	0.6136	0.1889
0.6428	0.4058	0.6428	0.2915	0.6428	0.2621	0.6428	0.2377	0.6428	0.2257	0.6428	0.2153	0.6428	0.201
0.6734	0.4176	0.6734	0.2915	0.6734	0.2621	0.6734	0.2496	0.6734	0.2424	0.6734	0.229	0.6734	0.2118
0.7055	0.4176	0.7055	0.3079	0.7055	0.2812	0.7055	0.2691	0.7055	0.2585	0.7055	0.2404	0.7055	0.2196
0.7391	0.6488	0.7391	0.4251	0.7391	0.3472	0.7391	0.3008	0.7391	0.2825	0.7391	0.2517	0.7391	0.2204
0.7743	0.6488	0.7743	0.4251	0.7743	0.3472	0.7743	0.3112	0.7743	0.2928	0.7743	0.2621	0.7743	0.2275
0.8111	0.6742	0.8111	0.456	0.8111	0.398	0.8111	0.3532	0.8111	0.3182	0.8111	0.2686	0.8111	0.2275
0.8497	0.6742	0.8497	0.456	0.8497	0.4173	0.8497	0.3854	0.8497	0.3578	0.8497	0.3131	0.8497	0.2643
0.8902	0.6985	0.8902	0.456	0.8902	0.4173	0.8902	0.3854	0.8902	0.3632	0.8902	0.3306	0.8902	0.2863
0.9326	0.7612	0.9326	0.5383	0.9326	0.474	0.9326	0.427	0.9326	0.3916	0.9326	0.3416	0.9326	0.2945
0.977	1.0292	0.977	0.6621	0.977	0.5476	0.977	0.4756	0.977	0.4268	0.977	0.3654	0.977	0.3149
1.0235	1.0292	1.0235	0.6621	1.0235	0.5897	1.0235	0.5355	1.0235	0.4903	1.0235	0.4219	1.0235	0.3545
1.0723	1.0292	1.0723	0.7033	1.0723	0.6314	1.0723	0.5714	1.0723	0.5209	1.0723	0.4434	1.0723	0.372
1.1233	1.3137	1.1233	0.8999	1.1233	0.7545	1.1233	0.6502	1.1233	0.5729	1.1233	0.4678	1.1233	0.3909
1.1768	1.3137	1.1768	0.8999	1.1768	0.7545	1.1768	0.6502	1.1768	0.5729	1.1768	0.4701	1.1768	0.3999
1.2328	1.3137	1.2328	0.9857	1.2328	0.8645	1.2328	0.7685	1.2328	0.691	1.2328	0.5723	1.2328	0.4547
1.2916	1.3137	1.2916	1.0916	1.2916	0.9479	1.2916	0.8357	1.2916	0.746	1.2916	0.6124	1.2916	0.4829
1.353	1.4089	1.353	1.0916	1.353	0.9479	1.353	0.8357	1.353	0.746	1.353	0.6124	1.353	0.4909
1.4175	1.729	1.4175	1.213	1.4175	1.0369	1.4175	0.9214	1.4175	0.8354	1.4175	0.709	1.4175	0.5885
1.485	1.729	1.485	1.213	1.485	1.0369	1.485	0.9542	1.485	0.8918	1.485	0.778	1.485	0.6506
1.5557	2.0447	1.5557	1.2726	1.5557	1.0865	1.5557	0.9691	1.5557	0.8918	1.5557	0.789	1.5557	0.6724
1.6298	2.0861	1.6298	1.4394	1.6298	1.2876	1.6298	1.162	1.6298	1.057	1.6298	0.8882	1.6298	0.7096
1.7074	2.1771	1.7074	1.5528	1.7074	1.397	1.7074	1.2648	1.7074	1.1508	1.7074	0.9654	1.7074	0.7705
1.7887	2.7163	1.7887	1.7697	1.7887	1.4137	1.7887	1.2648	1.7887	1.1508	1.7887	0.9665	1.7887	0.8229
1.8738	2.7163	1.8738	1.7697	1.8738	1.4137	1.8738	1.2648	1.8738	1.1545	1.8738	1.0307	1.8738	0.8752
1.963	2.7163	1.963	1.7697	1.963	1.4137	1.963	1.296	1.963	1.2176	1.963	1.0825	1.963	0.9154
2.0565	2.7163	2.0565	1.7697	2.0565	1.4137	2.0565	1.332	2.0565	1.2549	2.0565	1.1146	2.0565	0.9373
2.1544	2.7163	2.1544	1.7697	2.1544	1.5305	2.1544	1.4116	2.1544	1.3081	2.1544	1.1549	2.1544	1.0039
2.257	2.6722	2.257	1.7165	2.257	1.5315	2.257	1.4444	2.257	1.3645	2.257	1.2229	2.257	1.0568
2.3645	2.6722	2.3645	1.7165	2.3645	1.5867	2.3645	1.4923	2.3645	1.409	2.3645	1.2586	2.3645	1.0784
2.4771	2.6722	2.4771	1.7165	2.4771	1.6824	2.4771	1.5289	2.4771	1.409	2.4771	1.2586	2.4771	1.0784
2.595	2.6722	2.595	1.7165	2.595	1.6824	2.595	1.5289	2.595	1.409	2.595	1.2586	2.595	1.0784

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.6722	2.7186	1.7165	2.7186	1.6824	2.7186	1.5289	2.7186	1.409	2.7186	1.2586	2.7186	1.0784
2.848	2.6722	2.848	1.7165	2.848	1.6824	2.848	1.5289	2.848	1.409	2.848	1.2586	2.848	1.0784
2.9836	2.6722	2.9836	1.7165	2.9836	1.6824	2.9836	1.5289	2.9836	1.4086	2.9836	1.2312	2.9836	1.0531
3.1257	2.6722	3.1257	1.7165	3.1257	1.4081	3.1257	1.249	3.1257	1.1684	3.1257	1.0862	3.1257	0.9782
3.2745	2.6722	3.2745	1.5912	3.2745	1.3838	3.2745	1.249	3.2745	1.1419	3.2745	0.9784	3.2745	0.8937
3.4305	2.4258	3.4305	1.3157	3.4305	1.2378	3.4305	1.1421	3.4305	1.0837	3.4305	0.977	3.4305	0.843
3.5938	2.4258	3.5938	1.3154	3.5938	1.2378	3.5938	1.1238	3.5938	1.0502	3.5938	0.961	3.5938	0.8401
3.7649	2.4258	3.7649	1.3154	3.7649	1.2378	3.7649	1.1238	3.7649	1.0494	3.7649	0.9359	3.7649	0.8192
3.9442	2.4258	3.9442	1.3154	3.9442	1.2378	3.9442	1.1098	3.9442	1.0413	3.9442	0.9304	3.9442	0.8192
4.132	2.4258	4.132	1.3154	4.132	1.2378	4.132	1.1098	4.132	1.0413	4.132	0.9304	4.132	0.8192
4.3288	2.4258	4.3288	1.3154	4.3288	1.2378	4.3288	1.069	4.3288	0.9785	4.3288	0.8739	4.3288	0.7783
4.5349	2.4258	4.5349	1.3154	4.5349	1.1837	4.5349	1.0539	4.5349	0.9618	4.5349	0.8274	4.5349	0.6979
4.7508	1.9701	4.7508	1.0977	4.7508	1.0417	4.7508	0.9199	4.7508	0.872	4.7508	0.7786	4.7508	0.6734
4.977	1.9701	4.977	1.0977	4.977	1.0417	4.977	0.8879	4.977	0.839	4.977	0.7604	4.977	0.6667
5.214	1.9701	5.214	1.0977	5.214	0.9918	5.214	0.8856	5.214	0.8097	5.214	0.7297	5.214	0.6413
5.4623	1.4677	5.4623	0.9173	5.4623	0.8237	5.4623	0.7835	5.4623	0.7434	5.4623	0.6763	5.4623	0.5975
5.7224	1.3373	5.7224	0.8915	5.7224	0.8183	5.7224	0.7788	5.7224	0.7416	5.7224	0.6761	5.7224	0.5967
5.9948	1.186	5.9948	0.8915	5.9948	0.8073	5.9948	0.7595	5.9948	0.7218	5.9948	0.6568	5.9948	0.5793
6.2803	1.186	6.2803	0.8742	6.2803	0.7554	6.2803	0.7165	6.2803	0.6807	6.2803	0.6166	6.2803	0.5424
6.5793	1.1682	6.5793	0.7476	6.5793	0.6961	6.5793	0.6558	6.5793	0.6206	6.5793	0.564	6.5793	0.5054
6.8926	1.1682	6.8926	0.6278	6.8926	0.5979	6.8926	0.5695	6.8926	0.5433	6.8926	0.5064	6.8926	0.4688
7.2208	1.1682	7.2208	0.6161	7.2208	0.5433	7.2208	0.5063	7.2208	0.4825	7.2208	0.4512	7.2208	0.4513
7.5646	1.1682	7.5646	0.6161	7.5646	0.5366	7.5646	0.5063	7.5646	0.4825	7.5646	0.4512	7.5646	0.4437
7.9248	1.1682	7.9248	0.5885	7.9248	0.535	7.9248	0.5063	7.9248	0.4825	7.9248	0.4463	7.9248	0.4346
8.3022	1.1682	8.3022	0.5885	8.3022	0.535	8.3022	0.5063	8.3022	0.4825	8.3022	0.4463	8.3022	0.4294
8.6975	0.9253	8.6975	0.5885	8.6975	0.535	8.6975	0.5063	8.6975	0.4825	8.6975	0.4463	8.6975	0.4203
9.1116	0.9253	9.1116	0.5885	9.1116	0.5144	9.1116	0.4908	9.1116	0.4754	9.1116	0.4448	9.1116	0.4063
9.5455	0.9253	9.5455	0.5885	9.5455	0.5144	9.5455	0.4844	9.5455	0.4667	9.5455	0.4352	9.5455	0.3996
10	0.7548	10	0.5609	10	0.5124	10	0.4745	10	0.4536	10	0.4198	10	0.3951
10.4762	0.7548	10.4762	0.5609	10.4762	0.5124	10.4762	0.4741	10.4762	0.444	10.4762	0.4021	10.4762	0.3892
10.975	0.7267	10.975	0.5609	10.975	0.5124	10.975	0.4741	10.975	0.444	10.975	0.4021	10.975	0.3809
11.4976	0.6866	11.4976	0.5132	11.4976	0.4705	11.4976	0.4496	11.4976	0.4297	11.4976	0.3972	11.4976	0.3755
12.045	0.6015	12.045	0.4763	12.045	0.4518	12.045	0.4317	12.045	0.415	12.045	0.3892	12.045	0.3696
12.6186	0.6015	12.6186	0.41	12.6186	0.3905	12.6186	0.381	12.6186	0.372	12.6186	0.3644	12.6186	0.3629
13.2194	0.6015	13.2194	0.41	13.2194	0.3885	13.2194	0.3742	13.2194	0.365	13.2194	0.3591	13.2194	0.3578

PTWW023.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 23 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 76 ft. ~ Line 13 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6015	13.8489	0.41	13.8489	0.3885	13.8489	0.3742	13.8489	0.365	13.8489	0.3547	13.8489	0.3535
14.5083	0.6015	14.5083	0.41	14.5083	0.3885	14.5083	0.3742	14.5083	0.365	14.5083	0.3547	14.5083	0.3503
15.1991	0.6015	15.1991	0.41	15.1991	0.3885	15.1991	0.3742	15.1991	0.365	15.1991	0.3547	15.1991	0.3482
15.9228	0.6015	15.9228	0.41	15.9228	0.3885	15.9228	0.3742	15.9228	0.365	15.9228	0.3547	15.9228	0.3479
16.681	0.6015	16.681	0.41	16.681	0.3885	16.681	0.3742	16.681	0.365	16.681	0.3547	16.681	0.3479
17.4753	0.6015	17.4753	0.41	17.4753	0.3885	17.4753	0.3742	17.4753	0.365	17.4753	0.3547	17.4753	0.3479
18.3074	0.5419	18.3074	0.3695	18.3074	0.363	18.3074	0.3584	18.3074	0.3547	18.3074	0.3494	18.3074	0.3448
19.1791	0.5419	19.1791	0.3591	19.1791	0.352	19.1791	0.348	19.1791	0.3453	19.1791	0.3436	19.1791	0.3423
20.0923	0.5419	20.0923	0.3591	20.0923	0.352	20.0923	0.348	20.0923	0.3453	20.0923	0.3422	20.0923	0.3402
21.049	0.521	21.049	0.3591	21.049	0.352	21.049	0.348	21.049	0.3453	21.049	0.3422	21.049	0.3398
22.0513	0.3887	22.0513	0.3591	22.0513	0.352	22.0513	0.348	22.0513	0.3453	22.0513	0.3422	22.0513	0.3398
23.1013	0.3887	23.1013	0.3591	23.1013	0.352	23.1013	0.348	23.1013	0.3453	23.1013	0.3422	23.1013	0.3398
24.2013	0.3887	24.2013	0.3591	24.2013	0.352	24.2013	0.348	24.2013	0.3453	24.2013	0.3422	24.2013	0.3398
25.3536	0.3465	25.3536	0.3405	25.3536	0.3398	25.3536	0.3398	25.3536	0.34	25.3536	0.3397	25.3536	0.3389
26.5609	0.3465	26.5609	0.3401	26.5609	0.3394	26.5609	0.339	26.5609	0.3387	26.5609	0.3384	26.5609	0.3378
27.8256	0.3465	27.8256	0.3401	27.8256	0.3394	27.8256	0.3389	27.8256	0.3385	27.8256	0.3378	27.8256	0.337
29.1505	0.3442	29.1505	0.3397	29.1505	0.3388	29.1505	0.3383	29.1505	0.3378	29.1505	0.3372	29.1505	0.3367
30.5386	0.3442	30.5386	0.3397	30.5386	0.3388	30.5386	0.3383	30.5386	0.3378	30.5386	0.3372	30.5386	0.3366
31.9927	0.3385	31.9927	0.3371	31.9927	0.3371	31.9927	0.337	31.9927	0.3369	31.9927	0.3366	31.9927	0.3363
33.516	0.3362	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.3361	33.516	0.336	33.516	0.3358
35.1119	0.3356	35.1119	0.3356	35.1119	0.3356	35.1119	0.3355	35.1119	0.3355	35.1119	0.3354	35.1119	0.3353
36.7838	0.3351	36.7838	0.3351	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.335	36.7838	0.3349
38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3346	38.5353	0.3345	38.5353	0.3345
40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342	40.3702	0.3342
42.2924	0.334	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3339	42.2924	0.3338
44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336	44.3062	0.3336
46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333	46.4159	0.3333
48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331	48.626	0.3331
50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3328	50.9414	0.3329

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0291	0.1098	0.0261	0.1098	0.0245	0.1098	0.0231	0.1098	0.0223	0.1098	0.0216	0.1098	0.0208
0.115	0.0308	0.115	0.0261	0.115	0.0245	0.115	0.0235	0.115	0.0231	0.115	0.0225	0.115	0.0216
0.1204	0.0313	0.1204	0.0263	0.1204	0.0247	0.1204	0.0243	0.1204	0.0238	0.1204	0.0231	0.1204	0.0222
0.1262	0.0313	0.1262	0.027	0.1262	0.0257	0.1262	0.0247	0.1262	0.0243	0.1262	0.0235	0.1262	0.0225
0.1322	0.0313	0.1322	0.0271	0.1322	0.0258	0.1322	0.0248	0.1322	0.0244	0.1322	0.0236	0.1322	0.0228
0.1385	0.0313	0.1385	0.0277	0.1385	0.0266	0.1385	0.0256	0.1385	0.0246	0.1385	0.0237	0.1385	0.0229
0.1451	0.0316	0.1451	0.0295	0.1451	0.0282	0.1451	0.0271	0.1451	0.026	0.1451	0.0241	0.1451	0.0229
0.152	0.0321	0.152	0.03	0.152	0.0287	0.152	0.0275	0.152	0.0264	0.152	0.0244	0.152	0.0229
0.1592	0.0331	0.1592	0.0312	0.1592	0.0301	0.1592	0.029	0.1592	0.028	0.1592	0.0266	0.1592	0.0247
0.1668	0.0367	0.1668	0.0325	0.1668	0.0315	0.1668	0.0306	0.1668	0.0297	0.1668	0.0282	0.1668	0.0261
0.1748	0.0508	0.1748	0.0427	0.1748	0.0386	0.1748	0.0351	0.1748	0.0322	0.1748	0.0288	0.1748	0.0268
0.1831	0.0587	0.1831	0.0493	0.1831	0.0443	0.1831	0.0399	0.1831	0.0363	0.1831	0.0306	0.1831	0.0273
0.1918	0.0587	0.1918	0.0493	0.1918	0.0443	0.1918	0.0399	0.1918	0.0363	0.1918	0.0306	0.1918	0.0279
0.2009	0.0587	0.2009	0.0493	0.2009	0.0443	0.2009	0.0399	0.2009	0.0363	0.2009	0.0331	0.2009	0.0302
0.2105	0.0587	0.2105	0.0493	0.2105	0.0443	0.2105	0.0404	0.2105	0.0389	0.2105	0.0364	0.2105	0.0329
0.2205	0.0587	0.2205	0.0493	0.2205	0.0457	0.2205	0.0431	0.2205	0.041	0.2205	0.038	0.2205	0.0341
0.231	0.0587	0.231	0.0493	0.231	0.046	0.231	0.044	0.231	0.0422	0.231	0.0389	0.231	0.0357
0.242	0.0587	0.242	0.0509	0.242	0.0487	0.242	0.0466	0.242	0.0447	0.242	0.0413	0.242	0.0372
0.2535	0.065	0.2535	0.0574	0.2535	0.053	0.2535	0.049	0.2535	0.0455	0.2535	0.0413	0.2535	0.0388
0.2656	0.0733	0.2656	0.0587	0.2656	0.0535	0.2656	0.049	0.2656	0.0455	0.2656	0.0438	0.2656	0.0418
0.2783	0.0818	0.2783	0.06	0.2783	0.0535	0.2783	0.0509	0.2783	0.0496	0.2783	0.0471	0.2783	0.044
0.2915	0.0818	0.2915	0.062	0.2915	0.0583	0.2915	0.0549	0.2915	0.052	0.2915	0.0487	0.2915	0.0449
0.3054	0.0818	0.3054	0.0666	0.3054	0.0624	0.3054	0.0586	0.3054	0.0551	0.3054	0.05	0.3054	0.0464
0.3199	0.0818	0.3199	0.0705	0.3199	0.0662	0.3199	0.0624	0.3199	0.0595	0.3199	0.0545	0.3199	0.0485
0.3352	0.0876	0.3352	0.0771	0.3352	0.0711	0.3352	0.0669	0.3352	0.0636	0.3352	0.058	0.3352	0.0513
0.3511	0.0909	0.3511	0.0809	0.3511	0.0752	0.3511	0.0701	0.3511	0.0656	0.3511	0.058	0.3511	0.0513
0.3678	0.1218	0.3678	0.0952	0.3678	0.0823	0.3678	0.0721	0.3678	0.0656	0.3678	0.058	0.3678	0.0513
0.3853	0.1363	0.3853	0.1059	0.3853	0.0921	0.3853	0.081	0.3853	0.0722	0.3853	0.0592	0.3853	0.0513
0.4037	0.1363	0.4037	0.1059	0.4037	0.0921	0.4037	0.0824	0.4037	0.0764	0.4037	0.0665	0.4037	0.0575
0.4229	0.1363	0.4229	0.1059	0.4229	0.0921	0.4229	0.0855	0.4229	0.0804	0.4229	0.0715	0.4229	0.0617
0.4431	0.1363	0.4431	0.1059	0.4431	0.094	0.4431	0.0891	0.4431	0.0845	0.4431	0.0764	0.4431	0.0665
0.4642	0.1376	0.4642	0.1059	0.4642	0.0981	0.4642	0.0923	0.4642	0.0869	0.4642	0.0774	0.4642	0.0681
0.4863	0.1484	0.4863	0.1248	0.4863	0.1118	0.4863	0.1006	0.4863	0.091	0.4863	0.0833	0.4863	0.0742
0.5094	0.1825	0.5094	0.1398	0.5094	0.1233	0.5094	0.11	0.5094	0.0992	0.5094	0.0876	0.5094	0.0762

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.2221	0.5337	0.1614	0.5337	0.1351	0.5337	0.1155	0.5337	0.1031	0.5337	0.0876	0.5337	0.0762
0.5591	0.2221	0.5591	0.1614	0.5591	0.1351	0.5591	0.1155	0.5591	0.1031	0.5591	0.0896	0.5591	0.0765
0.5857	0.2221	0.5857	0.1614	0.5857	0.1351	0.5857	0.1155	0.5857	0.1037	0.5857	0.096	0.5857	0.0844
0.6136	0.2221	0.6136	0.1614	0.6136	0.1351	0.6136	0.1189	0.6136	0.1123	0.6136	0.1017	0.6136	0.0888
0.6428	0.2266	0.6428	0.1631	0.6428	0.1365	0.6428	0.1189	0.6428	0.1143	0.6428	0.1052	0.6428	0.0925
0.6734	0.2266	0.6734	0.1631	0.6734	0.1399	0.6734	0.1301	0.6734	0.1222	0.6734	0.1096	0.6734	0.0952
0.7055	0.2266	0.7055	0.1631	0.7055	0.1399	0.7055	0.1301	0.7055	0.1222	0.7055	0.1116	0.7055	0.0981
0.7391	0.2266	0.7391	0.1631	0.7391	0.143	0.7391	0.1345	0.7391	0.1261	0.7391	0.1118	0.7391	0.0981
0.7743	0.3193	0.7743	0.2152	0.7743	0.1824	0.7743	0.16	0.7743	0.144	0.7743	0.1231	0.7743	0.1049
0.8111	0.3193	0.8111	0.2152	0.8111	0.1824	0.8111	0.16	0.8111	0.144	0.8111	0.1231	0.8111	0.107
0.8497	0.3193	0.8497	0.2152	0.8497	0.1824	0.8497	0.1667	0.8497	0.154	0.8497	0.1353	0.8497	0.1176
0.8902	0.3193	0.8902	0.2152	0.8902	0.1916	0.8902	0.1759	0.8902	0.1631	0.8902	0.1433	0.8902	0.1231
0.9326	0.4908	0.9326	0.3016	0.9326	0.248	0.9326	0.2165	0.9326	0.1943	0.9326	0.165	0.9326	0.1395
0.977	0.4908	0.977	0.3016	0.977	0.248	0.977	0.2165	0.977	0.1943	0.977	0.1747	0.977	0.1534
1.0235	0.4908	1.0235	0.3016	1.0235	0.248	1.0235	0.2165	1.0235	0.1945	1.0235	0.1819	1.0235	0.1618
1.0723	0.4908	1.0723	0.3016	1.0723	0.2621	1.0723	0.2405	1.0723	0.2228	1.0723	0.1964	1.0723	0.1694
1.1233	0.5832	1.1233	0.3442	1.1233	0.2717	1.1233	0.2405	1.1233	0.2228	1.1233	0.1964	1.1233	0.1694
1.1768	0.5832	1.1768	0.383	1.1768	0.3194	1.1768	0.2821	1.1768	0.2518	1.1768	0.2159	1.1768	0.1892
1.2328	0.5832	1.2328	0.3885	1.2328	0.3512	1.2328	0.3199	1.2328	0.2945	1.2328	0.2544	1.2328	0.2149
1.2916	0.5832	1.2916	0.422	1.2916	0.3725	1.2916	0.3349	1.2916	0.3073	1.2916	0.2656	1.2916	0.2265
1.353	0.641	1.353	0.422	1.353	0.3725	1.353	0.3349	1.353	0.3156	1.353	0.2834	1.353	0.2456
1.4175	0.641	1.4175	0.422	1.4175	0.3743	1.4175	0.354	1.4175	0.3356	1.4175	0.3035	1.4175	0.2655
1.485	0.641	1.485	0.4469	1.485	0.4167	1.485	0.3896	1.485	0.3647	1.485	0.3228	1.485	0.2776
1.5557	0.641	1.5557	0.4762	1.5557	0.4448	1.5557	0.4175	1.5557	0.3928	1.5557	0.3511	1.5557	0.3012
1.6298	0.7619	1.6298	0.4978	1.6298	0.4567	1.6298	0.4269	1.6298	0.4034	1.6298	0.3639	1.6298	0.3171
1.7074	0.8123	1.7074	0.641	1.7074	0.5693	1.7074	0.5131	1.7074	0.4665	1.7074	0.3982	1.7074	0.3348
1.7887	0.9259	1.7887	0.7593	1.7887	0.678	1.7887	0.6117	1.7887	0.5548	1.7887	0.4723	1.7887	0.3909
1.8738	0.974	1.8738	0.7878	1.8738	0.708	1.8738	0.6465	1.8738	0.6002	1.8738	0.5234	1.8738	0.4347
1.963	1.1341	1.963	0.8565	1.963	0.7538	1.963	0.6879	1.963	0.6337	1.963	0.5452	1.963	0.4471
2.0565	1.2264	2.0565	0.8865	2.0565	0.7941	2.0565	0.7185	2.0565	0.6577	2.0565	0.5616	2.0565	0.4596
2.1544	1.2264	2.1544	0.8865	2.1544	0.7941	2.1544	0.7185	2.1544	0.6577	2.1544	0.5616	2.1544	0.4626
2.257	1.2264	2.257	0.8865	2.257	0.8031	2.257	0.7429	2.257	0.6869	2.257	0.5894	2.257	0.49
2.3645	1.9612	2.3645	1.0488	2.3645	0.8406	2.3645	0.7656	2.3645	0.7007	2.3645	0.5944	2.3645	0.5058
2.4771	2.3059	2.4771	1.2401	2.4771	0.9963	2.4771	0.8264	2.4771	0.721	2.4771	0.6253	2.4771	0.5241
2.595	2.9123	2.595	1.4466	2.595	1.0857	2.595	0.885	2.595	0.7616	2.595	0.6332	2.595	0.5408

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.9123	2.7186	1.4466	2.7186	1.0857	2.7186	0.885	2.7186	0.7616	2.7186	0.6332	2.7186	0.5408
2.848	2.9123	2.848	1.4466	2.848	1.0857	2.848	0.885	2.848	0.7616	2.848	0.6332	2.848	0.5408
2.9836	2.9123	2.9836	1.4466	2.9836	1.0857	2.9836	0.885	2.9836	0.7616	2.9836	0.6332	2.9836	0.5408
3.1257	2.9123	3.1257	1.4466	3.1257	1.0857	3.1257	0.885	3.1257	0.7616	3.1257	0.6332	3.1257	0.5408
3.2745	1.5957	3.2745	1.0453	3.2745	0.9516	3.2745	0.877	3.2745	0.7616	3.2745	0.6332	3.2745	0.5408
3.4305	1.5557	3.4305	1.0453	3.4305	0.9516	3.4305	0.877	3.4305	0.7616	3.4305	0.6332	3.4305	0.5408
3.5938	1.5557	3.5938	1.0453	3.5938	0.9516	3.5938	0.877	3.5938	0.7616	3.5938	0.6332	3.5938	0.5408
3.7649	1.5557	3.7649	1.0453	3.7649	0.9516	3.7649	0.877	3.7649	0.7616	3.7649	0.6332	3.7649	0.5408
3.9442	1.5557	3.9442	1.0453	3.9442	0.9516	3.9442	0.877	3.9442	0.7616	3.9442	0.6332	3.9442	0.5408
4.132	1.5557	4.132	1.0453	4.132	0.9516	4.132	0.877	4.132	0.7616	4.132	0.6332	4.132	0.5408
4.3288	1.5557	4.3288	1.0453	4.3288	0.9516	4.3288	0.877	4.3288	0.7616	4.3288	0.6332	4.3288	0.5408
4.5349	1.5557	4.5349	1.0453	4.5349	0.9516	4.5349	0.877	4.5349	0.7616	4.5349	0.6332	4.5349	0.5497
4.7508	1.5557	4.7508	1.0453	4.7508	0.9516	4.7508	0.877	4.7508	0.7616	4.7508	0.6485	4.7508	0.5929
4.977	1.5557	4.977	1.0453	4.977	0.9516	4.977	0.877	4.977	0.8145	4.977	0.7118	4.977	0.6356
5.214	1.5557	5.214	1.0774	5.214	0.9882	5.214	0.9135	5.214	0.8523	5.214	0.7561	5.214	0.6761
5.4623	1.9438	5.4623	1.1547	5.4623	1.0213	5.4623	0.9313	5.4623	0.8675	5.4623	0.7713	5.4623	0.7153
5.7224	2.3998	5.7224	1.3627	5.7224	1.1739	5.7224	1.0456	5.7224	0.9654	5.7224	0.8922	5.7224	0.7914
5.9948	2.3998	5.9948	1.5021	5.9948	1.3429	5.9948	1.2312	5.9948	1.1504	5.9948	1.0241	5.9948	0.8812
6.2803	2.3998	6.2803	1.5021	6.2803	1.3429	6.2803	1.2512	6.2803	1.1843	6.2803	1.0774	6.2803	0.9578
6.5793	2.3998	6.5793	1.5021	6.5793	1.3429	6.5793	1.2512	6.5793	1.1843	6.5793	1.0975	6.5793	1.0045
6.8926	3.1388	6.8926	1.9009	6.8926	1.6283	6.8926	1.4593	6.8926	1.3283	6.8926	1.142	6.8926	1.0496
7.2208	3.805	7.2208	2.1966	7.2208	1.9285	7.2208	1.7483	7.2208	1.606	7.2208	1.3871	7.2208	1.1403
7.5646	4.7167	7.5646	2.7844	7.5646	2.3279	7.5646	1.9882	7.5646	1.8385	7.5646	1.605	7.5646	1.3242
7.9248	5.9632	7.9248	3.6137	7.9248	2.9424	7.9248	2.4467	7.9248	2.1357	7.9248	1.7196	7.9248	1.5158
8.3022	5.9632	8.3022	3.6314	8.3022	2.9505	8.3022	2.4467	8.3022	2.1357	8.3022	1.7196	8.3022	1.5826
8.6975	5.9632	8.6975	3.6314	8.6975	2.9505	8.6975	2.4467	8.6975	2.1357	8.6975	1.8333	8.6975	1.5826
9.1116	6.0802	9.1116	3.994	9.1116	3.2398	9.1116	2.7398	9.1116	2.4034	9.1116	1.9297	9.1116	1.6805
9.5455	7.0171	9.5455	3.994	9.5455	3.2398	9.5455	2.7398	9.5455	2.4034	9.5455	1.9297	9.5455	1.7636
10	7.0171	10	3.994	10	3.2398	10	2.7398	10	2.4034	10	1.9297	10	1.7636
10.4762	7.0171	10.4762	3.994	10.4762	3.2398	10.4762	2.7398	10.4762	2.4034	10.4762	1.9297	10.4762	1.7636
10.975	7.0171	10.975	3.994	10.975	3.2398	10.975	2.7398	10.975	2.4034	10.975	1.9297	10.975	1.7636
11.4976	7.0171	11.4976	3.994	11.4976	3.2398	11.4976	2.7398	11.4976	2.4034	11.4976	1.9297	11.4976	1.7636
12.045	5.2219	12.045	3.6403	12.045	3.2162	12.045	2.7398	12.045	2.4034	12.045	1.9297	12.045	1.7187
12.6186	5.0673	12.6186	3.0551	12.6186	2.7236	12.6186	2.4671	12.6186	2.2578	12.6186	1.9297	12.6186	1.6337
13.2194	4.0804	13.2194	2.3646	13.2194	2.1777	13.2194	2.0501	13.2194	1.9348	13.2194	1.7387	13.2194	1.5139

PTWW144.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 144 ~ SLAB ONLY Vertical Responses ~ Elevation 77 ft. ~ EL77_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	2.9165	13.8489	2.0669	13.8489	1.847	13.8489	1.6801	13.8489	1.5651	13.8489	1.4188	13.8489	1.2854
14.5083	2.6881	14.5083	1.6507	14.5083	1.5024	14.5083	1.3808	14.5083	1.2797	14.5083	1.2024	14.5083	1.1256
15.1991	1.5581	15.1991	1.2904	15.1991	1.2517	15.1991	1.2013	15.1991	1.1519	15.1991	1.0646	15.1991	0.999
15.9228	1.5542	15.9228	1.2147	15.9228	1.1521	15.9228	1.1013	15.9228	1.0583	15.9228	0.9867	15.9228	0.9108
16.681	1.4175	16.681	1.0273	16.681	0.9864	16.681	0.9638	16.681	0.9391	16.681	0.889	16.681	0.8585
17.4753	1.4175	17.4753	1.0273	17.4753	0.9836	17.4753	0.9427	17.4753	0.9076	17.4753	0.8505	17.4753	0.8328
18.3074	1.1231	18.3074	0.9783	18.3074	0.923	18.3074	0.8869	18.3074	0.8621	18.3074	0.8332	18.3074	0.8176
19.1791	1.1231	19.1791	0.9783	19.1791	0.923	19.1791	0.8869	19.1791	0.8621	19.1791	0.8298	19.1791	0.8009
20.0923	0.8104	20.0923	0.8039	20.0923	0.8062	20.0923	0.8037	20.0923	0.7987	20.0923	0.7864	20.0923	0.7691
21.049	0.7585	21.049	0.7386	21.049	0.7381	21.049	0.7388	21.049	0.7391	21.049	0.738	21.049	0.7329
22.0513	0.7383	22.0513	0.7037	22.0513	0.6966	22.0513	0.7001	22.0513	0.7024	22.0513	0.7046	22.0513	0.7037
23.1013	0.7383	23.1013	0.7037	23.1013	0.6917	23.1013	0.685	23.1013	0.6858	23.1013	0.6855	23.1013	0.6829
24.2013	0.7383	24.2013	0.7037	24.2013	0.6917	24.2013	0.6843	24.2013	0.6792	24.2013	0.6724	24.2013	0.666
25.3536	0.657	25.3536	0.6609	25.3536	0.6609	25.3536	0.6593	25.3536	0.6571	25.3536	0.6528	25.3536	0.6477
26.5609	0.6463	26.5609	0.6367	26.5609	0.6334	26.5609	0.6316	26.5609	0.6306	26.5609	0.6294	26.5609	0.6281
27.8256	0.6035	27.8256	0.592	27.8256	0.5982	27.8256	0.6021	27.8256	0.6048	27.8256	0.6081	27.8256	0.6105
29.1505	0.6025	29.1505	0.5884	29.1505	0.5872	29.1505	0.5894	29.1505	0.5914	29.1505	0.5947	29.1505	0.5976
30.5386	0.6025	30.5386	0.5884	30.5386	0.5867	30.5386	0.5865	30.5386	0.5868	30.5386	0.5878	30.5386	0.5891
31.9927	0.5822	31.9927	0.5848	31.9927	0.5843	31.9927	0.5837	31.9927	0.5832	31.9927	0.5826	31.9927	0.5824
33.516	0.5739	33.516	0.5752	33.516	0.5756	33.516	0.5758	33.516	0.5759	33.516	0.5759	33.516	0.5759
35.1119	0.5693	35.1119	0.5693	35.1119	0.5694	35.1119	0.5695	35.1119	0.5695	35.1119	0.5697	35.1119	0.5698
36.7838	0.5638	36.7838	0.564	36.7838	0.564	36.7838	0.5641	36.7838	0.5641	36.7838	0.5642	36.7838	0.5643
38.5353	0.5589	38.5353	0.5591	38.5353	0.5591	38.5353	0.5592	38.5353	0.5592	38.5353	0.5593	38.5353	0.5594
40.3702	0.5545	40.3702	0.5547	40.3702	0.5547	40.3702	0.5547	40.3702	0.5548	40.3702	0.5548	40.3702	0.5549
42.2924	0.5506	42.2924	0.5506	42.2924	0.5507	42.2924	0.5507	42.2924	0.5507	42.2924	0.5508	42.2924	0.5509
44.3062	0.5469	44.3062	0.5469	44.3062	0.5469	44.3062	0.547	44.3062	0.547	44.3062	0.5471	44.3062	0.5472
46.4159	0.5434	46.4159	0.5435	46.4159	0.5435	46.4159	0.5436	46.4159	0.5436	46.4159	0.5436	46.4159	0.5438
48.626	0.5403	48.626	0.5403	48.626	0.5403	48.626	0.5404	48.626	0.5404	48.626	0.5404	48.626	0.5406
50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5373	50.9414	0.5374	50.9414	0.5376

ISSUED BY
RPP-WTP PDC

MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No.
24590-PTF-MV-CNP-DISTC-00001
Data Sheet No.
24590-PTF-MVD-CNP-00016

R11105819

Project:	***RPP-WTP***	P&ID:	***24590-PTF-M6-CNP-00010, 24590-QL-POA-MEVV-00002-07-23***
Project No:	***24590***	Process Data:	***24590-PTF-MVC-CNP-00015*** 1
Project Site:	***Hanford***	Vessel Drawing	***24590-QL-POA-MEVV-00002-07-08***
Description:	***Cesium Evaporator Nitric Acid Rectifier CNP-DISTC-00001***		

Reference Data

Charge Vessels (Tag Numbers)	***N/A***
Pulsejet Mixers / Agitators (Tag Numbers)	***N/A***
RFDs/Pumps (Tag Numbers)	***N/A***

Quality Level		***Q (Note 8 & 15)*** 1	Fabrication Specs	***24590-WTP-3PS-MV00-T0001***
Seismic Category		***SC-I (Note 15)*** 1	Design Code	***ASME section VIII Division 1***
Service/Contents		***Nitric Acid***	Code Stamp	***Yes, U1 Stamp***
Design Specific Gravity		***1.50***	NB Registration	***Yes***
Maximum Operating Volume	gal	***22***	Wind Design	***None***
Total Volume	gal	***877***	Snow/Ash Design	***None***
Postweld Heat Treat		***Not Required***	Seismic Design	***24590-WTP-3PS-MV00-T0002***
Seismic Base Moment	ft*lb	***N/A***		***24590-WTP-3PS-SS90-T0001***

Design Data

Inside Diameter	inch	***42***		Corrosion Allowance inch	***0.04***
Length/Height (TL-TL)	inch	***144***			
		Vessel Operating	Vessel Design	Coil / Jacket Design	Notes
Internal Pressure	psig	***1.08 psia***	***50***	***N/A***	
External Pressure	psig	***0*** 1	***14.7***	***N/A***	
Temperature	°F	***104***	***230***	***N/A***	
Min. Design Metal Temp.	°F	***40***		Hydrostatic Test Pressure PSIG	***65***

Materials of Construction

Component	Material	Containment	Notes
Top Head	***SB 688 UNS N08367 (AL6XN)***	***Auxiliary***	***3/8" thickness***
Shell	***SB 688 UNS N08367 (AL6XN)***	***Primary***	***3/8" thickness***
Lower Cone	***SB 688 UNS N08367 (AL6XN)***	***Primary***	***3/8" thickness***
Vessel Support	***A-554 MT-304,*** 1 ***A-240 304SS (note 5)***	***N/A***	
Jacket/Coils/Half-Pipe Jacket	***N/A***	***N/A***	
Internals	***SB 688 UNS N08367***	***N/A***	
Pipe	***SB 690 UNS N08367 (AL6XN) (6% MO Seamless)***	***Note 1***	
Forgings/ Bar stock	***N/A***		
Gaskets	***N/A***		
Bolting (Captive Bolts)	***N/A***		
Other (Fittings)			

1

	MECHANICAL SYSTEMS DATA SHEET: VESSEL	PLANT ITEM No. *24590-PTF-MV-CNP-DISTC-00001* Data Sheet No. *24590-PTF-MVD-CNP-00016*

Miscellaneous Data

Orientation	***Vertical***
Support Type	***Stainless Steel ASTM A554 MT-304 (Max. Carbon 0.30%)***
Insulation Function	***N/A***
Insulation Thickness (inch)	***None***
Insulation Material	***None***
External Finish	***Welds Descaled as Laid***
Internal Finish	***Welds Ground Smooth***

Notes

(1) Nozzles located below the top of the overflow nozzle are primary containment. See 24590-WTP-3PS-MV00-T0001 for NDE requirements.
(2) Nozzle tolerance +/- 1/4"
(3) 40 years design life.
(4) NDE for this vessel must meet requirements per para 6.1, 6.2 and 7.2 of specification 24590-WTP-3PS-MV00-T0001.
(5) Maximum Carbon content of 0.030 percent for all welded components.
(6) All welds forming part of the primary and auxiliary containment including nozzle attachment welds shall be subject to 100% volumetric examination.
1 ***(7) Deleted.***
1 ***(8) Vendor will provide Item at BNI quality level Q, which correlates to the vendors quality level of QL-2.***
(9) Vendor Design information is from document 24590-QL-POA-MEVV-00002-10-00011.
(10) Equipment Cyclic Data is from document 24590-QL-POA-MEVV-00002-10-00002.
(11) This vessel requires a fatigue analysis or fatigue assessment.
(12) When combining vessel loading with seismic, seller should 1 ***use design pressure. Seller has the option to use 2 psi or 15% over maximum operating pressure, whichever is greatest, not to exceed vessel design pressure and full vacuum in lieu of vessel design pressure.***
1 ***(13) Contents of this drawing are Dangerous Waste Permit Affecting.***
1 ***(14) Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.***
1 ***(15) For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore conservative.***
1 ***(16) Allowable nozzle loads shall be per SC-I stainless steel nozzle design loads of 24590-WTP-3PS-MV00-T0001.***

Safety screening/evaluation required? ☒Yes ☐No If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below.

Revision History

Rev	Description	By	Checked	EN&S	Approved	Date
1	Updated to add Dangerous Waste Permit Affecting note, DOE AEA note (14), reflect WSGM analysis, 24590-PTF-U0D-W16T-00001 changes, and update other data. Supersedes 24590-PTF-MWD-CNP-00001, Rev. C03	D. Tate	S. Thakkar	B. Hall	J. Julyk	8/24/09
0	Issued for Procurement	R. Rickenbach	S. Thakkar	S. Sontag	J. Julyk	08/06/2008

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Identification

Component Tag Number	24590-PTF-MV-CNP-DISTC-00001	Safety Classification	☒ SC ☐ SS ☐ APC ☐ SDC ☐ SDS ☐ RRC Note 12 1
Manufacturer / Supplier	AREVA NP, INC.		
Requisition Number	24590-QL-POA-MEVV-00002		
Model	N/A	Seismic Category	☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV Note 12 1
Description (Include descriptive text [e.g., location, elevation])	CESIUM EVAPORATOR NITRIC ACID RECTIFIER CNP-DISTC-00001, ROOM P-0320, ELEVATION 56'-0"		
Safety Function(s)	Prevent post seismic disruption of H2 vessel purge air pathways, spread of contamination into C3 areas. 1		

Seismic Safety Function	☒ Yes ☐ No	Room Number(s):	P-0320
Maintenance Accessible	☒ Yes ☐ No	Method of Maintenance Access:	☐ Remote ☒ Hands On ☐ None
Seismic Operability Requirements: 1	☐ During Seismic Event 1	☐ After Seismic Event	
ITS Equipment Type:	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical

Equipment Environmental Qualification (EEQ)

Environment ☒ Mild ☐ Harsh	Hi Rad Service ☐ Yes ☒ No	Design Life (yrs) ☐ 40 ☒ Other ____
Contamination Class: C3		Note 13 1
Radiation Class: R3		

Parameter Type/Units	Parameter Value	Time Duration (number)	Time Units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Normal					
Normal High Temperature (°F)	95	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	Note 1
Normal Low Temperature (°F)	59	40	yrs	24590-PTF-U0D-W16T-00001, Note 8	Note 1
Normal High Relative Humidity (%RH)	100	40	yrs	24590-PTF-U0D-W16T-00001	Note 1
Normal Low Relative Humidity (%RH)	10	40	yrs	24590-PTF-U0D-W16T-00001	Note 1
Normal High Pressure (in.-w.g.)	0	40	yrs	24590-PTF-U0D-W16T-00001	Note 1
Normal Low Pressure (in.-w.g.)	-0.4	40	yrs	24590-PTF-U0D-W16T-00001	Note 1
Normal Radiation Dose Rate (mR/hr)	10	40	yrs	24590-PTF-U0D-W16T-00001	Note 1
Vibration Magnitude (g)	N/A	N/A	N/A	N/A 1	Note 1
Vibration Frequency (Hz)	N/A	N/A	N/A	N/A 1	Note 1
Additional Normal Information:	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Time Duration (number)	Time units	WTP Document Number (BUYER)	Submittal Number (SELLER)
Abnormal					
Abnormal High Temperature (°F)	125	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 & 11	Note 1
Abnormal Low Temperature (°F)	Note 10 40	8	hr/yr	24590-PTF-U0D-W16T-00001, Note 8 & 10	Note 1
Abnormal High Relative Humidity (%RH)	100	24	hr/yr	24590-PTF-U0D-W16T-00001	Note 1
Abnormal Low Relative Humidity (%RH)	2	22	hr/yr	24590-PTF-U0D-W16T-00001, Note 11	Note 1
Abnormal High Pressure (in.-w.g.)	4	8	hr/yr	24590-PTF-U0D-W16T-00001	Note 1
Abnormal Low Pressure (in.-w.g.)	-7.3	8	hr/yr	24590-PTF-U0D-W16T-00001	Note 1
Abnormal Radiation Dose Rate (mR/hr)	10, Note 5	0	hr/yr	24590-PTF-U0D-W16T-00001	Note 1
Wet Sprinkler System Present	Yes	2	hr	24590-PTF-U0D-W16T-00001	Note 1
Additional Abnormal Information	See Note 2 for pressure units.				
Design Basis Events (DBE)					
DBE High Temperature (°F)	130	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8 & 11	Note 1
DBE Low Temperature (°F)	40	1000	hrs	24590-PTF-U0D-W16T-00001, Note 8	Note 1
DBE High Relative Humidity (%RH)	100	482	hrs	24590-PTF-U0D-W16T-00001	Note 1
DBE Low Relative Humidity (%RH)	6.0	1000	hrs	24590-PTF-U0D-W16T-00001, Note 11	Note 1
DBE High Pressure (in.-w.g.)	4	1000	hrs	24590-PTF-U0D-W16T-00001	Note 1
DBE Low Pressure (in.-w.g.)	-7.3	1000	hrs	24590-PTF-U0D-W16T-00001	Note 1
DBE Radiation Dose Rate (mR/hr)	10, Note 5	0	hrs	24590-PTF-U0D-W16T-00001	Note 1
Flood Height (ft)	0.67	1000	hrs	24590-PTF-U0D-W16T-00001	Note 1
Submergence (ft)	0.3, Note 6	1000	hrs	24590-QL-POA-MEVV-00002-07-03	Note 1
Chemical/Spray Exposure	YES, Note 9	12.5	hrs	24590-PTF-U0D-W16T-00001	Note 1
Additional DBE Information	See Note 2 for pressure units.				

EQUIPMENT QUALIFICATION DATASHEET (EQD)

DBE Chemical Exposure Details	
DBE Chemical Types/Concentrations	0.1M, 2M SODIUM HYDROXIDE 2M NITRIC ACID 1

Interfaces (Electrical)	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Interfaces (Mechanical)	
Mounting Configuration (orientation)	VERTICAL, SEE VENDOR SUBMITAL 24590-QL-POA-MEVV-00002-07-03.
Mounting Method (bolts, welds, etc.)	WELDS, SEE DWG. 24590-PTF-DB-S13T-00057
Auxiliary Devices	N/A

Equipment Seismic Qualification (ESQ)

Parameter	Title	Reference/Document Number	Version / Revision	Remarks
WTP Seismic Design Specification (BUYER)	Engineering Specification for Seismic Qualification Criteria for Pressure Vessels Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks.	24590-WTP-3PS-MV00-T0002 24590-WTP-3PS-SS90-T0001	002 001 1	N/A
Specified Seismic Load (BUYER)	Seismic Analysis of Pretreatment Building - WSGM In-Structure Response Spectre (ISRS) 1	24590-PTF-S0C-S15T-00057 1	00A 1	Calculation is not included in MR, see attached figures 37, 38 and 114 per CCN 185267. 1
Design Seismic Load (SELLER	1	1	1	Note 1 1
Qualification Method (SELLER)	1	1	1	Note 1 1
Qualification Report Number (SELLER)	1	1	1	Note 1 1
Submittal Number (BUYER)	TBD 1	TBD 1	TBD 1	None 1

Notes and Additional Information

1. Data to be provided by seller through the submittal process as required on the G-321-E form.
2. Where pressure is given in inches of water column (in.-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in.-w.g.)
3. deleted. 1
4. The equipment qualification will be documented in accordance with the requirements in Appendix D of Engineering Specification for Environmental Qualification of Mechanical Equipment, document number 24590-WTP-3PS-G000-T0015. for the passive and active safety functions.
5. Abnormal and DBE Radiation dose rates are set equal to normal and do not contribute to the total integrated dose rate.
6. Submergence depth is the difference between the lowest point on the equipment and the flood depth above the floor. The submergence depth is set to zero if the lowest section of the equipment is above the flood depth.
7. Environmental data from calculation 24590-PTF-U0D-W16T-00001 is for room environment only.
8. For application of AISC N690, 1 abnormal temperatures shall be applied as Normal Operation Temperature, T_O, with seismic effects, E_S. The Design basis event temperatures shall be applied as a Thermal Load generated by a postulated accident, T_A, without seismic effects, E_s. 1
9. See DBE Chemical Exposure Details. 1
10. Abnormal minimum temperature is set equal to the normal minimum temperature (59F) for the purposes of seismic 1 analysis. A DBE seismic event coincident with an extreme low abnormal temperature is not a credible scenario. [The probability of an abnormal minimum temperature is estimated as follows: temperatures <40 F occur 31% of the year (average historical weather data, 0.31 probability); a loss of heating is assumed to occur 8 hrs/yr (0.001 probability); combined probability is 0.31 x 0.001 = 0.00031 (3.1E-4). The combination of this event with a seismic DBE (4 E-04 probability) is not credible (<1 E-06 probability).]
11. Parameter values used on data sheet have been previously established and determined to provide more conservative 1 constraints than values derived from 24590-PTF-U0D-W16T-00001.
12. For commercial reasons, safety and seismic classification may be higher than elsewhere documented, and therefore 1 conservative.
13. Facility design life is 40 years. Seller will determine equipment design life and required maintenance / replacement 1 intervals to maintain qualification of equipment components subject to wear or aging.

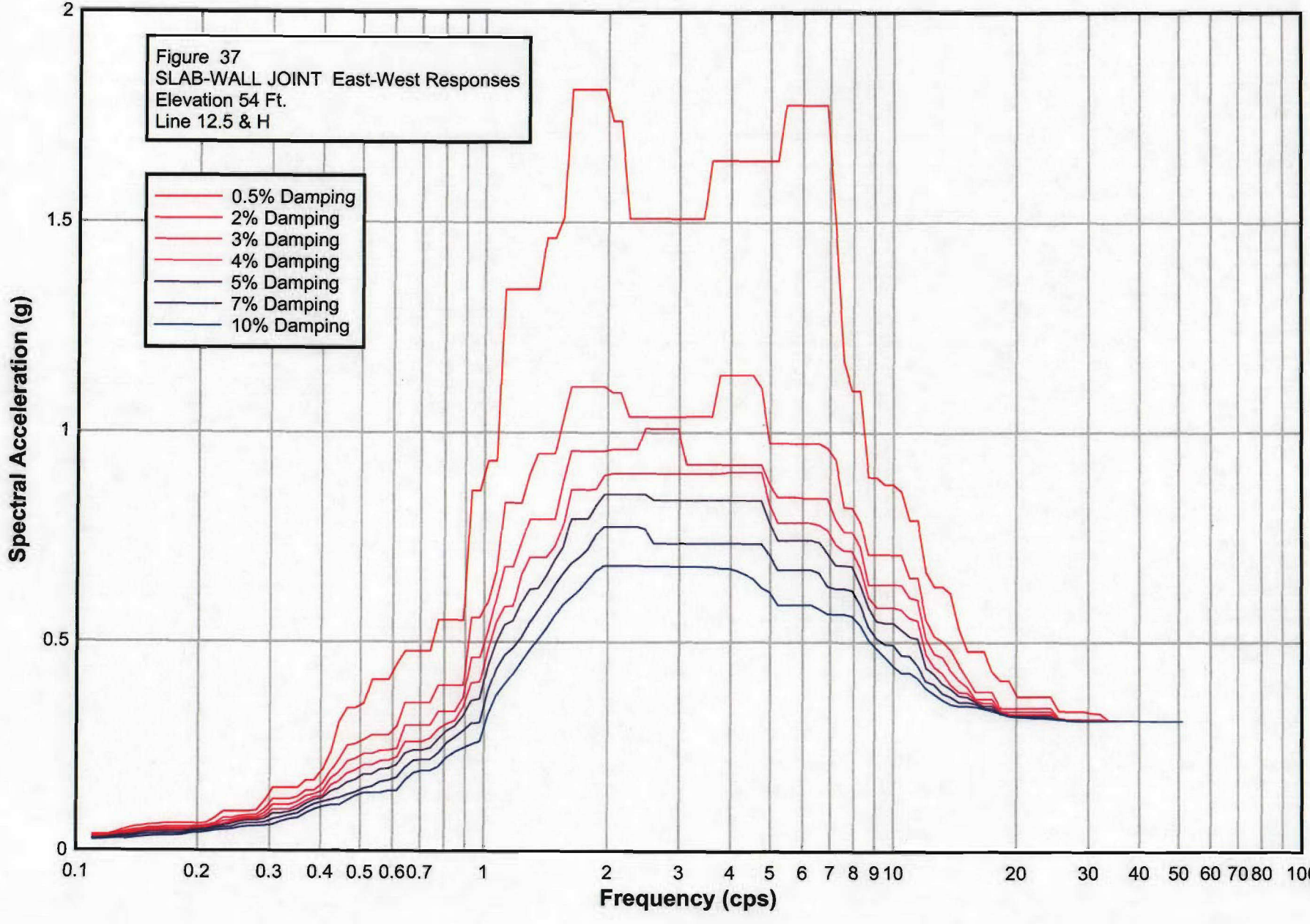
REFERENCES

1. 24590-WTP-PSAR-ESH-01-002-02, Rev. 04E, Preliminary Documented Safety Analysis to Support Construction 1 Authorization; PT Facility Specific Information.
2. deleted. 1
3. 24590-PTF-M6-CNP-00010, Rev. 2, P&ID - PTF Cesium Nitric Acid Recovery Process System Rectifier and Condensers.
4. 24590-PTF-U0D-W16T-00001, Rev. 0, PTF Room Environment Datasheet [Including DCNs: 24590-PTF-U0N-W16T 1 -00001, 24590-PTF-U0N-W16T-00003, & 24590-PTF-U0N-W16T-00004].
5. 24590-WTP-DB-ENG-01-001, Rev. 1N, Basis of Deisgn. 1
6. 24590-QL-POA-MEVV-00002-07-08, Rev. 00B, DRAWING - CNP DISTILLATION COLUMN VESSEL 1
7. 24590-PTF-M6X-CNP-00037 Rev. 002, MS LINE LIST FOR P&ID 24590-PTF-M6-CNP-00010, REV. 2 1

RPP-WTP Pretreatment Facility ISRS

1

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A

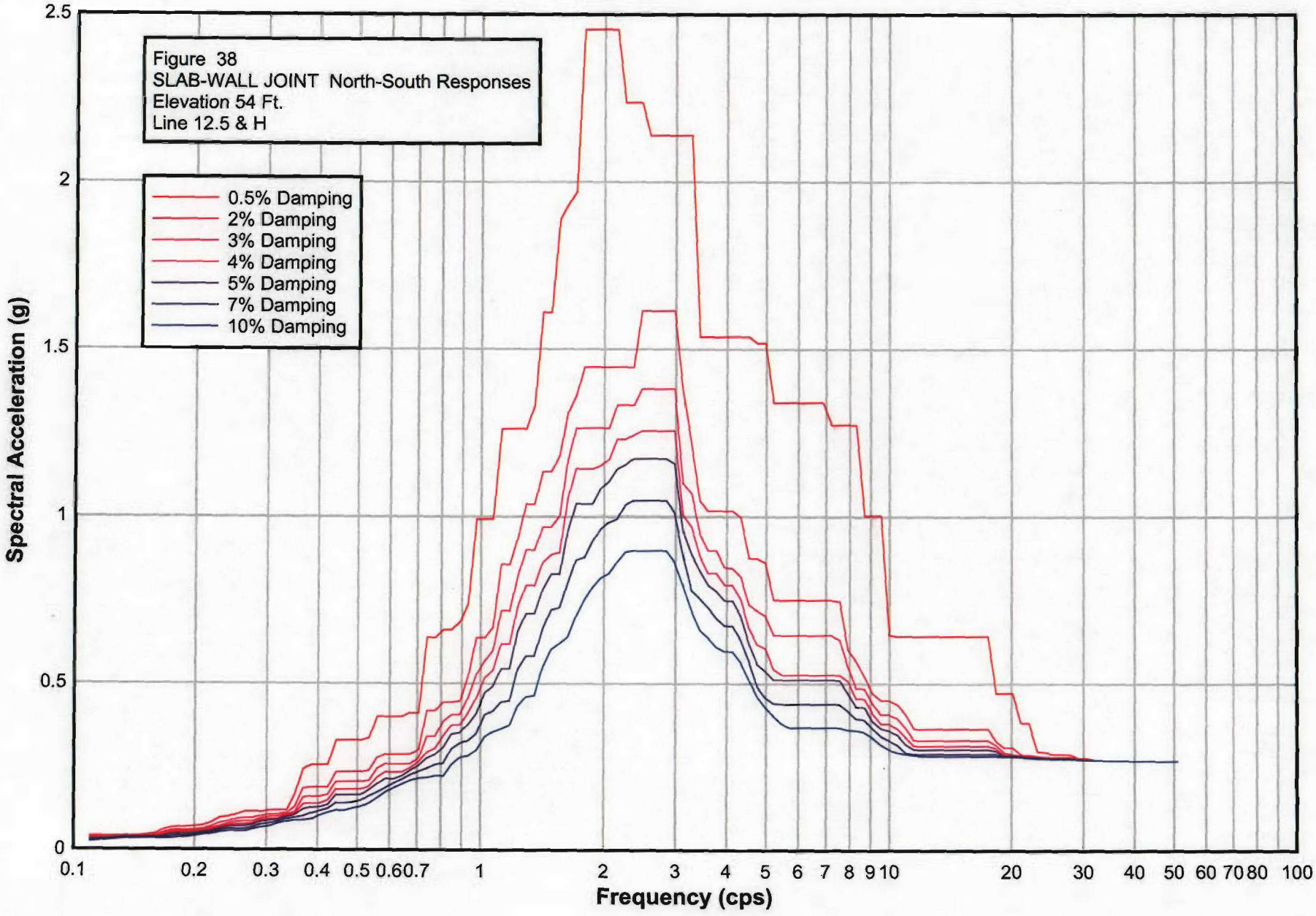


1

RPP-WTP Pretreatment Facility ISRS

1

Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



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RPP-WTP Pretreatment Facility ISRS

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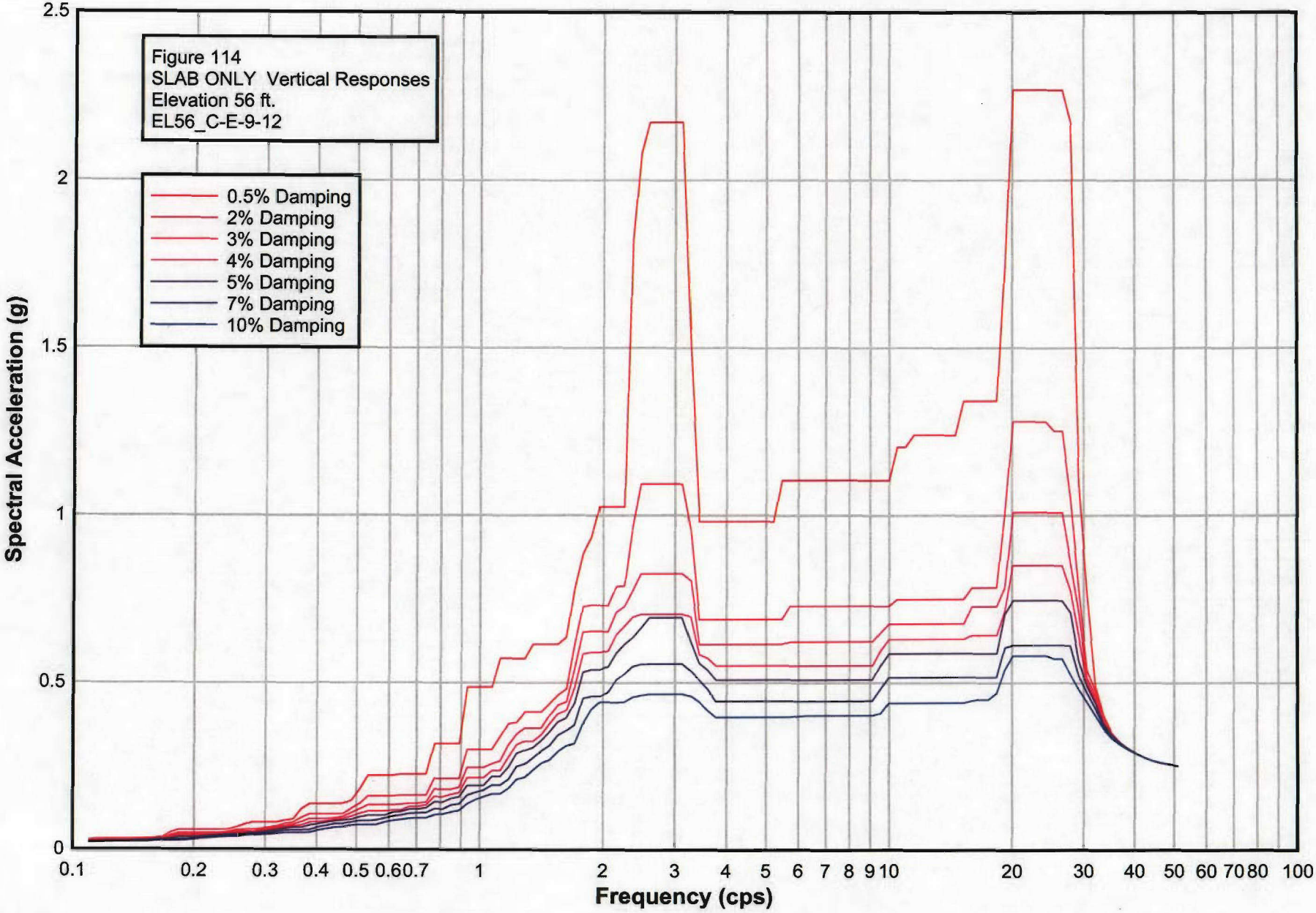
Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A



1

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW037.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 37 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0375	0.1098	0.0344	0.1098	0.0327	0.1098	0.0312	0.1098	0.0298	0.1098	0.0274	0.1098	0.0252
0.115	0.0375	0.115	0.0344	0.115	0.0327	0.115	0.0312	0.115	0.0299	0.115	0.0277	0.115	0.0258
0.1204	0.0375	0.1204	0.0344	0.1204	0.0331	0.1204	0.0322	0.1204	0.0312	0.1204	0.0294	0.1204	0.0269
0.1262	0.0431	0.1262	0.0397	0.1262	0.0378	0.1262	0.036	0.1262	0.0343	0.1262	0.0314	0.1262	0.0278
0.1322	0.0504	0.1322	0.045	0.1322	0.042	0.1322	0.0393	0.1322	0.0369	0.1322	0.0328	0.1322	0.0281
0.1385	0.056	0.1385	0.0489	0.1385	0.0449	0.1385	0.0414	0.1385	0.0384	0.1385	0.0344	0.1385	0.0303
0.1451	0.058	0.1451	0.0509	0.1451	0.0475	0.1451	0.0445	0.1451	0.0419	0.1451	0.0375	0.1451	0.0325
0.152	0.0616	0.152	0.0546	0.152	0.0506	0.152	0.0472	0.152	0.0442	0.152	0.0391	0.152	0.0338
0.1592	0.062	0.1592	0.0546	0.1592	0.0506	0.1592	0.0472	0.1592	0.0442	0.1592	0.0396	0.1592	0.0351
0.1668	0.064	0.1668	0.056	0.1668	0.0517	0.1668	0.0481	0.1668	0.0451	0.1668	0.0403	0.1668	0.0356
0.1748	0.064	0.1748	0.056	0.1748	0.0517	0.1748	0.0481	0.1748	0.0451	0.1748	0.0403	0.1748	0.0356
0.1831	0.064	0.1831	0.056	0.1831	0.0517	0.1831	0.0481	0.1831	0.0451	0.1831	0.0403	0.1831	0.0368
0.1918	0.0641	0.1918	0.0561	0.1918	0.0517	0.1918	0.0495	0.1918	0.0477	0.1918	0.0445	0.1918	0.0404
0.2009	0.0642	0.2009	0.0583	0.2009	0.0558	0.2009	0.0535	0.2009	0.0513	0.2009	0.0474	0.2009	0.0424
0.2105	0.0665	0.2105	0.0603	0.2105	0.0575	0.2105	0.0549	0.2105	0.0525	0.2105	0.049	0.2105	0.0448
0.2205	0.078	0.2205	0.0647	0.2205	0.062	0.2205	0.0595	0.2205	0.0573	0.2205	0.0533	0.2205	0.0484
0.231	0.0933	0.231	0.0774	0.231	0.0694	0.231	0.063	0.231	0.0598	0.231	0.0556	0.231	0.0503
0.242	0.0933	0.242	0.0774	0.242	0.0723	0.242	0.0678	0.242	0.0638	0.242	0.0567	0.242	0.0513
0.2535	0.0933	0.2535	0.0817	0.2535	0.0771	0.2535	0.0729	0.2535	0.0692	0.2535	0.0628	0.2535	0.0553
0.2656	0.0933	0.2656	0.0839	0.2656	0.0794	0.2656	0.0754	0.2656	0.0718	0.2656	0.0653	0.2656	0.0575
0.2783	0.0954	0.2783	0.0847	0.2783	0.0794	0.2783	0.0754	0.2783	0.0718	0.2783	0.0653	0.2783	0.058
0.2915	0.1187	0.2915	0.0987	0.2915	0.089	0.2915	0.0813	0.2915	0.0753	0.2915	0.0668	0.2915	0.0592
0.3054	0.1504	0.3054	0.1235	0.3054	0.1097	0.3054	0.0985	0.3054	0.0894	0.3054	0.0758	0.3054	0.0633
0.3199	0.1504	0.3199	0.1235	0.3199	0.1097	0.3199	0.0985	0.3199	0.0894	0.3199	0.0801	0.3199	0.0706
0.3352	0.1504	0.3352	0.1235	0.3352	0.1097	0.3352	0.0985	0.3352	0.0931	0.3352	0.0857	0.3352	0.0762
0.3511	0.1504	0.3511	0.1289	0.3511	0.1172	0.3511	0.107	0.3511	0.0997	0.3511	0.0894	0.3511	0.0786
0.3678	0.168	0.3678	0.1438	0.3678	0.1303	0.3678	0.1186	0.3678	0.1121	0.3678	0.1017	0.3678	0.0898
0.3853	0.168	0.3853	0.1438	0.3853	0.1346	0.3853	0.1279	0.3853	0.1219	0.3853	0.1115	0.3853	0.0992
0.4037	0.194	0.4037	0.1598	0.4037	0.1426	0.4037	0.1306	0.4037	0.1259	0.4037	0.117	0.4037	0.1054
0.4229	0.2368	0.4229	0.1906	0.4229	0.1721	0.4229	0.1558	0.4229	0.1416	0.4229	0.1217	0.4229	0.1092
0.4431	0.3088	0.4431	0.2193	0.4431	0.1881	0.4431	0.1671	0.4431	0.1496	0.4431	0.1273	0.4431	0.1097
0.4642	0.3417	0.4642	0.2524	0.4642	0.2138	0.4642	0.1852	0.4642	0.1637	0.4642	0.1345	0.4642	0.1211
0.4863	0.3417	0.4863	0.256	0.4863	0.2208	0.4863	0.1928	0.4863	0.1701	0.4863	0.1409	0.4863	0.1323
0.5094	0.3522	0.5094	0.2656	0.5094	0.2325	0.5094	0.2054	0.5094	0.1831	0.5094	0.1497	0.5094	0.1391

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW037.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 37 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.4096	0.5337	0.2771	0.5337	0.2325	0.5337	0.2054	0.5337	0.1831	0.5337	0.1539	0.5337	0.1396
0.5591	0.4096	0.5591	0.2771	0.5591	0.2398	0.5591	0.2148	0.5591	0.1949	0.5591	0.1654	0.5591	0.1396
0.5857	0.4096	0.5857	0.2771	0.5857	0.2404	0.5857	0.2159	0.5857	0.1975	0.5857	0.1686	0.5857	0.1441
0.6136	0.4475	0.6136	0.2969	0.6136	0.2444	0.6136	0.2234	0.6136	0.2051	0.6136	0.1751	0.6136	0.1441
0.6428	0.478	0.6428	0.3547	0.6428	0.3006	0.6428	0.2612	0.6428	0.2347	0.6428	0.1988	0.6428	0.168
0.6734	0.478	0.6734	0.3547	0.6734	0.3006	0.6734	0.2612	0.6734	0.2413	0.6734	0.2165	0.6734	0.1872
0.7055	0.478	0.7055	0.3547	0.7055	0.3006	0.7055	0.2612	0.7055	0.2413	0.7055	0.2186	0.7055	0.1922
0.7391	0.478	0.7391	0.3547	0.7391	0.3006	0.7391	0.2692	0.7391	0.2463	0.7391	0.2186	0.7391	0.1922
0.7743	0.5518	0.7743	0.3958	0.7743	0.3332	0.7743	0.2918	0.7743	0.268	0.7743	0.2351	0.7743	0.2018
0.8111	0.5518	0.8111	0.3958	0.8111	0.3332	0.8111	0.3035	0.8111	0.2874	0.8111	0.2587	0.8111	0.2236
0.8497	0.5518	0.8497	0.3958	0.8497	0.3332	0.8497	0.3117	0.8497	0.2984	0.8497	0.2723	0.8497	0.2373
0.8902	0.5518	0.8902	0.3958	0.8902	0.3656	0.8902	0.3431	0.8902	0.3226	0.8902	0.2873	0.8902	0.2462
0.9326	0.8605	0.9326	0.5585	0.9326	0.4629	0.9326	0.4023	0.9326	0.3602	0.9326	0.3049	0.9326	0.2549
0.977	0.8605	0.977	0.5585	0.977	0.4629	0.977	0.4045	0.977	0.3644	0.977	0.3083	0.977	0.2637
1.0235	0.9315	1.0235	0.5965	1.0235	0.5261	1.0235	0.4814	1.0235	0.4436	1.0235	0.3837	1.0235	0.3277
1.0723	0.9315	1.0723	0.6685	1.0723	0.603	1.0723	0.5467	1.0723	0.4995	1.0723	0.4355	1.0723	0.3729
1.1233	1.3398	1.1233	0.8315	1.1233	0.6788	1.1233	0.5837	1.1233	0.5408	1.1233	0.4681	1.1233	0.3987
1.1768	1.3398	1.1768	0.8315	1.1768	0.6788	1.1768	0.5855	1.1768	0.5505	1.1768	0.4858	1.1768	0.4238
1.2328	1.3398	1.2328	0.8315	1.2328	0.7369	1.2328	0.6596	1.2328	0.5925	1.2328	0.5105	1.2328	0.452
1.2916	1.3398	1.2916	0.9002	1.2916	0.7926	1.2916	0.7024	1.2916	0.6263	1.2916	0.5455	1.2916	0.4806
1.353	1.3398	1.353	0.9485	1.353	0.7926	1.353	0.7024	1.353	0.6282	1.353	0.574	1.353	0.5058
1.4175	1.4626	1.4175	0.9485	1.4175	0.7926	1.4175	0.7024	1.4175	0.6579	1.4175	0.6026	1.4175	0.5321
1.485	1.4626	1.485	0.9485	1.485	0.7926	1.485	0.7282	1.485	0.6958	1.485	0.636	1.485	0.5624
1.5557	1.5113	1.5557	1.0297	1.5557	0.8797	1.5557	0.7754	1.5557	0.726	1.5557	0.6634	1.5557	0.5886
1.6298	1.8158	1.6298	1.1086	1.6298	0.9552	1.6298	0.8627	1.6298	0.7931	1.6298	0.6875	1.6298	0.6064
1.7074	1.8158	1.7074	1.1086	1.7074	0.9552	1.7074	0.8627	1.7074	0.7931	1.7074	0.7024	1.7074	0.6246
1.7887	1.8158	1.7887	1.1086	1.7887	0.9552	1.7887	0.8627	1.7887	0.7931	1.7887	0.7213	1.7887	0.6476
1.8738	1.8158	1.8738	1.1086	1.8738	0.9552	1.8738	0.8651	1.8738	0.8263	1.8738	0.7567	1.8738	0.6698
1.963	1.8158	1.963	1.1086	1.963	0.9552	1.963	0.8972	1.963	0.8525	1.963	0.7755	1.963	0.683
2.0565	1.7414	2.0565	1.0948	2.0565	0.9593	2.0565	0.9017	2.0565	0.8525	2.0565	0.7755	2.0565	0.683
2.1544	1.7414	2.1544	1.0948	2.1544	0.9593	2.1544	0.9017	2.1544	0.8525	2.1544	0.7755	2.1544	0.683
2.257	1.5091	2.257	1.0367	2.257	0.9593	2.257	0.9017	2.257	0.8525	2.257	0.7755	2.257	0.683
2.3645	1.5091	2.3645	1.0367	2.3645	0.9593	2.3645	0.9017	2.3645	0.8525	2.3645	0.7755	2.3645	0.683
2.4771	1.5091	2.4771	1.0367	2.4771	1.009	2.4771	0.9017	2.4771	0.852	2.4771	0.7697	2.4771	0.6811
2.595	1.5091	2.595	1.0367	2.595	1.009	2.595	0.9017	2.595	0.8387	2.595	0.7357	2.595	0.6811

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW037.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 37 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	1.5091	2.7186	1.0367	2.7186	1.009	2.7186	0.9017	2.7186	0.8387	2.7186	0.7357	2.7186	0.6811
2.848	1.5091	2.848	1.0367	2.848	1.009	2.848	0.9017	2.848	0.8387	2.848	0.7357	2.848	0.6811
2.9836	1.5091	2.9836	1.0367	2.9836	1.009	2.9836	0.9017	2.9836	0.8387	2.9836	0.7357	2.9836	0.6811
3.1257	1.5091	3.1257	1.0367	3.1257	0.9237	3.1257	0.9017	3.1257	0.8387	3.1257	0.7357	3.1257	0.6811
3.2745	1.5091	3.2745	1.0367	3.2745	0.9237	3.2745	0.9017	3.2745	0.8387	3.2745	0.7357	3.2745	0.6811
3.4305	1.5091	3.4305	1.0367	3.4305	0.9237	3.4305	0.9017	3.4305	0.8387	3.4305	0.7357	3.4305	0.6801
3.5938	1.6472	3.5938	1.0367	3.5938	0.9237	3.5938	0.9017	3.5938	0.8387	3.5938	0.7357	3.5938	0.6801
3.7649	1.6472	3.7649	1.1356	3.7649	0.9237	3.7649	0.9017	3.7649	0.8387	3.7649	0.7357	3.7649	0.6766
3.9442	1.6472	3.9442	1.1356	3.9442	0.9237	3.9442	0.906	3.9442	0.8387	3.9442	0.7357	3.9442	0.6759
4.132	1.6472	4.132	1.1356	4.132	0.9237	4.132	0.906	4.132	0.8387	4.132	0.7357	4.132	0.6712
4.3288	1.6472	4.3288	1.1356	4.3288	0.9237	4.3288	0.906	4.3288	0.8387	4.3288	0.7357	4.3288	0.6626
4.5349	1.6472	4.5349	1.1356	4.5349	0.9237	4.5349	0.906	4.5349	0.8387	4.5349	0.7357	4.5349	0.6525
4.7508	1.6472	4.7508	1.1048	4.7508	0.9237	4.7508	0.906	4.7508	0.8387	4.7508	0.7357	4.7508	0.6316
4.977	1.6472	4.977	0.9746	4.977	0.8757	4.977	0.829	4.977	0.7851	4.977	0.7083	4.977	0.6206
5.214	1.6472	5.214	0.9746	5.214	0.8463	5.214	0.785	5.214	0.7434	5.214	0.6732	5.214	0.5898
5.4623	1.7798	5.4623	0.9746	5.4623	0.8463	5.4623	0.785	5.4623	0.7434	5.4623	0.6732	5.4623	0.5898
5.7224	1.7798	5.7224	0.9746	5.7224	0.8463	5.7224	0.785	5.7224	0.7434	5.7224	0.6732	5.7224	0.5898
5.9948	1.7798	5.9948	0.9746	5.9948	0.8438	5.9948	0.785	5.9948	0.7434	5.9948	0.6732	5.9948	0.5898
6.2803	1.7798	6.2803	0.9746	6.2803	0.8438	6.2803	0.785	6.2803	0.7434	6.2803	0.6732	6.2803	0.5898
6.5793	1.7798	6.5793	0.9746	6.5793	0.8438	6.5793	0.7804	6.5793	0.7393	6.5793	0.6657	6.5793	0.5795
6.8926	1.7798	6.8926	0.963	6.8926	0.8429	6.8926	0.7674	6.8926	0.7128	6.8926	0.6345	6.8926	0.5677
7.2208	1.4914	7.2208	0.935	7.2208	0.7922	7.2208	0.7331	7.2208	0.6844	7.2208	0.6283	7.2208	0.5677
7.5646	1.168	7.5646	0.822	7.5646	0.7632	7.5646	0.7188	7.5646	0.6833	7.5646	0.6283	7.5646	0.5677
7.9248	1.0987	7.9248	0.8201	7.9248	0.7623	7.9248	0.7176	7.9248	0.6811	7.9248	0.6237	7.9248	0.5627
8.3022	1.0987	8.3022	0.7845	8.3022	0.7283	8.3022	0.6777	8.3022	0.6364	8.3022	0.5884	8.3022	0.5417
8.6975	0.8935	8.6975	0.7092	8.6975	0.6368	8.6975	0.6061	8.6975	0.5819	8.6975	0.5373	8.6975	0.5059
9.1116	0.8935	9.1116	0.7092	9.1116	0.6368	9.1116	0.5827	9.1116	0.5505	9.1116	0.5085	9.1116	0.4846
9.5455	0.8763	9.5455	0.7092	9.5455	0.6368	9.5455	0.5827	9.5455	0.5459	9.5455	0.4951	9.5455	0.4643
10	0.8763	10	0.7092	10	0.6368	10	0.5827	10	0.5459	10	0.4934	10	0.4429
10.4762	0.8603	10.4762	0.7092	10.4762	0.6368	10.4762	0.5774	10.4762	0.5297	10.4762	0.4688	10.4762	0.4271
10.975	0.791	10.975	0.6543	10.975	0.6067	10.975	0.5582	10.975	0.5137	10.975	0.4674	10.975	0.4271
11.4976	0.791	11.4976	0.6543	11.4976	0.6014	11.4976	0.5519	11.4976	0.5094	11.4976	0.4435	11.4976	0.4142
12.045	0.6677	12.045	0.5543	12.045	0.5086	12.045	0.4716	12.045	0.4394	12.045	0.4081	12.045	0.3915
12.6186	0.6325	12.6186	0.5145	12.6186	0.4727	12.6186	0.4409	12.6186	0.4251	12.6186	0.4004	12.6186	0.3774
13.2194	0.6325	13.2194	0.5025	13.2194	0.4639	13.2194	0.4269	13.2194	0.4021	13.2194	0.379	13.2194	0.3634

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW037.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 37 ~ SLAB-WALL JOINT East-West Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6152	13.8489	0.4815	13.8489	0.433	13.8489	0.3995	13.8489	0.3896	13.8489	0.3705	13.8489	0.3527
14.5083	0.5318	14.5083	0.4455	14.5083	0.4096	14.5083	0.381	14.5083	0.3726	14.5083	0.3575	14.5083	0.3484
15.1991	0.4787	15.1991	0.4141	15.1991	0.3936	15.1991	0.3795	15.1991	0.3697	15.1991	0.3575	15.1991	0.3484
15.9228	0.4787	15.9228	0.3815	15.9228	0.3644	15.9228	0.3609	15.9228	0.358	15.9228	0.3528	15.9228	0.3467
16.681	0.4787	16.681	0.3815	16.681	0.3644	16.681	0.3544	16.681	0.3483	16.681	0.3439	16.681	0.3416
17.4753	0.4307	17.4753	0.3815	17.4753	0.3644	17.4753	0.3544	17.4753	0.3483	17.4753	0.3418	17.4753	0.337
18.3074	0.4095	18.3074	0.3431	18.3074	0.3367	18.3074	0.3354	18.3074	0.3336	18.3074	0.3315	18.3074	0.3305
19.1791	0.4095	19.1791	0.3431	19.1791	0.3349	19.1791	0.3293	19.1791	0.3262	19.1791	0.3251	19.1791	0.325
20.0923	0.3708	20.0923	0.3431	20.0923	0.3349	20.0923	0.3293	20.0923	0.3262	20.0923	0.3243	20.0923	0.323
21.049	0.3708	21.049	0.3431	21.049	0.3349	21.049	0.3293	21.049	0.3262	21.049	0.3236	21.049	0.3215
22.0513	0.3708	22.0513	0.3431	22.0513	0.3349	22.0513	0.3293	22.0513	0.3262	22.0513	0.323	22.0513	0.3199
23.1013	0.3708	23.1013	0.3431	23.1013	0.3349	23.1013	0.3293	23.1013	0.3262	23.1013	0.323	23.1013	0.3199
24.2013	0.3708	24.2013	0.3431	24.2013	0.3349	24.2013	0.3293	24.2013	0.3255	24.2013	0.3206	24.2013	0.3186
25.3536	0.3358	25.3536	0.3197	25.3536	0.3192	25.3536	0.3187	25.3536	0.3181	25.3536	0.317	25.3536	0.3164
26.5609	0.3358	26.5609	0.3169	26.5609	0.3159	26.5609	0.3158	26.5609	0.3158	26.5609	0.3155	26.5609	0.3148
27.8256	0.3358	27.8256	0.3169	27.8256	0.3159	27.8256	0.3153	27.8256	0.3149	27.8256	0.3143	27.8256	0.3137
29.1505	0.3358	29.1505	0.3165	29.1505	0.3153	29.1505	0.3142	29.1505	0.3137	29.1505	0.3132	29.1505	0.313
30.5386	0.3312	30.5386	0.3165	30.5386	0.3153	30.5386	0.3142	30.5386	0.3133	30.5386	0.3131	30.5386	0.313
31.9927	0.3297	31.9927	0.3163	31.9927	0.3146	31.9927	0.3138	31.9927	0.3132	31.9927	0.3131	31.9927	0.313
33.516	0.3144	33.516	0.3134	33.516	0.3133	33.516	0.3132	33.516	0.3132	33.516	0.3131	33.516	0.313
35.1119	0.3135	35.1119	0.3134	35.1119	0.3133	35.1119	0.3132	35.1119	0.3132	35.1119	0.3131	35.1119	0.313
36.7838	0.3134	36.7838	0.3133	36.7838	0.3132	36.7838	0.3132	36.7838	0.3132	36.7838	0.3131	36.7838	0.313
38.5353	0.3132	38.5353	0.3132	38.5353	0.3131	38.5353	0.3131	38.5353	0.3131	38.5353	0.3131	38.5353	0.313
40.3702	0.3131	40.3702	0.3131	40.3702	0.3131	40.3702	0.313	40.3702	0.313	40.3702	0.313	40.3702	0.3129
42.2924	0.313	42.2924	0.3129	42.2924	0.3129	42.2924	0.3129	42.2924	0.3129	42.2924	0.3129	42.2924	0.3129
44.3062	0.3128	44.3062	0.3128	44.3062	0.3128	44.3062	0.3128	44.3062	0.3128	44.3062	0.3128	44.3062	0.3128
46.4159	0.3127	46.4159	0.3127	46.4159	0.3127	46.4159	0.3127	46.4159	0.3127	46.4159	0.3127	46.4159	0.3127
48.626	0.3126	48.626	0.3126	48.626	0.3126	48.626	0.3126	48.626	0.3126	48.626	0.3126	48.626	0.3126
50.9414	0.3125	50.9414	0.3125	50.9414	0.3125	50.9414	0.3125	50.9414	0.3125	50.9414	0.3125	50.9414	0.3125

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW038.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 38 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0405	0.1098	0.0365	0.1098	0.0342	0.1098	0.0322	0.1098	0.0303	0.1098	0.0272	0.1098	0.0235
0.115	0.0405	0.115	0.0365	0.115	0.0342	0.115	0.0322	0.115	0.0303	0.115	0.0272	0.115	0.0259
0.1204	0.0405	0.1204	0.0365	0.1204	0.0342	0.1204	0.0322	0.1204	0.031	0.1204	0.0297	0.1204	0.028
0.1262	0.0405	0.1262	0.0365	0.1262	0.0352	0.1262	0.0342	0.1262	0.0334	0.1262	0.0318	0.1262	0.0297
0.1322	0.0405	0.1322	0.0382	0.1322	0.037	0.1322	0.0359	0.1322	0.0349	0.1322	0.0333	0.1322	0.0316
0.1385	0.0411	0.1385	0.0392	0.1385	0.0382	0.1385	0.0372	0.1385	0.0363	0.1385	0.0348	0.1385	0.0328
0.1451	0.0417	0.1451	0.0398	0.1451	0.0387	0.1451	0.0377	0.1451	0.0368	0.1451	0.0352	0.1451	0.0332
0.152	0.0439	0.152	0.0401	0.152	0.0387	0.152	0.0377	0.152	0.0368	0.152	0.0352	0.152	0.0332
0.1592	0.0462	0.1592	0.0416	0.1592	0.0396	0.1592	0.0377	0.1592	0.0368	0.1592	0.0352	0.1592	0.0332
0.1668	0.0584	0.1668	0.0506	0.1668	0.0463	0.1668	0.0426	0.1668	0.0395	0.1668	0.0352	0.1668	0.0332
0.1748	0.0645	0.1748	0.0566	0.1748	0.0522	0.1748	0.0484	0.1748	0.045	0.1748	0.0394	0.1748	0.0332
0.1831	0.0668	0.1831	0.0583	0.1831	0.0541	0.1831	0.0504	0.1831	0.0471	0.1831	0.0415	0.1831	0.0354
0.1918	0.0678	0.1918	0.0586	0.1918	0.0543	0.1918	0.0507	0.1918	0.0474	0.1918	0.0418	0.1918	0.038
0.2009	0.0697	0.2009	0.0596	0.2009	0.0543	0.2009	0.0514	0.2009	0.0487	0.2009	0.0438	0.2009	0.0411
0.2105	0.0722	0.2105	0.062	0.2105	0.0582	0.2105	0.0547	0.2105	0.0516	0.2105	0.0482	0.2105	0.0446
0.2205	0.0819	0.2205	0.0709	0.2205	0.0651	0.2205	0.06	0.2205	0.0574	0.2205	0.0531	0.2205	0.0475
0.231	0.0959	0.231	0.0792	0.231	0.0703	0.231	0.0665	0.231	0.063	0.231	0.0578	0.231	0.0525
0.242	0.0984	0.242	0.0845	0.242	0.0774	0.242	0.0721	0.242	0.0681	0.242	0.0618	0.242	0.0551
0.2535	0.1059	0.2535	0.0913	0.2535	0.0833	0.2535	0.0763	0.2535	0.0702	0.2535	0.0618	0.2535	0.0551
0.2656	0.1138	0.2656	0.0944	0.2656	0.084	0.2656	0.0763	0.2656	0.0702	0.2656	0.0618	0.2656	0.0551
0.2783	0.1138	0.2783	0.0944	0.2783	0.084	0.2783	0.0779	0.2783	0.074	0.2783	0.0677	0.2783	0.0611
0.2915	0.1138	0.2915	0.1008	0.2915	0.0946	0.2915	0.0892	0.2915	0.0843	0.2915	0.0764	0.2915	0.0677
0.3054	0.1179	0.3054	0.1056	0.3054	0.0987	0.3054	0.0926	0.3054	0.0872	0.3054	0.0785	0.3054	0.0706
0.3199	0.1179	0.3199	0.1056	0.3199	0.0987	0.3199	0.0926	0.3199	0.0894	0.3199	0.0844	0.3199	0.0786
0.3352	0.1179	0.3352	0.1098	0.3352	0.1056	0.3352	0.1017	0.3352	0.0982	0.3352	0.0921	0.3352	0.0848
0.3511	0.1654	0.3511	0.129	0.3511	0.1133	0.3511	0.1075	0.3511	0.1035	0.3511	0.0964	0.3511	0.088
0.3678	0.2415	0.3678	0.1832	0.3678	0.1565	0.3678	0.1364	0.3678	0.1213	0.3678	0.1006	0.3678	0.088
0.3853	0.2549	0.3853	0.187	0.3853	0.1595	0.3853	0.1387	0.3853	0.1269	0.3853	0.1092	0.3853	0.091
0.4037	0.2549	0.4037	0.187	0.4037	0.1595	0.4037	0.1387	0.4037	0.1279	0.4037	0.1163	0.4037	0.1034
0.4229	0.2549	0.4229	0.187	0.4229	0.1651	0.4229	0.1485	0.4229	0.1344	0.4229	0.1233	0.4229	0.1111
0.4431	0.3288	0.4431	0.2339	0.4431	0.2038	0.4431	0.1813	0.4431	0.1641	0.4431	0.1399	0.4431	0.1181
0.4642	0.3288	0.4642	0.2339	0.4642	0.2038	0.4642	0.1813	0.4642	0.1641	0.4642	0.1399	0.4642	0.1181
0.4863	0.3288	0.4863	0.2339	0.4863	0.2038	0.4863	0.1813	0.4863	0.1641	0.4863	0.1421	0.4863	0.1246
0.5094	0.3288	0.5094	0.2339	0.5094	0.2038	0.5094	0.1813	0.5094	0.1641	0.5094	0.1472	0.5094	0.1295

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW038.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 38 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%	
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.3356	0.5337	0.2387	0.5337	0.2081	0.5337	0.19	0.5337	0.1796	0.5337	0.1614	0.5337	0.1401
0.5591	0.3997	0.5591	0.2762	0.5591	0.244	0.5591	0.2179	0.5591	0.1971	0.5591	0.1724	0.5591	0.1556
0.5857	0.3997	0.5857	0.2863	0.5857	0.2573	0.5857	0.2332	0.5857	0.2128	0.5857	0.1853	0.5857	0.1724
0.6136	0.3997	0.6136	0.2863	0.6136	0.2573	0.6136	0.2332	0.6136	0.2128	0.6136	0.1998	0.6136	0.1858
0.6428	0.3997	0.6428	0.2863	0.6428	0.2573	0.6428	0.2332	0.6428	0.2219	0.6428	0.2115	0.6428	0.1969
0.6734	0.411	0.6734	0.2863	0.6734	0.2574	0.6734	0.2449	0.6734	0.2378	0.6734	0.2244	0.6734	0.2072
0.7055	0.411	0.7055	0.301	0.7055	0.2757	0.7055	0.2638	0.7055	0.2534	0.7055	0.2357	0.7055	0.2156
0.7391	0.6367	0.7391	0.4169	0.7391	0.3404	0.7391	0.2927	0.7391	0.2746	0.7391	0.2445	0.7391	0.217
0.7743	0.6367	0.7743	0.4169	0.7743	0.3404	0.7743	0.3038	0.7743	0.2858	0.7743	0.2555	0.7743	0.2218
0.8111	0.6596	0.8111	0.4428	0.8111	0.386	0.8111	0.3422	0.8111	0.3081	0.8111	0.2598	0.8111	0.2218
0.8497	0.6596	0.8497	0.4428	0.8497	0.4051	0.8497	0.3738	0.8497	0.347	0.8497	0.3034	0.8497	0.256
0.8902	0.6828	0.8902	0.4451	0.8902	0.4051	0.8902	0.3738	0.8902	0.3511	0.8902	0.3194	0.8902	0.2761
0.9326	0.737	0.9326	0.5191	0.9326	0.4567	0.9326	0.411	0.9326	0.3766	0.9326	0.328	0.9326	0.2821
0.977	0.9914	0.977	0.6358	0.977	0.525	0.977	0.4553	0.977	0.408	0.977	0.3484	0.977	0.2994
1.0235	0.9914	1.0235	0.6358	1.0235	0.5662	1.0235	0.5139	1.0235	0.4702	1.0235	0.4041	1.0235	0.3384
1.0723	0.9914	1.0723	0.6668	1.0723	0.5976	1.0723	0.5399	1.0723	0.4914	1.0723	0.4166	1.0723	0.3541
1.1233	1.2606	1.1233	0.8561	1.1233	0.7168	1.1233	0.6174	1.1233	0.5433	1.1233	0.4431	1.1233	0.3633
1.1768	1.2606	1.1768	0.8561	1.1768	0.7168	1.1768	0.6174	1.1768	0.5433	1.1768	0.4467	1.1768	0.3729
1.2328	1.2606	1.2328	0.935	1.2328	0.8202	1.2328	0.7293	1.2328	0.6556	1.2328	0.5433	1.2328	0.4321
1.2916	1.2606	1.2916	1.0351	1.2916	0.8991	1.2916	0.793	1.2916	0.708	1.2916	0.5814	1.2916	0.4586
1.353	1.3319	1.353	1.0351	1.353	0.8991	1.353	0.793	1.353	0.708	1.353	0.5814	1.353	0.4631
1.4175	1.6092	1.4175	1.1325	1.4175	0.9683	1.4175	0.8621	1.4175	0.7817	1.4175	0.6627	1.4175	0.5486
1.485	1.6092	1.485	1.1325	1.485	0.9683	1.485	0.885	1.485	0.8264	1.485	0.7199	1.485	0.6006
1.5557	1.8872	1.5557	1.1818	1.5557	1.0008	1.5557	0.892	1.5557	0.8264	1.5557	0.7265	1.5557	0.6185
1.6298	1.9322	1.6298	1.3084	1.6298	1.1683	1.6298	1.0534	1.6298	0.9565	1.6298	0.8016	1.6298	0.6401
1.7074	1.9702	1.7074	1.3601	1.7074	1.2627	1.7074	1.1415	1.7074	1.0371	1.7074	0.8692	1.7074	0.7006
1.7887	2.4552	1.7887	1.4456	1.7887	1.2629	1.7887	1.1415	1.7887	1.0371	1.7887	0.8773	1.7887	0.7486
1.8738	2.4552	1.8738	1.4456	1.8738	1.2629	1.8738	1.1415	1.8738	1.0371	1.8738	0.9259	1.8738	0.788
1.963	2.4552	1.963	1.4456	1.963	1.2629	1.963	1.1498	1.963	1.0818	1.963	0.9626	1.963	0.8157
2.0565	2.4552	2.0565	1.4456	2.0565	1.2629	2.0565	1.1701	2.0565	1.1049	2.0565	0.9829	2.0565	0.8288
2.1544	2.4552	2.1544	1.4456	2.1544	1.3316	2.1544	1.2297	2.1544	1.1411	2.1544	0.9932	2.1544	0.8645
2.257	2.2367	2.257	1.4456	2.257	1.3316	2.257	1.2297	2.257	1.1534	2.257	1.0344	2.257	0.8939
2.3645	2.2367	2.3645	1.4456	2.3645	1.3316	2.3645	1.2422	2.3645	1.1724	2.3645	1.0471	2.3645	0.898
2.4771	2.2367	2.4771	1.6143	2.4771	1.3804	2.4771	1.2551	2.4771	1.1724	2.4771	1.0471	2.4771	0.898
2.595	2.138	2.595	1.6143	2.595	1.3804	2.595	1.2551	2.595	1.1724	2.595	1.0471	2.595	0.898

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW038.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 38 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.138	2.7186	1.6143	2.7186	1.3804	2.7186	1.2551	2.7186	1.1724	2.7186	1.0471	2.7186	0.898
2.848	2.138	2.848	1.6143	2.848	1.3804	2.848	1.2551	2.848	1.1724	2.848	1.0471	2.848	0.898
2.9836	2.138	2.9836	1.6143	2.9836	1.3804	2.9836	1.2551	2.9836	1.1568	2.9836	1.0114	2.9836	0.8645
3.1257	2.138	3.1257	1.3773	3.1257	1.0982	3.1257	1.0035	3.1257	0.9573	3.1257	0.8829	3.1257	0.7931
3.2745	2.138	3.2745	1.2119	3.2745	1.0686	3.2745	0.9673	3.2745	0.886	3.2745	0.778	3.2745	0.7168
3.4305	1.5368	3.4305	1.0471	3.4305	0.9495	3.4305	0.8824	3.4305	0.8379	3.4305	0.7547	3.4305	0.6598
3.5938	1.5368	3.5938	1.0165	3.5938	0.898	3.5938	0.8299	3.5938	0.7946	3.5938	0.7273	3.5938	0.6376
3.7649	1.5368	3.7649	1.0165	3.7649	0.898	3.7649	0.8299	3.7649	0.7769	3.7649	0.6958	3.7649	0.6089
3.9442	1.5368	3.9442	1.0165	3.9442	0.8472	3.9442	0.7941	3.9442	0.7477	3.9442	0.6723	3.9442	0.5955
4.132	1.5368	4.132	1.0165	4.132	0.845	4.132	0.7941	4.132	0.7477	4.132	0.6723	4.132	0.5955
4.3288	1.5368	4.3288	0.9973	4.3288	0.8194	4.3288	0.7522	4.3288	0.7017	4.3288	0.6303	4.3288	0.5622
4.5349	1.5368	4.5349	0.8745	4.5349	0.7347	4.5349	0.6652	4.5349	0.6197	4.5349	0.5656	4.5349	0.5097
4.7508	1.518	4.7508	0.8745	4.7508	0.7183	4.7508	0.6169	4.7508	0.5587	4.7508	0.4909	4.7508	0.4618
4.977	1.518	4.977	0.8614	4.977	0.7025	4.977	0.6052	4.977	0.5367	4.977	0.4572	4.977	0.4284
5.214	1.3404	5.214	0.7497	5.214	0.6443	5.214	0.5421	5.214	0.5109	5.214	0.4398	5.214	0.4021
5.4623	1.3404	5.4623	0.7497	5.4623	0.6443	5.4623	0.5254	5.4623	0.5109	5.4623	0.438	5.4623	0.3783
5.7224	1.3404	5.7224	0.7497	5.7224	0.6443	5.7224	0.5254	5.7224	0.5109	5.7224	0.438	5.7224	0.3681
5.9948	1.3404	5.9948	0.7497	5.9948	0.6443	5.9948	0.5254	5.9948	0.5109	5.9948	0.438	5.9948	0.3681
6.2803	1.3404	6.2803	0.7497	6.2803	0.6443	6.2803	0.5254	6.2803	0.5109	6.2803	0.438	6.2803	0.3681
6.5793	1.3404	6.5793	0.7497	6.5793	0.6443	6.5793	0.5254	6.5793	0.5109	6.5793	0.438	6.5793	0.3681
6.8926	1.3404	6.8926	0.7497	6.8926	0.6443	6.8926	0.5254	6.8926	0.5109	6.8926	0.438	6.8926	0.3681
7.2208	1.274	7.2208	0.7497	7.2208	0.6443	7.2208	0.5254	7.2208	0.5109	7.2208	0.438	7.2208	0.3681
7.5646	1.274	7.5646	0.7455	7.5646	0.6309	7.5646	0.5254	7.5646	0.5092	7.5646	0.438	7.5646	0.3681
7.9248	1.274	7.9248	0.6003	7.9248	0.5494	7.9248	0.5064	7.9248	0.471	7.9248	0.4168	7.9248	0.3609
8.3022	1.274	8.3022	0.5659	8.3022	0.4849	8.3022	0.454	8.3022	0.4288	8.3022	0.394	8.3022	0.3594
8.6975	1.0027	8.6975	0.521	8.6975	0.4849	8.6975	0.454	8.6975	0.4288	8.6975	0.3913	8.6975	0.3536
9.1116	1.0027	9.1116	0.4701	9.1116	0.4386	9.1116	0.4105	9.1116	0.3865	9.1116	0.3654	9.1116	0.3376
9.5455	1.0027	9.5455	0.4494	9.5455	0.4069	9.5455	0.3794	9.5455	0.3652	9.5455	0.3418	9.5455	0.3167
10	0.6463	10	0.4494	10	0.4069	10	0.3794	10	0.3585	10	0.3293	10	0.3015
10.4762	0.6411	10.4762	0.4371	10.4762	0.3959	10.4762	0.3648	10.4762	0.347	10.4762	0.3169	10.4762	0.2936
10.975	0.6411	10.975	0.4085	10.975	0.3668	10.975	0.3387	10.975	0.3179	10.975	0.2923	10.975	0.2891
11.4976	0.6411	11.4976	0.3647	11.4976	0.3304	11.4976	0.3133	11.4976	0.3024	11.4976	0.2893	11.4976	0.2857
12.045	0.6411	12.045	0.3647	12.045	0.3304	12.045	0.3133	12.045	0.3024	12.045	0.2893	12.045	0.2839
12.6186	0.6411	12.6186	0.3647	12.6186	0.3304	12.6186	0.3133	12.6186	0.3024	12.6186	0.2893	12.6186	0.2831
13.2194	0.6411	13.2194	0.3647	13.2194	0.3304	13.2194	0.3133	13.2194	0.3024	13.2194	0.2893	13.2194	0.2831

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW038.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 38 ~ SLAB-WALL JOINT North-South Responses ~ Elevation 54 Ft. ~ Line 12.5 H

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	0.6411	13.8489	0.3647	13.8489	0.3304	13.8489	0.3133	13.8489	0.3024	13.8489	0.2893	13.8489	0.2831
14.5083	0.6411	14.5083	0.3647	14.5083	0.3304	14.5083	0.3133	14.5083	0.3024	14.5083	0.2893	14.5083	0.2831
15.1991	0.6411	15.1991	0.3647	15.1991	0.3304	15.1991	0.3133	15.1991	0.3024	15.1991	0.2893	15.1991	0.2831
15.9228	0.6411	15.9228	0.3647	15.9228	0.3304	15.9228	0.3133	15.9228	0.3024	15.9228	0.2893	15.9228	0.2831
16.681	0.6411	16.681	0.3647	16.681	0.3304	16.681	0.3133	16.681	0.3024	16.681	0.2893	16.681	0.2831
17.4753	0.6411	17.4753	0.3647	17.4753	0.3304	17.4753	0.3133	17.4753	0.3024	17.4753	0.2893	17.4753	0.2831
18.3074	0.4714	18.3074	0.3284	18.3074	0.3152	18.3074	0.3052	18.3074	0.298	18.3074	0.2893	18.3074	0.2831
19.1791	0.4714	19.1791	0.3088	19.1791	0.2936	19.1791	0.2872	19.1791	0.2851	19.1791	0.2842	19.1791	0.2825
20.0923	0.4714	20.0923	0.3088	20.0923	0.2886	20.0923	0.2865	20.0923	0.2851	20.0923	0.2833	20.0923	0.2814
21.049	0.3824	21.049	0.2877	21.049	0.2842	21.049	0.2843	21.049	0.2836	21.049	0.2819	21.049	0.2801
22.0513	0.3824	22.0513	0.2873	22.0513	0.2834	22.0513	0.2816	22.0513	0.2806	22.0513	0.2795	22.0513	0.2783
23.1013	0.2973	23.1013	0.2832	23.1013	0.2814	23.1013	0.2802	23.1013	0.2793	23.1013	0.2779	23.1013	0.2765
24.2013	0.2947	24.2013	0.2805	24.2013	0.2788	24.2013	0.2776	24.2013	0.2768	24.2013	0.2763	24.2013	0.2756
25.3536	0.288	25.3536	0.2805	25.3536	0.2788	25.3536	0.2776	25.3536	0.2768	25.3536	0.2757	25.3536	0.2749
26.5609	0.288	26.5609	0.2805	26.5609	0.2788	26.5609	0.2776	26.5609	0.2768	26.5609	0.2757	26.5609	0.2747
27.8256	0.2867	27.8256	0.28	27.8256	0.2782	27.8256	0.2771	27.8256	0.2762	27.8256	0.2751	27.8256	0.2741
29.1505	0.2773	29.1505	0.2753	29.1505	0.2749	29.1505	0.2745	29.1505	0.2742	29.1505	0.2738	29.1505	0.2732
30.5386	0.2773	30.5386	0.2727	30.5386	0.2726	30.5386	0.2725	30.5386	0.2724	30.5386	0.2723	30.5386	0.2721
31.9927	0.2707	31.9927	0.271	31.9927	0.271	31.9927	0.2711	31.9927	0.2711	31.9927	0.2712	31.9927	0.2712
33.516	0.2707	33.516	0.2707	33.516	0.2706	33.516	0.2706	33.516	0.2706	33.516	0.2706	33.516	0.2706
35.1119	0.27	35.1119	0.27	35.1119	0.27	35.1119	0.2701	35.1119	0.2701	35.1119	0.2701	35.1119	0.2701
36.7838	0.2695	36.7838	0.2696	36.7838	0.2696	36.7838	0.2696	36.7838	0.2697	36.7838	0.2697	36.7838	0.2697
38.5353	0.2693	38.5353	0.2693	38.5353	0.2693	38.5353	0.2693	38.5353	0.2693	38.5353	0.2693	38.5353	0.2693
40.3702	0.269	40.3702	0.269	40.3702	0.269	40.3702	0.269	40.3702	0.269	40.3702	0.269	40.3702	0.269
42.2924	0.2687	42.2924	0.2687	42.2924	0.2687	42.2924	0.2687	42.2924	0.2687	42.2924	0.2687	42.2924	0.2688
44.3062	0.2685	44.3062	0.2685	44.3062	0.2685	44.3062	0.2685	44.3062	0.2685	44.3062	0.2685	44.3062	0.2685
46.4159	0.2683	46.4159	0.2683	46.4159	0.2683	46.4159	0.2683	46.4159	0.2683	46.4159	0.2683	46.4159	0.2683
48.626	0.2681	48.626	0.2681	48.626	0.2681	48.626	0.2681	48.626	0.2681	48.626	0.2681	48.626	0.2681
50.9414	0.2679	50.9414	0.2679	50.9414	0.2679	50.9414	0.2679	50.9414	0.2679	50.9414	0.2679	50.9414	0.2679

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW114.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 114 ~ SLAB ONLY Vertical Responses ~ Elevation 56 ft. ~ EL56_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.1098	0.0291	0.1098	0.026	0.1098	0.0244	0.1098	0.0229	0.1098	0.022	0.1098	0.0213	0.1098	0.0204
0.115	0.0309	0.115	0.026	0.115	0.0244	0.115	0.0233	0.115	0.0229	0.115	0.0221	0.115	0.0211
0.1204	0.0313	0.1204	0.0263	0.1204	0.0245	0.1204	0.024	0.1204	0.0236	0.1204	0.0227	0.1204	0.0217
0.1262	0.0313	0.1262	0.027	0.1262	0.0257	0.1262	0.0245	0.1262	0.024	0.1262	0.0232	0.1262	0.0221
0.1322	0.0313	0.1322	0.0271	0.1322	0.0258	0.1322	0.0247	0.1322	0.0243	0.1322	0.0234	0.1322	0.0224
0.1385	0.0313	0.1385	0.0277	0.1385	0.0265	0.1385	0.0255	0.1385	0.0245	0.1385	0.0234	0.1385	0.0224
0.1451	0.0316	0.1451	0.0295	0.1451	0.0282	0.1451	0.027	0.1451	0.0259	0.1451	0.0239	0.1451	0.0224
0.152	0.032	0.152	0.0298	0.152	0.0285	0.152	0.0273	0.152	0.0261	0.152	0.024	0.152	0.0224
0.1592	0.033	0.1592	0.0311	0.1592	0.0299	0.1592	0.0288	0.1592	0.0278	0.1592	0.0261	0.1592	0.0242
0.1668	0.0367	0.1668	0.0323	0.1668	0.0312	0.1668	0.0302	0.1668	0.0292	0.1668	0.0277	0.1668	0.0257
0.1748	0.0507	0.1748	0.0427	0.1748	0.0385	0.1748	0.035	0.1748	0.0321	0.1748	0.0284	0.1748	0.0264
0.1831	0.0586	0.1831	0.0492	0.1831	0.0442	0.1831	0.0399	0.1831	0.0362	0.1831	0.0306	0.1831	0.0266
0.1918	0.0586	0.1918	0.0492	0.1918	0.0442	0.1918	0.0399	0.1918	0.0362	0.1918	0.0306	0.1918	0.0268
0.2009	0.0586	0.2009	0.0492	0.2009	0.0442	0.2009	0.0399	0.2009	0.0362	0.2009	0.0324	0.2009	0.0296
0.2105	0.0586	0.2105	0.0492	0.2105	0.0442	0.2105	0.0399	0.2105	0.0384	0.2105	0.0358	0.2105	0.0324
0.2205	0.0586	0.2205	0.0492	0.2205	0.0453	0.2205	0.0426	0.2205	0.0407	0.2205	0.0377	0.2205	0.0338
0.231	0.0586	0.231	0.0492	0.231	0.0457	0.231	0.0438	0.231	0.0419	0.231	0.0388	0.231	0.0354
0.242	0.0586	0.242	0.0509	0.242	0.0486	0.242	0.0465	0.242	0.0445	0.242	0.0411	0.242	0.0369
0.2535	0.0648	0.2535	0.0573	0.2535	0.0529	0.2535	0.0489	0.2535	0.0454	0.2535	0.0411	0.2535	0.0371
0.2656	0.0731	0.2656	0.0586	0.2656	0.0535	0.2656	0.049	0.2656	0.0454	0.2656	0.0424	0.2656	0.0402
0.2783	0.0817	0.2783	0.0599	0.2783	0.0535	0.2783	0.05	0.2783	0.0485	0.2783	0.0458	0.2783	0.0426
0.2915	0.0817	0.2915	0.0618	0.2915	0.058	0.2915	0.0547	0.2915	0.0516	0.2915	0.0479	0.2915	0.0437
0.3054	0.0817	0.3054	0.0663	0.3054	0.0622	0.3054	0.0584	0.3054	0.0549	0.3054	0.0489	0.3054	0.0448
0.3199	0.0817	0.3199	0.0702	0.3199	0.0659	0.3199	0.0622	0.3199	0.0589	0.3199	0.0532	0.3199	0.047
0.3352	0.0872	0.3352	0.0767	0.3352	0.0707	0.3352	0.066	0.3352	0.0626	0.3352	0.0568	0.3352	0.0498
0.3511	0.0906	0.3511	0.0807	0.3511	0.0749	0.3511	0.0699	0.3511	0.0653	0.3511	0.0578	0.3511	0.0501
0.3678	0.1215	0.3678	0.095	0.3678	0.0822	0.3678	0.072	0.3678	0.0653	0.3678	0.0578	0.3678	0.0501
0.3853	0.136	0.3853	0.1057	0.3853	0.0918	0.3853	0.0807	0.3853	0.0718	0.3853	0.0586	0.3853	0.0506
0.4037	0.136	0.4037	0.1057	0.4037	0.0918	0.4037	0.0821	0.4037	0.0762	0.4037	0.0664	0.4037	0.0571
0.4229	0.136	0.4229	0.1057	0.4229	0.0918	0.4229	0.085	0.4229	0.0799	0.4229	0.0709	0.4229	0.0612
0.4431	0.136	0.4431	0.1057	0.4431	0.0934	0.4431	0.0886	0.4431	0.084	0.4431	0.0758	0.4431	0.0653
0.4642	0.1373	0.4642	0.1057	0.4642	0.0974	0.4642	0.0914	0.4642	0.0859	0.4642	0.0763	0.4642	0.067
0.4863	0.1478	0.4863	0.1237	0.4863	0.1107	0.4863	0.0996	0.4863	0.0902	0.4863	0.0823	0.4863	0.073
0.5094	0.1813	0.5094	0.1382	0.5094	0.1216	0.5094	0.1082	0.5094	0.0975	0.5094	0.0865	0.5094	0.075

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW114.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g) ~ Figure 114 ~ SLAB ONLY Vertical Responses ~ Elevation 56 ft. ~ EL56_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
0.5337	0.2215	0.5337	0.1604	0.5337	0.1342	0.5337	0.1149	0.5337	0.1022	0.5337	0.0865	0.5337	0.075
0.5591	0.2215	0.5591	0.1604	0.5591	0.1342	0.5591	0.1149	0.5591	0.1022	0.5591	0.0882	0.5591	0.075
0.5857	0.2215	0.5857	0.1604	0.5857	0.1342	0.5857	0.1149	0.5857	0.1022	0.5857	0.0937	0.5857	0.082
0.6136	0.2215	0.6136	0.1604	0.6136	0.1342	0.6136	0.1176	0.6136	0.1109	0.6136	0.1	0.6136	0.0872
0.6428	0.2258	0.6428	0.1621	0.6428	0.1356	0.6428	0.1177	0.6428	0.1129	0.6428	0.1028	0.6428	0.0895
0.6734	0.2258	0.6734	0.1621	0.6734	0.1383	0.6734	0.1286	0.6734	0.1207	0.6734	0.108	0.6734	0.0932
0.7055	0.2258	0.7055	0.1621	0.7055	0.1383	0.7055	0.1286	0.7055	0.1207	0.7055	0.109	0.7055	0.0946
0.7391	0.2258	0.7391	0.1621	0.7391	0.1409	0.7391	0.1325	0.7391	0.1242	0.7391	0.1095	0.7391	0.0946
0.7743	0.3171	0.7743	0.2132	0.7743	0.1805	0.7743	0.1582	0.7743	0.1421	0.7743	0.1212	0.7743	0.1034
0.8111	0.3171	0.8111	0.2132	0.8111	0.1805	0.8111	0.1582	0.8111	0.1421	0.8111	0.1212	0.8111	0.1063
0.8497	0.3171	0.8497	0.2132	0.8497	0.1805	0.8497	0.1653	0.8497	0.1529	0.8497	0.1331	0.8497	0.1125
0.8902	0.3171	0.8902	0.2132	0.8902	0.1863	0.8902	0.1706	0.8902	0.1575	0.8902	0.137	0.8902	0.117
0.9326	0.4856	0.9326	0.2988	0.9326	0.2458	0.9326	0.2147	0.9326	0.1923	0.9326	0.1629	0.9326	0.1372
0.977	0.4856	0.977	0.2988	0.977	0.2458	0.977	0.2147	0.977	0.1923	0.977	0.1712	0.977	0.1498
1.0235	0.4856	1.0235	0.2988	1.0235	0.2458	1.0235	0.2147	1.0235	0.1923	1.0235	0.1778	1.0235	0.1585
1.0723	0.4856	1.0723	0.2988	1.0723	0.2567	1.0723	0.2357	1.0723	0.2186	1.0723	0.1927	1.0723	0.1661
1.1233	0.571	1.1233	0.3365	1.1233	0.2645	1.1233	0.2357	1.1233	0.2186	1.1233	0.1927	1.1233	0.1661
1.1768	0.571	1.1768	0.3761	1.1768	0.3118	1.1768	0.2752	1.1768	0.2461	1.1768	0.2094	1.1768	0.1827
1.2328	0.571	1.2328	0.3802	1.2328	0.3434	1.2328	0.3123	1.2328	0.287	1.2328	0.2477	1.2328	0.2092
1.2916	0.571	1.2916	0.4124	1.2916	0.3638	1.2916	0.324	1.2916	0.2966	1.2916	0.2555	1.2916	0.2155
1.353	0.6146	1.353	0.4124	1.353	0.3638	1.353	0.324	1.353	0.3054	1.353	0.2746	1.353	0.2387
1.4175	0.6146	1.4175	0.4124	1.4175	0.3638	1.4175	0.3436	1.4175	0.3262	1.4175	0.2952	1.4175	0.259
1.485	0.6146	1.485	0.4377	1.485	0.4023	1.485	0.3763	1.485	0.3523	1.485	0.3122	1.485	0.2688
1.5557	0.6146	1.5557	0.4628	1.5557	0.4325	1.5557	0.406	1.5557	0.3819	1.5557	0.3421	1.5557	0.2937
1.6298	0.6344	1.6298	0.4805	1.6298	0.4418	1.6298	0.4164	1.6298	0.3937	1.6298	0.3554	1.6298	0.3103
1.7074	0.7807	1.7074	0.6115	1.7074	0.5414	1.7074	0.4855	1.7074	0.4393	1.7074	0.3723	1.7074	0.3174
1.7887	0.8828	1.7887	0.7257	1.7887	0.6496	1.7887	0.585	1.7887	0.5302	1.7887	0.452	1.7887	0.3759
1.8738	0.9335	1.8738	0.7297	1.8738	0.6518	1.8738	0.5887	1.8738	0.5371	1.8738	0.4575	1.8738	0.418
1.963	1.0248	1.963	0.7297	1.963	0.6518	1.963	0.5887	1.963	0.5371	1.963	0.4575	1.963	0.4401
2.0565	1.0248	2.0565	0.7297	2.0565	0.6518	2.0565	0.5945	2.0565	0.5478	2.0565	0.4696	2.0565	0.4401
2.1544	1.0248	2.1544	0.7864	2.1544	0.7093	2.1544	0.6425	2.1544	0.5884	2.1544	0.5086	2.1544	0.4401
2.257	1.0248	2.257	0.788	2.257	0.7266	2.257	0.6685	2.257	0.6147	2.257	0.5258	2.257	0.4416
2.3645	1.8203	2.3645	0.9657	2.3645	0.7731	2.3645	0.6955	2.3645	0.6344	2.3645	0.5474	2.3645	0.4561
2.4771	2.0792	2.4771	1.093	2.4771	0.8239	2.4771	0.7035	2.4771	0.6626	2.4771	0.5541	2.4771	0.4612
2.595	2.1716	2.595	1.093	2.595	0.8239	2.595	0.7035	2.595	0.6934	2.595	0.5552	2.595	0.4649

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW114.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 114 ~ SLAB ONLY Vertical Responses ~ Elevation 56 ft. ~ EL56_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
2.7186	2.1716	2.7186	1.093	2.7186	0.8239	2.7186	0.7035	2.7186	0.6934	2.7186	0.5552	2.7186	0.4649
2.848	2.1716	2.848	1.093	2.848	0.8239	2.848	0.7035	2.848	0.6934	2.848	0.5552	2.848	0.4649
2.9836	2.1716	2.9836	1.093	2.9836	0.8239	2.9836	0.7035	2.9836	0.6934	2.9836	0.5552	2.9836	0.4649
3.1257	2.1716	3.1257	1.093	3.1257	0.8239	3.1257	0.7035	3.1257	0.6934	3.1257	0.5552	3.1257	0.4649
3.2745	1.4998	3.2745	0.9545	3.2745	0.8037	3.2745	0.6961	3.2745	0.6196	3.2745	0.5335	3.2745	0.458
3.4305	0.9809	3.4305	0.6884	3.4305	0.6145	3.4305	0.5843	3.4305	0.558	3.4305	0.5075	3.4305	0.4416
3.5938	0.9809	3.5938	0.6884	3.5938	0.6145	3.5938	0.5735	3.5938	0.5378	3.5938	0.48	3.5938	0.4174
3.7649	0.9809	3.7649	0.6884	3.7649	0.6145	3.7649	0.5503	3.7649	0.5077	3.7649	0.4448	3.7649	0.3971
3.9442	0.9809	3.9442	0.6884	3.9442	0.6145	3.9442	0.5503	3.9442	0.5077	3.9442	0.4448	3.9442	0.3971
4.132	0.9809	4.132	0.6884	4.132	0.6145	4.132	0.5503	4.132	0.5077	4.132	0.4448	4.132	0.3971
4.3288	0.9809	4.3288	0.6884	4.3288	0.6145	4.3288	0.5503	4.3288	0.5077	4.3288	0.4448	4.3288	0.3971
4.5349	0.9809	4.5349	0.6884	4.5349	0.6145	4.5349	0.5503	4.5349	0.5077	4.5349	0.4448	4.5349	0.3971
4.7508	0.9809	4.7508	0.6884	4.7508	0.6145	4.7508	0.5503	4.7508	0.5077	4.7508	0.4448	4.7508	0.3971
4.977	0.9809	4.977	0.6884	4.977	0.6145	4.977	0.5503	4.977	0.5077	4.977	0.4448	4.977	0.3971
5.214	0.9809	5.214	0.6884	5.214	0.6145	5.214	0.5503	5.214	0.5077	5.214	0.4448	5.214	0.3971
5.4623	1.1044	5.4623	0.6884	5.4623	0.6145	5.4623	0.5503	5.4623	0.5077	5.4623	0.4448	5.4623	0.3971
5.7224	1.1044	5.7224	0.7283	5.7224	0.622	5.7224	0.5503	5.7224	0.5077	5.7224	0.4448	5.7224	0.3971
5.9948	1.1044	5.9948	0.7283	5.9948	0.622	5.9948	0.5503	5.9948	0.5077	5.9948	0.4448	5.9948	0.3998
6.2803	1.1044	6.2803	0.7283	6.2803	0.622	6.2803	0.5503	6.2803	0.5077	6.2803	0.4448	6.2803	0.4016
6.5793	1.1044	6.5793	0.7283	6.5793	0.622	6.5793	0.5503	6.5793	0.5077	6.5793	0.4448	6.5793	0.4016
6.8926	1.1044	6.8926	0.7283	6.8926	0.622	6.8926	0.5503	6.8926	0.5077	6.8926	0.4448	6.8926	0.4016
7.2208	1.1044	7.2208	0.7283	7.2208	0.622	7.2208	0.5503	7.2208	0.5077	7.2208	0.4448	7.2208	0.4016
7.5646	1.1044	7.5646	0.7283	7.5646	0.622	7.5646	0.5503	7.5646	0.5077	7.5646	0.4448	7.5646	0.4016
7.9248	1.1044	7.9248	0.7283	7.9248	0.622	7.9248	0.5503	7.9248	0.5077	7.9248	0.4448	7.9248	0.4016
8.3022	1.1044	8.3022	0.7283	8.3022	0.622	8.3022	0.5503	8.3022	0.5077	8.3022	0.4448	8.3022	0.4016
8.6975	1.1044	8.6975	0.7283	8.6975	0.622	8.6975	0.5503	8.6975	0.5077	8.6975	0.4448	8.6975	0.4016
9.1116	1.1044	9.1116	0.7283	9.1116	0.622	9.1116	0.5503	9.1116	0.5077	9.1116	0.4455	9.1116	0.4016
9.5455	1.1044	9.5455	0.7283	9.5455	0.6496	9.5455	0.5959	9.5455	0.5516	9.5455	0.4806	9.5455	0.4077
10	1.1044	10	0.7283	10	0.6753	10	0.6293	10	0.5867	10	0.5157	10	0.4392
10.4762	1.204	10.4762	0.7487	10.4762	0.6753	10.4762	0.6293	10.4762	0.5867	10.4762	0.5157	10.4762	0.4392
10.975	1.204	10.975	0.7487	10.975	0.6753	10.975	0.6293	10.975	0.5867	10.975	0.5157	10.975	0.4392
11.4976	1.2393	11.4976	0.7487	11.4976	0.6753	11.4976	0.6293	11.4976	0.5867	11.4976	0.5157	11.4976	0.4392
12.045	1.2393	12.045	0.7487	12.045	0.6753	12.045	0.6293	12.045	0.5867	12.045	0.5157	12.045	0.4392
12.6186	1.2393	12.6186	0.7487	12.6186	0.6753	12.6186	0.6293	12.6186	0.5867	12.6186	0.5157	12.6186	0.4392
13.2194	1.2393	13.2194	0.7487	13.2194	0.6753	13.2194	0.6293	13.2194	0.5867	13.2194	0.5157	13.2194	0.4392

Numerical data from 24590-PTF-S0C-S15T-00057, Rev. A; eMedia file 24590-RMCD-02169 "PTF Final ISRS Dplots"
PTWW114.grf ~ RPP-WTP Pretreatment Facility ISRS ~ Calc No.: 24590-PTF-S0C-S15T-00057, Rev. A ~ Frequency (cps) ~ Spectral Acceleration (g)
~ Figure 114 ~ SLAB ONLY Vertical Responses ~ Elevation 56 ft. ~ EL56_C-E-9-12

Damping	0.50%		2%		3%		4%		5%		7%		10%
Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.	Freq.	Accel.
13.8489	1.2393	13.8489	0.7487	13.8489	0.6753	13.8489	0.6293	13.8489	0.5867	13.8489	0.5157	13.8489	0.4392
14.5083	1.2393	14.5083	0.7487	14.5083	0.6753	14.5083	0.6293	14.5083	0.5867	14.5083	0.5157	14.5083	0.4392
15.1991	1.3415	15.1991	0.7487	15.1991	0.6753	15.1991	0.6293	15.1991	0.5867	15.1991	0.5157	15.1991	0.4392
15.9228	1.3415	15.9228	0.7838	15.9228	0.7272	15.9228	0.6416	15.9228	0.5867	15.9228	0.5157	15.9228	0.4453
16.681	1.3415	16.681	0.7838	16.681	0.7272	16.681	0.6416	16.681	0.5867	16.681	0.5157	16.681	0.4493
17.4753	1.3415	17.4753	0.7838	17.4753	0.7272	17.4753	0.6416	17.4753	0.5867	17.4753	0.5157	17.4753	0.4493
18.3074	1.3415	18.3074	0.7838	18.3074	0.7272	18.3074	0.6416	18.3074	0.5867	18.3074	0.5157	18.3074	0.4681
19.1791	1.7415	19.1791	1.0077	19.1791	0.7827	19.1791	0.7138	19.1791	0.7037	19.1791	0.6041	19.1791	0.5379
20.0923	2.2676	20.0923	1.2791	20.0923	1.0078	20.0923	0.8492	20.0923	0.7444	20.0923	0.6108	20.0923	0.5802
21.049	2.2676	21.049	1.2791	21.049	1.0078	21.049	0.8492	21.049	0.7444	21.049	0.6108	21.049	0.5802
22.0513	2.2676	22.0513	1.2791	22.0513	1.0078	22.0513	0.8492	22.0513	0.7444	22.0513	0.6108	22.0513	0.5802
23.1013	2.2676	23.1013	1.2791	23.1013	1.0078	23.1013	0.8492	23.1013	0.7444	23.1013	0.6108	23.1013	0.5802
24.2013	2.2676	24.2013	1.2791	24.2013	1.0078	24.2013	0.8492	24.2013	0.7444	24.2013	0.6108	24.2013	0.5802
25.3536	2.2676	25.3536	1.2517	25.3536	1.0078	25.3536	0.8492	25.3536	0.7444	25.3536	0.6108	25.3536	0.5708
26.5609	2.2676	26.5609	1.2517	26.5609	1.0078	26.5609	0.8492	26.5609	0.7444	26.5609	0.6108	26.5609	0.5708
27.8256	2.169	27.8256	1.0486	27.8256	0.8581	27.8256	0.7745	27.8256	0.7093	27.8256	0.6108	27.8256	0.5248
29.1505	1.0972	29.1505	0.7793	29.1505	0.7092	29.1505	0.6373	29.1505	0.5666	29.1505	0.5216	29.1505	0.4804
30.5386	0.7655	30.5386	0.5382	30.5386	0.5146	30.5386	0.5014	30.5386	0.4905	30.5386	0.4703	30.5386	0.4417
31.9927	0.49	31.9927	0.4758	31.9927	0.4619	31.9927	0.4498	31.9927	0.4394	31.9927	0.4224	31.9927	0.4018
33.516	0.4005	33.516	0.3959	33.516	0.3892	33.516	0.3827	33.516	0.3768	33.516	0.3684	33.516	0.3616
35.1119	0.3498	35.1119	0.3494	35.1119	0.3485	35.1119	0.3471	35.1119	0.3453	35.1119	0.3411	35.1119	0.3342
36.7838	0.3221	36.7838	0.3222	36.7838	0.322	36.7838	0.3215	36.7838	0.3209	36.7838	0.3191	36.7838	0.3155
38.5353	0.3028	38.5353	0.303	38.5353	0.303	38.5353	0.3028	38.5353	0.3026	38.5353	0.3017	38.5353	0.2998
40.3702	0.2881	40.3702	0.2882	40.3702	0.2883	40.3702	0.2883	40.3702	0.2882	40.3702	0.2878	40.3702	0.2867
42.2924	0.2762	42.2924	0.2764	42.2924	0.2765	42.2924	0.2765	42.2924	0.2765	42.2924	0.2763	42.2924	0.2758
44.3062	0.2664	44.3062	0.2665	44.3062	0.2666	44.3062	0.2666	44.3062	0.2666	44.3062	0.2666	44.3062	0.2664
46.4159	0.2593	46.4159	0.2596	46.4159	0.2598	46.4159	0.26	46.4159	0.2602	46.4159	0.2605	46.4159	0.2608
48.626	0.2549	48.626	0.2552	48.626	0.2553	48.626	0.2555	48.626	0.2556	48.626	0.2558	48.626	0.2561
50.9414	0.2512	50.9414	0.2513	50.9414	0.2514	50.9414	0.2515	50.9414	0.2516	50.9414	0.2518	50.9414	0.252

Table III.10.G.A – Pretreatment Plant Miscellaneous Unit Systems

Miscellaneous Unit System Description[a]	Miscellaneous Unit System Designation	Description Drawings	Narrative Description, Tables, & Figures	Maximum Capacity (gallons)
		-P1-P01T-00001, Rev 7 -P1-P01T-P0002, Rev 7	Group 10, Addendum C of this Permit.	
Cesium Nitric Acid Recovery Process System CNP-EVAP-00001 (Cesium Evaporator Separator Vessel)	CNP	**24590-PTF** -3PS-MEVV-T0002, Rev 4 -M5-V17T-00014, Rev 2 M6-CNP-00001, Rev 2 -M6-CNP-00002, Rev 2 -M6-CNP-00008, Rev 2 -M6-CNP-00008001, Rev 0 -MV-CNP-P0001, Rev 0 -MV-CNP-P0002, Rev 1 -MV-CNP-P0005, Rev 0 -MVD-CNP-P0003, Rev 1 -MVD-CNP-P0010, Rev 0 ~~-MWD-CNP-P0001, Rev 0~~ -N1D-CNP-P0005, Rev 1 -N1D-CNP-P0006, Rev 3 -N1D-CNP-P0009, Rev 1 -N1D-CNP-P0011, Rev 1 -P1-P01T-00001, Rev 8 -P1-P01T-P0002, Rev 7 -P1-P01T-00003, Rev 4 -P1-P01T-00004, Rev 6	Section 4.1.2.6.; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	CNP-EVAP-00001 = RESERVED

Table III.10.G.A – Pretreatment Plant Miscellaneous Unit Systems

Miscellaneous Unit System Description[a]	Miscellaneous Unit System Designation	Description Drawings	Narrative Description, Tables, & Figures	Maximum Capacity (gallons)
Cesium Nitric Acid Recovery Process System (Cont.) CNP-HX-00001 (Cesium Evaporator Concentrate Reboiler	CNP	**24590-PTF** -3PS-MEVV- T0002, Rev 4 -M5-V17T-P0014, Rev 2 -M6-CNP-00001, Rev 2 -M6-CNP-00002, Rev 2 -M6-CNP-00008, Rev 2 ~~-MED-CNP-P0003, Rev 0~~ ~~-MED-CNP-P0004, Rev 1~~ -MED-CNP-~~P0005. Rev 0~~ 00005, Rev 4 ~~-MED-CNP-P0010, Rev 0~~ -P1-P01T-00001, Rev 7 -P1-P01T-P0002, Rev 7 -P1-P01T-00003, Rev 4 -P1-P01T-00004, Rev 6	Section 4.1.2.6.; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	N/A
Cesium Nitric Acid Recovery Process System (Cont.) CNP-DISTC-00001 (Cesium Evaporator Nitric Acid Rectifier Column)	CNP	**24590-PTF** -M5-V17T-00014, Rev 2 -M6-CNP-00010, Rev 2 -MVD-CNP-00016, Rev 1 -N1D-CNP-00001, Rev 1 -P1-P01T-00003, Rev 4 -3PS-MEVV- T0002, Rev 4	Section 4.1.2.6.; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	RESERVED

Table III.10.G.A – Pretreatment Plant Miscellaneous Unit Systems

Miscellaneous Unit System Description[a]	Miscellaneous Unit System Designation	Description Drawings	Narrative Description, Tables, & Figures	Maximum Capacity (gallons)
Cesium Nitric Acid Recovery Process System (Cont.) CNP-HX-00002 (Cesium Evaporator Primary Condenser) CNP-HX-00003 (Cesium Evaporator Inter-Condenser) CNP-HX-00004 (Cesium Evaporator After-Condenser)	CNP	**24590-PTF** -M5-V17T-00014, Rev 2 -M6-CNP-00001, Rev 2 -M6-CNP-00002, Rev 2 -M6-CNP-00008001, Rev 0 -M6-CNP-00010, Rev 2 -MED-CNP-~~P0003, Rev 0~~ 00003, Rev 4 -MED-CNP-~~P0004, Rev 0~~00004, Rev 5 -~~MED-CNP-P0005, Rev 0~~ -MED-CNP-~~P0010, Rev 0~~ 00010, Rev 3 -N1D-CNP-P0002, Rev 1 -N1D-CNP-P0003, Rev 1 -N1D-CNP-P0012, Rev 1 -P1-P01T-00001, Rev 7 -P1-P01T-P0002, Rev 7 -P1-P01T-00003, Rev 4 -P1-P01T-00004, Rev 6 -3PS-MEVV- T0002, Rev 4	Section 4.1.2.6.; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	N/A N/A N/A
Treated LAW Evaporation Process System TLP-SEP-00001 (Treated LAW Evaporator Separator Vessel)	TLP	**24590-PTF** -3PS-MEVV- T0001, Rev 2 -M5-V17T-00005, Rev 2 -M6-TLP-00001, Rev 3 -M6-TLP-00002, Rev 3	Section 4.1.2.11; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit	TLP-SEP-00001= 13,359

Table III.10.G.A.i – Pretreatment Plant Vessel Vent Systems Associated with Pretreatment Plant Miscellaneous Unit Systems

Description	Designation	Description Drawings	Narrative Description, Tables & Figures
Process Vessel Vent System (Cont.) PVV-FAN-00001A (Vessel Vent Exhaust Fan) PVV-FAN-00001B (Vessel Vent Exhaust Fan)	PVV	**24590-PTF** -M5-V17T-00021001, Rev 2 -M5-V17T-00021004, Rev 2 -P1-P01T-P0002, Rev 7 -P1-P01T-00003, Rev 4 -P1-P01T-00004, Rev 6	Section 4.1.2.16; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.
Pretreatment Pulse Jet Mixer Exhaust Vent System PJV-HEPA-00001A (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001B (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001C (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001D (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001E (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001F (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00001G (PJV Primary Exhaust HEPA Filter) PJV-HEPA-00002A (PJV Secondary Exhaust HEPA Filter) PJV-HEPA-00002B (PJV Secondary Exhaust HEPA Filter)	PJV	**24590-PTF** -M5-V17T-00021002, Rev 2 -M6-PJV-00001, Rev 3 -M6-PJV-00002, Rev 3 -M6-PJV-00004, Rev 3 ~~-MVD-PJV-P0003, Rev 0~~ -N1D-PJV-P0001, Rev 1 -P1-P01T-00001, Rev 7	Section 4.1.2.17; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.

Table III.10.G.A.i – Pretreatment Plant Vessel Vent Systems Associated with Pretreatment Plant Miscellaneous Unit Systems

Description	Designation	Description Drawings	Narrative Description, Tables & Figures
PJV-HEPA-00002C (PJV Secondary Exhaust HEPA Filter) PJV-HEPA-00002D (PJV Secondary Exhaust HEPA Filter) PJV-HEPA-00002E (PJV Secondary Exhaust HEPA Filter) PJV-HEPA-00002F (PJV Secondary Exhaust HEPA Filter)			
Pretreatment Pulse Jet Mixer Exhaust Vent System (Cont.) PJV-FAN-00001A (PJV Exhaust Fan) PJV-FAN-00001B (PJV Exhaust Fan) PJV-FAN-00001C (PJV Exhaust Fan)	PJV	**24590-PTF** -M5-V17T-00021002, Rev 2 -M6-PJV-00001, Rev 3 -M6-PJV-00002, Rev 3 -M6-PJV-00004, Rev 3 ~~-MVD-PJV-P0003, Rev 0~~ -N1D-PJV-P0001, Rev 1 -P1-P01T-00001, Rev 7	Section 4.1.2.17; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.
Pretreatment Pulse Jet Mixer Exhaust Vent System (Cont.) PJV-DMST-00002A (PJV Demister) PJV-DMST-00002B (PJV Demister) PJV-DMST-00002C (PJV Demisters)	PJV	**24590-PTF** -M5-V17T-00021002, Rev 2 -M6-PJV-00001, Rev 3 -M6-PJV-00002, Rev 3 -M6-PJV-00004, Rev 3 ~~-MVD-PJV-P0003, Rev 0~~ -N1D-PJV-P0001, Rev 1 -P1-P01T-00003, Rev 4	Section 4.1.2.17; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-10-035

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Replace Mechanical Systems Data Sheets and Equipment Assembly Drawings for the PTF Ultrafiltration Feed Vessels UFP-VSL-00002A/B in Appendix 8.6 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

D. M. Busche — 3/21/2013 Date

GRANT W. RYAN for

Reviewed by ORP Program Office:

D. L. Noyes — 4/9/13 Date

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-10-035

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update and replace the following Mechanical Data Sheets and Equipment Assembly Drawings in Appendix 8.6 of the DWP.

Appendix 8.6			
Replace:	24590-PTF-MVD-UFP-P0014, Rev. 0	With:	24590-PTF-MVD-UFP-00014, Rev. 11
	24590-PTF-MVD-UFP-P0015, Rev. 0		24590-PTF-MVD-UFP-00015, Rev. 11
	24590-PTF-MV-UFP-P0003, Rev. 0 24590-PTF-MV-UFP-P0004, Rev. 0		24590-PTF-MV-UFP-00003, Rev. 6
			24590-PTF-MV-UFP-00004, Rev. 6
			24590-PTF-MV-UFP-00016, Rev. 3
			24590-PTF-MV-UFP-00017, Rev. 3
			24590-PTF-MV-UFP-00018, Rev. 3
			24590-PTF-MV-UFP-00028, Rev. 1
			24590-PTF-MV-UFP-00029, Rev. 1
			24590-PTF-MV-UFP-00030, Rev. 1
			24590-PTF-MV-UFP-00031, Rev. 1

The referenced data sheets and drawings have been revised. They incorporate changes provided in applicable document change forms (e.g., DCN, SCN, SDDR, FCN, FCR, etc.) and changes associated with the resolution to comments on change documents since the issuance of the last revision of the permitted data sheets and drawings. This modification requests Ecology approval and incorporation into the permit, the specific changes to these data sheets and drawings that are indicated by revision notes and clouds. Revisions are the result of ongoing design changes.

Significant changes are summarized below:

Mechanical System Data Sheets (24590-PTF-MVD-UFP-00014, Rev 11 and 24590-PTF-MVD-UFP-00015, Rev 11):

- Added and updated reference documents for the Piping and Instrumentation Diagrams (P&ID), calculations, vessel drawing, and reports
- Updated Design Data such as quality level, design specific gravity, volumes (maximum operating and total), weights (empty, operating, and test), external pressure (vessel operating and vessel design), temperature (vessel design and coil/jacket design). Added Design Data for the sparger operation and sparger design
- Added Materials of Construction Data for the steam spargers, pulse jet mixer (PJM) nozzles, recirculation nozzles, and PJM cluster fill/PJM nozzle fill
- Revised Notes and Remarks section
- Added Seismic information section
- Updated the Equipment Cyclic Data Sheet - Parent Vessel and Equipment Cyclic Data Sheet - PJMs. Added Equipment Cyclic Data Sheet - Steam Spargers
- Added Design Considerations for Loads Induced by PJMs, PJM Overblow Loads, PJM Cluster Overblow Load, and Nozzle Loads
- Added Equipment Qualification Datasheet (EQD)
- Added Attachment 1, Reference for Data Sheets 24590-PTF-MVD-UFP-00014/00015

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-10-035

Equipment Assembly Drawings (24590-PTF-MV-UFP-00003 and -00004, Rev 6; 24590-PTF-MV-UFP-00016 through -00018, Rev 3; and 24590-PTF-MV-UFP-00028 through -00031, Rev 1):

- Converted drawings from single sheets to multiple sheets to provide clearer representation of vessels UFP-VSL-00002A/B
- Revised vessels' internal layout
- Modified, deleted, and added notes, holds, and references
- Where appropriate, incorporated changes from change documentation identified in the General Notes section on each drawing

This PCN updates information in Appendix 8.6 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.

The following outstanding change documents have been submitted to Ecology pursuant to Permit Condition III.10.C.9.h and are maintained in the WTP Operating Record:

- 24590-PTF-MVN-UFP-00053 for drawings 24590-PTF-MV-UFP-00004, 24590-PTF-MV-UFP-00016, 24590-PTF-MV-UFP-00017, 24590-PTF-MV-UFP-00018, 24590-PTF-MV-UFP-00028, 24590-PTF-MV-UFP-00029, 24590-PTF-MV-UFP-00030, and 24590-PTF-MV-UFP-00031

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl 5/9/13

S. Dahl Date

MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No. *24590-PTF-MV-UFP-VSL-00002A*

R11376341

2Project:	***RPP-WTP***	P&ID:	***24590-PTF-M6-UFP-00002001, 00002002, 00010007, 00021001, 00021002, 24590-PTF-M6-HLP-00010003***
Project No:	***24590***	Calculations: 11	***Attachment 1***
Project Site:	***Hanford***	Vessel Drawing	***24590-PTF-MV-UFP-00003/00016/00017***
Description:	***Ultrafiltration Feed Vessel***	Reports / other Documents 11	***Attachment 1*** ISSUED BY RPP-WTP PDC

Reference Data 11

Charge Vessels (Tag Numbers)	***N/A***
Pulse jet Mixers / Agitators (Tag Numbers)	***UFP-PJM-00006, UFP-PJM-00007, UFP-PJM-00008, UFP-PJM-00009, UFP-PJM-00010, UFP-PJM-00011***
RFDs/Pumps (Tag Numbers)	***N/A***

Design Data 11

Quality Level		***Q (See Note 16)***	Fabrication Specs	***24590-WTP-3PS-MV00-T0001***		
Seismic Category		***SC-1 (See Note 16)***	Design Code	***ASME Section VIII Division 1***		
Service/Contents		***Radioactive Liquid***	Code Stamp	***Yes***		
Design Specific Gravity		***1.6***	NB Registration	***Yes***		
Maximum Operating Volume	gal	***35,404 (Note 22)***	Weights (lbs)	Empty	Operating	Test
Total Volume	gal	***39,629 (Note 22)***	**Estimated (Note 20)**	***185,000***	***658,000***	***503,000***
Equipment Qualification		***See EQD Sections***				

Inside Diameter	inch	***168***					Wind Design	***Not Required***
Length/Height (TL-TL)	inch	***369***					Snow Design	***Not Required***
		Vessel Operating	Vessel Design	Coil/Jacket Design	Sparger Operation	Sparger Design	Seismic Design	***24590-WTP-3PS-MV00-T0002 24590-WTP-3PS-SS90-T0001***
Internal Pressure	psig	***ATM***	***15***	***35***	***135***	***160***		
External Pressure	psig	***1.5 (Note 3)***	***2 (Note 3)***	***0***	***ATM***	***15***	Postweld Heat Treat	***Not Required***
Temperature	°F	***194***	***230***	***230 max (Note 11)***	***358***	***375***	Corrosion Allowance ***(Note 19)***	Inch ***0.040 for all wetted surfaces including jacket***
Min. Design Metal Temp.	°F	***40***						

Materials of Construction 11

Component	Material	Minimum Thickness / Size	Containment
Top Head	***SA 240 304 Note 1***	***See Drawing***	***Auxiliary (note 8)***
Shell	***SA 240 304 Note 1***	***See Drawing***	***Primary (note 8)***
Bottom Head	***SA 240 304 Note 1***	***See Drawing***	***Primary (note 8)***
Support	***SA 240 304 Note 1***	***See Drawing***	***N/A***
Jacket/Coils/Half-Pipe Jacket	***SA 240 304 Note 1***	***See Drawing***	***N/A***
Internals	***SA 240 304 Note 1***	***See Drawing***	***Thermowell Primary***
Pipe Nozzles	***SA 312 TP304 Note 1***	***See Drawing***	***Primary (note 8)***
Forgings/ Bar stock	***SA 182 F304 Note 1***	***See Drawing***	***N/A***
Wash Ring Pipe	***SA 312 TP304 Note 1***	***See Drawing***	***N/A***
Steam Spargers	***SB 622 (seamless) UNS N10276***	***See Drawing***	***Auxiliary (Note 8 & 12)***
Bolting/Gaskets	***N/A***	***N/A***	***N/A***
Pulse Jet Mixer Nozzles	***Cast Stellite 12, SA-240-304 Shroud (Note1)***	***See Drawing***	***N/A***
Recirculation Nozzles	***SA 312 TP304***	***N/A***	***N/A***
PJM Cluster Fill / PJM Nozzle Fill	***See Note 13***	***See Drawing***	***N/A***

Miscellaneous Data

Orientation	***Vertical***	Support Type	***Skirt***
Insulation Function	***Not Applicable***	Insulation Material	***Not Applicable***
Insulation Thickness (inch)	***Not Applicable***	Internal Finish	***Note 2***
		External Finish	***Note 2***

Notes/Remarks

Note 1: Maximum 0.030% carbon.

Note 2: Welds descaled as laid. Grind smooth shell welds under the jacket.

Note 3: External design pressure for shell areas under the jacket shall be rated for the jacket internal design pressure plus 2.0 psig (negative) vessel external design pressure to account for ventilation fan pressure. External design pressure of 2.0 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with additional margin.(see 24590-PTF-M6C-PVP-00017).

Note 4: Deleted.

Note 5: Contents of this document are Dangerous Waste Permit affecting.

Note 6: Delete.

Note 7: This vessel is in a Black Cell.

Note 8: All welds forming part of the primary and auxiliary containment including nozzle attachment welds shall be subjected to 100% volumetric examination.

Note 9: Not used.

Note 10: Deleted.

Note 11: Vessel is heated to 194 °F and maintained at that temperature for roughly 8 to 16 hours digestion period. Little to no coolant flow through cooling jacket during that period of time occurs, (see 24590-WTP-RPT-ENG-06-014).

Note 12: The material for Nozzles N12 and N27 and the steam sparger riser and ring pipe connected to these nozzles shall be SB-622 UNS No. N10276 (Hastelloy 276). Also, the material for the steam sparger ring support shall be SB-622 (or SB-575) UNS No. 10276. For each hole area on the steam sparger ring, a weld deposit buildup with Stellite 21 shall be provided.

Note 13: (a) The intent is to provide a concrete mix with low chlorides, low moisture, low porosity and inhibits corrosion. The concrete formulation and blending should follow the relevant paragraphs in ASTM C 94 Option B. The Portland cement should be Type I/II conforming to ASTM C 150. Coarse aggregates shall be no larger than 3/4" diameter. The coarse and fine aggregates should be tested for chloride content using ASTM C 1152 and requiring less than 0.01% (100 ppm) acid-soluble chloride, and by limiting the water chloride content to less than 200 ppm. The concrete mix shall include chemical admixtures, follow ASTM C494 for control over admixtures. A final report, see ASTM C494 Section 19, shall be submitted, the report is required to have a precision statement.
Additional WTP requirements:

- Do not use blast furnace slag in the concrete.
- To reduce the permeability, the water-to-cement ratio shall be low, lower than 0.40%, using a Type F admixture in quantities that have no adverse effects on fresh and hardened properties.
- To reduce the corrosion, an admixture shall be used, calcium nitrate is to be added at a concentration no more than 32 lb/yd3.
- Use Type F fly ash and silica fume, to reduce porosity, add in quantities to minimize porosity with no adverse effects on fresh and hardened properties.
- The concrete is to fill the entire cluster volume up to the bottom of the fill nozzle. Concrete shall be poured in a manner that allows for the even distribution of aggregate and mechanically vibrated to assure no major pockets or voids. Concrete is to be poured through more than one nozzle, in lifts. The seam between lifts is not important.
  - Because of the unique geometry and inability to rework or repair the concrete, assurance that the fill is complete and 100% filled via in-process observance, boroscope or other methods. Fill report shall be provided.
  - Curing: The concrete shall be thoroughly cured (at least 30 days) before the shroud is closed.
  - The seller shall submit mix design and complete procedure for concreting for buyer's approval.
  - The concrete fill can be purchased commercial

(b). Fill gap completely between PJM shroud and stellite nozzles with Aremco 646-N Ceramacast (or equal), see CCN 156345 for procedure.

Note 14: Deleted.

Note 15: Deleted.

Note 16: The whole vessel (including all the internals and the cooling jacket) to be designed, fabricated, tested to Design Level 1 (L-1) and Black Cell requirements as defined in 24590-WTP-3PS-MV00-T0001.

Note 17: Extensive Revision. Major changes are:Changed quality level, operating external pressure, added Data Reference, revised Note 3, deleted Note 4 and Note 15, revised Note 11 added Note 16 and Note 17, added functional/safety requirements, change to parent vessel cyclic data, change PJM cyclic data, added E&NS table and signature, added section for "Hydrodynamic Loads -Pulse Jet Mixers", added section for "Multiple Overblow Loading - PJMs". added Section for Nozzle Loads, added EQ section. If any Sections contain a revision triangle next to the Section heading, it means the entire section has been revised or is new - the entire section must be reviewed for changes/additions, change to hydrodynamic loads for normal operations, change to PJM cyclic data. Added Attachment 1 for BNI use only.

Note 18: Revised the following: Note 3, Note 11, Note 13 and Note 16. Design Considerations for Loads Induced by Pulse jet Mixers (PJMs), Hydrodynamic Loads Due to PJM Operations, PJM Overblow Loads. Notes for Nozzle Loads, Equipment Qualification data to new form. Added the Steam Sparging System, deleted Note 14.

Note 19: Localized bottom Head Erosion = 0.877 in and PJM Outlet Nozzle Erosion = 0.485 in, (reference 24590-WTP-M0C-50-00004, Rev 00E, Table 10-7).

Note 20: Vendor to supply final as-built vessel empty and test weights.

Note 21: Localized corrosion/erosion allowance for the Steam Sparger holes is 0.02 inches. The steam sparger piping will have a total corrosion/erosion allowance of 0.135 (total for inside, outside, and general corrosion allowance (reference CCN 233172). The values used for the Steam Sparger corrosion/erosion (per CCN 233172) design will be superseded after issuance of the revised corrosion/erosion evaluation for this vessel. The CCN 233172 is tracked as an assumption requiring verification in the vessel seismic and stress analysis calculation.

Note 22: Vessel volumes are approximate and do not account for the manufacturing tolerances, nozzles and displacements of internals.

Seismic 11

Seismic analysis to be combined with operating conditions. When considering Seismic Loads they are only to be combined with Operating Conditions, not Design Conditions (Reference, 24590-WTP-RPT-M-07-007). The vessel is located in the Pretreatment facility, Room P-0104. The ISRS Information related to Room P-0104 of the PreTreat Facility is in figures 21E, 22E and 24E of 24590-PTF S0C-S15T-00057.

Equipment Cyclic Data Sheet - Parent Vessel 11

Component Plant Item Number:	*24590-PTF-MV-UFP-VSL-00002A*
Component Description	*Parent*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*ASME SA240 304 with 0.030 % max carbon*
Design Life	*40 Years*
Component Function and Life Cycle Description	*The system receives waste from Ultrafiltration Feed Preparation Vessels. This vessel is a high solids vessel. The waste is heated using direct steam injection and is cooled using the vessel cooling jacket and external heat exchanger. Solids will be kept suspended using the pulse jet mixers and air spargers.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*-2 (-37)*	*15*	*10*	*Nominal assumption for testing. Input values shown in parentheses are for the parent vessel shell directly under cooling jacket. Jacket design pressure is +35 psig.*
Operating Pressure	psig	*-1.5 (-36.5)* *-1.5 (-36.5)*	*0* *2.8*	*7.0E6* *40*	*Maximum Operating (vessel connected to PVP header)* *Loss of Power(assume normal operations at -1.5 psig then power loss and pressure spike to 2.8 psig). Use jacket design pressure for vessel shell covered by jacket.*
Operating Temperature	°F	*59 (50)*	*194*	*5150*	*Input values shown in parentheses are for the parent vessel shell directly under cooling jacket. Jacket minimum temperature is 50°F.*
Contents Specific Gravity		*1.0*	*1.6*	*5150*	*Liquid varies from water to slurry.*
Contents Level	inch	*0*	*395*	*5150*	
Localized Features					
Cooling Jacket (operating conditions)		*50°F chilled water inlet temp*	*50°F chilled water outlet temp*	*5150*	*Parent vessel contents are heated to 194°F with the cooling water flow shut off. After 8 to 16 hour digestion period the cooling water is returned at 50°F until the vessel contents are cooled to 77°F. (24590-WTP-RPT-ENG-06-014)*
Hot Nozzles		*59*	*358*	*5150*	*N12 and N27 are Steam Sparger inlets.*

Cyclic Data Notes- Parent Vessel 11

- ***Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.***
- ***Deleted***
- ***Hot Nozzles N12 and N27 are for Steam Sparger.***
- ***Cooling Jacket outlet temperature is taken as the coolest temperature possible at the outlet for the more conservative structural response.***

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Equipment Cyclic Data Sheet - PJMs (11)

Component Plant Item Number:	*UFP-PJM-00006, UFP-PJM-00007, UFP-PJM-00008, UFP-PJM-00009, UFP-PJM-00010, UFP-PJM-00011*
Component Description	*Pulse Jet Mixers (PJM)*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*ASME SA240 304 with 0.030% max carbon*
Design Life	*40 Years*
Component Function and Life Cycle Description	*These pulse jet mixers (PJMs) are cyclically loaded using vacuum to fully fill the PJM with process liquid and compressed air to empty the PJM. The PJMs are contained within a parent vessel with varying liquid level. They shall be designed to cycle between the maximum operating pressure and the minimum operating pressure plus the external static head imposed by the parent vessel. The PJM supports shall be designed to cycle between fully buoyant (PJM empty and parent vessel full) and fully loaded (PJM full and parent vessel empty) states. Thrust load shall be applied only to the fully buoyant state. Assume the parent vessel is full for 50% of the number of PJM cycles.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*80*	*100*	*24590-PTF-MVC-10-00003 & 24590-PTF-M6-UFP-00010004, 00010005, 00010006 - ITS pressure set at 75 psig. Not to be used concurrent with seismic or other occasional loads*
Operating Pressure	psig	*FV*	*52*	*9.0E6*	*24590-QL-POA-MPE0-00002-25-02 & 24590-PTF-MVC-10-00003 (25% contingency added)*
Operating Temperature	°F	*59*	*194*	*5150*	*Same as Parent Vessel*
Contents Specific Gravity		*1.0*	*1.6*	*5150*	*Same as Parent Vessel*
Contents Level	inch	*Empty*	*Flooded*	*9.0E6*	
Thrust	lbf	*-420*	*420*	*9.0E6*	
Localized Features					
Nozzles					
Supports		*Buoyant*	*Loaded*	*9.0E6*	

Cyclic Data Notes- PJM

- ***Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.***

Equipment Cyclic Data Sheet – Steam Spargers 11

Component Plant Item Number:	*There is no Component Plant Item Number associated with Nozzles N12 and N27*
Component Description	*Steam Spargers*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction		*Hastelloy C-276 (UNS N10276)*			
Design Life		*40 Years*			
Component Function and Life Cycle Description		*The Steam Spargers will heat the process fluid until it gets up to temperature for digestion and will sustain this temperature for the time required to complete digestion. It will take up to approximately 9 hrs to heat and from 8 to 16 hrs to digest, (24590-WTP-RPT-ENG-06-014). The Steam Sparger is pressurized by air until the vessel is full and steam is introduced. The vessel heating occurs 5150 times in the life of the vessel (40 years). When steam heating is no longer required the Steam Spargers are again pressured by air.*			
Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*160*	*10*	*Nominal assumption for testing. Pressures are for steam which bounds the air pressure design pressures.*
Operating Pressure	psig	*FV*	*135*	*5150*	
Operating Temp	°F	*59*	*358*	*5150*	*Steam operating pressures bound air values. 358 °F is saturation temperature at 135 psig. Minimum temperature same as parent vessel. Steam temperature bounds air maximum temperatures.*
Contents Specific Gravity		*Air*	*Steam*	*5150*	*Air pressure will be used to keep slurry out of pipe.*

Equipment Cyclic Data Sheet Notes 11

- *Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.*
- *Recommended corrosion allowance 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch general erosion allowance.)*
- *Localized corrosion/erosion allowance for the Steam Sparger holes is 0.031 inches. (reference CCN 233172).*
- *This vessel will experience 5150 heated batch cycles over the 40 year life of the plant.*

Design Considerations for Loads Induced by Pulse Jet Mixers (PJMs) △11

Pulse Jet Mixers (PJMs) are designed to mix the vessel contents using a liquid jet discharge. PJMs are driven by compressed air. The mixing is required to enhance heat transfer, to break up hydrogen-containing particles, and to homogenize the solution. Normally, the PJMs are operated simultaneously within the parent vessel.

The PJMs operate in the following three cycles: Suction, Drive and Vent. During the suction cycle a vacuum is created in the PJM headspace and the level within the PJM rises to fill the PJM. During the drive cycle the PJM is pressurized and liquid is discharged. During the vent cycle, the pressure in the headspace approaches atmospheric and the level within the PJM is allowed to reach equilibrium.

Vessel components shall be designed to withstand loading induced by PJM operations as described herein.

Normal Operations: Liquid flows around internal structures within the parent vessel producing hydrodynamic loads such as drag and vortex shedding.

To mitigate the dynamic effects, the following pipe sizes dipped internal to the vessel are required to have a minimum first natural frequency that is double the vortex shedding frequency:

Nominal Pipe Size	Minimum First Natural Frequency
1 inch	7.4 Hz*
2 inch	4.0 Hz*
3 inch	2.74 Hz**

* See 24590-WTP-MVC-50-00006, Section 8.1.1.2
** By extrapolation from 1 inch and 2 inch

Overblow Condition: Occasionally the drive cycle lasts too long and compressed air is discharged from the PJM. Overblows can also occur during system calibration. One or multiple PJMs may overblow at any time. These conditions induce acoustic and bubble rise loads on structures.

All internal components shall be designed for the combination of normal operational hydrodynamic loads and overblow loads. Single overblows (SOB) are assumed to act concurrently with the seismic event, however multiple overblows (MOB) are not assumed to act concurrently with the seismic event. Figure 1 (below) provides the acoustic load intensity that encompasses both SOB and MOB.

Hydrodynamic Loads Due to PJM Operations △11

Normal operation imposes a cyclical load ranging between 0.040 and -0.059 psi in the radial direction and 0.150 to -0.024 psi in the vertical direction for 9.0E6 cycles. The hydrodynamic pressure applies across the projected area of the component. Positive hydrodynamic forces act in the radial, outward direction and the vertical, upward direction. Seller shall apply the radial load simultaneously in the radial direction and normal to the radial direction in the horizontal plane.

PJM Overblow Loads (11)

Discussion: *During normal operation, pulse jet mixers (PJMs) mix the fluid by pulling in (suction) and pushing out (drive) fluid. During an upset condition, designated as an 'overblow', air is discharged following the drive cycle of one or more PJMs. The load consists of acoustic pressure (2Hz to 200Hz) developed in the first 200ms of the event and a load due to the bubble rising through the fluid.*

The acoustic load and the bubble load are design loads as defined by ASME B&PVC, Section VIII, Division 1, UG-22, applied statically. The acoustic load is not added to the bubble rise load because they occur at different times during the overblow event.

Acoustic Load	• ***The acoustic design load in Figure 1 is applied to the visible (as viewed from the overblow origin) surface of cylindrical targets such as pipes, charge vessels, and PJMs. The load is applied in the direction normal to the principal axis of the target as illustrated in Figure 2. Note: The intended net effective load on the target is equal to the projected (i.e. cross-sectional) area of the object times the acoustic design load (psi) indicated in Figure 1.*** • ***Each target is considered independent of the surrounding targets: e.g. the surrounding targets do not impede the acoustic wave by casting a shadow, as illustrated in Figure 2.*** • ***The load is <u>not</u> applied to small supports such as gussets, brackets, tabs, clamps, and bolts because they are rigid and the pressure drop across the target is negligible.*** • ***When the vessel contains multiple PJMs, the load from one PJM is independent of the load from other PJMs. The loads are not additive for multiple overblows.*** • ***No internal components shall be placed within 5 PJM nozzle diameters (5 * 4 in = 20 in) of a spherical zone centered at any overblowing PJM nozzle.***

Figure 1: Acoustic Design Load

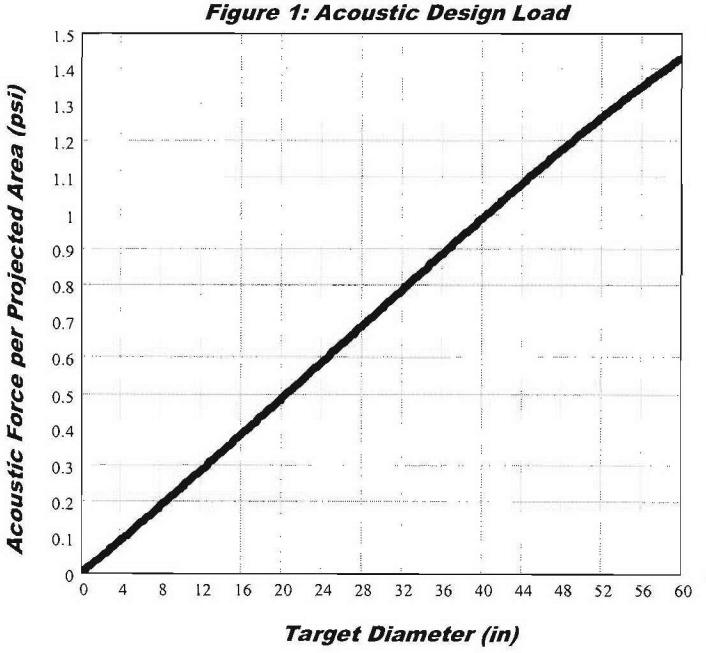
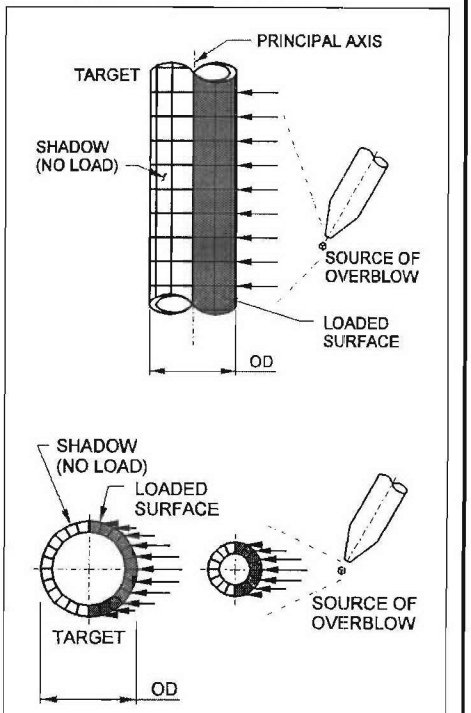


Figure 2: Load Application



The following data is required to determine the load:

- ***Target Diameter***
- ***Target Principal Axis***
- ***Overblow Source Coordinates***

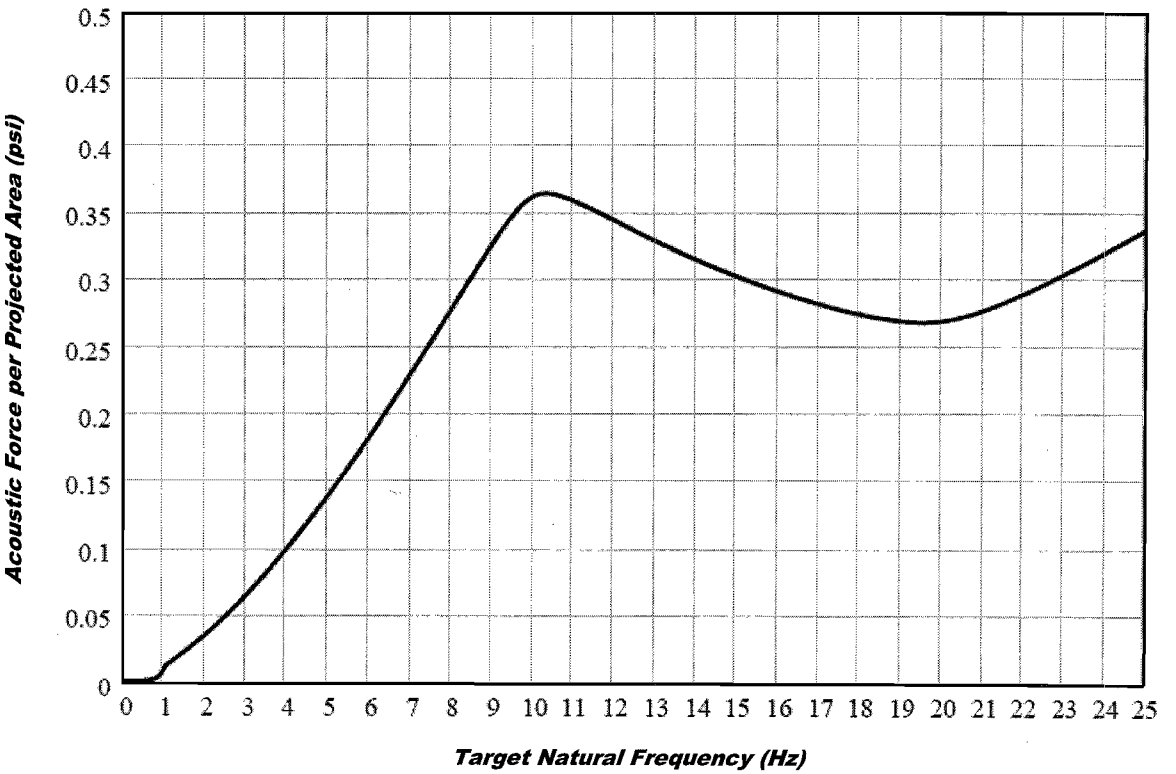
Number of Acoustic Cycles	***1000 events X 40 cycles/event for a total of 40,000 acoustic cycles.***
Bubble Rise Load	***A vertical force per projected area of 1.7 psi is applied to the surfaces in the 36-inch diameter cylindrical zone centered at the overblowing PJM(s). The bubble can be at any elevation above the overblowing PJM and only affects one zone (36-inch diameter region) at a time. When there are multiple PJMs in a vessel (MOB), each PJM has it's own bubble. To simplify analysis the bubble can be applied in a continuous cylindrical zone above each PJM top head.***
Number Bubble Rise Cycles	***1000 events X 1 cycle/event for total of 1000 cycles.***

PJM Cluster Overblow Load (11)

Discussion: *The acoustic design pressure on the cluster is determined from equation 5-8 in 24590-WTP-MVC-50-00011, Rev B. The worst-case orientation of the load needs to be determined by the user.*

Acoustic Load	***The following is the load magnitude for the PJM Cluster in HLP-VSL-00027A/B/28 with an outer radius of 89.5 inches measured to the outer most radii of the cluster. Follow the steps described below:*** ***1. Isolate the PJM Cluster and supports from parent vessel*** ***2. Run a modal analysis and determine the first frequency*** ***3. Use Figure 3 (below) to find the acoustic force per projected area*** ***4. Apply the static load in the same orientation as indicated in Figure 2 (above)***
Number of Acoustic Cycles	***1000 events X 40 cycles/event***

Figure 3: Acoustic Design Pressure on Cluster



Nozzle Loads (11)

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N01	113	120	3"	Weight	54	182	52	91	57	100
				Seismic	546	324	319	1153	1043	788
				Thermal	171	279	229	383	768	768
N02	15	212	8"	Weight	234	731	234	555	348	2250
				Seismic	4198	1444	3479	3869	10201	2363
				Thermal	893	1083	1193	2700	5394	9000
N03	145	212	12"	Weight	364	582	364	2033	1275	1275
				Seismic	3374	2321	2660	13781	20738	20738
				Thermal	4090	1424	2524	9300	18600	18600
N05	190	194	3"	Weight	52	84	52	107	67	67
				Seismic	284	189	341	737	1348	1103
				Thermal	171	259	229	448	898	930
N07	170	150	2"	Weight	50	90	50	57	57	57
				Seismic	186	123	186	212	319	319
				Thermal	114	100	152	130	259	259
N08	15	212	3"	Weight	52	318	52	117	74	74
				Seismic	284	303	284	810	1213	1213
				Thermal	171	328	229	493	988	988
N09	170	175	2"	Weight	50	120	50	60	60	60
				Seismic	186	123	186	222	334	334
				Thermal	114	100	152	136	272	272
N10	170	175	2"	Weight	50	60	50	57	57	57
				Seismic	186	123	186	210	315	315
				Thermal	114	100	152	195	256	256
N11	15	212	3"	Weight	52	112	52	99	63	81
				Seismic	350	189	284	688	1029	1029
				Thermal	171	153	229	418	838	838
N12	160	375	4"	Weight	87	249	87	279	125	603
				Seismic	770	385	480	1509	2147	2147
				Thermal	310	299	450	878	1757	1757
N13	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	270	123	186	277	415	415
				Thermal	114	158	152	169	337	337
N14	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	200	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N15	124	140	2"	Weight	50	76	50	75	75	75
				Seismic	186	189	186	277	415	415
				Thermal	114	142	152	169	337	337

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N16	124	140	2"	Weight	50	99	50	75	75	75
				Seismic	186	313	186	341	415	415
				Thermal	114	100	152	169	337	337
N17	124	140	2"	Weight	50	60	50	72	72	72
				Seismic	186	123	186	264	397	397
				Thermal	114	171	152	162	323	323
N18	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N20	197	212	2"	Weight	50	77	50	57	57	100
				Seismic	186	123	186	212	131	613
				Thermal	114	100	152	130	100	75
N23	15	212	24"	Weight	Manway					
				Seismic						
				Thermal						
N24	169	120	3"	Weight	52	419	52	108	68	68
				Seismic	284	399	284	1003	1115	1115
				Thermal	171	153	229	453	908	908
N25	15	212	8"	Weight	234	373	234	741	464	464
				Seismic	1285	858	1285	5159	7732	7732
				Thermal	893	795	1193	3600	7193	7193
N26	112	120	3"	Weight	52	358	52	116	73	73
				Seismic	284	340	284	802	1201	1201
				Thermal	171	153	229	488	978	978
N27	160	375	4"	Weight	87	249	87	279	125	603
				Seismic	770	385	480	1509	2147	2147
				Thermal	310	299	450	878	1757	1757
N34	145	212	3"	Weight	52	160	52	275	69	300
				Seismic	284	194	284	761	1139	350
				Thermal	290	153	736	463	928	928
N38 Parent	100	212	6"	Weight	N38 is parent nozzle, nozzle loads are applied via N38A, N38B, N38C					
				Seismic						
				Thermal						
N38A (Note D)	15	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	39	40	38	77	77
N38B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	38	40	38	77	77

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N38C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N41	15	113	2" OD	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N44	30	138	2"	Weight	50	60	50	54	54	54
				Seismic	186	123	196	359	298	298
				Thermal	114	198	152	133	242	242
N45	140	212	10"	Weight	264	1417	264	600	600	300
				Seismic	5912	1393	3532	9625	19425	19688
				Thermal	953	1473	1268	8450	250	450
N48	35	140	6"	Weight	210	335	210	598	374	462
				Seismic	1160	775	1314	4240	6367	6367
				Thermal	735	654	983	2685	5370	5370
N49	35	140	6"	Weight	210	335	210	376	235	235
				Seismic	1160	775	1160	2671	4009	4009
				Thermal	735	654	983	1691	3383	3383
N51	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N52	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N53	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N54	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N55	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N56	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N57	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N58	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N59	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N60	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N61	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N62	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N63	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N64	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N65	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N66	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N69 Parent	100	212	6"	Weight	N69 is parent nozzle, nozzle loads are applied via N69A, N69B, N69C					
				Seismic						
				Thermal						
N69A (Note D)	15	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N69B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N69C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N70 Parent	100	212	6"	Weight	N70 is parent nozzle, nozzle loads are applied via N70A, N70B, N70C					
				Seismic						
				Thermal						
N70A (Note D)	15	212	1"	Weight	15	23	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N70B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N70C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N76	15	212	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800
N77	15	212	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800

Notes for Nozzle Loads

A. Direction of load application is per diagrams in 24590-WTP-3PS-MV00-T0001 Appendix A.

B. For nozzles in head: x = North/South, y = Vertical, and z = East/West - Vessel 0° defined as north.

C. Nozzle loads shown are to be used in place of those specified in 24590-WTP-3PS-MV00-T0001 – do not apply any thermal reduction factors.

D. Values provided at plate on top of parent nozzle.

E. Design Pressure and Temperatures to be used for Nozzle Qualification only. 11

F. Use Vessel internal pressures and temperatures for nozzle design 11

G. All Pretreatment RGM Seismic Piping Nozzles loads from Plant Design have a 1.75 load factor applied to all seismic loads to address coupling effects between the flexible vessels and piping in accordance with the Seismic Classification and Evaluation for the Pretreatment Facility Piping and Vessels, 24590-WTP-RPT-ENG-09-040. (BNI use only, see 24590-WTP-GPG-ENG-0150, Rev 0 for nozzle load management).

H. HPAV nozzles loads are provided from the Vessel Analysis Group to Plant Design via a CCN to communicate the results of the Stress Analysis Calculation in which HPAV nozzles have been identified requiring evaluation. 11

Equipment Identification		
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-UFP-VSL-00002A	Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MVD-UFP-00014	
Description	Ultrafiltration Feed Vessel for the Ultrafiltration Process System (UFP)	Seismic Category ☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	Located in PTF Room P-0104, Elev. 0'-0", colume lines J/14.5	
Safety Function(s)	UFP-VSL-00002A (parent vessel) is considered a high active process vessel credited to prevent spills of large quantities of high activity process liquid and provide primary confinement for radioactive releases. Reference: 24590-WTP-PSAR-ESH-01-002-02,Section 4.3.5. Pulse Jet Mixers (PJMs) provide a mixing function in the vessel to provent hydrogen accumulation. Air sparger piping provides air to mix solids and dilute hydrogen to prevent hydrogen accumulation. Vessel level instrumentation which includes the bubbler tubes, provides level monitoring to prevent overflows of non-Newtonian fluids into Newtonian overflow vessles and ensure proper headspace volumes are maintained for hydrogen dilution. Reference: 24590-WTP-PSAR-ESH-01-002-02, Section 4.3.4	
Equipment Safety Function Type	☒ Passive Mechanical	☐ Active Mechanical ☐ Electrical
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☒ During Seismic Event	☒ After Seismic Event ☐ None

Equipment Environmental Qualification (EEQ)

(Parameter values stated in this section do not include process conditions or operation induced conditions)

Classification of Environment ☒ Mild ☐ Harsh

Qualified Life (years) ☒ 40 ☐ Other

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note a	Years	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	59	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	90	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	5	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g.)	0 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g.)	(-) 1.4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mRad/hr)	533000 (E-Note 4)	40 (E-Note 3)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	N/A			
Abnormal Ambients				
High Temperature (°F)	127	8	hours / year	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	6	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	533000 (E-Note 4)	0 (E-Note 3)	Years (Note e-2)	24590-PTF-U0D-W16T-00001, E-Note 1
Exposure to Wet Sprinkler System	☐ Yes ☒ No	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional Abnormal Ambient Information	N/A			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	135	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	40	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	6	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	533000 (E-Note 4)	0 (E-Note 3)	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Submergence	☐ Yes ☒ No (E-Note 5)	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Chemical/Spray Exposure	☒ Yes ☐ No	12.5	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional DBE Information	N/A			

DBE Chemical Exposure Details

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	Process Rad Condensate Nitric Acid 2M Sodium Hydroxide 2M Sodium Permanganate 1M Strontium Nitrate 1M Water Neutral Solution (RLD45), 77 F, pH 7.0 Sodium Hydroxide (PVP04), 77 F, pH 12.0 Sodium Hydroxide (UFP26), 77 F, pH 14.5 Sodium Hydroxide (PVP02), 77 F, pH 15.0 Sodium Hydroxide (UFP01), 77 F, pH 15.5 Sodium Hydroxide (UFP04), 77 F, pH 15.5 Sodium Hydroxide (PVP06), 79 F, pH 12.5 Sodium Hydroxide (UFP33), 84 F, pH 14.5 Soduim Hydroxide (FRP13), 110 F, pH 14.5 Sodium Hydroxide (HLP09), 113 F, pH 13.5 Souium Hydroxide (HLP11), 113 F, pH 14.5 Sodium Hydroxide (HLP12), 113 F, pH 15.0 Sodium Hydroxide (HLP13), 113 F, pH 15.0 Sodium Hydroxide (TCP05), 120 F, pH 15.0 Sodium Hydroxide (FEP19), 121 F, pH 15.0 Sodium Hydroxide (FRP14), 191 F, pH 15.0

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Mechanical Interfaces	
Mounting Configuration (orientation)	A vertical vessel with a support skirt, mounted on the base ring beam, which is welded to the embed plate.
Mounting Method (bolts, welds, etc.)	Welded skirt to ring beam welded to embedment plates. Embedment plate details per 24590-PTF-DD-S13T-00039, 24590-PTF-DD-S13T-00036, 24590-PTF-DD-S13T-00043, 24590-PTF-DDS13T-00045 provided to the vendor in the material requisition.
Auxiliary Devices	UFP-PJM-00006, UFP-PJM-00007, UFP-PJM-00008, UFP-PJM-00009, UFP-PJM-00010, UFP-PJM-00011

Equipment Seismic Qualification (ESQ)				
Parameter	**Title**	**Reference/Document Number**	**Version / Revision**	**Remarks**
WTP Seismic Design Specification	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. Engineering Specification for Seismic Qualification Criteria for Pressure Vessels.	24590-WTP-3PS-SS90-T0001 24590-WTP-3PS-MV00-T0002	2 3	N/A
Specified Seismic Load Parameters	Seismic Analysis of Pretreatment Building-WSGM In Structure Response Spectre (ISRS)	24590-PTF-S0C-S15T-00057	A	Seismic Response Spectra Curves: Figures , 21E, 22E and 24E. CCN 185271

Equipment Qualification Notes and Additional Information

a) For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

b) The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.

c) The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

d) If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

e) (1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

(2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

f) The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

g) Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.

h) The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

i) Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

Equipment Qualification Notes and Additional Information
E-Note 1: BNI (BUYER) shall perform Equipment Environmental Qualification in accordance with 24590-WTP-DC-ENG-06-001, Design Criteria for Environmental and Natural Phenomena Hazard Qualification of Equipment.
E-Note 2: Where pressure is given in inches of water column (in-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in-w.g.).
E-Note 3: Supplier (SELLER) shall perform Equipment Seismic Qualification in accordance with the listed parameters and the applicable specification requirements.
E-Note 4: Normal environmental conditions shall be taken to exist over a 40 year period less the duration for which abnormal conditions exist. DBE durations are in addition to the normal and abnormal durations. Further, whenever the normal, abnormal, and DBE radiation dose rates are the same, the normal radiation dose integrated over 40 years adequately accounts for dose during the abnormal and DBE conditions and hence the Abnormal and DBE radiation dose duration are shown as 0.
E-Note 5: The flood height of 2.08 ft does not create a submergence issue with this vessel.

DOE Radioactive Materials Disclaimer:

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Screening / Evaluation Required? If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below	X	Yes		No

Approval

Rev	Description	System Engineer	Vessel Engineer	Checked	Reviewed/ MET	E&NS	Approved	Date
0	Issued for Purchase	M. Askar	HK	US/RDS	J.Julyk	N/A	MWH	05/06/03
1	Revised as Noted	M. A	HK	CS	JJ	N/A	MWH	08/18/03
2	Revised as Noted	MA	HK	PA/CS	RES	N/A	MWH	11/14/03
3	Revised as Noted	MA	HK	PA/CS	JJ	N/A	MWH	02/05/04
4	Revised as Noted	M. Askar	H. Khurana	P. Aviguetero C. Slater	J. Julyk	N/A	M. Hoffmann	05/10/04
5	Revised as Noted	M. Askar	H. Khurana	P. Aviguetero C. Slater	J. Julyk	N/A	M. Hoffmann	03/10/05
6	Deleted Note 10 on sheet 2	M. Askar	H. Khurana	SC/ C. Slater	J. Julyk	N/A	M. Hoffmann	04/12/05
7	Revised concrete for cluster fill per note 13. Revised overblow condition loads. Number of overblow cycles revised to 1000 from 100.	M. Askar	H. Khurana	C. Slater	RES	N/A	M. Hoffmann	06/30/05
8	Revised per note 14 on page 2 and as noted	M. Askar	H. Khurana	JRP/APP	DB/CS	N/A	J. Julyk	10/22/05
9	Revised as noted. Incorporated SDDR #24590-WTP-SDDR-M-06-00129.	J. Medina	H. Khurana	M Arulumpalu m D Adler	C. Slater/ R. Stevens	N/A	J. Julyk	04/04/06
10	Revised per Note 17 on page 2.	D. Vo	M. Seed	R Peters	D. Adler	C. Lindquist	J Julyk	4/14/09
11	Revised per Note 18 and as noted by revision triangles. Supersedes 24590-PTF-MVD-UFP-P0014, Rev 2.	D. Vo	B. Dunlap	B. Makadia	D. Adler	J. Hinckley	J Julyk	5/20/11

REFERENCE for Data Sheet 24590-PTF-MVD-UFP-00014/00015, Rev 11 (For BNI Use Only)
Vessel Tags: UFP-VSL-00002A/B

Data	Document #	Rev	Document Title/ Comments
Quality Level	24590-PTF-M6-UFP-00002001 24590-PTF-M6-UFP-00003001	0 0	*P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A* *P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*
Seismic Category	24590-PTF-M6-UFP-00002001 24590-PTF-M6-UFP-00003001	0 0	*P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A* *P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*
Design Specific Gravity	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties*
Max Operating Volume	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Total Volume	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Inside Diameter	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Length TL-TL	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Operating Pressure (external)	24590-PTF-M6C-PVP-00017	A	HADCRT Analysis of PTF PVP System at various Operating Scenarios / (see sheet 14 - the PVP scrubber inlet is controlled to 35 in-wg) External pressure of 1.5 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with an additional margin.
Operating Pressure (internal)		N/A	*Maximum value possible assuming fans off is atmospheric pressure*
Design Pressure (internal)	24590-WTP-DB-ENG-01-001	01P	*Basis of Design/* use 15 psig
Design Pressure (external)	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis of PTF PVP System at Various Operating Scenarios/* use operating with 30% margin
Jacket Design Pressure (internal)	24590-PTF-MVC-10-00003 24590-PTF-M6C-10-00008	C 00A	*PTF Vessel Cyclic Datasheet Inputs/ (* 24590-PTF-MVE-10-00012*)* *Overpressure Protection Evaluation for PTF Process Vessel Cooling Jackets /* For the Cooling Jacket pressure parameter(35psig).
Operating Temp	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties/* Table 4-18
Design Temp	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties/* Table 4-18
Jacket Design Temp	24590-PTF-MVC-UFP-00006	E	*Design of Cooling Jacket for Ultrafiltration feed Vessels UFP-2A/2B* 50°F for chilled water inlet Same as parent vessel assuming little or no flow during steam heating - 212°F
Corrosion Allowance, Erosion allowance	24590-PTF-N1D-UFP-00003	5	*Corrosion Evaluation UFP-VSL-00002A/B*
Materials of Construction	24590-PTF-MV-UFP-00003 24590-PTF-MV-UFP-00004	4 4	*Equipment Assembly Ultra filtration Feed Vessel UFP-VSL-00002A* *Equipment Assembly Ultra filtration Feed Vessel UFP-VSL-00002B*
Design Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00012)
Operating Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* /additional margin added (25%) (24590-PTF-MVE-10-00012)
Operating Temperature (PJM)			*Same as parent vessel*
Cyclic Data (Vessel)	24590-PTF-MVC-10-00003 24590-PTF-MVC-UFP-00006	C E	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00005) *Design of Cooling Jacket for Ultrafiltration feed Vessels UFP-2A/2B* / cooling jacket temperatures (min, max)
Cyclic Data (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* / used for number of cycles (24590-PTF-MVE-10-00012*)*

REFERENCE for Data Sheet 24590-PTF-MVD-UFP-00014/00015, Rev 11 (For BNI Use Only)
Vessel Tags: UFP-VSL-00002A/B

Data	Document #	Rev	Document Title/ Comments
Cyclic Data (Steam Spargers)	24590-WTP-RPT-ENG-06-014	0	*Technical Report-Design Evaluations Supporting Resolution of External Flowsheet Review Team (EFRT).* use for digestion time of 8 hours.
	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs*
	24590-PTF-M6C-UFP-00022	A	*Sizing of Steam Sparger Rings and Associated Piping for UFP-VSL-00002A/B* / for steam pressure of 71 psig see Figure 1 on sheet 15, (saturation temp of 316 F for P= 71 psig)
	24590-PTF-M6X-UFP-00298	0	*MS Line List for P&ID 24590-PTF-M6-UFP-00002001* / used 160 psig for design pressure for high pressure steam lines, for UFP-VSL-00002A only.
	24590-PTF-M6X-UFP-00499	0	*MS Line List for P&ID 24590-PTF-M6-UFP-00003001* / used 160 psig for design pressure for high pressure steam lines, for UFP-VSL-00002B only.
Hydrodynamic Loads	24590-WTP-MVC-50-00006	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with non-Newtonian Fluids* / use for pressure
	24590-PTF-MVC-10-00003	C	PTF Vessel Cyclic Datasheet Inputs / used for number of cycles (24590-PTF-MVE-10-00012)
Single PJM Overblow Loads	24590-WTP-MVC-50-00011	B	*Pulse Jet Mixer Overblow Vessel Loads*
Single Overblow cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (*24590-PTF-MVE-10-00004*)*
Multiple Overblow Cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (*24590-PTF-MVE-10-00004)
Nozzle Loads *(UFP-VSL-00002A only)*	CCN 230862	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00002A*
	CCN 124015	N/A	*Nozzle Design Loads for UFP-VSL-00002A*
	CCN 227905	N/A	*UFP-VSL-00002A Nozzle N08 Design Loads*
Nozzle Loads *(UFP-VSL-00002B only)*	CCN 230863	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00002B*
	CCN 124016	N/A	*Nozzle Design Loads for UFP-VSL-00002B*
Nozzle Design Temp - Design Pressure *(UFP-VSL-00002A only)*	24590-PTF-M6X-UFP-00298	0	*MS Line List for 24590-PTF-M6-UFP-00002001 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00302	0	*MS Line List for 24590-PTF-M6-UFP-00002002 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00221	0	*MS Line List for 24590-PTF-M6-UFP-00010007 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00256	0	*MS Line List for 24590-PTF-M6-UFP-00021001 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00257	0	*MS Line List for 24590-PTF-M6-UFP-00021002 UFP-VSL-00002A*
	24590-PTF-M6X-HLP-00343	0	*MS Line List for 24590-PTF-M6-HLP-00010003-HLP-VSL-00002A*
Nozzle Design Temp - Design Pressure *(UFP-VSL-00002B only)*	24590-PTF-M6X-UFP-00499	0	*MS Line List for 24590-PTF-M6-UFP-00003001 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00500	0	*MS Line List for 24590-PTF-M6-UFP-00003002 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00221	0	*MS Line List for 24590-PTF-M6-UFP-00010007 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00261	0	*MS Line List for 24590-PTF-M6-UFP-00022001 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00262	0	*MS Line List for 24590-PTF-M6-UFP-00022002 UFP-VSL-00002B*
	24590-PTF-M6X-HLP-00338	0	*MS Line List for 24590-PTF-M6-HLP-00010002 HLP-VSL-00002B*
Equipment Environmental Qualification (EEQ)	24590-PTF-U0D-W16T-00001	2	*PTF Room Environment Data Sheet (*24590-PTF-U0N-W16T-00007*)*
Nozzle Load Management	24590-WTP-GPG-ENG-0150	0	*Plant Design/Mechanical System Equipment Interfaces: Terminal End Equipment / CCN 229865*

MECHANICAL SYSTEMS DATA SHEET: VESSEL

PLANT ITEM No. ***24590-PTF-MV-UFP-VSL-00002B***

R11376342

Project:	***RPP-WTP***	P&ID:	***24590-PTF-M6-UFP-00003001, 00003002, 00010007, 00022001, 00022002; 24590-PTF-M6-HLP-00010002***
Project No:	***24590*** 11	Calculations:	***Attachment 1***
Project Site:	***Hanford***	Vessel Drawing	***24590-PTF-MV-UFP-00004/00017/00018***
Description:	***Ultrafiltration Feed Vessel*** 11	Reports/ other Documents	***Attachment 1***

ISSUED BY RPP-WTP PDC

Reference Data 11

Charge Vessels (Tag Numbers)	***N/A***
Pulse jet Mixers / Agitators (Tag Numbers)	***UFP-PJM-00012, UFP-PJM-00013, UFP-PJM-00014, UFP-PJM-00015, UFP-PJM-00016, UFP-PJM-00017***
RFDs/Pumps (Tag Numbers)	***N/A***

Design Data 11

Quality Level	***Q (See Note 16)***	Fabrication Specs	***24590-WTP-3PS-MV00-T0001***			
Seismic Category	***SC-I (See Note 16)***	Design Code	***ASME Section VIII Division 1***			
Service/Contents	***Radioactive Liquid***	Code Stamp	***Yes***			
Design Specific Gravity	***1.6***	NB Registration	***Yes***			
Maximum Operating Volume gal	***35,404 (Note 22)***	Weights (lbs)	Empty	Operating	Test	
Total Volume gal	***39,629 (Note 22)***	**Estimated (Note 20)**	***185,000***	***658,000***	***503,000***	
Equipment Qualification	***See EQD Sections***					

Inside Diameter	inch	***168***					Wind Design	***Not Required***
Length/Height (TL-TL)	inch	***369***					Snow Design	***Not Required***
		Vessel Operating	Vessel Design	Coil/Jacket Design	Sparger Operation	Sparger Design	Seismic Design	***24590-WTP-3PS-MV00-T0002*** ***24590-WTP-3PS-SS90-T0001***
Internal Pressure	psig	***ATM***	***15***	***35***	***135***	***160***		
External Pressure	psig	***1.5 (Note 3)***	***2 (Note 3)***	***0***	***ATM***	***15***	Postweld Heat Treat	***Not Required***
Temperature	°F	***194***	***230***	***230 max (Note 11)***	***358***	***375***	Corrosion Allowance ***(Note 19)***	Inch ***0.040 for all wetted surfaces including jacket***
Min. Design Metal Temp.	°F	***40***						

Materials of Construction 11

Component	Material	Minimum Thickness / Size	Containment
Top Head	***SA 240 304 Note 1***	***See Drawing***	***Auxiliary (note 8)***
Shell	***SA 240 304 Note 1***	***See Drawing***	***Primary (note 8)***
Bottom Head	***SA 240 304 Note 1***	***See Drawing***	***Primary (note 8)***
Support	***SA 240 304 Note 1***	***See Drawing***	***N/A***
Jacket/Coils/Half-Pipe Jacket	***SA 240 304 Note 1***	***See Drawing***	***N/A***
Internals	***SA 240 304 Note 1***	***See Drawing***	***Thermowells Primary***
Pipe Nozzles	***SA 312 TP304 Note 1***	***See Drawing***	***Primary (note 8)***
Forgings/ Bar stock	***SA 182 F304 Note 1***	***See Drawing***	***N/A***
Wash Ring Pipe	***SA 312 TP304 Note 1***	***See Drawing***	***N/A***
Steam Spargers	***SB 622 (seamless) UNS N10276***	***See Drawing***	***Auxiliary (Note 8 & 12)***
Bolting/Gaskets	***N/A***	***N/A***	***N/A***
Pulse Jet Mixer Nozzles	***Cast Stellite 12, SA-240-304 Shroud (Note 1)***	***See Drawing***	***N/A***
Recirculation Nozzles	***SA 312 TP304***	***N/A***	***N/A***
PJM Cluster Fill / PJM Nozzle Fill	***See Note 13***	***See Drawing***	***N/A***

Miscellaneous Data

Orientation	***Vertical***	Support Type	***Skirt***
Insulation Function	***Not Applicable***	Insulation Material	***Not Applicable***
Insulation Thickness (inch)	***Not Applicable***	Internal Finish	***Note 2***
		External Finish	***Note 2***

Notes/Remarks

Note 1: Maximum 0.030% carbon.

Note 2: Welds descaled as laid. Grind smooth shell welds under the jacket.

11 ***Note 3:*** External design pressure for shell areas under the jacket shall be rated for the jacket internal design pressure plus 2.0 psig (negative) vessel external design pressure to account for ventilation fan pressure. External design pressure of 2.0 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with additional margin.(see 24590-PTF-M6C-PVP-00017).

Note 4: Deleted.

Note 5: Contents of this document are Dangerous Waste Permit affecting.

11 ***Note 6:*** Delete.

Note 7: This vessel is in a Black Cell.

Note 8: All welds forming part of the primary and auxiliary containment including nozzle attachment welds shall be subjected to 100% volumetric examination.

Note 9: Not used.

Note 10: Deleted.

11 ***Note 11:*** Vessel is heated to 194 °F and maintained at that temperature for roughly 8 to 16 hours digestion period. Little to no coolant flow through cooling jacket during that period of time occurs, (see 24590-WTP-RPT-ENG-06-014).

Note 12: The material for Nozzles N12 and N27 and the steam sparger riser and ring pipe connected to these nozzles shall be SB-622 UNS No. N10276 (Hastelloy 276). Also, the material for the steam sparger ring support shall be SB-622 (or SB-575) UNS No. 10276. For each hole area on the steam sparger ring, a weld deposit buildup with Stellite 21 shall be provided.

11 ***Note 13:*** (a) The intent is to provide a concrete mix with low chlorides, low moisture, low porosity and inhibits corrosion. The concrete formulation and blending should follow the relevant paragraphs in ASTM C 94 Option B. The Portland cement should be Type I/II conforming to ASTM C 150. Coarse aggregates shall be no larger than 3/4" diameter. The coarse and fine aggregates should be tested for chloride content using ASTM C 1152 and requiring less than 0.01% (100 ppm) acid-soluble chloride, and by limiting the water chloride content to less than 200 ppm. The concrete mix shall include chemical admixtures, follow ASTM C494 for control over admixtures. A final report, see ASTM C494 Section 19, shall be submitted, the report is required to have a precision statement.
Additional WTP requirements:

- Do not use blast furnace slag in the concrete.
- To reduce the permeability, the water-to-cement ratio shall be low, lower than 0.40%, using a Type F admixture in quantities that have no adverse effects on fresh and hardened properties.
- To reduce the corrosion, an admixture shall be used, calcium nitrate is to be added at a concentration no more than 32 lb/yd^3.
- Use Type F fly ash and silica fume, to reduce porosity, add in quantities to minimize porosity with no adverse effects on fresh and hardened properties.
- The concrete is to fill the entire cluster volume up to the bottom of the fill nozzle. Concrete shall be poured in a manner that allows for the even distribution of aggregate and mechanically vibrated to assure no major pockets or voids. Concrete is to be poured through more than one nozzle, in lifts. The seam between lifts is not important.
  - Because of the unique geometry and inability to rework or repair the concrete, assurance that the fill is complete and 100% filled via in-process observance, boroscope or other methods. Fill report shall be provided.
  - Curing: The concrete shall be thoroughly cured (at least 30 days) before the shroud is closed.
  - The seller shall submit mix design and complete procedure for concreting for buyer's approval.
  - The concrete fill can be purchased commercial

(b). Fill gap completely between PJM shroud and stellite nozzles with Aremco 646-N Ceramacast (or equal), see CCN 156345 for procedure.

11 ***Note 14:*** Deleted.

Note 15: Deleted.

11 ***Note 16:*** The whole vessel (including all the internals and the cooling jacket) to be designed, fabricated, tested to Design Level 1 (L-1) and Black Cell requirements as defined in 24590-WTP-3PS-MV00-T0001.

Note 17: Changed quality level, operating external pressure, added Data Reference, revised Note 3, deleted Note 11 and Note15, added Note 16 and Note 17, added functional/safety requirements, change to parent vessel cyclic data, change PJM cyclic data, added E&NS table and signature, added section for "Hydrodynamic Loads -Pulse Jet Mixers", added section for "Multiple Overblow Loading - PJMs". added Section for Nozzle Loads, added EQ section. If any Sections contain a revision triangle next to the Section heading, it means the entire section has been revised or is new - the entire section must be reviewed for changes/additions, change to hydrodynamic loads for normal operations, change to PJM cyclic data. Added Attachment 1 for BNI use only.

11 ***Note 18:*** Revised the following: Note 3, Note 11, Note 13 and Note 16. Design Considerations for Loads Induced by Pulse jet Mixers (PJMs), Hydrodynamic Loads Due to PJM Operations, PJM Overblow Loads. Notes for Nozzle Loads, Equipment Qualification data to new form. Added the Steam Sparging System, deleted Note 14.

11 ***Note 19:*** Localized bottom Head Erosion = 0.877 in and PJM Outlet Nozzle Erosion = 0.485 in, (reference 24590-WTP-M0C-50-00004, Rev 00E, Table 10-7).

11 ***Note 20:*** Vendor to supply final as-built vessel empty and test weights.

11 ***Note 21:*** Localized corrosion/erosion allowance for the Steam Sparger holes is 0.02 inches. The steam sparger piping will have a total corrosion/erosion allowance of 0.135 (total for inside, outside, and general corrosion allowance (reference CCN 233172). The values used for the Steam Sparger corrosion/erosion (per CCN 233172) design will be superseded after issuance of the revised corrosion/erosion evaluation for this vessel. The CCN 233172 is tracked as an assumption requiring verification in the vessel seismic and stress analysis calculation.

11 ***Note 22:*** Vessel volumes are approximate and do not account for the manufacturing tolerances, nozzles and displacements of internals.

Seismic 11

Seismic analysis to be combined with operating conditions. When considering Seismic Loads they are only to be combined with Operating Conditions, not Design Conditions (Reference, 24590-WTP-RPT-M-07-007). The vessel is located in the Pretreatment facility, Room P-0104. The ISRS Information related to Room P-0104 of the PreTreat Facility is in figures 21E, 22E and 24E of 24590-PTF S0C-S15T-00057.

Equipment Cyclic Data Sheet-Parent Vessel 11

Component Plant Item Number:	*24590-PTF-MV-UFP-VSL-00002B*
Component Description	*Parent*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*ASME SA240 304 with 0.030 % max carbon.*
Design Life	*40 Years*
Component Function and Life Cycle Description	*The system receives waste from Ultrafiltration Feed Preparation Vessels. This vessel is a high solids vessel. The waste is heated using direct steam injection and is cooled using the vessel cooling jacket and an external heat exchanger. Solids will be kept suspended using the pulse jet mixers and air spargers.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*-2 (-37)*	*15*	*10*	*Nominal assumption for testing. Input values shown in parentheses are for the parent vessel shell directly under cooling jacket. Jacket design pressure is +35 psig.*
Operating Pressure	psig	*-1.5 (-36.5)* *-1.5 (-36.5)*	*0* *2.8*	*7.0E6* *40*	*Maximum Operating (vessel connected to PVP header)* *Loss of Power(assume normal operations at -1.5 psig then power loss and pressure spike to 2.8 psig). Use jacket design pressure for vessel shell covered by jacket.*
Operating Temperature	°F	*59 (50)*	*194*	*5150*	*Input values shown in parentheses are for the parent vessel shell directly under cooling jacket. Jacket minimum temperature is 50°F.*
Contents Specific Gravity		*1.0*	*1.6*	*5150*	*Liquid varies from water to slurry*
Contents Level	inch	*0*	*395*	*5150*	
Localized Features					
Cooling Jacket (operating conditions)		*50°F chilled water inlet temp*	*50°F chilled water outlet temp*	*5150*	*Parent vessel contents are heated to 194°F with the cooling water flow shut off. After 8 to 16 hour digestion period the cooling water is returned at 50°F until the vessel contents are cooled to 77°F. (24590-WTP-RPT-ENG-06-014)*
Hot Nozzles		*59*	*358*	*5150*	*N12 and N27 are Steam Sparger inlets.*

Cyclic Data Notes- Parent Vessel 11

- ***Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.***
- ***Deleted***
- ***Hot Nozzles N12 and N27 are for Steam Sparger.***
- ***Cooling Jacket outlet temperature is taken as the coolest temperature possible at the outlet for the more conservative structural response.***

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Equipment Cyclic Data Sheet - PJMs 11

Component Plant Item Number:	*UFP-PJM-00012, UFP-PJM-00013, UFP-PJM-00014, UFP-PJM-00015, UFP-PJM-00016, UFP-PJM-00017*
Component Description	*Pulse Jet Mixers*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction	*ASME SA240 304 with 0.030 % max carbon*
Design Life	*40 Years*
Component Function and Life Cycle Description	*These pulse jet mixers (PJMs) are cyclically loaded using vacuum to fully fill the PJM with process liquid and compressed air to empty the PJM. The PJMs are contained within a parent vessel with varying liquid level. They shall be designed to cycle between the maximum operating pressure and the minimum operating pressure plus the external static head imposed by the parent vessel. The PJM supports shall be designed to cycle between fully buoyant (PJM empty and parent vessel full) and fully loaded (PJM full and parent vessel empty) states. Thrust load shall be applied only to the fully buoyant state. Assume the parent vessel is full for 50% of the number of PJM cycles.*

Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*80*	*100*	*24590-PTF-MVC-10-00003 & 24590-PTF-M6-UFP-00010001, 00010002, 00010003 - ITS pressure set at 75 psig. Not to be used concurrent with seismic or other occasional loads*
Operating Pressure	psig	*FV*	*52*	*9.0E6*	*24590-QL-POA-MPE0-00002-25-02 & 24590-PTF-MVC-10-00003 (25% contingency added)*
Operating Temperature	°F	*59*	*194*	*5150*	*Same as Parent Vessel*
Contents Specific Gravity		*1.0*	*1.6*	*5150*	*Same as Parent Vessel*
Contents Level	inch	*Empty*	*Flooded*	*9.0E6*	
Thrust	lbf	*-420*	*420*	*9.0E6*	
Localized Features					
Nozzles					
Supports		*Buoyant*	*Loaded*	*9.0E6*	

Cyclic Data Notes- PJM

- ***Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.***

Equipment Cyclic Data Sheet – Steam Spargers 11

Component Plant Item Number:	*There is no Component Plant Item Number associated with Nozzles N12 and N27*
Component Description	*Steam Spargers*

The information below is provisional and envelopes operational duty for fatigue assessment. It is not to be used as operational data.

Materials of Construction		*Hastelloy C-276 (UNS N10276)*			
Design Life		*40 Years*			
Component Function and Life Cycle Description		*The Steam Spargers will heat the process fluid until it gets up to temperature for digestion and will sustain this temperature for the time required to complete digestion. It will take up to approximately 9 hrs to heat and from 8 to 16 hrs to digest, (24590-WTP-RPT-ENG-06-014). The Steam Sparger is pressurized by air until the vessel is full and steam is introduced. The vessel heating occurs 5150 times in the life of the vessel (40 years). When steam heating is no longer required the Steam Spargers are again pressured by air.*			
Load Type		Min	Max	Number of Cycles	Comment
Design Pressure	psig	*FV*	*160*	*10*	*Nominal assumption for testing. Pressures are for steam which bounds the air pressure design pressures.*
Operating Pressure	psig	*FV*	*135*	*5150*	
Operating Temp	°F	*59*	*358*	*5150*	*Steam operating pressures bound air values. 358 °F is saturation temperature at 135 psig. Minimum temperature same as parent vessel. Steam temperature bounds air maximum temperatures.*
Contents Specific Gravity		*Air*	*Steam*	*5150*	*Air pressure will be used to keep slurry out of pipe.*

Cyclic Data Notes- Steam Spargers 11

- ***Cycle increase: The Seller must increase the numbers of operational cycles given above by 10% to account for commissioning duty unless otherwise noted.***
- ***Recommended corrosion allowance 0.040 inch (includes 0.024 inch corrosion allowance and 0.016 inch general erosion allowance.***
- ***Localized corrosion/erosion allowance for the Steam Sparger holes is 0.031 inches. (reference CCN 233172).***
- ***This vessel will experience 5150 heated batch cycles over the 40 year life of the plant.***

Design Considerations for Loads Induced by Pulse Jet Mixers (PJMs) 11

Pulse Jet Mixers (PJMs) are designed to mix the vessel contents using a liquid jet discharge. PJMs are driven by compressed air. The mixing is required to enhance heat transfer, to break up hydrogen-containing particles, and to homogenize the solution. Normally, the PJMs are operated simultaneously within the parent vessel.

The PJMs operate in the following three cycles: Suction, Drive and Vent. During the suction cycle a vacuum is created in the PJM headspace and the level within the PJM rises to fill the PJM. During the drive cycle the PJM is pressurized and liquid is discharged. During the vent cycle, the pressure in the headspace approaches atmospheric and the level within the PJM is allowed to reach equilibrium.

Vessel components shall be designed to withstand loading induced by PJM operations as described herein.

Normal Operations: Liquid flows around internal structures within the parent vessel producing hydrodynamic loads such as drag and vortex shedding.

To mitigate the dynamic effects, the following pipe sizes dipped internal to the vessel are required to have a minimum first natural frequency that is double the vortex shedding frequency:

Nominal Pipe Size	Minimum First Natural Frequency
1 inch	7.4 Hz*
2 inch	4.0 Hz*
3 inch	2.74 Hz**

* See 24590-WTP-MVC-50-00006, Section 8.1.1.2
** By extrapolation from 1 inch and 2 inch

Overblow Condition: Occasionally the drive cycle lasts too long and compressed air is discharged from the PJM. Overblows can also occur during system calibration. One or multiple PJMs may overblow at any time. These conditions induce acoustic and bubble rise loads on structures.

All internal components shall be designed for the combination of normal operational hydrodynamic loads and overblow loads. Single overblows (SOB) are assumed to act concurrently with the seismic event, however multiple overblows (MOB) are not assumed to act concurrently with the seismic event. Figure 1 (below) provides the acoustic load intensity that encompasses both SOB and MOB.

Hydrodynamic Loads Due to PJM Operations 11

Normal operation imposes a cyclical load ranging between 0.040 and -0.059 psi in the radial direction and 0.150 to-0.024 psi in the vertical direction for 9.0E6 cycles. The hydrodynamic pressure applies across the projected area of the component. Positive hydrodynamic forces act in the radial, outward direction and the vertical, upward direction. Seller shall apply the radial load simultaneously in the radial direction and normal to the radial direction in the horizontal plane.

PJM Overblow Loads (11)

Discussion: *During normal operation, pulse jet mixers (PJMs) mix the fluid by pulling in (suction) and pushing out (drive) fluid. During an upset condition, designated as an 'overblow', air is discharged following the drive cycle of one or more PJMs. The load consists of acoustic pressure (2Hz to 200Hz) developed in the first 200ms of the event and a load due to the bubble rising through the fluid.*

The acoustic load and the bubble load are design loads as defined by ASME B&PVC, Section VIII, Division 1, UG-22, applied statically. The acoustic load is not added to the bubble rise load because they occur at different times during the overblow event.

Acoustic Load	• ***The acoustic design load in Figure 1 is applied to the visible (as viewed from the overblow origin) surface of cylindrical targets such as pipes, charge vessels, and PJMs. The load is applied in the direction normal to the principal axis of the target as illustrated in Figure 2. Note: The intended net effective load on the target is equal to the projected (i.e. cross-sectional) area of the object times the acoustic design load (psi) indicated in Figure 1.*** • ***Each target is considered independent of the surrounding targets: e.g. the surrounding targets do not impede the acoustic wave by casting a shadow, as illustrated in Figure 2.*** • ***The load is <u>not</u> applied to small supports such as gussets, brackets, tabs, clamps, and bolts because they are rigid and the pressure drop across the target is negligible.*** • ***When the vessel contains multiple PJMs, the load from one PJM is independent of the load from other PJMs. The loads are not additive for multiple overblows.*** • ***No internal components shall be placed within 5 PJM nozzle diameters (5 * 4 in = 20 in) of a spherical zone centered at any overblowing PJM nozzle.***
Number of Acoustic Cycles	***1000 events X 40 cycles/event for a total of 40,000 acoustic cycles.***
Bubble Rise Load	***A vertical force per projected area of 1.7 psi is applied to the surfaces in the 36-inch diameter cylindrical zone centered at the overblowing PJM(s). The bubble can be at any elevation above the overblowing PJM and only affects one zone (36-inch diameter region) at a time. When there are multiple PJMs in a vessel (MOB), each PJM has it's own bubble. To simplify analysis the bubble can be applied in a continuous cylindrical zone above each PJM top head.***
Number Bubble Rise Cycles	***1000 events X 1 cycle/event for total of 1000 cycles.***

Figure 1: Acoustic Design Load

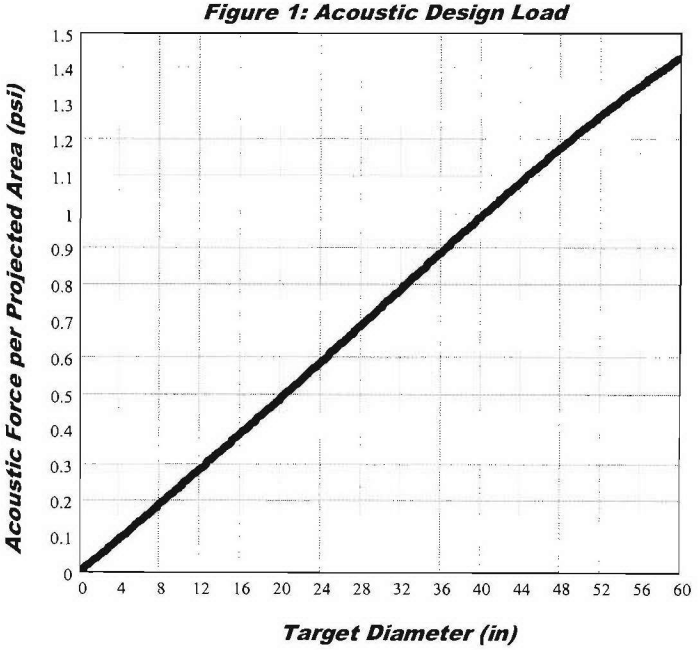
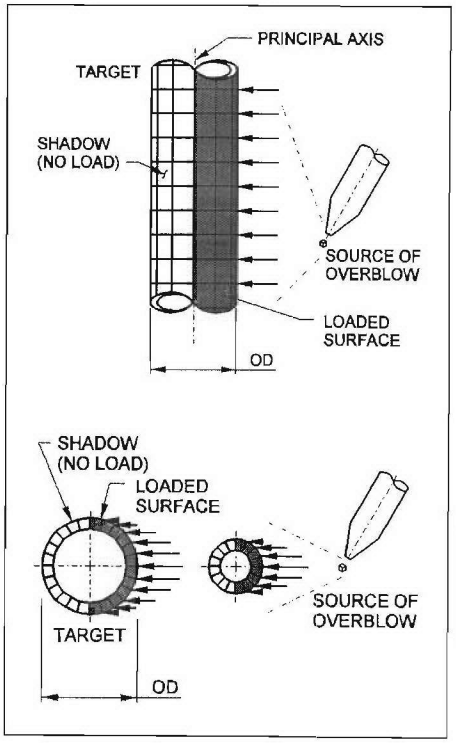


Figure 2: Load Application



The following data is required to determine the load:

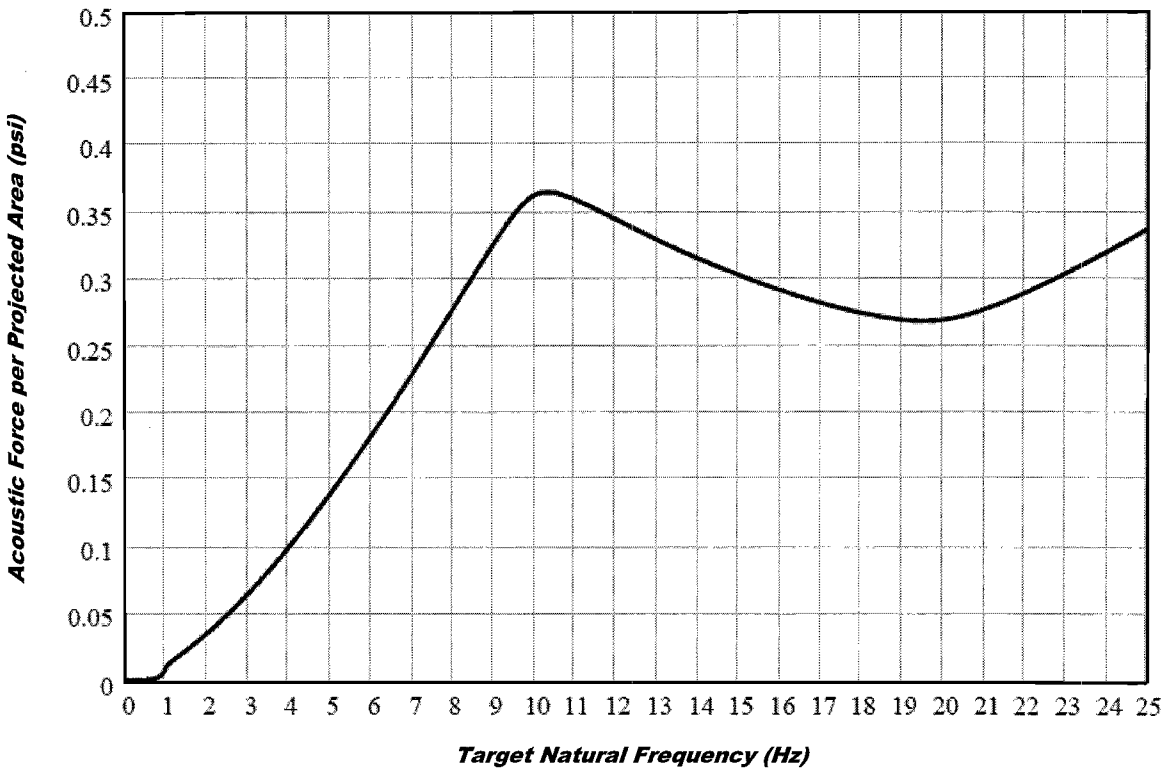
- ***Target Diameter***
- ***Target Principal Axis***
- ***Overblow Source Coordinates***

PJM Cluster Overblow Load 11

Discussion: *The acoustic design pressure on the cluster is determined from equation 5-8 in 24590-WTP-MVC-50-00011, Rev B. The worst-case orientation of the load needs to be determined by the user.*

Acoustic Load	***The following is the load magnitude for the PJM Cluster in HLP-VSL-00027A/B/28 with an outer radius of 89.5 inches measured to the outer most radii of the cluster. Follow the steps described below:*** ***1. Isolate the PJM Cluster and supports from parent vessel*** ***2. Run a modal analysis and determine the first frequency*** ***3. Use Figure 3 (below) to find the acoustic force per projected area*** ***4. Apply the static load in the same orientation as indicated in Figure 2 (above)***
Number of Acoustic Cycles	***1000 events X 40 cycles/event***

Figure 3: Acoustic Design Pressure on Cluster



Nozzle Loads (11)

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N01	113	120	3"	Weight	52	480	52	95	60	250
				Seismic	481	455	284	655	980	613
				Thermal	171	153	229	398	798	798
N02	15	212	8"	Weight	234	744	234	1069	394	1224
				Seismic	2251	1607	2795	4384	9622	6571
				Thermal	893	795	1193	3060	6114	6114
N03	145	212	12"	Weight	364	1033	364	2033	1275	2517
				Seismic	2501	1327	2067	13781	20738	20738
				Thermal	2082	1185	1778	9300	18600	18600
N05	190	194	3"	Weight	52	84	52	111	70	70
				Seismic	284	189	284	768	1152	263
				Thermal	171	350	229	468	938	1200
N07	170	150	2"	Weight	50	85	50	51	51	51
				Seismic	186	123	186	396	285	285
				Thermal	114	100	152	116	232	232
N09	170	175	2"	Weight	50	100	50	60	60	60
				Seismic	186	123	186	263	131	525
				Thermal	114	300	164	75	75	450
N10	170	175	2"	Weight	50	67	50	54	54	54
				Seismic	186	149	186	131	413	298
				Thermal	114	100	152	250	242	242
N11	15	212	3"	Weight	52	88	52	63	39	39
				Seismic	746	189	336	700	1488	963
				Thermal	171	195	229	850	200	150
N12	160	375	4"	Weight	87	249	87	279	125	603
				Seismic	770	385	480	1509	2147	2147
				Thermal	310	299	450	878	1757	1757
N13	124	140	2"	Weight	50	114	50	75	75	75
				Seismic	186	438	186	277	415	672
				Thermal	114	100	152	169	337	337
N14	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	506	415
				Thermal	114	100	152	169	337	337
N15	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	273	163	186	277	445	415
				Thermal	114	179	152	169	337	337
N16	124	140	2"	Weight	50	127	50	75	75	75
				Seismic	186	322	186	277	415	557
				Thermal	114	100	152	169	337	337
N17	124	140	2"	Weight	50	106	50	65	65	124
				Seismic	186	422	186	273	361	940
				Thermal	114	100	152	147	293	293

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N18	124	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	294	777	415
				Thermal	114	100	152	169	337	337
N20	197	212	2"	Weight	50	75	50	59	59	59
				Seismic	186	123	186	175	327	175
				Thermal	114	143	152	400	266	350
N23	15	212	24"	Weight	Manway					
				Seismic						
				Thermal						
N24	169	120	3"	Weight	52	315	52	110	69	69
				Seismic	284	301	284	761	1139	1139
				Thermal	171	225	229	562	928	928
N25	15	212	8"	Weight	234	373	234	741	464	464
				Seismic	1285	858	1285	5159	7732	7732
				Thermal	893	795	1193	3600	7193	7193
N26	112	120	3"	Weight	52	297	52	116	73	73
				Seismic	284	284	284	802	1201	1201
				Thermal	171	153	229	488	978	978
N27	160	375	4"	Weight	87	249	87	279	125	603
				Seismic	770	385	480	1509	2147	2147
				Thermal	310	299	450	878	1757	1757
N34	145	212	3"	Weight	52	108	52	110	69	143
				Seismic	284	268	284	761	1139	1139
				Thermal	171	153	400	463	928	928
N38	100	212	6"	Weight	N38 is parent nozzle, nozzle loads are applied via N38A, N38B, N38C					
				Seismic						
				Thermal						
N38A (Note D)	15	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N38B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N38C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N41	15	113	2" OD	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N44	30	138	2"	Weight	50	60	50	100	52	52
				Seismic	186	123	382	438	289	289
				Thermal	114	100	152	118	235	235

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N45	140	212	10"	Weight	279	1024	264	950	1200	2600
				Seismic	1771	1159	5392	10238	3150	6738
				Thermal	953	1356	1268	8650	1450	1450
N48	35	140	6"	Weight	210	335	210	376	235	235
				Seismic	1160	775	1160	2671	4009	4009
				Thermal	735	654	983	1691	3383	3383
N49	35	140	6"	Weight	210	335	210	376	235	235
				Seismic	1160	775	1160	2671	4009	4009
				Thermal	735	654	983	1691	3383	3383
N51	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N52	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N53	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N54	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N55	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N56	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N57	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N58	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N59	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N60	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N61	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N62	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N63	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N64	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N65	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N66	150	140	2"	Weight	50	60	50	75	75	75
				Seismic	186	123	186	277	415	415
				Thermal	114	100	152	169	337	337
N69	100	212	6"	Weight	N69 is parent nozzle, nozzle loads are applied via N69A, N69B, N69C					
				Seismic						
				Thermal						
N69A (Note D)	15	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N69B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N69C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N70	100	212	6"	Weight	N70 is parent nozzle, nozzle loads are applied via N70A, N70B, N70C					
				Seismic						
				Thermal						
N70A (Note D)	15	212	1"	Weight	15	23	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N70B (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N70C (Note D)	100	212	1"	Weight	15	20	15	20	20	20
				Seismic	53	35	53	65	96	96
				Thermal	30	26	40	38	77	77
N76	15	212	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800

Nozzle	Nozzle Press (psig) (Note E)	Nozzle Temp (F°) (Note E)	Size	Load Type	Loads - lbs			Moments - ft-lbs		
					Fx	Fy	Fz	Mx	My	Mz
N77	15	212	8"	Weight	475	750	475	1500	950	950
				Seismic	1313	875	1313	5163	7744	7744
				Thermal	600	550	800	2400	4800	4800

Notes for Nozzle Loads

A. Direction of load application is per diagrams in 24590-WTP-3PS-MV00-T0001 Appendix A.

B. For nozzles in head: x = North/South, y = Vertical, and z = East/West - Vessel 0° defined as north.

C. Nozzle loads shown are to be used in place of those specified in 24590-WTP-3PS-MV00-T0001 -- do not apply any thermal reduction factors.

D. Values provided at plate on top of parent nozzle.

E. Design Pressure and Temperatures to be used for Nozzle Qualification only. 11

F. Use Vessel internal pressures and temperatures for nozzle design

11 *G. All Pretreatment RGM Seismic Piping Nozzles loads from Plant Design have a 1.75 load factor applied to all seismic loads to address coupling effects between the flexible vessels and piping in accordance with the Seismic Classification and Evaluation for the Pretreatment Facility Piping and Vessels, 24590-WTP-RPT-ENG-09-040. (BNI use only, see 24590-WTP-GPG-ENG-0150, Rev 0 for nozzle load management).*

H. HPAV nozzles loads are provided from the Vessel Analysis Group to Plant Design via a CCN to communicate the results of the Stress Analysis Calculation in which HPAV nozzles have been identified requiring evaluation. 11

Equipment Identification				
Full Component Tag Number or BNI Stock Code Number	24590-PTF-MV-UFP-VSL-00002B			Safety Classification ☒ SC ☐ SS ☐ APC-PAM
Equipment Datasheet Number	24590-PTF-MVD-UFP-00015			
Description	Ultrafiltration Feed Vessel for the Ultrafiltration Process System (UFP)			Seismic Category ☒ SC-I ☐ SC-II ☐ SC-III ☐ SC-IV ☐ SC-III Seismic Interaction only
Location (Facility / Building and Room No.)	Located in PTF Room P-0104, Elev. 0'-0", colume lines J/ 16			
Safety Function(s)	UFP-VSL-00002A (parent vessel) is considered a high active process vessel credited to prevent spills of large quantities of high activity process liquid and provide primary confinement for radioactive releases. Reference: 24590-WTP-PSAR-ESH-01-002-02,Section 4.3.5. Pulse Jet Mixers (PJMs) provide a mixing function in the vessel to provent hydrogen accumulation. Air sparger piping provides air to mix solids and dilute hydrogen to prevent hydrogen accumulation. Vessel level instrumentation which includes the bubbler tubes, provides level monitoring to prevent overflows of non-Newtonian fluids into Newtonian overflow vessles and ensure proper headspace volumes are maintained for hydrogen dilution. Reference: 24590-WTP-PSAR-ESH-01-002-02, Section 4.3.4			
Equipment Safety Function Type	☒ Passive Mechanical	☐ Active Mechanical	☐ Electrical	
Seismic Safety Function ☒ Yes ☐ No	Seismic Operability Requirements ☒ During Seismic Event	☒ After Seismic Event	☐ None	

Equipment Environmental Qualification (EEQ)

(Parameter values stated in this section do not include process conditions or operation induced conditions)

Classification of Environment ☒ Mild ☐ Harsh

Qualified Life (years) ☒ 40 ☐ Other

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
High Temperature (°F)	113	Note a	Years	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	59	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	90	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	5	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g.)	0 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g.)	(-) 1.4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mRad/hr)	533000 (E-Note 4)	40 (E-Note 3)	Years (Note e-1)	24590-PTF-U0D-W16T-00001, E-Note 1

EQUIPMENT QUALIFICATION DATASHEET (EQD)

Equipment Environmental Qualification (EEQ) *(continued)*

Parameter Type/Units	Parameter Value	Parameter Duration (number)	Duration Units	WTP Source Document Number
Normal Ambients				
Plant/Process Induced Vibration	☐ Yes ☒ No			
Additional Normal Ambient Information:	N/A			
Abnormal Ambients				
High Temperature (°F)	127	8	hours / year	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	6	Note c	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	Note d	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	533000 (E-Note 4)	0 (E-Note 3)	Years (Note e-2)	24590-PTF-U0D-W16T-00001, E-Note 1
Exposure to Wet Sprinkler System	☐ Yes ☒ No	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional Abnormal Ambient Information	N/A			
Design Basis Events (DBE) Ambients				
High Temperature (°F)	135	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Temperature (°F)	40	Note b	N/A	24590-PTF-U0D-W16T-00001, E-Note 1
High Relative Humidity (%RH)	100c	40	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Relative Humidity (%RH)	6	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
High Pressure (in.-w.g)	4 (E-Note 2)	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Low Pressure (in.-w.g)	(-) 7.3 (E-Note 2)	1000	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Radiation Dose Rate (mR/hr)	533000 (E-Note 4)	0 (E-Note 3)	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Submergence	☐ Yes ☒ No (E-Note 5)	N/A	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Chemical/Spray Exposure	☒ Yes ☐ No	12.5	hours	24590-PTF-U0D-W16T-00001, E-Note 1
Additional DBE Information	N/A			

DBE Chemical Exposure Details

DBE Chemical Exposure Details	
DBE Chemical Types / Concentrations	Process Rad Condensate Nitric Acid 2M Sodium Hydroxide 2M Sodium Permanganate 1M Strontium Nitrate 1M Water Neutral Solution (RLD45), 77 F, pH 7.0 Sodium Hydroxide (PVP04), 77 F, pH 12.0 Sodium Hydroxide (UFP26), 77 F, pH 14.5 Sodium Hydroxide (PVP02), 77 F, pH 15.0 Sodium Hydroxide (UFP01), 77 F, pH 15.5 Sodium Hydroxide (UFP04), 77 F, pH 15.5 Sodium Hydroxide (PVP06), 79 F, pH 12.5 Sodium Hydroxide (UFP33), 84 F, pH 14.5 Soduim Hydroxide (FRP13), 110 F, pH 14.5 Sodium Hydroxide (HLP09), 113 F, pH 13.5 Souium Hydroxide (HLP11), 113 F, pH 14.5 Sodium Hydroxide (HLP12), 113 F, pH 15.0 Sodium Hydroxide (HLP13), 113 F, pH 15.0 Sodium Hydroxide (TCP05), 120 F, pH 15.0 Sodium Hydroxide (FEP19), 121 F, pH 15.0 Sodium Hydroxide (FRP14), 191 F, pH 15.0

Electrical Interfaces Supporting the Safety Function	
Power Supply Voltage (VAC, VDC)	N/A
Power Supply Frequency (Hz)	N/A
Power Connection Method	N/A
I/O Signals to/from Equipment	N/A
I/O Connection Method	N/A

Mechanical Interfaces	
Mounting Configuration (orientation)	A vertical vessel with a support skirt, mounted on the base ring beam, which is welded to the embed plate.
Mounting Method (bolts, welds, etc.)	Welded skirt to ring beam welded to embedment plates. Embedment plate details per 24590-PTF-DD-S13T-00039, 24590-PTF-DD-S13T-00036, 24590-PTF-DD-S13T-00043, 24590-PTF-DD-S13T-00045 provided to the vendor in the material requisition.
Auxiliary Devices	UFP-PJM-00012, UFP-PJM-00013, UFP-PJM-00014, UFP-PJM-00015, UFP-PJM-00016, UFP-PJM-00017

Equipment Seismic Qualification (ESQ)				
Parameter	**Title**	**Reference/Document Number**	**Version / Revision**	**Remarks**
WTP Seismic Design Specification	Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks. Engineering Specification for Seismic Qualification Criteria for Pressure Vessels.	4590-WTP-3PS-SS90-T0001 24590-WTP-3PS-MV00-T0002	2 3	N/A
Specified Seismic Load Parameters	Seismic Analysis of Pretreatment Building - WSGM In Structure Response Spectre (ISRS)	24590-PTF-S0C-S15T-00057	A	Seismic Response Spectra Curves: Figures , 21E, 22E and 24E. CCN 185271

Equipment Qualification Notes and Additional Information

a) For thermal aging, the high normal temperature shall be assumed to subsist for 40 years less the duration of the high abnormal temperature. For any lesser qualified life, the normal and abnormal condition durations shall be assigned proportionally. The abnormal temperature is stated to subsist for a certain number of hours per year. It shall be taken to subsist for this number of hours for each year of the qualified life.

b) The ability to provide the safety function at the low normal temperature, the low abnormal temperature or the low DBE temperature (whichever be the lowest) shall be established by test, analysis, or operating experience. The thermal aging at these respective low temperatures will be conservatively covered by the thermal aging per item a) above. Therefore, no duration is assigned for the low temperatures.

c) The ability to provide the safety function at the extremes of the normal and abnormal humidity conditions, taking into consideration the high and the low normal and high and low abnormal, shall be established by test, analysis, or operating experience. No duration is assigned for the normal and abnormal humidity conditions.

d) If the performance of the safety function of the equipment is affected by ambient pressure, the ability to provide the safety function at the extremes of the normal and abnormal pressure conditions, taking into consideration the high and the low normal and the high and low abnormal pressures, shall be established by test, analysis, or operating experience. No duration is assigned to the normal and abnormal pressure conditions.

e) (1) If the abnormal radiation dose rate is the same as the normal radiation dose rate, the normal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the abnormal radiation dose rate is "0."

(2) If the abnormal radiation dose rate is higher than the normal radiation dose rate, the abnormal radiation dose rate shall be assumed to subsist for 40 years, or any lesser qualified life, and the duration of the normal radiation dose rate is "0."

f) The DBE conditions shall be taken to subsist for the stated number of hours following the qualified life of the equipment.

g) Spray due to fire sprinkler actuation shall be taken to occur once over the entire qualified life duration for a period of 2 hours, even if the qualified life is a period less than 40 years. If spray qualification is provided for DBE conditions (whether for water or chemical spray), then separate qualification for the fire sprinkler spray need not be provided.

h) The values stated in this EQD are the ambients and do not include the thermodynamic and radiation conditions imposed by the process fluids, self-heating, etc. The data pertaining to process fluid and service induced parameters are to be taken into account where significant, such as in thermal aging analyses. These data can be obtained from the equipment data sheets or the Equipment Specification.

i) Equipment that is to be installed in inaccessible locations must be qualified to a 40-year life without the need for maintenance or replacement.

Notes and Additional Information
E-Note 1: BNI (BUYER) shall perform Equipment Environmental Qualification in accordance with 24590-WTP-DC-ENG-06-001, Design Criteria for Environmental and Natural Phenomena Hazard Qualification of Equipment.
E-Note 2: Where pressure is given in inches of water column (in-w.c.) in the source document, it is generally assumed that this is in reference to atmospheric pressure and is therefore equivalent to inches of water gage (in-w.g.).
E-Note 3: Supplier (SELLER) shall perform Equipment Seismic Qualification in accordance with the listed parameters and the applicable specification requirements.
E-Note 4: Normal environmental conditions shall be taken to exist over a 40 year period less the duration for which abnormal conditions exist. DBE durations are in addition to the normal and abnormal durations. Further, whenever the normal, abnormal, and DBE radiation dose rates are the same, the normal radiation dose integrated over 40 years adequately accounts for dose during the abnormal and DBE conditions and hence the Abnormal and DBE radiation dose duration are shown as 0.
E-Note 5: The flood height of 2.08 ft does not create a submergence issue with this vessel.

DOE Radioactive Materials Disclaimer:

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the US Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Screening / Evaluation Required? If yes per 24590-WTP-GPP-SREG-002, E&NS signature required below	X	Yes		No

Approval

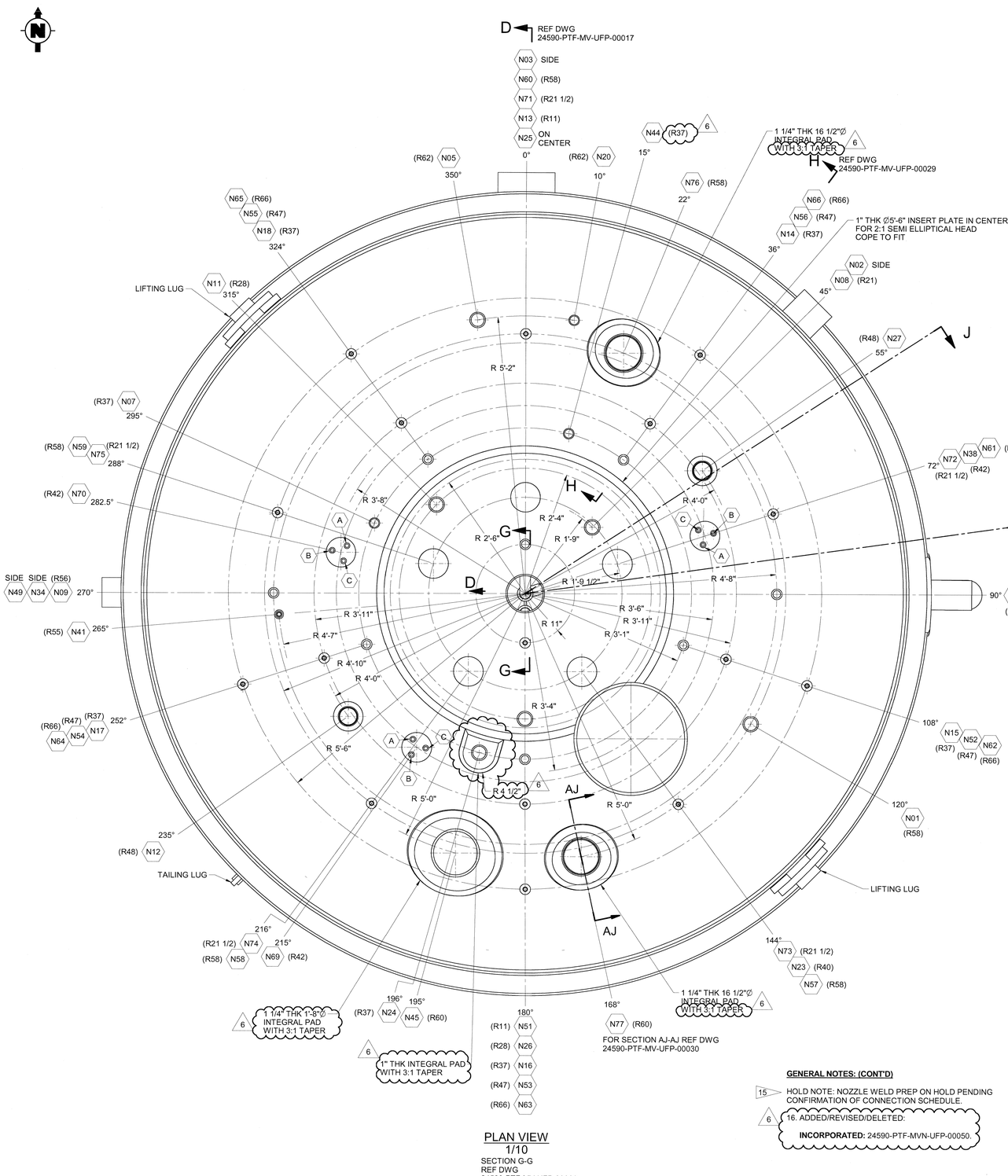
Rev	Description	System Engineer	Vessel Engineer	Checked	Reviewed/ MET	E&NS	Approved	Date
0	Issued for Purchase	M. Askar	HK	US/RDS	J. Julyk	N/A	MWH	05/06/03
1	Revised as Noted	M. A	HK	CS	JJ	N/A	MWH	08/18/03
2	Revised as Noted	M. A	HK	PA/CS	RES	N/A	MWH	11/14/03
3	Revised as Noted	M. A	HK	PA/CS	JJ	N/A	MWH	02/05/04
4	Revised as Noted	M. Askar	H. Khurana	P. Aviguetero C. Slater	J. Julyk	N/A	M. Hoffmann	05/10/04
5	Revised as Noted	M. Askar	H. Khurana	P. Aviguetero C. Slater	J. Julyk	N/A	M. Hoffmann	03/10/05
6	Deleted note 10 on page 2	M. Askar	H. Khurana	SC/ C. Slater	J. Julyk	N/A	M. Hoffmann	04/12/05
7	Revised concrete for cluster fill per note 13. Revised overblow condition loads. Number of overblow cycles revised to 1000 from 100.	M. Askar	H. Khurana	C. Slater	RES	N/A	M. Hoffmann	06/30/05
8	Revised per note 14 on page2 and as noted.	M. Askar	H. Khurana	JRP/APP	DA/CS	N/A	J. Julyk	10/22/05
9	Revised as noted. Incorporated SDDR #24590-WTP-SDDR-M-06-00129.	J.Medina	H. Khurana	JRP/APP	CS/RES	N/A	J. Julyk	04/04/06
10	Revised per Note 17 on page 2.	D. Vo	M Seed	R Peters	D. Adler	C. Lindquist	J Julyk	4/14/09
11	Revised per Note 18 and as noted by revision triangles. Supersedes 24590-PTF-MVD-UFP-P0015, Rev 2	Doug VO	B DUNLAP	B. Makadia	D. Adler	S.Hinckley	J Julyk	5/20/11

REFERENCE for Data Sheet 24590-PTF-MVD-UFP-00014/00015, Rev 11 (For BNI Use Only)
Vessel Tags: UFP-VSL-00002A/B

Data	Document #	Rev	Document Title/ Comments
Quality Level	24590-PTF-M6-UFP-00002001 24590-PTF-M6-UFP-00003001	0 0	*P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A* *P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*
Seismic Category	24590-PTF-M6-UFP-00002001 24590-PTF-M6-UFP-00003001	0 0	*P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002A* *P&ID PTF Ultrafiltration Process System Feed Vessel UFP-VSL-00002B*
Design Specific Gravity	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties*
Max Operating Volume	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Total Volume	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Inside Diameter	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Length TL-TL	24590-PTF-M6C-UFP-00008	D	*Vessel Sizing Calculation for UFP Ultrafiltration Vessels UFP-VSL-00002A/B*
Operating Pressure (external)	24590-PTF-M6C-PVP-00017	A	HADCRT Analysis of PTF PVP System at various Operating Scenarios / (see sheet 14 - the PVP scrubber inlet is controlled to 35 in-wg) External pressure of 1.5 psig is based on a normal operating pressure of -35 in WG (1.26 psig) with an additional margin.
Operating Pressure (internal)		N/A	*Maximum value possible assuming fans off is atmospheric pressure*
Design Pressure (internal)	24590-WTP-DB-ENG-01-001	01P	*Basis of Design/* use 15 psig
Design Pressure (external)	24590-PTF-M6C-PVP-00017	A	*HADCRT Analysis of PTF PVP System at Various Operating Scenarios/* use operating with 30% margin
Jacket Design Pressure (internal)	24590-PTF-MVC-10-00003 24590-PTF-M6C-10-00008	C 00A	*PTF Vessel Cyclic Datasheet Inputs/ (* 24590-PTF-MVE-10-00012*)* *Overpressure Protection Evaluation for PTF Process Vessel Cooling Jackets /* For the Cooling Jacket pressure parameter(35psig).
Operating Temp	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties/* Table 4-18
Design Temp	24590-WTP-RPT-ENG-07-007	A	*Process Stream Properties/* Table 4-18
Jacket Design Temp	24590-PTF-MVC-UFP-00006	E	*Design of Cooling Jacket for Ultrafiltration feed Vessels UFP-2A/2B* 50°F for chilled water inlet Same as parent vessel assuming little or no flow during steam heating - 212°F
Corrosion Allowance, Erosion allowance	24590-PTF-N1D-UFP-00003	5	*Corrosion Evaluation UFP-VSL-00002A/B*
Materials of Construction	24590-PTF-MV-UFP-00003 24590-PTF-MV-UFP-00004	4 4	*Equipment Assembly Ultra filtration Feed Vessel UFP-VSL-00002A* *Equipment Assembly Ultra filtration Feed Vessel UFP-VSL-00002B*
Design Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00012)
Operating Pressure (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* /additional margin added (25%) (24590-PTF-MVE-10-00012)
Operating Temperature (PJM)			*Same as parent vessel*
Cyclic Data (Vessel)	24590-PTF-MVC-10-00003 24590-PTF-MVC-UFP-00006	C E	*PTF Vessel Cyclic Datasheet Inputs* (24590-PTF-MVE-10-00005) *Design of Cooling Jacket for Ultrafiltration feed Vessels UFP-2A/2B* / cooling jacket temperatures (min, max)
Cyclic Data (PJM)	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs* / used for number of cycles (24590-PTF-MVE-10-00012*)*

REFERENCE for Data Sheet 24590-PTF-MVD-UFP-00014/00015, Rev 11 (For BNI Use Only)
Vessel Tags: UFP-VSL-00002A/B

Data	Document #	Rev	Document Title/ Comments
Cyclic Data (Steam Spargers)	24590-WTP-RPT-ENG-06-014	0	*Technical Report-Design Evaluations Supporting Resolution of External Flowsheet Review Team (EFRT).* use for digestion time of 8 hours.
	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs*
	24590-PTF-M6C-UFP-00022	A	*Sizing of Steam Sparger Rings and Associated Piping for UFP-VSL-00002A/B* / for steam pressure of 71 psig see Figure 1 on sheet 15, (saturation temp of 316 F for P= 71 psig)
	24590-PTF-M6X-UFP-00298	0	*MS Line List for P&ID 24590-PTF-M6-UFP-00002001* / used 160 psig for design pressure for high pressure steam lines, for UFP-VSL-00002A only.
	24590-PTF-M6X-UFP-00499	0	*MS Line List for P&ID 24590-PTF-M6-UFP-00003001* / used 160 psig for design pressure for high pressure steam lines, for UFP-VSL-00002B only.
Hydrodynamic Loads	24590-WTP-MVC-50-00006	A	*Hydrodynamic Loads for Normal PJM Operation in Vessels with non-Newtonian Fluids* / use for pressure
	24590-PTF-MVC-10-00003	C	PTF Vessel Cyclic Datasheet Inputs / used for number of cycles (24590-PTF-MVE-10-00012)
Single PJM Overblow Loads	24590-WTP-MVC-50-00011	B	*Pulse Jet Mixer Overblow Vessel Loads*
Single Overblow cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (*24590-PTF-MVE-10-00004*)*
Multiple Overblow Cycles	24590-PTF-MVC-10-00003	C	*PTF Vessel Cyclic Datasheet Inputs (*24590-PTF-MVE-10-00004)
Nozzle Loads *(UFP-VSL-00002A only)*	CCN 230862	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00002A*
	CCN 124015	N/A	*Nozzle Design Loads for UFP-VSL-00002A*
	CCN 227905	N/A	*UFP-VSL-00002A Nozzle N08 Design Loads*
Nozzle Loads *(UFP-VSL-00002B only)*	CCN 230863	N/A	*Supplemental Nozzle Design Loads for UFP-VSL-00002B*
	CCN 124016	N/A	*Nozzle Design Loads for UFP-VSL-00002B*
Nozzle Design Temp - Design Pressure *(UFP-VSL-00002A only)*	24590-PTF-M6X-UFP-00298	0	*MS Line List for 24590-PTF-M6-UFP-00002001 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00302	0	*MS Line List for 24590-PTF-M6-UFP-00002002 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00221	0	*MS Line List for 24590-PTF-M6-UFP-00010007 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00256	0	*MS Line List for 24590-PTF-M6-UFP-00021001 UFP-VSL-00002A*
	24590-PTF-M6X-UFP-00257	0	*MS Line List for 24590-PTF-M6-UFP-00021002 UFP-VSL-00002A*
	24590-PTF-M6X-HLP-00343	0	*MS Line List for 24590-PTF-M6-HLP-00010003-HLP-VSL-00002A*
Nozzle Design Temp - Design Pressure *(UFP-VSL-00002B only)*	24590-PTF-M6X-UFP-00499	0	*MS Line List for 24590-PTF-M6-UFP-00003001 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00500	0	*MS Line List for 24590-PTF-M6-UFP-00003002 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00221	0	*MS Line List for 24590-PTF-M6-UFP-00010007 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00261	0	*MS Line List for 24590-PTF-M6-UFP-00022001 UFP-VSL-00002B*
	24590-PTF-M6X-UFP-00262	0	*MS Line List for 24590-PTF-M6-UFP-00022002 UFP-VSL-00002B*
	24590-PTF-M6X-HLP-00338	0	*MS Line List for 24590-PTF-M6-HLP-00010002 HLP-VSL-00002B*
Equipment Environmental Qualification (EEQ)	24590-PTF-U0D-W16T-00001	2	*PTF Room Environment Data Sheet (*24590-PTF-U0N-W16T-00007*)*
Nozzle Load Management	24590-WTP-GPG-ENG-0150	0	*Plant Design/Mechanical System Equipment Interfaces: Terminal End Equipment / CCN 229865*



FOR SECTION AJ-AJ REF DWG
24590-PTF-MV-UFP-00030

PLAN VIEW
1/10
SECTION G-G
REF DWG
24590-PTF-MV-UFP-00029

NOZZLE	SIZE	SCHED/WALL	SERVICE/REMARKS	"Z" DIM	REF DWG-DET	CONNECTION
N01	3"	160S	INLET/REAGENT 6	33'-11"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N02	8"	80S	OUTLET/OVERFLOW	29'-9"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N03	12"	80S	OUTLET	12"	24590-WTP-MV-M59T-00016001 DET 3	12"-40S
N05	3"	160S	INLET	33'-10"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N07	2"	80S	INLET 6	34'-5"	24590-WTP-MV-M59T-00016001 DET 2	2"-40S
N08	3"	160S	INLET/REAGENT	34'-10"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N09	2"	160S	INLET TO WASH RING	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N10	2"	160S	INLET TO WASH RING 6	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N11	3"	80S	INLET 6	34'-9"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N12	4"	80S	STEAM INLET WITH G SLEEVE	34'-8"	24590-PTF-MV-UFP-00028 SECTION C-C	4"-40S
N13	2"	160S	AIR/VACUUM TO UFP-PJM-00006	34'-11"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N14	2"	160S	AIR/VACUUM TO UFP-PJM-00007	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N15	2"	160S	AIR/VACUUM TO UFP-PJM-00008	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N16	2"	160S	AIR/VACUUM TO UFP-PJM-00009	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N17	2"	160S	AIR/VACUUM TO UFP-PJM-00010	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N18	2"	160S	AIR/VACUUM TO UFP-PJM-00011	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N20	2"	160S	SAMPLE RETURN	33'-10"	24590-WTP-MV-M59T-00016001 DET 2	2"-80S
N22			DELETED			
N23	24"	PLATE	MANWAY 6	34'-7"	24590-WTP-MV-M59T-00017 DET 1	CAPPED
N24	3"	160S	INLET/REAGENT	34'-6"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N25	8"	80S	OUTLET/VESSEL VENT	35'-2"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N26	3"	80S	INLET/REAGENT 6	34'-9"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N27	4"	80S	STEAM INLET WITH G SLEEVE	34'-8"	24590-PTF-MV-UFP-00028 SECTION C-C	4"-40S
N34	3"	160S	OUTLET	12"	24590-WTP-MV-M59T-00016001 DET 3	3"-40S
N38	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N38A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N38B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N38C	1"	160S	LEVEL	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N40			DELETED 6			
N41	2" OD	SEE DETAIL	TEMPERATURE	34'-2"	24590-WTP-MV-M59T-00007 ASSY 1, DET 1	3/4"-10S
N44	2"	80S	INLET	34'-6"	24590-WTP-MV-M59T-00016001 DET 2	2"-40S
N45	10"	80S	INLET	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	10"-40S
N47			DELETED			
N48	6"	80S	CHILLED WATER JACKET OUT, TOP	24'-3"	24590-WTP-MV-M59T-00016001 DET 1	6"-10S
N49	6"	80S	CHILLED WATER JACKET IN, BOTTOM	4'-11"	24590-WTP-MV-M59T-00016001 DET 1	6"-10S
N50			DELETED			
N51	2"	160S	SPARGE AIR	34'-11"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N52	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N53	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N54	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N55	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N56	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N57	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N58	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N59	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N60	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N61	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N62	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N63	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N64	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N65	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N66	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N67			DELETED			
N68			DELETED			
N69	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N69A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N69B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N69C	1"	160S	LEVEL	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N70A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70C	1"	160S	LEVEL	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N71	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N72	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N73	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N74	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N75	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N76	8"	80S	ACCESS PORT 6	35'-1"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N77	8"	80S	ACCESS PORT	34'-0"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S

GENERAL NOTES:

1. DELETED.
2. FOR SHELL NOZZLES, "Z" DIMENSION IS MEASURED FROM THE CENTERLINE OF NOZZLE. FOR HEAD NOZZLES, ALL "Z" DIMENSIONS ARE MEASURED FROM BOTTOM TANGENT LINE TO NOZZLE FACE UNLESS NOTED OTHERWISE.
3. THE CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
4. REVISED/ADDED/DELETED: SEE ARCHIVE REVISIONS FOR LISTED CHANGES.
5. SELLER SHALL PROVIDE AND INSTALL TIEDOWN SWIVEL LUG MOUNTING STUDS PER 24590-WTP-MV-M59T-00003.
6. NOZZLES IN PLAN VIEW ARE READ FROM THE CENTER OUTWARD.
7. ALL WELDS OF THE PULSE JET MIXER CLUSTER SHALL BE FULL PENETRATION, ULTRASONICALLY TESTED OR DYE-PENETRANT TESTED AS A MINIMUM. ALL FULL PENETRATION WELDS OF SUPPORT MEMBERS SHALL BE ULTRASONICALLY TESTED AND IF FILLET WELDS ARE PERMITTED BY THE BUYER AND ARE NOT READILY ULTRASONICALLY TESTED, THEY MAY BE DYE-PENETRANT TESTED WITH APPROVAL FROM THE BUYER.
8. THE PULSE JET MIXER CLUSTER SHALL BE DESIGNED FOR THE EXTERNAL PRESSURE OF THE PARENT VESSEL STATIC HEAD. THE PJM CLUSTER FILL SHALL NOT BE CONSIDERED AS SUPPORT FOR EXTERNAL PRESSURE.
9. DELETED.
10. DELETED.
11. DELETED.
12. AIR SPARGER PIPING SHALL BE SHAPED TO HAVE A MINIMUM OF 6" CLEARANCE (SURFACE TO SURFACE) FROM ALL STEAM SPARGER PIPING.
13. PJM STELLITE CONE TECH NOTES:
    a) STELLITE LINER SHALL BE ENCASED WITH A STAINLESS STEEL SHROUD (SAME MATERIAL AS PJM'S) WITH A GAP LARGE ENOUGH TO FILL WITH CERAMIC GROUT (AREMCO CERAMACAST 646-N ZIRCONIUM OXIDE OR EQUAL).
    b) NO SHARP CORNERS ARE ALLOWED. ALL INTERIOR AND EXTERIOR EDGES SHALL BE PROVIDED WITH A RADIUS.
    c) STELLITE SHALL PROJECT 1/4" (+,- 1/16") PAST THE STAINLESS STEEL SHROUD.
    d) NO WELDING TO THE STELLITE MATERIAL IS ALLOWED.
    e) ALL WELDS TO STAINLESS STEEL SHROUD REQUIRE VOLUMETRIC EXAMINATION.
    f) AFTER ASSEMBLY AND GROUTING OF THE PJM STELLITE CONE ASSEMBLIES WITH STAINLESS STEEL SHROUD IS COMPLETE, 100% RADIOGRAPHY OF ONE COMPLETED PJM ASSEMBLY PER VESSEL IS REQUIRED PER ASME SECTION V ARTICLE 2 FOR VALIDATING GROUT POUR CONSISTENCY. ONLY THE STRAIGHT PORTIONS OF THE ASSEMBLY SHALL MEET THE REQUIREMENTS OF ARTICLE 2. DUE TO GEOMETRY THE AREA ADJACENT TO THE GROUT FILL FITTINGS, ELBOWS, AND CONE WILL BE CONSIDERED INFORMATIONAL AND ARE EXEMPT FROM MEETING THE REQUIREMENTS OF T-270 AND T-280 OF ASME SECTION V ARTICLE 2.
14. ADDED/REVISED/DELETED:

EXTENSIVE REVISION CHANGED AREAS ON DRAWING ARE NOT INDICATED.

ADDED: NOZZLES N71, N72, N73, N74, N75, N76, N77.
NOZZLE INTEGRAL PAD FOR N24, N45, N76, N77, AND CENTER INSERT PLATE INTOP HEAD.

REVISED: N01 FROM SCHED 80S TO 160S FROM RADIUS 28" TO RADIUS 58", "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 33'-11" 6
N02 FROM SCHED 40S TO 80S.
N05 FROM SCHED 80S TO 160S.
N08 FROM SCHED 80S TO 160S.
N09 FROM SCHED 80S TO 160S.
N10 FROM SCHED 80S TO 160S.
N20 FROM SCHED 80S TO 160S.
N24 FROM SCHED 80S TO 160S. 6
N25 FROM SCHED 40S TO 80S.
N34 FROM SCHED 80S TO 160S.
N07 FROM RADIUS 28", ORIENTATION 290° TO RADIUS 37", ORIENTATION 295° "Z" DIMENSION FROM 33'-10" TO "Z" DIMENSION 34'-6".
N24 FROM RADIUS 28", ORIENTATION 210° TO RADIUS 37", ORIENTATION 196° "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 34'-6".
N61 FROM RADIUS 48", ORIENTATION 292.5° TO RADIUS 55", ORIENTATION 265° "Z" DIMENSION FROM 34'-1" TO "Z" DIMENSION 34'-4".
N44 FROM RADIUS 28", ORIENTATION 15° TO RADIUS 37" "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 34'-6".
N_ FROM RADIUS 48", ORIENTATION 270° TO RADIUS 48", ORIENTATION 235°, "Z" DIMENSION FROM 34'-10" TO "Z" DIMENSION 34'-8".
N2_ FROM RADIUS 28", ORIENTATION 90° TO RADIUS 48", ORIENTATION 55°, "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 34'-8".
N23 FROM "Z" DIMENSION 33'-10" TO "Z" DIMENSION 34'-7" NOTE 13.

DELETED: NOZZLES N22, N40, N47, N50, N67, N68.
NOTE 1.

PER CALCULATION No. 24590-PTF-MVC-UFP-00024.

INCORPORATED: 24590-PTF-MVN-UFP-00042.
24590-QL-MRC-MVA0-B0002-T0002.

GENERAL NOTES: (CONT'D)

15 HOLD NOTE: NOZZLE WELD PREP ON HOLD PENDING CONFIRMATION OF CONNECTION SCHEDULE.

6 16. ADDED/REVISED/DELETED:
INCORPORATED: 24590-PTF-MVN-UFP-00050.

THIS DRAWING TO BE READ IN CONJUNCTION WITH MECHANICAL SYSTEMS DATA SHEET 24590-PTF-MVD-UFP-00014

REFERENCE DRAWINGS		
DWG NO	REV	TITLE
24590-PTF-MV-UFP-00016	2	LAYOUT OF INTERNALS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A
24590-PTF-MV-UFP-00017	2	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-PTF-MV-UFP-00028	0	STEAM SPARGER ASSEMBLY ULTRAFILTRATION
		FEED VESSEL UFP-VSL-00002A & B
24590-PTF-MV-UFP-00029	0	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-PTF-MV-UFP-00030	0	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-WTP-MV-M59T-00001	4	PRESSURE VESSEL TOLERANCES STANDARD DETAILS
24590-WTP-MV-M59T-00007	3	THERMOWELL CONNECTION STANDARD DETAILS
24590-WTP-MV-M59T-00011	2	WASH RINGS STANDARD DETAILS, DETAIL 1
24590-WTP-MV-M59T-00016001	3	VESSEL CONNECTIONS STANDARD DETAILS SHT 1 OF 3
24590-WTP-MV-M59T-00016003	1	VESSEL CONNECTIONS STANDARD DETAILS SHT 3 OF 3
24590-WTP-MV-M59T-00017	1	VESSEL INSPECTION MANWAY STANDARD DETAILS
24590-WTP-MV-M59T-00010	2	TAILING LUG STANDARD DETAILS
24590-WTP-MV-M59T-00009 6	2	LIFTING LUG STANDARD DETAILS
24590-WTP-MV-M59T-00018 6	3	VESSEL NAME PLATE STANDARD DETAILS
24590-WTP-PW-P30T-00001	1	WTP END PREP DETAIL FOR FIELD BUTT WELDS
24590-WTP-MV-M59T-00004	2	PULSE JET MIXERS STANDARD DETAILS
24590-WTP-MV-M59T-00003	0	TIE DOWN SWIVEL LUG MOUNTING STUDS STANDARD DETAILS

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
6	REVISED TO INCORPORATE CHANGES AND PER NOTE 16	ED	[illegible]	[illegible]	JJ	12/21/11
5	REVISED PER NOTE 14	BR	BM	CKW	JJ	08/08/2011
4	REVISED PER NOTE 4	HK	MS	CS	JJ	11/22/2005
3	REVISED PER NOTE 4	HK/MA	PA/CS	JJ	MH	05/102004
2	REVISED , SEE NOTE 4	HK/MA	PA/CS	JJ	PBK	09/04/2003
1	DELETED NOTE 5, ADDED NOTE 6	HK/MA	PA/CS	JJ	MWH	06/23/2003
0	REVISED, SEE NOTE #4 & ISSUED FOR PURCHASE	HK/MA	PA/RDS	JJ	MWH	05/06/2003

Q

REVISION HISTORY

ISSUED BY RPP-WTP PDC
TRT DATE
ISSUE STAMP

	PROJECT No.	24590
	SITE	HANFORD
	AREA	200E
	BUILDING No.	I0

	BY	DATE
ORIGINATOR	H. KHURANA / M. ASKAR	05/02/03
CHECKER	P. AVGUETERO / R. SIMMONS	05/04/03
APPROVER	M. HOFFMANN	05/06/02
REVIEWER	J. JULYK	05/02/03

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

EQUIPMENT ASSEMBLY
ULTRAFILTRATION FEED VESSEL
UFP-VSL-00002A

SCALE: NONE
24590-PTF-MV-UFP-00003
REV: 6

"E SIZE - 44x34

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

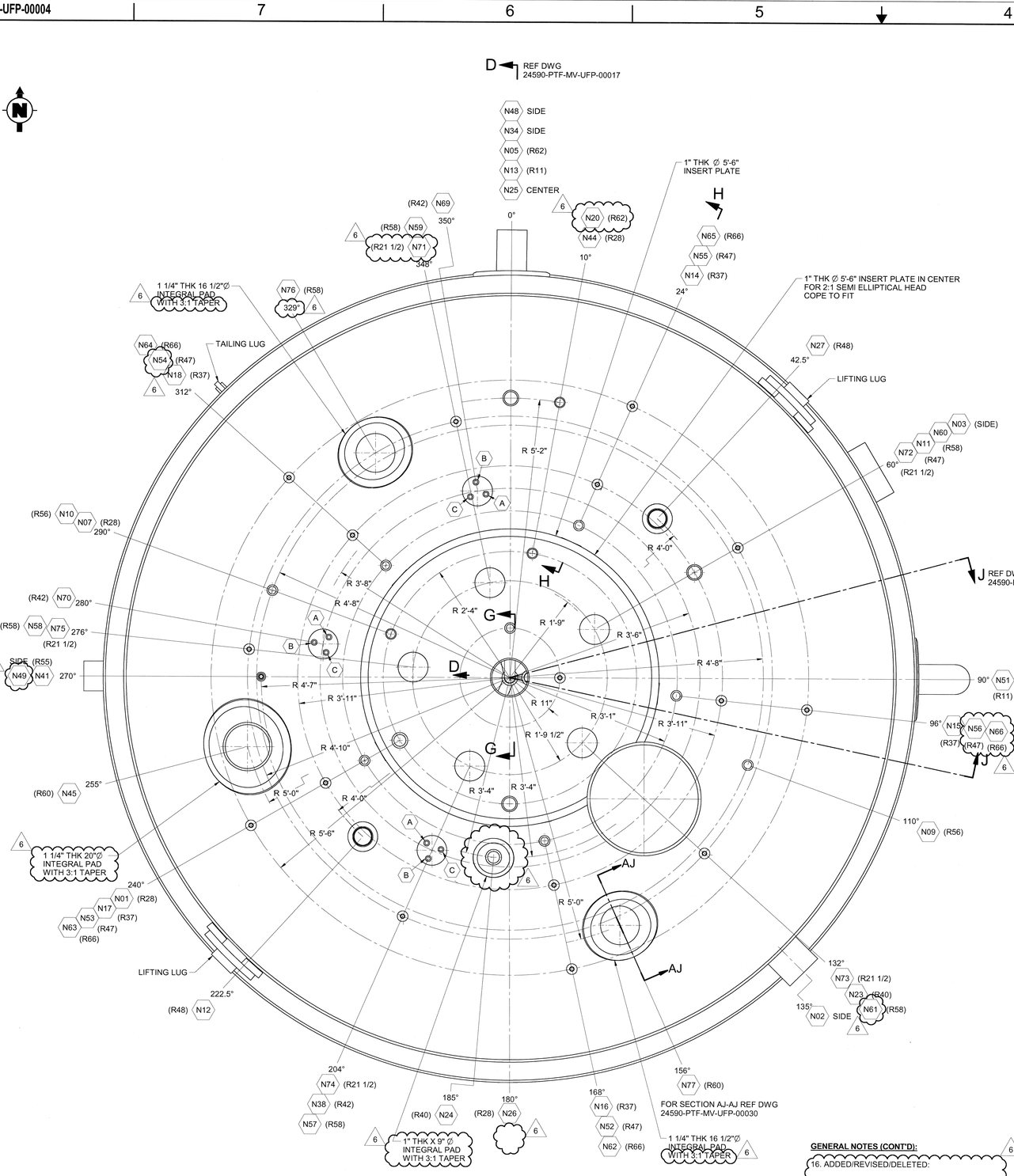
SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

R1145732

12/21/2011 11:42 AM

FORM E_MASTER 03/2003



PLAN VIEW
1/10
SECTION G-G
REF DWG 24590-PTF-MV-UFP-00029

NOZZLE	SIZE	SCHED/WALL	SERVICE/REMARKS	"Z" DIM	REF DWG-DET	CONNECTION
N01	3"	160S	INLET/REAGENT	34'-9"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N02	8"	80S	OUTLET/OVERFLOW	29'-9"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N03	12"	80S	OUTLET	12"	24590-WTP-MV-M59T-00016001 DET 3	12"-40S
N05	3"	160S	INLET (6)	33'-10"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N07	2"	80S	INLET	34'-8"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S (6)
N08			DELETED			
N09	2"	160S	INLET TO WASH RING	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N10	2"	160S	INLET TO WASH RING (6)	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S (6)
N11	3"	80S	INLET	34'-4"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N12	4"	80S	STEAM INLET WITH 6" SLEEVE (6)	34'-8"	24590-PTF-MV-UFP-00028 SECTION C-C	4"-40S
N13	2"	160S	AIR/VACUUM TO UFP-PJM-00012	34'-11"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N14	2"	160S	AIR/VACUUM TO UFP-PJM-00013	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N15	2"	160S	AIR/VACUUM TO UFP-PJM-00014	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N16	2"	160S	AIR/VACUUM TO UFP-PJM-00015	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N17	2"	160S	AIR/VACUUM TO UFP-PJM-00016	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N18	2"	160S	AIR/VACUUM TO UFP-PJM-00017	34'-7"	24590-WTP-MV-M59T-00016001 DET 3	2"-40S
N20	2"	160S	SAMPLE RETURN	33'-10"	24590-WTP-MV-M59T-00016001 DET 2	2"-80S
N22			DELETED			
N23	24"	PLATE	MANWAY (6)	34'-7"	24590-WTP-MV-M59T-00017 DET 1	CAPPED
N24	3"	160S	INLET/REAGENT	34'-6"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N25	8"	80S	OUTLET/VESSEL VENT	35'-2"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N26	3"	80S	INLET/REAGENT (6)	34'-9"	24590-WTP-MV-M59T-00016001 DET 2	3"-40S
N27	4"	80S	STEAM INLET WITH 6" SLEEVE (6)	34'-8"	24590-PTF-MV-UFP-00028 SECTION C-C	4"-40S
N34	3"	160S	OUTLET	12"	24590-WTP-MV-M59T-00016001 DET 3	3"-40S
N38	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N38A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N38B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N38C	1"	160S	LEVEL (6)	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N40			DELETED			
N41	2" OD	SEE DETAIL	TEMPERATURE	34'-2"	24590-WTP-MV-M59T-00007 ASSY 1, DET 1	3/4"-10S
N44	2"	80S	INLET	34'-9"	24590-WTP-MV-M59T-00016001 DET 2	2"-40S
N45	10"	80S	INLET	34'-1"	24590-WTP-MV-M59T-00016001 DET 3	10"-40S
N47			DELETED			
N48	6"	80S	CHILLED WATER JACKET OUT, TOP	24'-3"	24590-WTP-MV-M59T-00016001 DET 1	6"-10S
N49	6"	80S	CHILLED WATER JACKET IN, BOTTOM	4'-11"	24590-WTP-MV-M59T-00016001 DET 1	6"-10S
N50			DELETED			
N51	2"	160S	SPARGE AIR	34'-11"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N52	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N53	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N54	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N55	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N56	2"	160S	SPARGE AIR	34'-4"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N57	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N58	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N59	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N60	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N61	2"	160S	SPARGE AIR	34'-0"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N62	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N63	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N64	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N65	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N66	2"	160S	SPARGE AIR	33'-8"	24590-WTP-MV-M59T-00016001 DET 4	1" OD X 0.083" NOM WALL
N67			DELETED			
N68			DELETED			
N69	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N69A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N69B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N69C	1"	160S	LEVEL	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70	6"	80S	INSTRUMENTATION	34'-8"	24590-WTP-MV-M59T-00016003 DET 26	N/A
N70A	1"	160S	BALANCE	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70B	1"	160S	DENSITY	DET 26	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N70C	1"	160S	LEVEL	35'-2"	24590-WTP-MV-M59T-00016003 DET 26	1"-40S
N71	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N72	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N73	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N74	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N75	6"	40S	PJM CLUSTER FILL	34'-8 1/2"		CAPPED
N76	8"	80S	ACCESS PORT	34'-1"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S
N77	8"	80S	ACCESS PORT	34'-0"	24590-WTP-MV-M59T-00016001 DET 1	8"-40S

F REF DWG 24590-PTF-MV-UFP-00017

GENERAL NOTES:

1. DELETED.
2. FOR SHELL NOZZLES, "Z" DIMENSION IS MEASURED FROM THE CENTERLINE OF NOZZLE. FOR HEAD NOZZLES, ALL "Z" DIMENSIONS ARE MEASURED FROM BOTTOM TANGENT LINE TO NOZZLE FACE UNLESS NOTED OTHERWISE.
3. THE CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
4. REVISED/ADDED/DELETED: SEE ARCHIVE REVISIONS FOR LISTED CHANGES.
5. SELLER SHALL PROVIDE AND INSTALL TIEDOWN SWIVEL LUG MOUNTING STUDS PER 24590-WTP-MV-M59T-00003.
6. NOZZLES IN PLAN VIEW ARE READ FROM THE CENTER OUTWARD.
7. ALL WELDS OF THE PULSE JET MIXER CLUSTER SHALL BE FULL PENETRATION, ULTRASONICALLY TESTED OR DYE-PENETRANT TESTED AS A MINIMUM. ALL FULL PENETRATION WELDS OF SUPPORT MEMBERS SHALL BE ULTRASONICALLY TESTED AND IF FILLET WELDS ARE PERMITTED BY THE BUYER AND ARE NOT READILY ULTRASONICALLY TESTED, THEY MAY BE DYE-PENETRANT TESTED WITH APPROVAL FROM THE BUYER.
8. THE PULSE JET MIXER CLUSTER SHALL BE DESIGNED FOR THE EXTERNAL PRESSURE OF THE PARENT VESSEL STATIC HEAD. THE PJM CLUSTER FILL SHALL NOT BE CONSIDERED AS SUPPORT FOR EXTERNAL PRESSURE.
9. DELETED.
10. DELETED
11. DELETED.
12. AIR SPARGER PIPING SHALL BE SHAPED TO HAVE A MINIMUM OF 6" CLEARANCE (SURFACE TO SURFACE) FROM ALL STEAM SPARGER PIPING.
13. PJM STELLITE CONE TECH NOTES:
    a) STELLITE LINER SHALL BE ENCASED WITH A STAINLESS STEEL SHROUD (SAME MATERIAL AS PJM'S) WITH A GAP LARGE ENOUGH TO FILL WITH CERAMIC GROUT (AREMCO CERAMACAST 646-N ZIRCONIUM OXIDE OR EQUAL).
    b) NO SHARP CORNERS ARE ALLOWED. ALL INTERIOR AND EXTERIOR EDGES SHALL BE PROVIDED WITH A RADIUS.
    c) STELLITE SHALL PROJECT 1/4" (+,- 1/16") PAST THE STAINLESS STEEL SHROUD.
    d) NO WELDING TO THE STELLITE MATERIAL IS ALLOWED.
    e) ALL WELDS TO STAINLESS STEEL SHROUD REQUIRE VOLUMETRIC EXAMINATION.
    f) AFTER ASSEMBLY AND GROUTING OF THE PJM STELLITE CONE ASSEMBLIES WITH STAINLESS STEEL SHROUD IS COMPLETE, 100% RADIOGRAPHY OF ONE COMPLETED PJM ASSEMBLY PER VESSEL IS REQUIRED PER ASME SECTION V ARTICLE 2 FOR VALIDATING GROUT POUR CONSISTENCY. ONLY THE STRAIGHT PORTIONS OF THE ASSEMBLY SHALL MEET THE REQUIREMENTS OF ARTICLE 2. DUE TO GEOMETRY THE AREA ADJACENT TO THE GROUT FILL FITTINGS, ELBOWS, AND CONE WILL BE CONSIDERED INFORMATIONAL AND ARE EXEMPT FROM MEETING THE REQUIREMENTS OF T-270 AND T-280 OF ASME SECTION V ARTICLE 2.
14. ADDED/REVISED/DELETED:

EXTENSIVE REVISION CHANGED ARES ON DRAWING ARE NOT INDICATED.

ADDED: NOZZLES N71, N72, N73, N74, N75, N76, N77.
NOZZLE INTEGRAL PAD FOR N45, N76, N77, AND CENTER INSERT PLATE INTOP HEAD. NOTE 12.

REVISED: N01 FROM SCHED 80S TO 160S.
N02 FROM SCHED 40S TO 80S.
N05 FROM SCHED 80S TO 160S. (6)
N09 FROM SCHED 80S TO 160S.
N10 FROM SCHED 80S TO 160S.
N20 FROM SCHED 80S TO 160S.
N25 FROM SCHED 40S TO 80S. (6)
N34 FROM SCHED 80S TO 160S.
N41 FROM RADIUS 48", TO RADIUS 55", "Z" DIMENSION FROM 34'-0" TO "Z" DIMENSION 34'-2".
N07 "Z" DIMENSION FROM 33'-10" TO "Z" DIMENSION 34'-9".
N11 "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 34'-4".
N12 FROM RADIUS 21", ORIENTATION 300° TO RADIUS 48", ORIENTATION 222.5°, "Z" DIMENSION FROM 34'-2" TO "Z" DIMENSION 34'-8". (6) (6)
N23 "Z" DIMENSION FROM 33'-10" TO "Z" DIMENSION 34'-7".
N24 FROM RADIUS 28", ORIENTATION 210° TO RADIUS 40° ORIENTATION 185°, "Z" DIMENSION FROM 34'-9" TO "Z" DIMENSION 34'-6"
N27 FROM RADIUS 28", ORIENTATION 90° TO RADIUS 48° ORIENTATION 42.5°, "Z" DIMENSION FROM 34'-2" TO "Z" DIMENSION 34'-8".

DELETED: NOZZLES N08, N22, N40, N47, N50, N67, N68.
(6) NOTE 1, 9,10 AND 13 (6)
PER CALCULATION No. 24590-PTF-MVC-UFP-00024.

INCORPORATED: 24590-PTF-MVN-UFP-00042.
24590-QL-MRC-MVA0-B0002-T0002.

15 HOLD NOTE: NOZZLE WELD PREP ON HOLD PENDING CONFIRMATION OF CONNECTION SCHEDULE.

GENERAL NOTES (CONT'D):

16. ADDED/REVISED/DELETED:
    DELETED: NOTE 1.
    INCORPORATED: 24590-PTF-MVN-UFP-00050.

THIS DRAWING TO BE READ IN CONJUNCTION WITH MECHANICAL SYSTEMS DATA SHEET 24590-PTF-MVD-UFP-00015

REFERENCE DRAWINGS		
DWG NO	REV	TITLE
24590-PTF-MV-UFP-00018	2	LAYOUT OF INTERNALS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002B
24590-PTF-MV-UFP-00017	2	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-PTF-MV-UFP-00028	0	STEAM SPARGER ASSEMBLY ULTRAFILTRATION
		FEED VESSEL UFP-VSL-00002A & B
24590-PTF-MV-UFP-00029	0	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-PTF-MV-UFP-00030	0	SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL
		UFP-VSL-00002A & B
24590-WTP-MV-M59T-00001	4	PRESSURE VESSEL TOLERANCES STANDARD DETAILS
24590-WTP-MV-M59T-00007	3	THERMOWELL CONNECTION STANDARD DETAILS
24590-WTP-MV-M59T-00011	2	WASH RINGS STANDARD DETAILS DETAIL1
24590-WTP-MV-M59T-00016001	3	VESSEL CONNECTIONS STANDARD DETAILS SHT 1 OF 3
24590-WTP-MV-M59T-00016003	1	VESSEL CONNECTIONS STANDARD DETAILS SHT 3 OF 3
24590-WTP-MV-M59T-00017	1	VESSEL INSPECTION MANWAY STANDARD DETAILS
24590-WTP-MV-M59T-00010	2	TAILING LUG STANDARD DETAILS
24590-WTP-MV-M59T-00009	2	LIFTING LUG STANDARD DETAILS
24590-WTP-MV-M59T-00018	3	VESSEL NAME PLATE STANDARD DETAILS
24590-WTP-PW-P30T-00001	1	WTP END PREP DETAIL FOR FIELD BUTT WELDS
24590-WTP-MV-M59T-00004	2	PULSE JET MIXERS STANDARD DETAILS
24590-WTP-MV-M59T-00003	0	TIE DOWN SWIVEL LUG MOUNTING STUDS STANDARD DETAILS

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
6	REVISED TO INCORPORATE CHANGES AND PER NOTE 16					12/21/11
5	REVISED PER NOTE 14	BR	BM	CKW	JJ	08/08/2011
4	REVISED PER NOTE 4	HK	MS	CS	JJ	11/22/2005
3	REVISED PER NOTE 4	HK/MA	PA/CS	JJ	MH	05/102004
2	REVISED , SEE NOTE 4	HK/MA	PA/CS	JJ	PBK	09/04/2003
1	DELETED NOTE 5, ADDED NOTE 6	HK/MA	PA/CS	JJ	MWH	06/23/2003
0	REVISED, SEE NOTE #4 & ISSUED FOR PURCHASE	HK/MA	PA/RDS	JJ	MWH	05/06/2003

ISSUED BY RPP-WTP PDC
INIT. DATE ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	I0	

	BY	DATE
ORIGINATOR	H. KHURANA / M. ASKAR	05/02/03
CHECKER	P. AVIGUETERO / R. SIMMONS	05/04/03
APPROVER	M. HOFFMANN	05/06/02
REVIEWER	J. JULYK	05/02/03

CONTENT APPLICABLE TO ALARA? [XX] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

EQUIPMENT ASSEMBLY ULTRAFILTRATION FEED VESSEL UFP-VSL-00002B

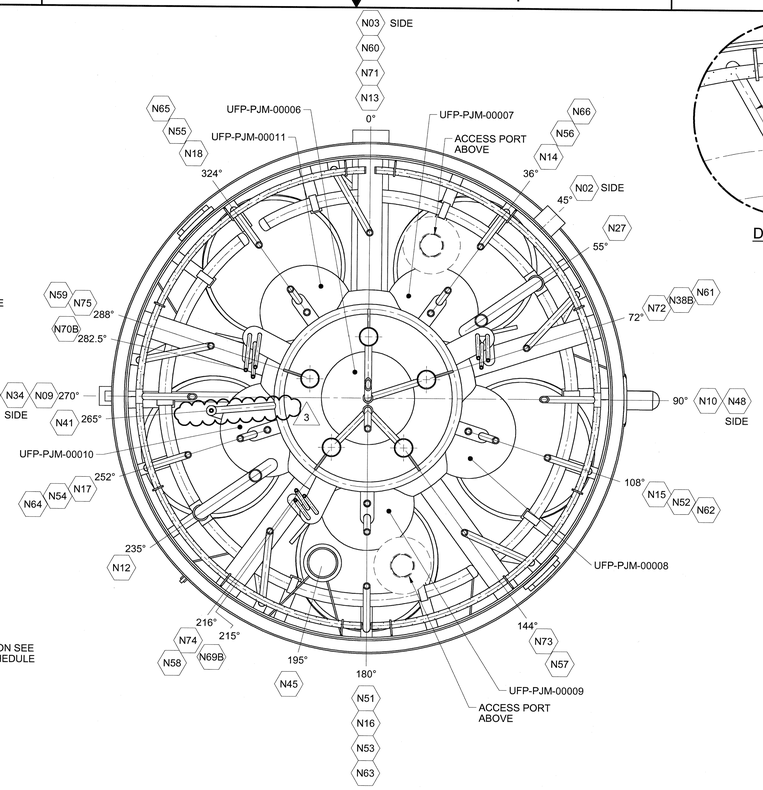
SCALE: NONE
24590-PTF-MV-UFP-00004
REV 6

E SIZE - 44x34
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

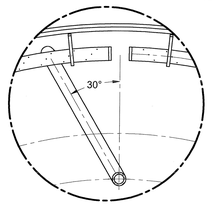
N1145733

12/20/2011 05:12 PM

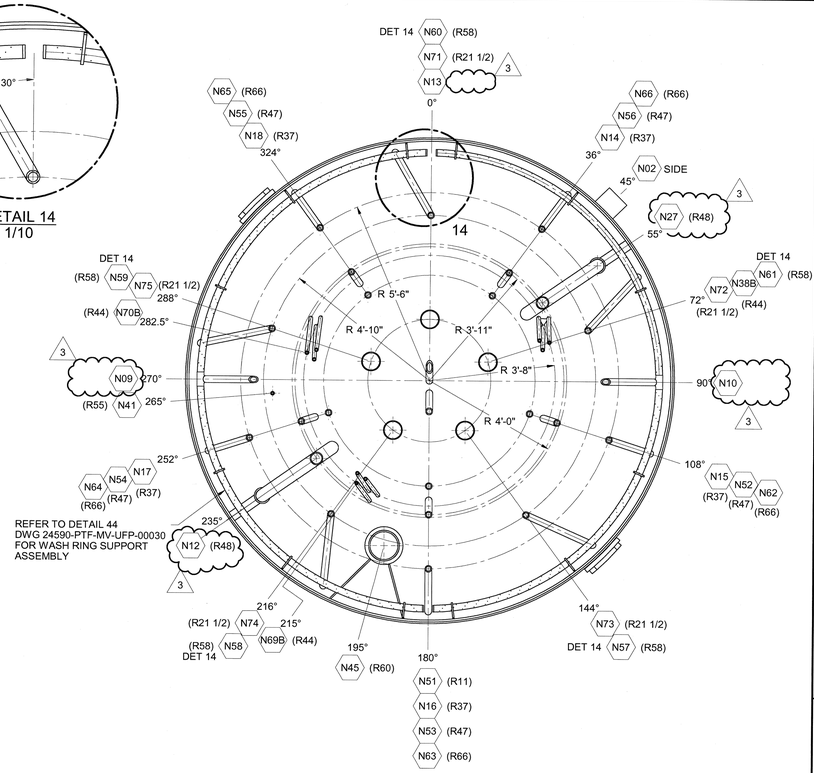
FORM E_MASTER 03/2003



SECTION B-B 1/20 TOP HEAD NOT SHOWN FOR CLARITY



DETAIL 14 1/10



SECTION C-C 1/20 TOP HEAD NOT SHOWN FOR CLARITY

SECTION K-K 1/20

SECTION L-L 1/20

GENERAL NOTES:

1. REVISED/ADDED/DELETED:
   SEE ARCHIVE REVISION FOR FOR LISTED CHANGES.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. ADDED/REVISED/DELETED:

   PER CALCULATION No. 24590-PTF-MVC-UFP-00024.

   EXTENSIVE REVISION CHANGED AREAS ON DRAWING ARE NOT INDICATED.

   ADDED: SECTION K-K.
   SECTION L-L.

   REVISED: VESSEL SKIRT THICKNESS.

   INCORPORATED: 24590-PTF-MVN-UFP-00042.
   OBSOLETE, 24590-WTP-M6N-M80T-00002.
   24590-WTP-M6N-M80T-00003.

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
3	REVISED TO INCORPORATE CHANGES	BR	BM	CKW	SJ	12/21/11
2	REVISED PER NOTE 3	BR	BM	CKW	SJ	08/08/2011
1	REVISED PER NOTE 1	HK	MS	CS	JJ	11/22/2005
0	ISSUED FOR PURCHASE	HA/MA	PA/CS	JJ	MH	5/10/04

REVISION HISTORY

ISSUED BY RPP-WTP PDC — INT / DATE ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	I0

	BY	DATE
ORIGINATOR	M. ASKAR/H. KHURANA	5/10/04
CHECKER	P. AVIGUETERO/C. SLATER	5/10/04
APPROVER	M. HOFFMANN	5/10/04
REVIEWER	J. JULYK	5/10/04

CONTENT APPLICABLE TO ALARA? [XX] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

LAYOUT OF INTERNALS ULTRAFILTRATION FEED VESSEL UFP-VSL-00002A

SCALE: NONE

24590-PTF-MV-UFP-00016 REV 3

"E" SIZE - 44x34

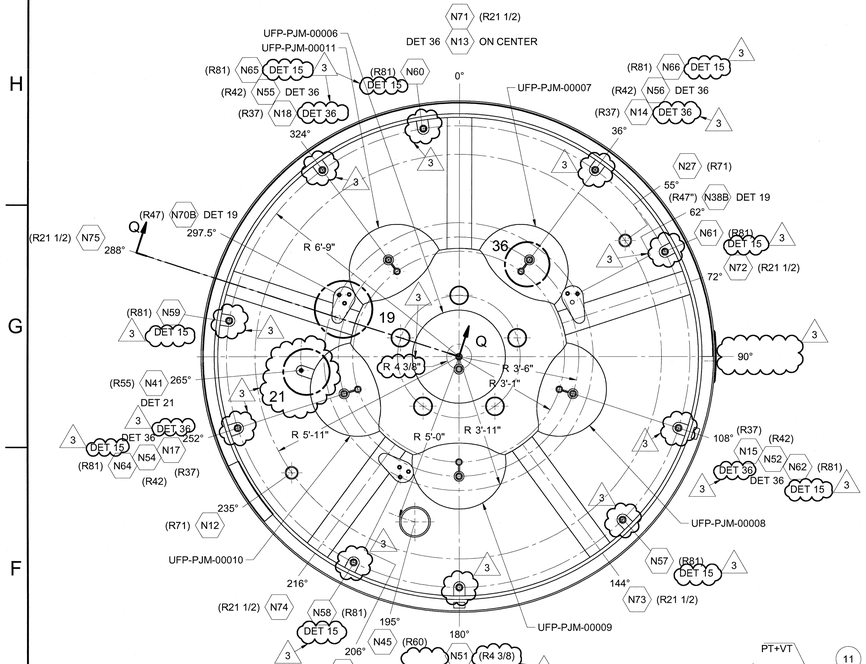
SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

COMPUTER GENERATED MANUAL DESIGN CHANGES NOT PERMITTED

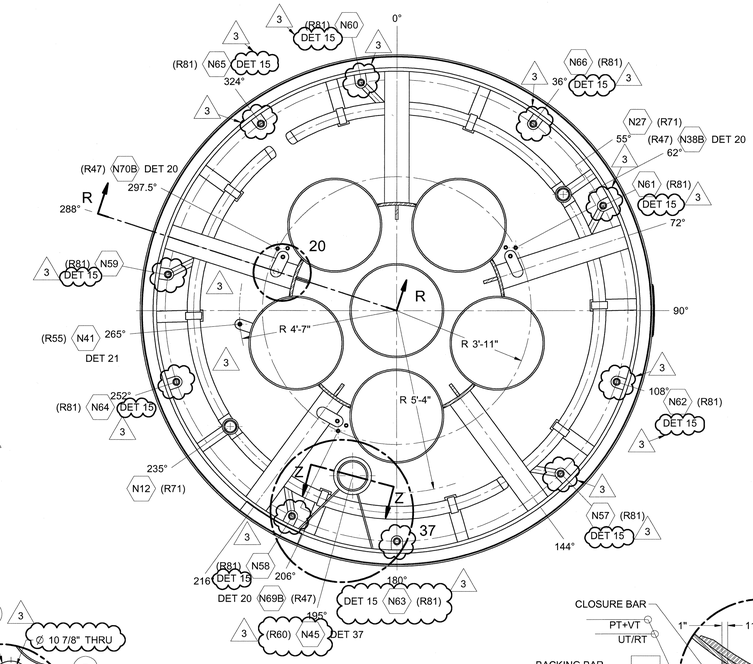
R1145734

12/21/2011 11:42 AM

FORM E_MASTER 03/2003



SECTION M-M
1/20
FROM REF DWG 24590-PTF-MV-UFP-00016



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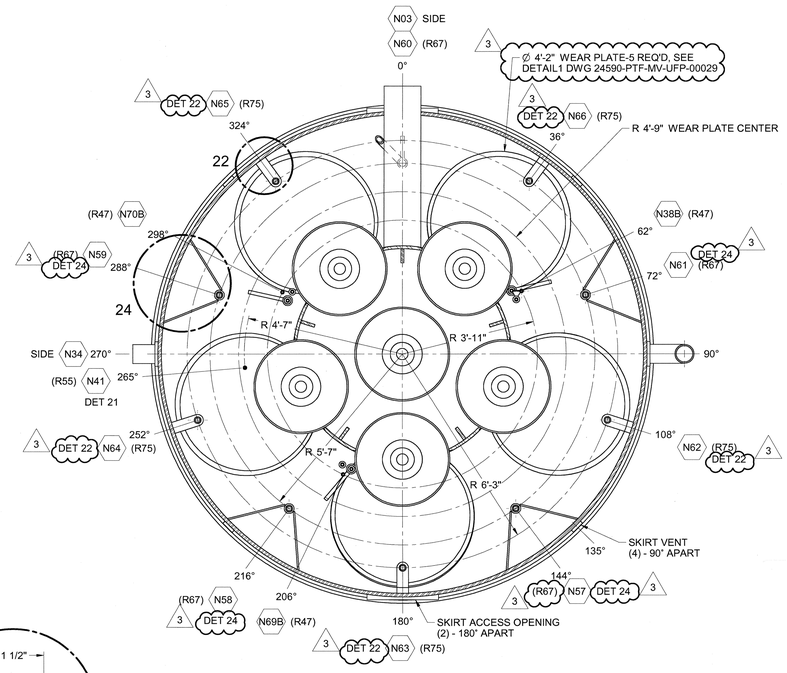

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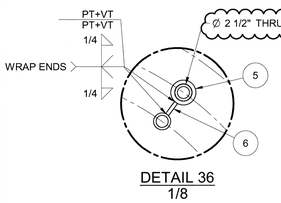
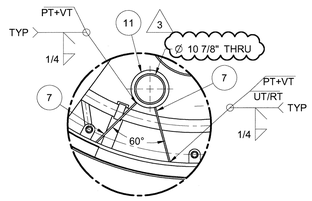
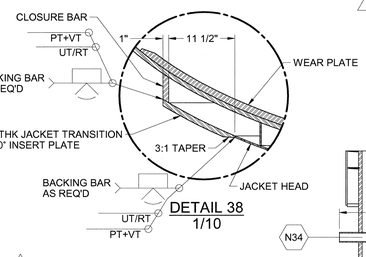
1/20
FROM REF DWG 24590-PTF-MV-UFP-00016



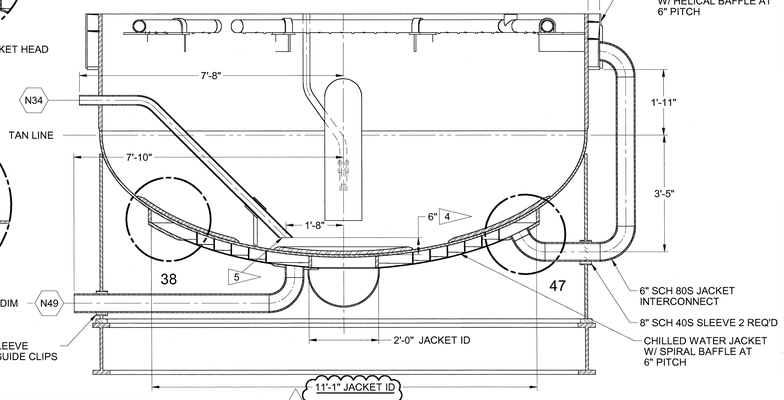
DETAIL 36
1/8



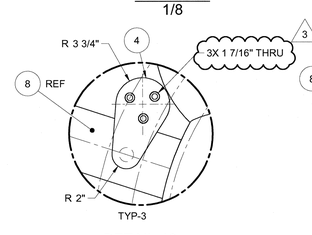
DETAIL 37
1/20



DETAIL 38
1/10



SECTION F-F
1/20
SOME ITEMS NOT SHOWN FOR CLARITY



DETAIL 19
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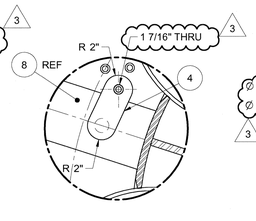

DETAIL 20
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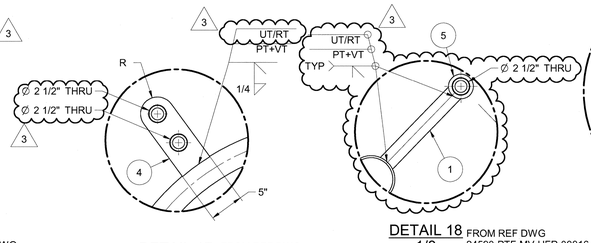
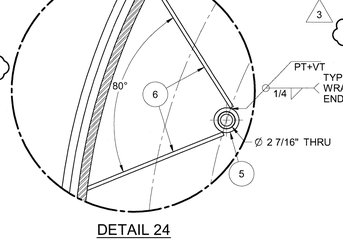
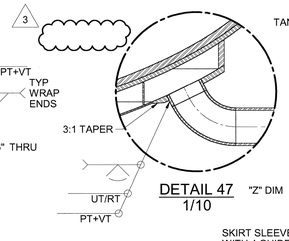


DETAIL 17
1/8
FROM REF DWG 24590-PTF-MV-UFP-00016

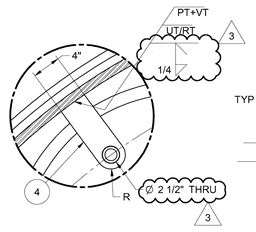
DETAIL 18
1/8
FROM REF DWG 24590-PTF-MV-UFP-00016



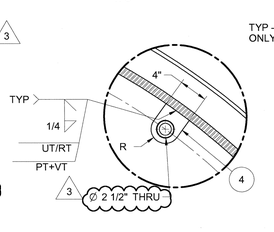
DETAIL 24
1/8



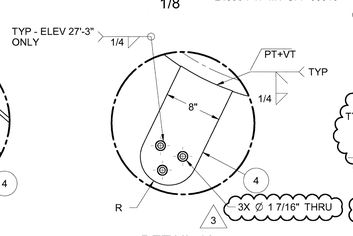
DETAIL 47
1/10



DETAIL 22
1/8



DETAIL 15
1/8
FROM REF DWG 24590-PTF-MV-UFP-00016



DETAIL 16
1/8
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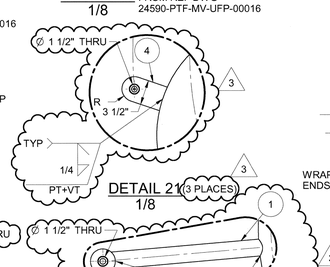
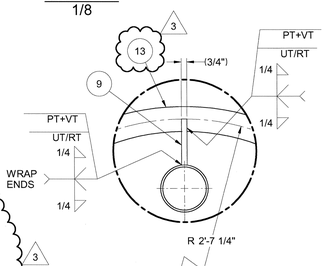
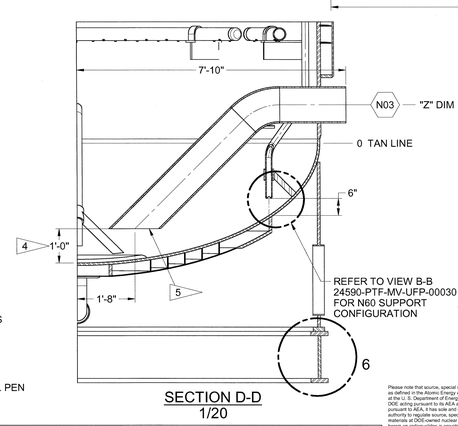


DETAIL 21 (3 PLACES)
1/8

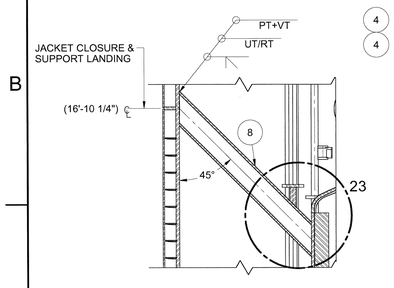
DETAIL 48
1/8



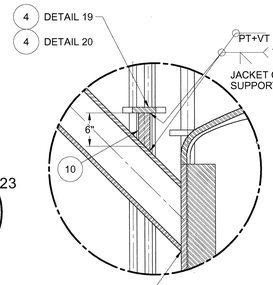
DETAIL 25
1/8



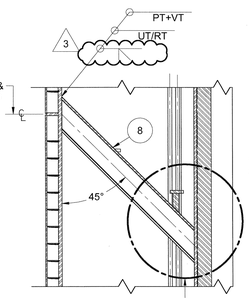
SECTION D-D
1/20



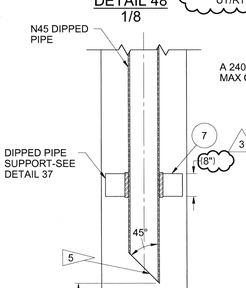
SECTION Q-Q
1/20



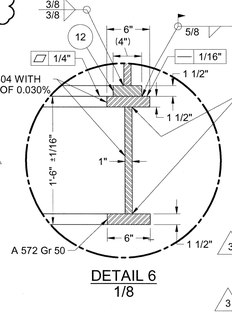
DETAIL 23
1/10



SECTION R-R
1/20



SECTION Z-Z
1/20



DETAIL 6
1/8

BILL OF MATERIALS DIPPED PIPE SUPPORTS

ITEM	THICK/SIZE	DESCRIPTION	QTY
1	2" SCH 80S	STRUCTURAL SUPPORT	A/R
2	1" THK X 2" PLATE	PIPE SUPPORT	A/R
3	1/2" THK PLATE	END CAP	A/R
4	1/2" THK PLATE	PIPE SUPPORT	A/R
5	Ø3 1/2" X 3" LENGTH BAR	PIPE SUPPORT COLLAR (MACHINED)	A/R
6	3/4" THK X 2" PLATE OR BAR	STRUCTURAL SUPPORT	A/R
7	1/2" X 8" PLATE OR BAR	PIPE SUPPORT	A/R
8	8" SCH 120S	STRUCTURAL SUPPORT	A/R
9	3/4" X 6" PLATE OR BAR	STRUCTURAL SUPPORT	A/R
10	Ø6" BAR	STRUCTURAL SUPPORT	A/R
11	12" THK X 8 3/4" LENGTH	PIPE SUPPORT	A/R
12	1 1/2" X 4" TALL PLATE	SKIRT BASE RING	A/R
13	3 SCH 80S	STRUCTURAL SUPPORT	A/R

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GENERAL NOTES:

1. REVISED/ADDED/DELETED:
   SEE ARCHIVE REVISION FOR FOR LISTED CHANGES.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. ADDED/REVISED/DELETED:

   PER CALCULATION No. 24590-PTF-MVC-UFP-00024.

   EXTENSIVE REVISION CHANGED AREAS ON DRAWING ARE NOT INDICATED.

   ADDED: SECTION M-M, SECTION N-N, SECTION P-P, SECTION Q-Q, SECTION R-R, SECTION Z-Z DETAILS 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 36, 37 3 3 3

   REVISED: CLEARANCE DIMENSION FOR PUMP OUTLET N-34 SHOWN ON SECTION F-F. INCORPORATED: 24590-PTF-MVN-UFP-00042.

   DELETED: STRUCTURAL SUPPORT FOR PUMP OUTLET N03 REFERENCE SECTION D-D. DIPPED PIPE OFFSET ON PUMP INLET N45.

   INCORPORATED: 24590-PTF-MVN-UFP-00042 AND 24590-WTP-MVN-M30-00001 3
4. CLEARANCE DIMENSION IS TAKEN FROM THE INSIDE BOTTOM HEAD CENTERLINE TO PUMP OUTLET.
5. FOR PUMP OUTLET PIPING PROVIDE MIN 1/8" RADIUS ON FINISHED EDGES.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that, pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
3	REVISED TO INCORPORATE CHANGES	BD	BM	CKW	JJ	12/21/11
2	REVISED PER NOTE 3	BR	BM	CKW	JJ	08/08/2011
1	REVISED PER NOTE 1	HK	MS	CS	JJ	11/22/2005
0	ISSUED FOR PURCHASE	HAMA	PACS	JJ	MH	5/10/04

REVISION HISTORY

Q

ISSUED BY RPP-WTP PDC — INIT / DATE — ISSUE STAMP

	BY	DATE
ORIGINATOR	M. ASKAR/H. KHURANA	5/10/04
CHECKER	P. AVIGUETERO/C. SLATER	5/10/04
APPROVER	M. HOFFMANN	5/10/04
REVIEWER	J. JULYK	5/10/04

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

PROJECT No. 24590 | SITE HANFORD | AREA 200E | BUILDING No. 10

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

SECTIONS AND DETAILS
ULTRAFILTRATION FEED VESSEL
UFP-VSL-00002A

SCALE: NONE
24590-PTF-MV-UFP-00017
REV 3

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFED IN 24590-WTP-GPP-SREG-002

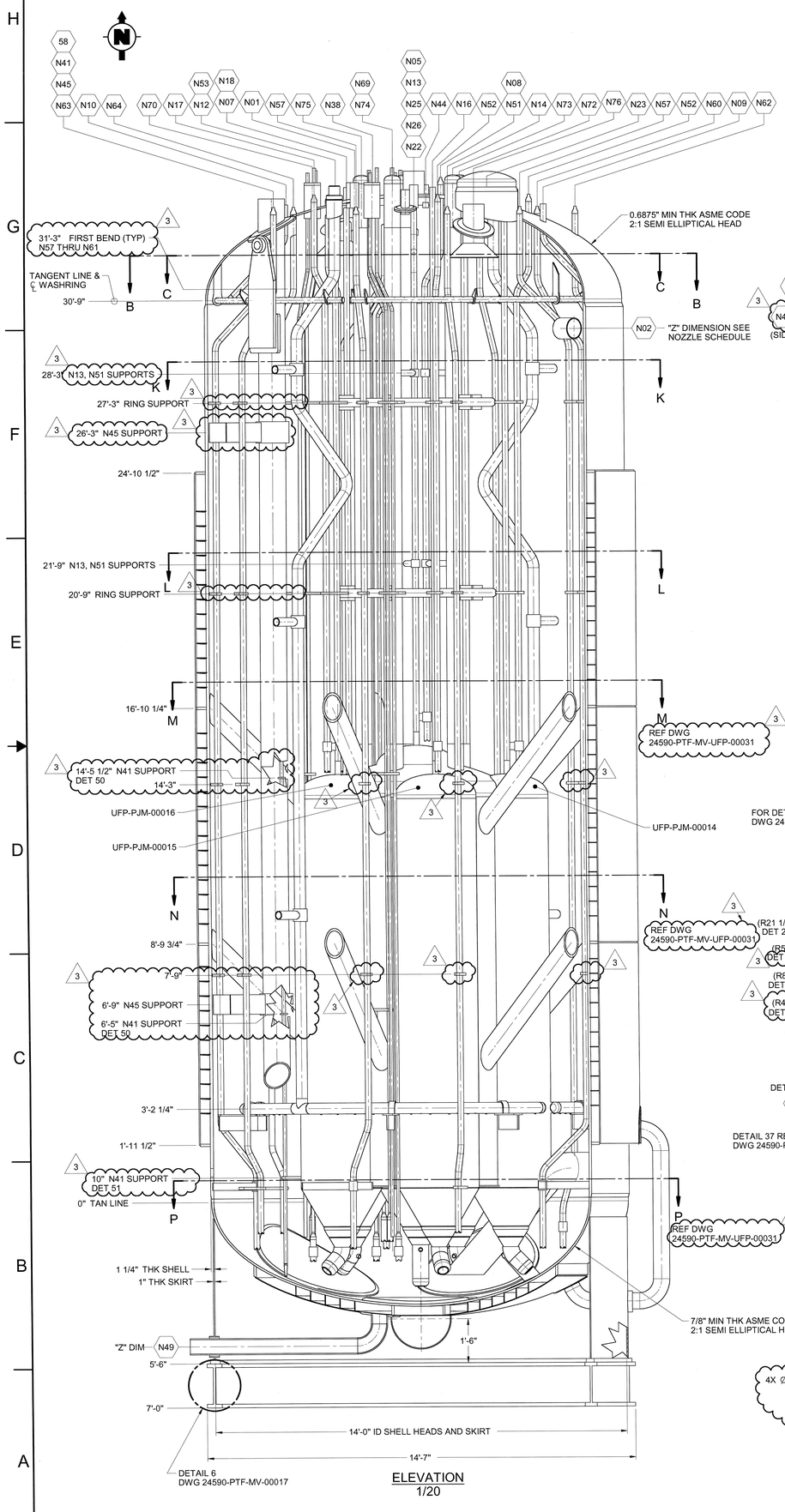
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

'E' SIZE - 44x34

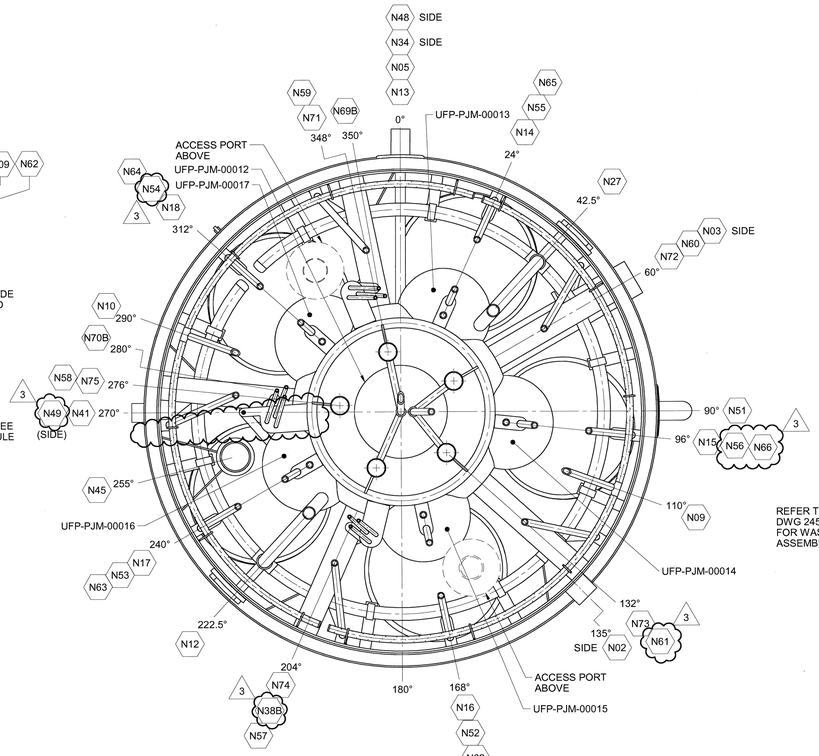
FORM E_MASTER 03/2003

R1145735

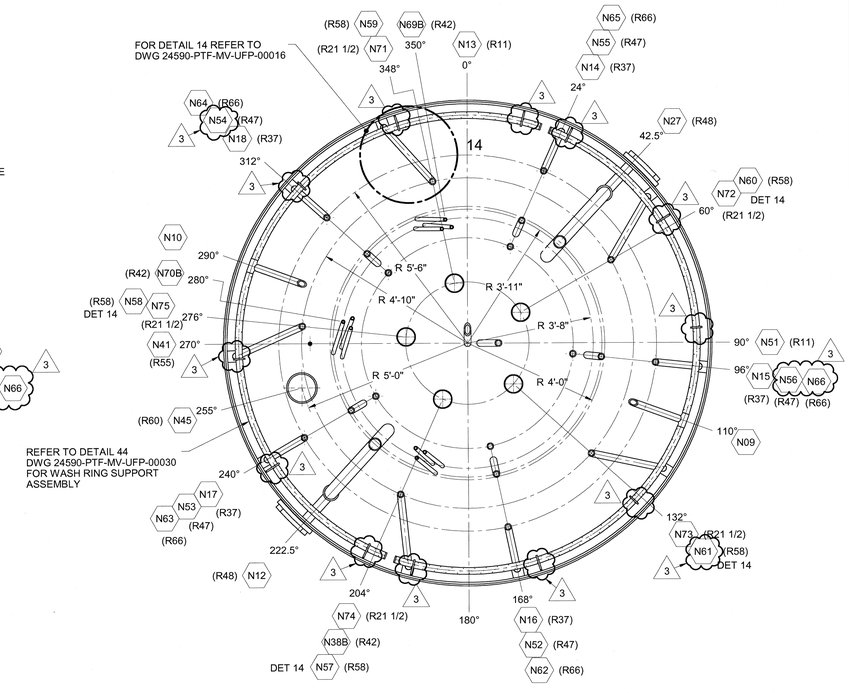
12/21/2011 11:42 AM



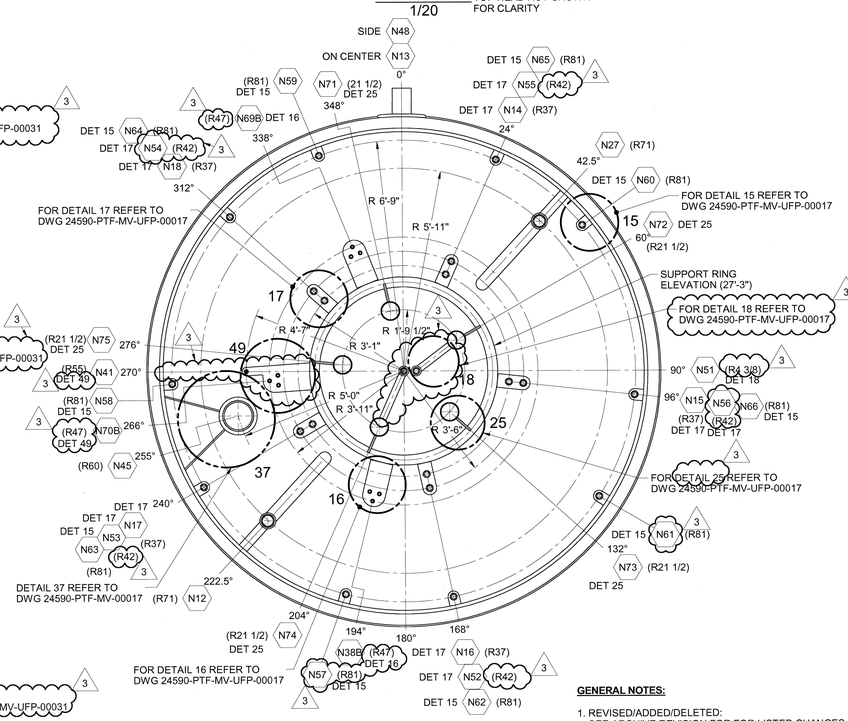
ELEVATION
1/20



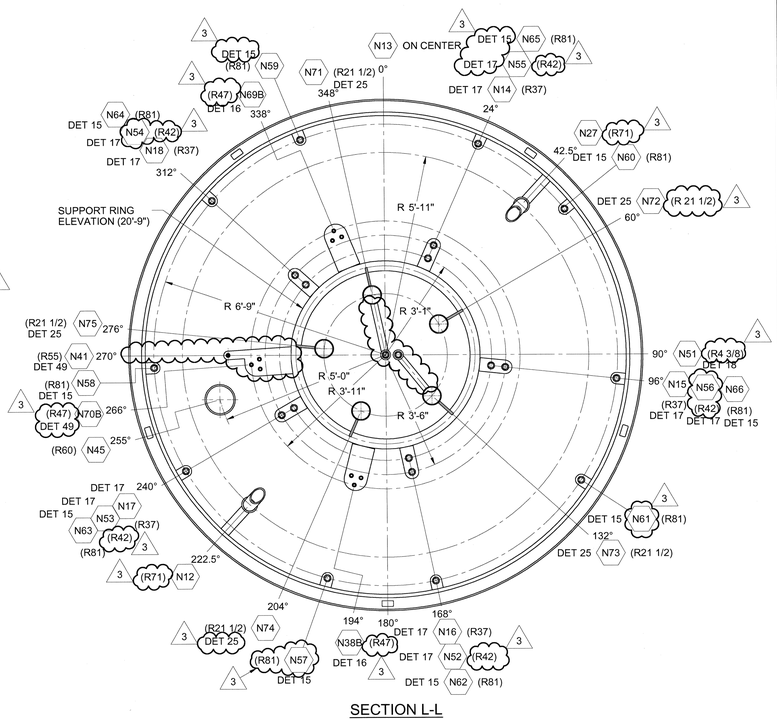
SECTION B-B
1/20
TOP HEAD NOT SHOWN FOR CLARITY



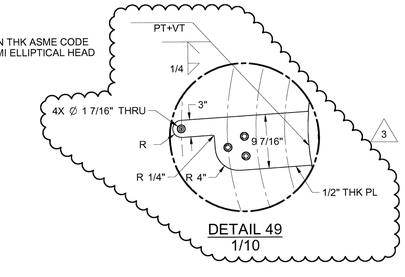
SECTION C-C
1/20
TOP HEAD NOT SHOWN FOR CLARITY



SECTION K-K
1/20



SECTION L-L
1/20



DETAIL 49
1/10

GENERAL NOTES:

1. REVISED/ADDED/DELETED:
   SEE ARCHIVE REVISION FOR FOR LISTED CHANGES.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. ADDED/REVISED/DELETED:

   EXTENSIVE REVISION CHANGED AREAS ON DRAWING ARE NOT INDICATED.

   ADDED: SECTION K-K.
   SECTION L-L.

3 REVISED: VESSEL SKIRT THICKNESS FROM 1/2" TO 1".

PER CALCULATION No. 24590-PTF-MVC-UFP-00024.

INCORPORATED: 24590-PTF-MVN-UFP-00042.
24590-WTP-M6N-M80T-00003.

3 4. ADDED/REVISED/DELETED:

INCORPORATED: 24590-PTF-MVN-UFP-00050.

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

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REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
3	REVISED TO INCORPORATE CHANGES AND PER NOTE 4					12/21/11
2	REVISED PER NOTE 3	BR	BM	CKW	JJ	08/08/2011
1	REVISED PER NOTE 1	HK	MS	CS	JJ	11/22/2005
0	ISSUED FOR PURCHASE	HA/MA	PA/CS	JJ	MH	5/10/04

REVISION HISTORY

ISSUED BY RPP-WTP PDC
INIT DATE
ISSUE STAMP

	BY	DATE
ORIGINATOR	M. ASKAR/H. KHURANA	5/10/04
CHECKER	P. AVIGUETERO/C. SLATER	5/10/04
APPROVER	M. HOFFMANN	5/10/04
REVIEWER	J. JULYK	5/10/04

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

PROJECT No. 24590
SITE HANFORD
AREA 200E
BUILDING No. I0

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

LAYOUT OF INTERNALS ULTRAFILTRATION FEED VESSEL UFP-VSL-00002B

SCALE: NONE
24590-PTF-MV-UFP-00018
REV 3

"E" SIZE - 44x34

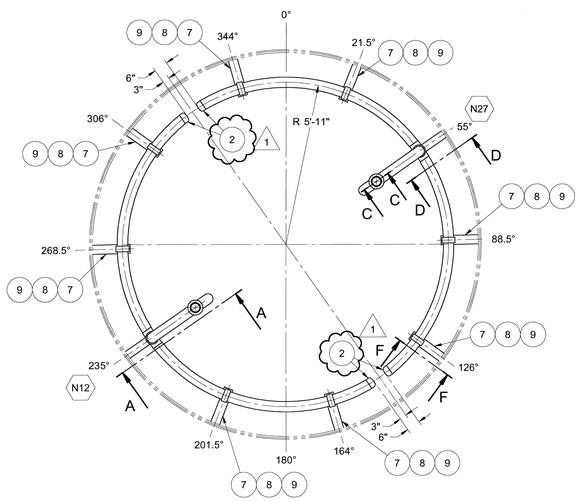
SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

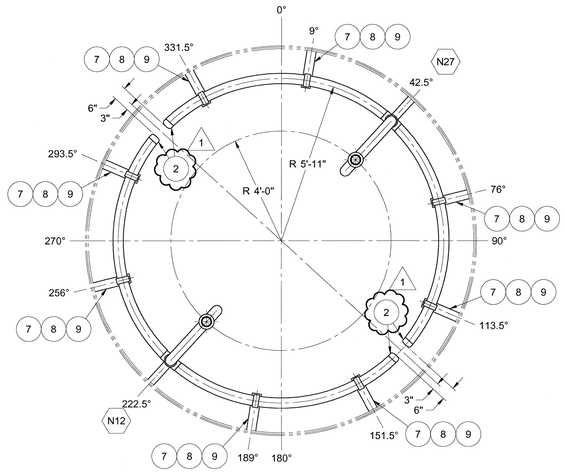
R1145736

12/21/2011 11:12 AM

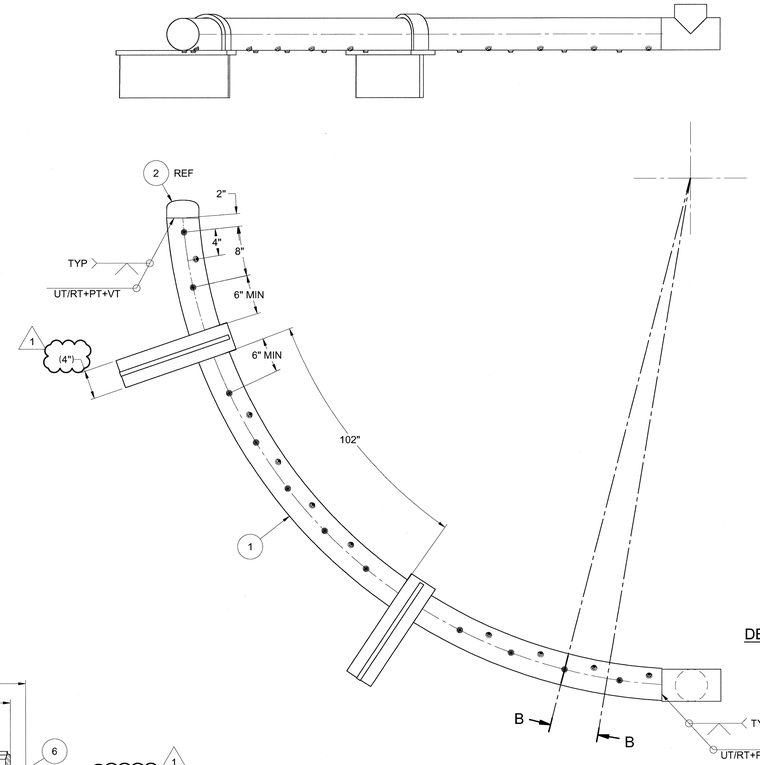
FORM E_MASTER 03/2003



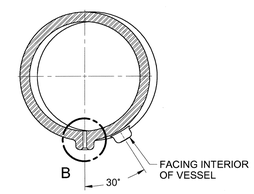
PLAN - UFP-VSL-00002A
1/25



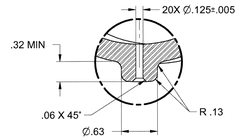
PLAN - UFP-VSL-00002B
1/25



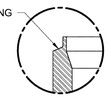
DETAIL A - STEAM SPARGER RING SEGMENT
1/8



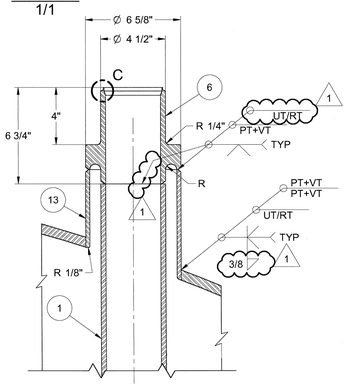
SECTION B-B
1/2



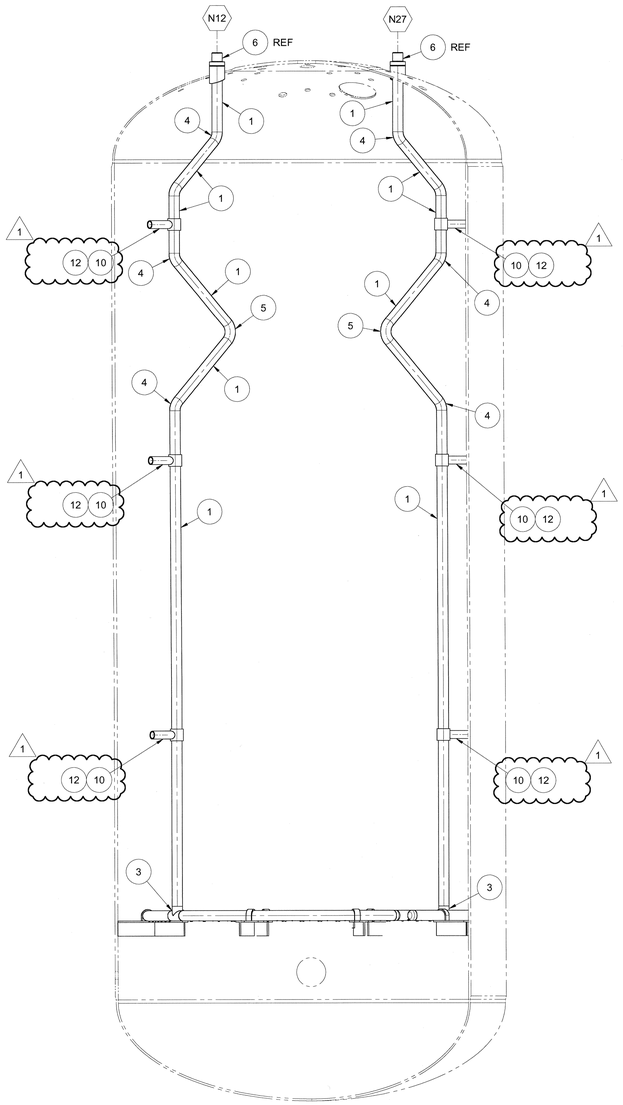
DETAIL B, STELLITE 21 WELD DEPOSIT
1/1



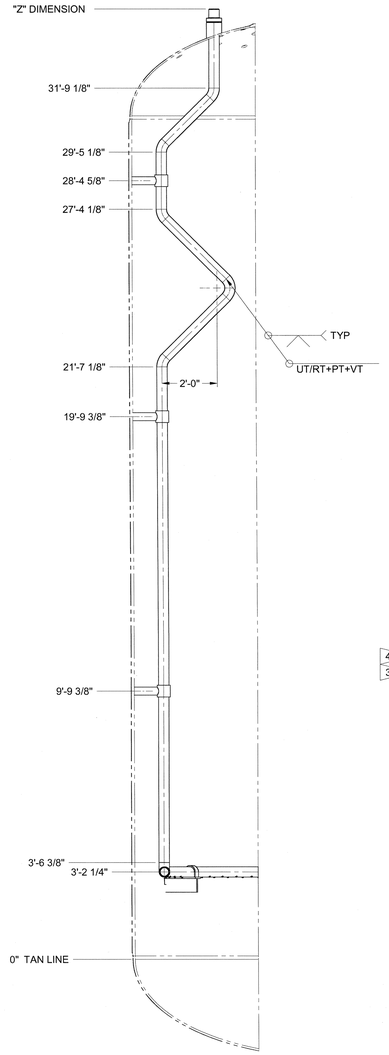
DETAIL C
1/1



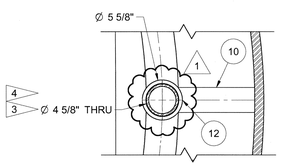
5 SECTION C-C
1/4



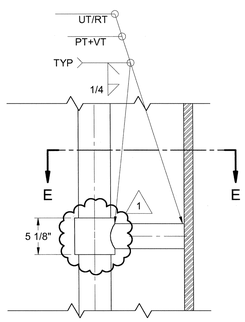
5 ELEVATION UFP-VSL-00002A/B
1/25



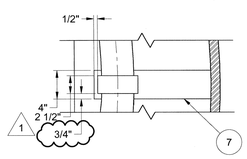
5 SECTION A-A
1/25



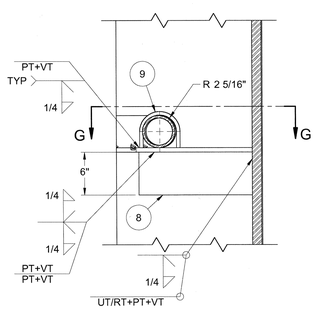
5 SECTION E-E
1/8



5 SECTION D-D
1/8



5 SECTION G-G
1/8



5 SECTION F-F
1/8

GENERAL NOTES:

1. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
2. REMOVE ALL BURRS AND SHARP EDGES.
3. HOLE BORE SHALL MAINTAIN 1/8" DIAMETRICAL CLEARANCE AROUND THE OUTSIDE DIAMETER OF THE PIPE BEING SUPPORTED.
4. PROVIDE MIN 1/8" CHAMFER TO HOLE BORE EDGES FOR ALL THRU-HOLES SUPPORTING PROCESS PIPING.
5. COMPONENTS, ASSEMBLY AND FABRICTATION DETAILS ARE TYPICAL FOR UFP-VSL-00002B.
6. ADDED/REVISED/DELETED:

INCORPORATED: 24590-PTF-MVN-UFP-00049.

THIS DRAWING TO BE READ IN CONJUNCTION WITH MECHANICAL SYSTEMS DATA SHEET 24590-PTF-MVD-UFP-00014

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO IT'S AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

BILL OF MATERIALS UFP-VSL-00002A

ITEM	THICK/SIZE	MATERIAL	DESCRIPTION	QTY
1	4" SCHED 80S	SB-622-N10276 SEAMLESS	SPARGER PIPING	A/R
2	4" SCHED 80S	SB-366-N10276	PIPE CAPS (WROUGHT FITTING)	4
3	4" SCHED 80S	SB-366-N10276	PIPE TEE (WROUGHT FITTING)	2
4	4" SCHED 80S	SB-366-N10276	45° ELBOW LONG RADIUS	8
5	4" SCHED 80S	SB-366-N10276	90° ELBOW LONG RADIUS	2
6	7" OD	SB-462-N10276	THERMAL SLEEVE - MACHINE PER DETAIL	2
7	4" X 5/8"	SB-575-N10276	HORIZONTAL SUPPORT TEE TOP PLATE	8
8	6" X 5/8"	SB-575-N10276	HORIZONTAL SUPPORT TEE WEB PLATE	8
9	2 1/2" X 1/2"	SB-575-N10276	HORIZONTAL SUPPORT BRACKET	8
10	4" SCHED 80S	SB-622-N10276 SEAMLESS	VERTICAL SUPPORT STAND-OFF	6
11			DELETED	
12	1/2"	SB-564-N10276	SLEEVE FOR VERTICAL SUPPORT RING	6
13	6" SCHED 80S	SA-312-TP-304 SEAMLESS	SLEEVE FOR NOZZLE N12, N27	2

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED TO INCORPORATE CHANGES AND PER NOTE 6	BR	BM	CKW	JJ	12/21/11
0	ISSUED FOR PURCHASE	BR	BM	CKW	JJ	08/08/2011

REVISION HISTORY

ISSUED BY RPP-WTP PDC — INIT — DATE — ISSUE STAMP

	BY	DATE
PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	I0	
ORIGINATOR	B. RADDON	8/8/2011
CHECKER	B. MAKADIA	8/8/2011
APPROVER	J. JULYK	8/8/2011
REVIEWER	K. CHIN	8/8/2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

STEAM SPARGER ASSEMBLY ULTRAFILTRATION FEED VESSEL UFP-VSL-00002A AND UFP-VSL-00002B

SCALE: AS SHOWN
24590-PTF-MV-UFP-00028
REV 1

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

"E" SIZE - 44x34

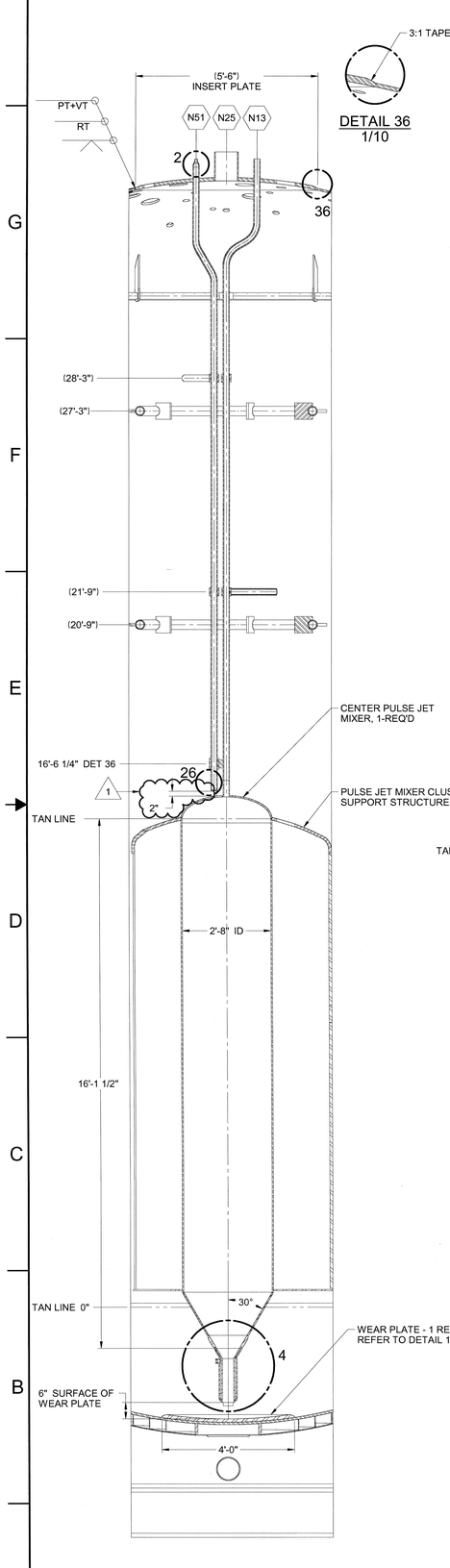
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

R1457737

12/21/2011 11:42 AM

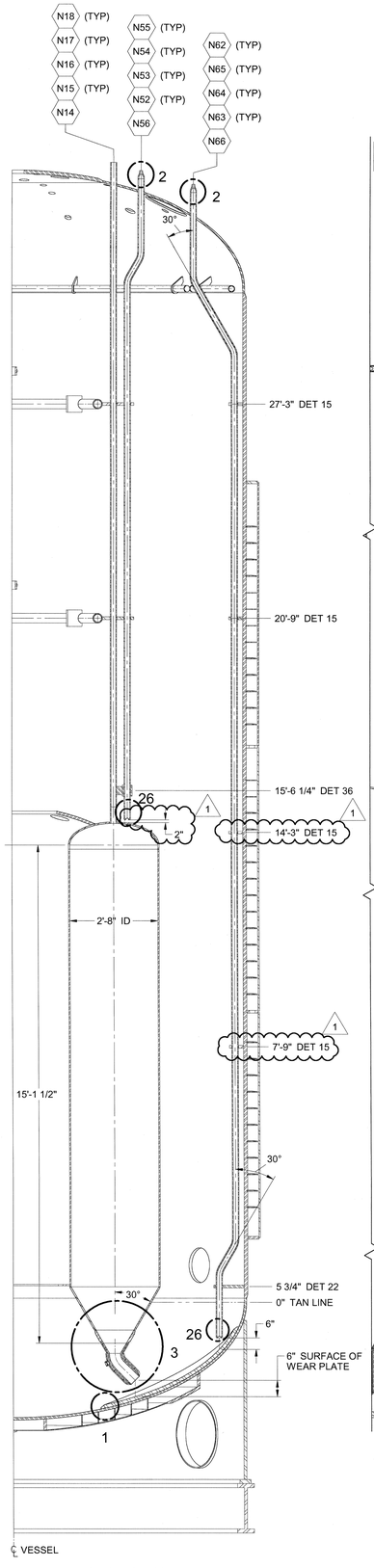
FORM E_MASTER 03/2003

BILL OF MATERIALS - PJM NOZZLE SLEEVE ASSEMBLY			
ITEM	MATERIAL	DESCRIPTION	QTY
1	SA-182-304	TRANSITION CONE	6
2	SA-240-304	SLEEVE CONE	6
3	SA-403-304	45° SLEEVE - 90° SR EL (SPLIT TO 45°)	5
4	SA-312-304	STR SLEEVE PIPE - 6" SCH XS	1
5	SA-403-304	RETENTION SLEEVE - 6" SCH XS PIPE CAP (DRILLED)	1
6	SA-312-304	STR SLEEVE PIPE - 6" SCH XS	5
7	SA-403-304	RETENTION SLEEVE - 6" SCH XS PIPE CAP (DRILLED)	5
8	SA-240-304	RETENTION RING	5
9	SA-182-304	COUPLING - 1" SCH XS (GROUT FILL)	6
10	SA-240-304	CAP (GROUT FILL)	6
11	646-N CERAMACAST	GROUT	A/R
12	STELLITE 12	NOZZLE CASTING 45°	5
13	STELLITE 12	NOZZLE CASTING STR	1



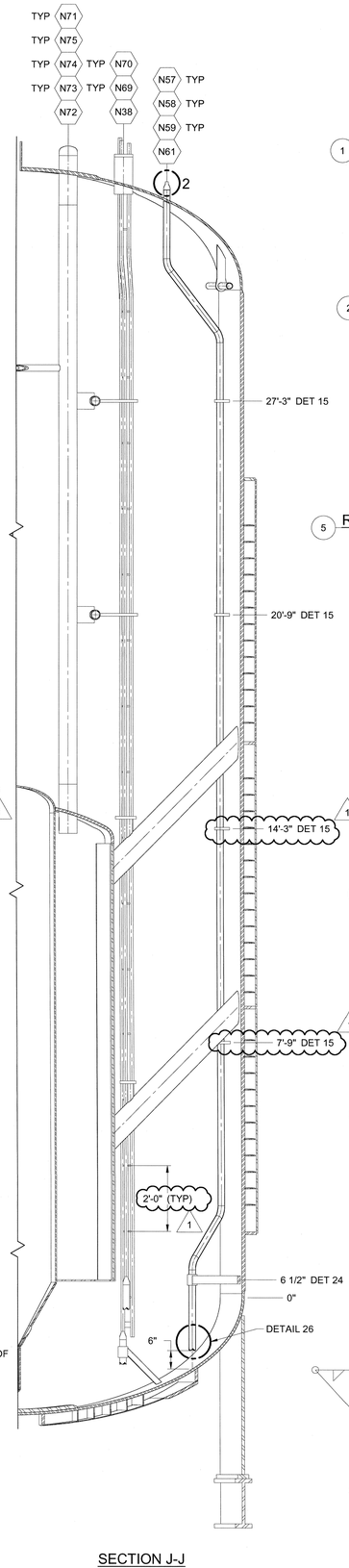
SECTION G-G
1/20

SOME ITEMS NOT SHOWN FOR CLARITY
FROM REF DWG
24590-PTF-MV-UFP-00003
24590-PTF-MV-UFP-00004



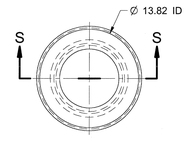
SECTION H-H
1/20

SOME ITEMS NOT SHOWN FOR CLARITY
FROM REF DWG
24590-PTF-MV-UFP-00003
24590-PTF-MV-UFP-00004

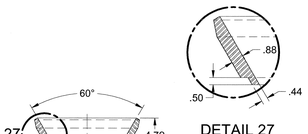


SECTION J-J
1/20

SOME ITEMS NOT SHOWN FOR CLARITY
FROM REF DWG
24590-PTF-MV-UFP-00003
24590-PTF-MV-UFP-00004

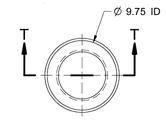


1 TRANSITION CONE
1/8

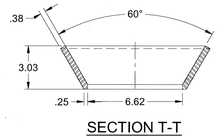


SECTION S-S
1/8

DETAIL 27
1/4

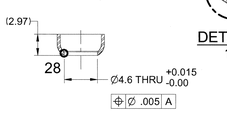


2 SLEEVE CONE
1/8

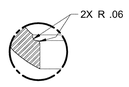


SECTION T-T
1/4

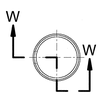
5 RETENTION SLEEVE
1/8



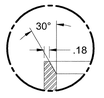
SECTION V-V
1/8



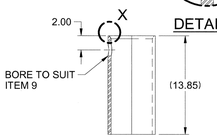
DETAIL 28
1/1



4 STR SLEEVE
1/8

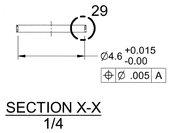


DETAIL X

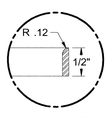


SECTION W-W
1/8

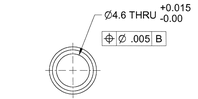
8 RETENTION RING
1/4



SECTION X-X
1/4

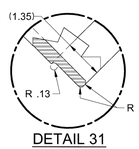


DETAIL 29
1/1

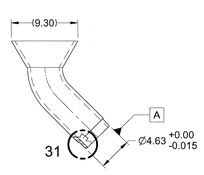


7 RETENTION SLEEVE
1/8

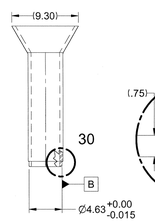
3 45 DEGREE SLEEVE
1/8



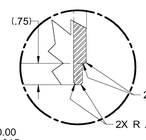
DETAIL 31
1/2



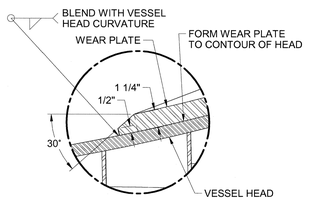
13 NOZZLE CASTING
1/8



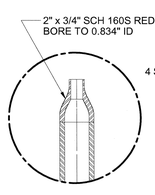
12 NOZZLE CASTING
1/8



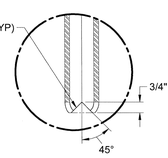
DETAIL 30
1/2



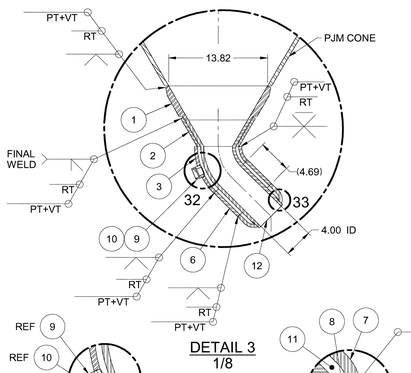
DETAIL 1
1/4

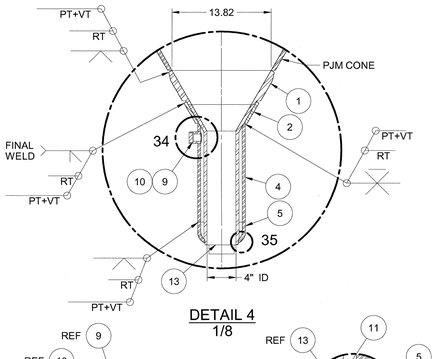


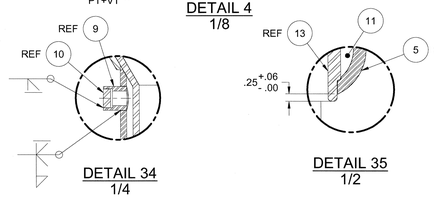
DETAIL 2
1/4



DETAIL 26
1/4







GENERAL NOTES:

1. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED TO INCORPORATE CHANGES	BD	BM	CKW	JJ	12/21/11
0	ISSUED FOR PURCHASE	BD	BM	CKW	JJ	08/08/2011

REVISION HISTORY

Q

ISSUED BY RPP-WTP PDC
INIT. DATE
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	B. RADDON	8/8/2011
CHECKER	B. MAKADIA	8/8/2011
APPROVER	J. JULYK	8/8/2011
REVIEWER	K. CHIN	8/8/2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV. 2
E&S SCREENING REQUIRED [X] YES [ ] NO E&S INITIAL IF YES

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL UFP-VSL-00002A & B

SCALE: NONE
24590-PTF-MV-UFP-00029
REV 1

"E" SIZE - 44x34

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFED IN 24590-WTP-GPP-SREG-002

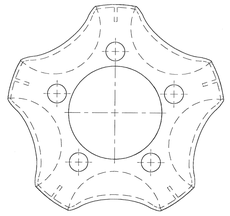
COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

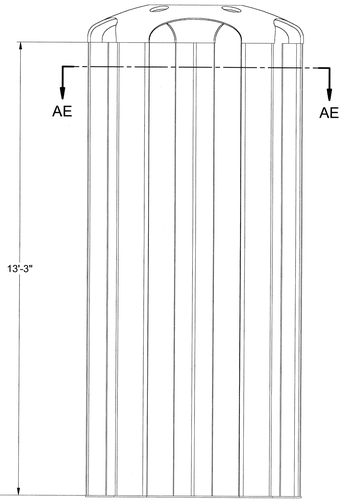
R1145738

12/21/2011 11:44 AM

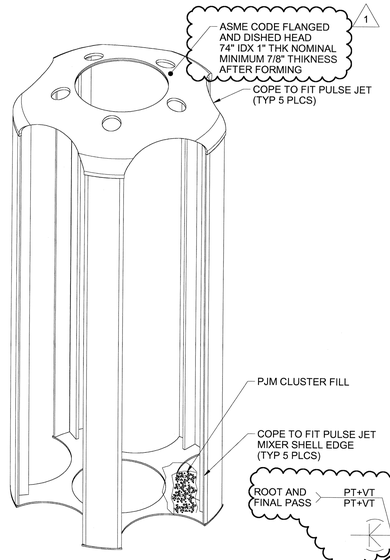
PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

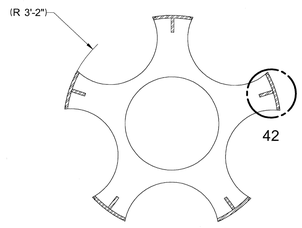
FORM E_MASTER 03/2003



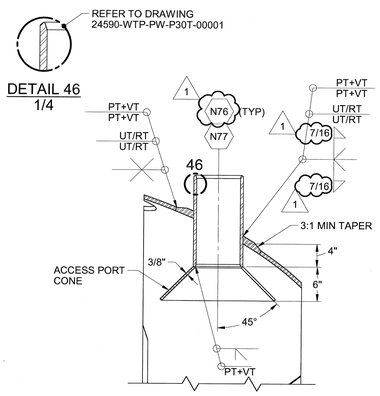


DETAIL 7 1/20 PJM CLUSTER SUPPORT STRUCTURE

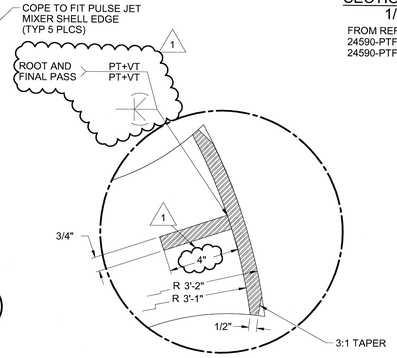




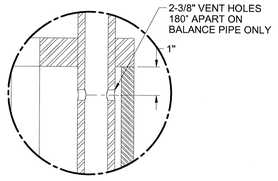
SECTION AE-AE 1/20



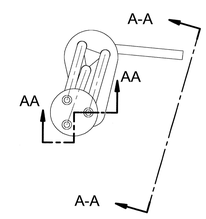
SECTION AJ-AJ 1/10
FROM REF DWG 24590-PTF-MV-00003 24590-PTF-MV-00004



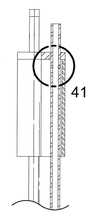
DETAIL 42 1/4 TYPICAL 5 PLACES



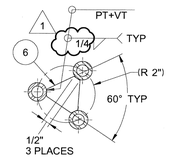
DETAIL 41



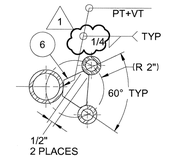
DETAIL 40 1/8 N38, N69, N70 SUPPORT ASSEMBLY



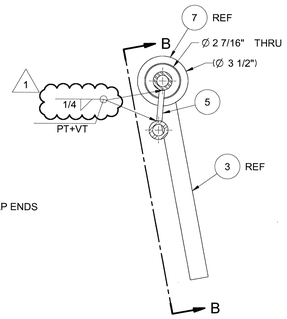
SECTION AA-AA 1/8



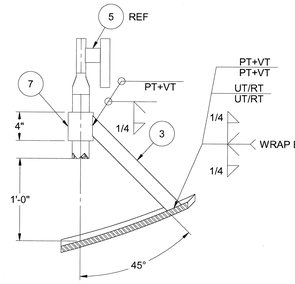
SECTION AB-AB 1/4



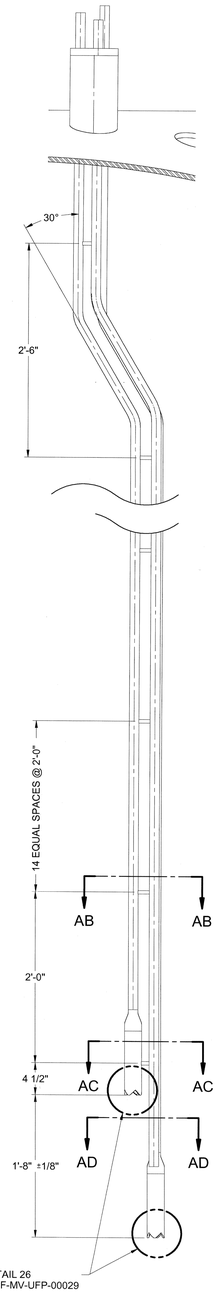
SECTION AC-AC 1/4



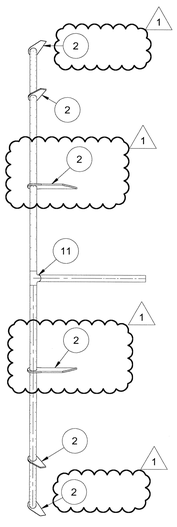
SECTION AD-AD 1/4

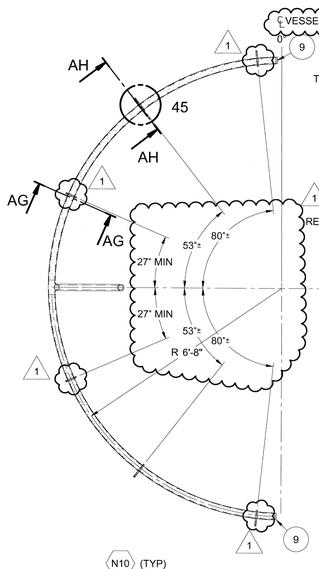


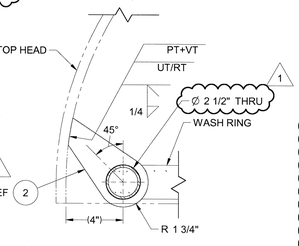
VIEW B-B 1/8



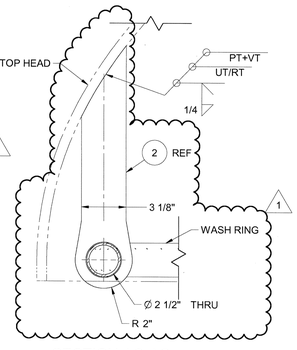
VIEW A-A 1/8 BOTTOM SUPPORT NOT SHOWN FOR CLARITY



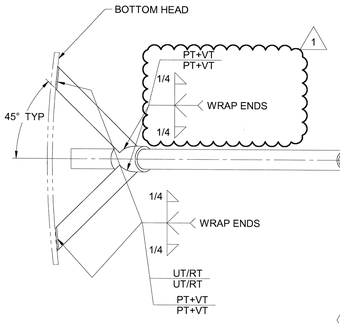


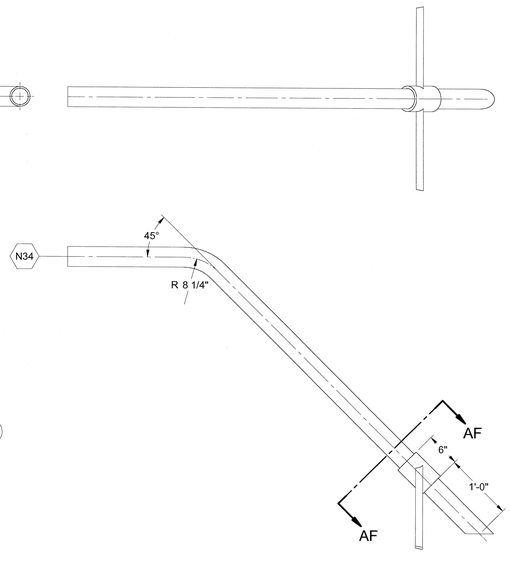


SECTION AH-AH 1/4



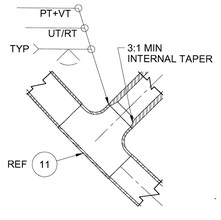
SECTION AG-AG 1/4



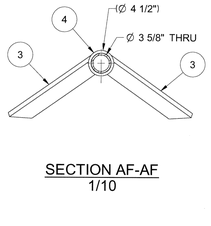


DETAIL 46 1/10 N34 SUPPORT ASSEMBLY

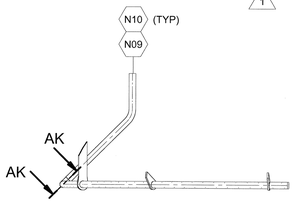
DETAIL 45 1/4
NOTE: TYPICAL SPACING FOR SUPPORT LOCATIONS



SECTION AK-AK



SECTION AF-AF 1/10



DETAIL 44 1/20 WASH RING SUPPORT ASSEMBLY

BILL OF MATERIALS WASH RING INSTRUMENTATION & N34 SUPPORTS

ITEM	THICK/SIZE	DESCRIPTION	QTY
1		DELETED	
2	1/2" THK PLATE	WASH RING STRUCTURAL SUPPORT	A/R
3	3/4" THK X 2" PLATE OR BAR	PIPE SUPPORT	A/R
4	4 1/2" ROUND BAR	N34 PIPE SUPPORT	A/R
5	3/8" THK X 2" PLATE OR BAR	INSTRUMENT PIPE INTERCONNECT	A/R
6	3/8" THK PLATE	INSTRUMENT PIPE INTERCONNECT	A/R
7	Ø 3 1/2" BAR	INSTRUMENTATION BTM HD SUPPORT	A/R
8	Ø 3 1/2" BAR	WASH RING SUPPORT	A/R
9	Ø 2 3/8" X 3/8" BAR OR PLATE	WASH RING END PLATE	A/R
10		DELETED	
11	2" SCH 40S	BUTT WELD TEE FITTING	A/R

GENERAL NOTES:

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REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED TO INCORPORATE CHANGES	BD	BM	CKW	JJ	12/21/11
0	ISSUED FOR PURCHASE	BD	BM	CKW	JJ	08/08/2011

REVISION HISTORY

Q

ISSUED BY RPP-WTP PDC INIT DATE

ISSUE STAMP

	BY	DATE
ORIGINATOR	B. RADDON	8/8/2011
CHECKER	B. MAKADIA	8/8/2011
APPROVER	J. JULYK	8/8/2011
REVIEWER	K. CHIN	8/8/2011

CONTENT APPLICABLE TO ALARA? [XX] YES [ ] NO

ADR NO. 24590-WTP-ADR-M-03-008 REV: 2

E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

SECTIONS AND DETAILS ULTRAFILTRATION FEED VESSEL UFP-VSL-00002A & B

SCALE:

24590-PTF-MV-UFP-00030

REV 1

"E" SIZE - 44x34

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFIED IN 24590-WTP-GPP-SREG-002

COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

12/21/2011 11:42 AM

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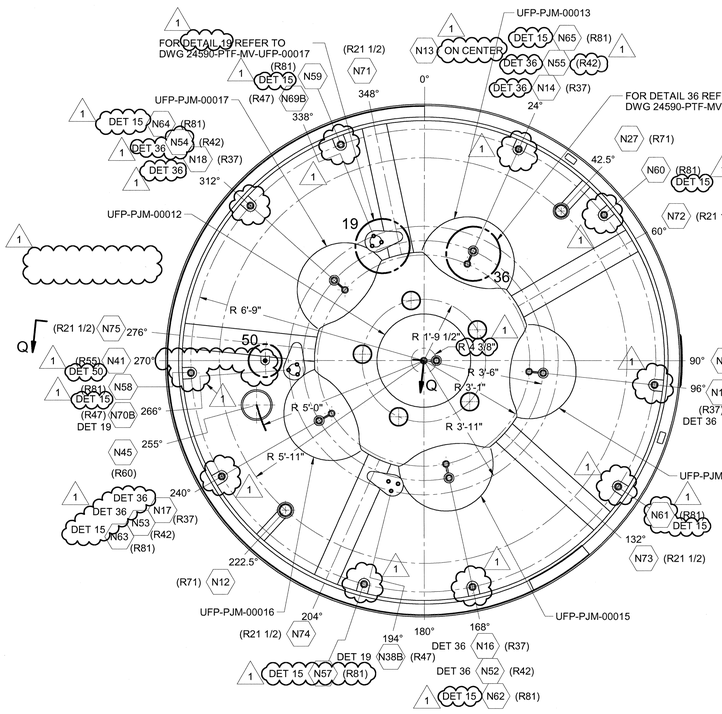
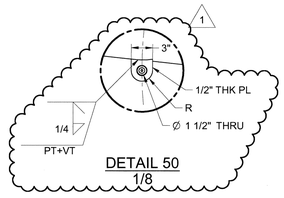
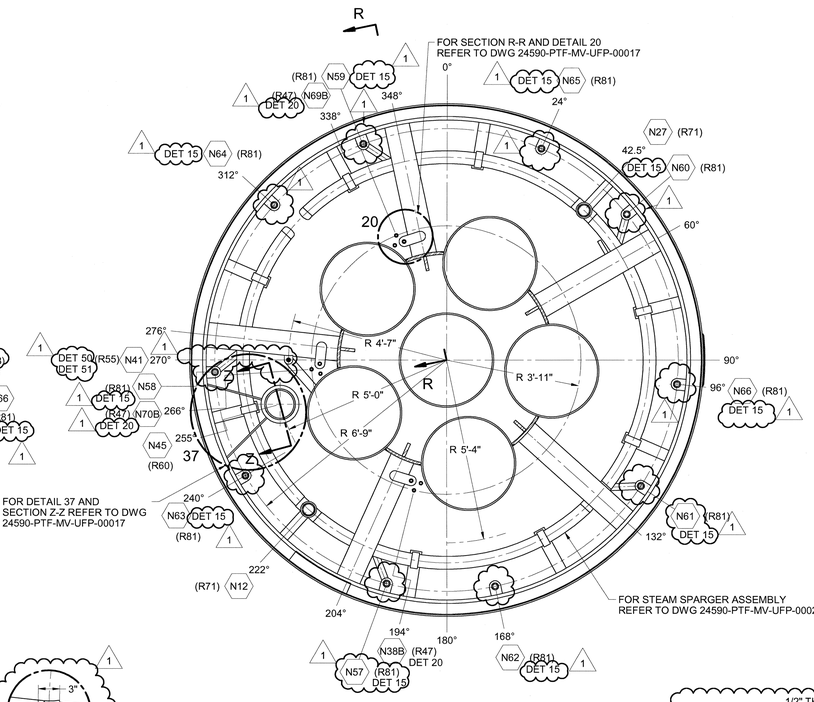


SECTION M-M
1/20
FROM REF DWG 24590-PTF-MV-UFP-00018



DETAIL 50
1/8



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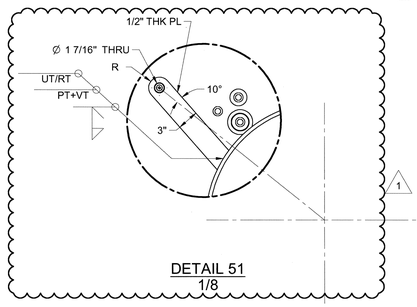
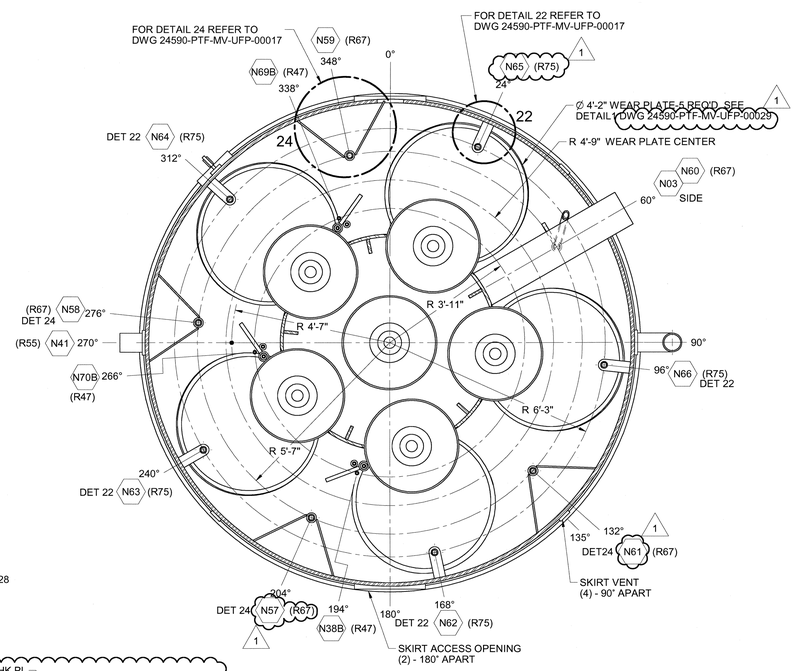
1/20
FROM REF DWG 24590-PTF-MV-UFP-00018



DETAIL 51
1/8



SECTION P-P
1/20
FROM REF DWG 24590-PTF-MV-UFP-00018

GENERAL NOTES:

1. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
2. ADDED/REVISED/DELETED:

   INCORPORATED: 24590-PTF-MVN-UFP-00050

PLEASE NOTE THAT SOURCE, SPECIAL NUCLEAR AND BYPRODUCT MATERIALS, AS DEFINED IN THE ATOMIC ENERGY ACT OF 1954 (AEA), ARE REGULATED AT THE U.S. DEPARTMENT OF ENERGY (DOE) FACILITIES EXCLUSIVELY BY DOE ACTING PURSUANT TO ITS AEA AUTHORITY. DOE ASSERTS, THAT PURSUANT TO THE AEA, IT HAS SOLE AND EXCLUSIVE RESPONSIBILITY AND AUTHORITY TO REGULATE SOURCE, SPECIAL NUCLEAR, AND BYPRODUCT MATERIALS AT DOE-OWNED NUCLEAR FACILITIES. INFORMATION CONTAINED HEREIN ON RADIONUCLIDES IS PROVIDED FOR PROCESS DESCRIPTION PURPOSES ONLY.

Q

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED TO INCORPORATE CHANGES AND PER NOTE 2	BJ	BMM	CKW	JJ	12/21/11
0	ISSUED FOR PURCHASE	BR	BM	CKW	JJ	08/08/2011

ISSUED BY RPP-WTP PDC — INIT / DATE — ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

	BY	DATE
ORIGINATOR	B. RADDON	8/8/2011
CHECKER	B. MAKADIA	8/8/2011
APPROVER	J. JULYK	8/8/2011
REVIEWER	K. CHIN	8/8/2011

CONTENT APPLICABLE TO ALARA? [XX] YES [ ] NO
ADR NO. 24590-WTP-ADR-M-03-008 REV: 2
E&NS SCREENING REQUIRED [X] YES [ ] NO E&NS INITIAL IF YES

LAYOUT OF INTERNALS ULTRAFILTRATION FEED VESSEL UFP-VSL-00002B

SCALE: NONE
'E' SIZE - 44x34

24590-PTF-MV-UFP-00031

REV 1

SCREENING IS REQUIRED FOR DRAWING TYPES IDENTIFED IN 24590-WTP-GPP-SREG-002

COMPUTER GENERATED - MANUAL DESIGN CHANGES NOT PERMITTED

R1145740

12/20/2011 05:12 PM

FORM E_MASTER 03/2003

Table III.10.E.A – Pretreatment Plant Tank Systems Description

Dangerous and/or Mixed Waste Tank Systems Name	System Designation	Engineering Description (Drawing Nos., Specifications Nos., etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
		-M6-UFP-00027007, Rev 0 -MLD-UFP-P0007, Rev 1 -MVD-UFP-00001, Rev 12 -MVD-UFP-~~P~~00014, Rev ~~0~~11 -MVD-UFP-~~P~~00015, Rev ~~0~~11 -MVD-UFP-00002, Rev 12 -MVD-UFP-P00005. Rev 11 -MVD-UFP-P00006, Rev 11 -MVD-UFP-P00007, Rev 11 -MV-UFP-00001001, Rev 1 -MV-UFP-00001002, Rev 1 -MV-UFP-00001003, Rev 1 -MV-UFP-00002001, Rev 1 -MV-UFP-00002002, Rev 1 -MV-UFP-00002003, Rev. 1 -MV-UFP-~~P000300~~00003, Rev ~~0~~6 -MV-UFP-~~P000400~~00004, Rev ~~0~~6 -MV-UFP-P0005, Rev 0 -MV-UFP-P0006, Rev 0 -MV-UFP-P0007, Rev 0 -MV-UFP-00016, Rev 3 -MV-UFP-00017, Rev 3 -MV-UFP-00018, Rev 3 -MV-UFP-00028, Rev 1 -MV-UFP-00029, Rev 1 -MV-UFP-00030, Rev 1 -MV-UFP-00031, Rev 1 -N1D-UFP-P0001, Rev 2 -N1D-UFP-P0002, Rev 2 -N1D-UFP-P0003, Rev 5		

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-12-007

Hanford Facility RCRA Permit Modification Notification Form
Part III, Operating Unit 10
Waste Treatment and Immobilization Plant

Index

Page 2 of 5: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant

Replace Piping and Instrumentation Diagrams (P&ID) for the PTF Cesium Ion Exchange Process (CXP) System Vessel (CXP-VSL-00004) and the PTF Waste Feed Evaporation Process (FEP) System Vessels (FEP-VSL-00017A and FEP-VSL-00017B), Reboilers, and Utility Racks in Appendix 8.2 of the Dangerous Waste Permit (DWP). Delete P&ID for vessel CXP-VSL-00001.

Submitted by Co-Operator:

D. M. Busche 3/11/13 Date

Reviewed by ORP Program Office:

DW

D. L. Noyes 4/8/13 Date

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-12-007

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update the P&ID drawings for the PTF CXP Cesium Ion Exchange Feed Vessel (CXP-VSL-00004), and the FEP Evaporator Feed Vessels (FEP-VSL-00017A and FEP-VSL-00017B), Evaporator Feed Pump (FEP-PMP-00007A) and Feed Vessel Bubbler, the FEP Reboilers (FDEP-RBLR-00001A and FEP-RBLR-00001B), the FEP Utility Services PSA Utility Rack (PSA-RK-00021) and PJMs (FEP-PJM-00001 through -00007, and -00017), the FEP PSA Utility Rack (PSA-RK-00022) and PJMs (FEP-PJM-00008 through -00015), and the FEP Utility Services Plant Wash Rack (PWD-RK-00002) in Appendix 8.2 of the DWP. This modification also deletes a drawing that illustrated vessel CXP-VSL-00001.

The following P&ID drawings are being submitted to replace the documents currently in Appendix 8.2 and/or to provide an increase in the number of P&ID drawings submitted as a result of converting source drawings into multiple drawings to provide a clearer representation of the system, including additional details for instrumentation and control logic. One P&ID is to be removed from Appendix 8.2 because it no longer contains DWP structures, systems, and components (SSC).

Appendix 8.2			
Replace:	24590-PTF-M6-CXP-00001004, Rev. 1	With:	24590-PTF-M6-CXP-00001004, Rev. 2
	24590-PTF-M6-FEP-00001001, Rev. 0		24590-PTF-M6-FEP-00001001, Rev. 1
			24590-PTF-M6-FEP-00001003, Rev. 0
			24590-PTF-M6-FEP-00001004, Rev. 0
	24590-PTF-M6-FEP-00002002, Rev. 0		24590-PTF-M6-FEP-00002002, Rev. 1
	24590-PTF-M6-FEP-00004002, Rev. 0		24590-PTF-M6-FEP-00004002, Rev. 1
	24590-PTF-M6-FEP-00006001, Rev. 0		24590-PTF-M6-FEP-00006001, Rev. 1
	24590-PTF-M6-FEP-00006002, Rev. 0		24590-PTF-M6-FEP-00006002, Rev. 1
	24590-PTF-M6-FEP-00006, Rev. 3		24590-PTF-M6-FEP-00006003, Rev. 1
			24590-PTF-M6-FEP-00006005, Rev. 0
	24590-PTF-M6-FEP-00006004, Rev. 0		24590-PTF-M6-FEP-00006004, Rev. 1
	24590-PTF-M6-FEP-00007001, Rev. 0		24590-PTF-M6-FEP-00007001, Rev. 1
	24590-PTF-M6-FEP-00007002, Rev. 0		24590-PTF-M6-FEP-00007002, Rev. 1
	24590-PTF-M6-FEP-00007003, Rev. 0		24590-PTF-M6-FEP-00007003, Rev. 1
			24590-PTF-M6-FEP-00007005, Rev. 0
	24590-PTF-M6-FEP-00007004, Rev. 0		24590-PTF-M6-FEP-00007004, Rev. 1
	24590-PTF-M6-FEP-00008, Rev. 4		24590-PTF-M6-FEP-00008001, Rev. 0
			24590-PTF-M6-FEP-00008002, Rev. 0
Remove:	24590-PTF-M6-CXP-00001001, Rev. 0	Explanation:	There are no DWP SSC's on the drawing; Vessel CXP-VSL-00001 removed.

This modification requests Ecology approval and incorporation into the permit the specific changes to the above DWP documents. Conversion from one to multiple drawings expands the drawings to provide more detail, in general, revision clouds are used to show changes, for drawings that have undergone major revision, no revision clouds are used.

Revisions are the result of ongoing design (changes from vendor preliminary data to vendor detailed design), quality/seismic flag changes, and general criteria from design verification review. The following identifies the significant changes that have been incorporated. Significant changes common to most or all P&IDs are summarized below:

- Converted drawings from a single sheet to multi-sheet drawings; or extended number of sheets in multi-sheet drawings
- Modified, deleted, and added notes, holds, drawing index, and references; revised ALARA Design Review (ADR) record

- Modified support/utility system lines, valves, in-line components, instruments and control logic
- Incorporated changes from change documentation identified in the Notes section on each drawing
- Added, moved, and/or modified seismic and quality flags

Significant changes specific to:
24590-PTF-M6-FEP-00001001:

- Portions related to Evaporator Feed Pump moved to Drawing 24590-PTF-M6-FEP-00001003 (indicated by empty cloud at B8). Location of nozzle N65 and piping to Feed Pump moved to grid B3 on drawing. As a result of the move, some change documentation cited in Note 19 refers to revisions shown on Drawing 24590-PTF-M6-FEP-00001003
- Portions related to Evaporator Feed Vessel Bubblers moved to Drawing 24590-PTF-M6-FEP-00001004 (indicated by empty cloud at C4)

Significant changes specific to:
24590-PTF-M6-FEP-00002002:

- Changed FEP-DHTR-00001 from In-Line Components to Mechanical Equipment; equipment tag added at top of P&ID drawings
- Incorporated fluid code and pipe specification changes to address steam supply to evaporator reboiler that requires a "DR" fluid code. Line codes DB and DC changed to DR to indicate Suspect Radioactive Steam
- Deleted components at C4, D4 and E4 as described by DCN Number 24590-PTF-M6N-FEP-00126
- Deleted seismic breaks at F4 and G5 as described by DCN 24590-PTF-M6N-M80T-00105
- Deleted extraneous diamond symbol in B4 as described by DCN 24590-PTF-M6N-FEP-00102
- Deleted slope designation at C7 as described by DCN 24590-PTF-M6N-M80T-00089

Significant changes specific to:
24590-PTF-M6-FEP-00004002:

- Changed FEP-DHTR-00002 from In-Line Components to Mechanical Equipment; equipment tag added at top of P&ID drawings
- Incorporated fluid code and pipe specification changes to address steam supply to evaporator reboiler that requires a "DR" fluid code. Line codes DB and DC changed to DR to indicate Suspect Radioactive Steam
- Deleted components at D4 and E4 as described by DCN Number 24590-PTF-M6N-FEP-00126
- Deleted seismic breaks at F4 and G5 as described by DCN 24590-PTF-M6N-M80T-00105
- Deleted slope designation at C7 as described by DCN 24590-PTF-M6N-M80T-00089

Significant changes specific to:
24590-PTF-M6-FEP-00006001, 002, 003, 004 and 005:

- Major revision, no revision clouds provided. Revised to illustrate that pulse jet mixers FEP-PJM-00001 through -00007 and -00017 are located in FEP-VSL-00017A as depicted on sheet 005
- Vessel FEP-VSL-00017A, pulse jet mixers and PJV header moved to Drawing 24590-PTF-M6-FEP-00006005
- Modified pressure reducing valves to provide for calibration as described by DCN Number 24590-PTF-M6LN-FEP-00005

Significant changes specific to:
24590-PTF-M6-FEP-00007001, 002, 003, 004 and 005:

- Major revision, no revision clouds provided. Revised to illustrate that pulse jet mixers FEP-PJM-00008 through -00015 are located in FEP-VSL-00017B as depicted on sheet 005
- Vessel FEP-VSL-00017B, pulse jet mixers and PJV header moved to Drawing 24590-PTF-M6-FEP-00007005

- Modified pressure reducing valves to provide for calibration as described by DCN Number 24590-PTF-M6LN-FEP-00005

Significant changes specific to:
24590-PTF-M6-FEP-00008001 and 24590-PTF-M6-FEP-00008002:

- Replaced 17 vacuum breakers with one as described by DCN Number 24590-PTF-M6N-FEP-00092. Deleted vacuum breakers are indicated by empty clouds along grid row D on sheet 001 and along grid row F on sheet 002
- Deleted seismic category and quality level flags, see for example D8 on sheet 002

Significant changes specific to:
24590-PTF-M6-CXP-00001001:

- This drawing no longer illustrates DWP SSCs

This PCN updates information in Appendix 8.2 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.

The following outstanding change documents have been submitted to Ecology pursuant to permit condition III.10.C.9.h and are maintained in the WTP Operating Record:

24590-PTF-M6-FEP-00001001:

- 24590-PTF-M6N-FEP-00131
- 24590-PTF-M6N-FEP-00107

24590-PTF-M6-FEP-00002002:

- 24590-PTF-M6LN-FEP-00029
- 24590-PTF-M6LN-M80T-00067
- 24590-PTF-M6N-FEP-00110
- 24590-PTF-M6N-M80T-00138

24590-PTF-M6-FEP-00004002:

- 24590-PTF-M6LN-FEP-00029
- 24590-PTF-M6LN-M80T-00067
- 24590-PTF-M6N-FEP-00115
- 24590-PTF-M6N-M80T-00138

24590-PTF-M6-FEP-00006001, 24590-PTF-M6-FEP-00006002 and 24590-PTF-M6-FEP-00006003:

- 24590-PTF-M6N-M80T-00124
- 24590-PTF-M6N-M80T-00126

24590-PTF-M6-FEP-00006004:

- 24590-PTF-M6LN-FEP-00025
- 24590-PTF-M6N-M80T-00124
- 24590-PTF-M6N-M80T-00126

24590-PTF-M6-FEP-00007001, 24590-PTF-M6-FEP-00007002, 24590-PTF-M6-FEP-00007003 and 24590-PTF-M6-FEP-00007004:

- 24590-PTF-M6N-M80T-00124
- 24590-PTF-M6N-M80T-00126

Quarter Ending March 31, 2013 24590-PTF-PCN-ENV-12-007

24590-PTF-M6-FEP-00008001:

- 24590-PTF-M6N-FEP-00118

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

See attached.

WAC 173-303-830 Modification Class:	Class 1	Class 1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class 1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

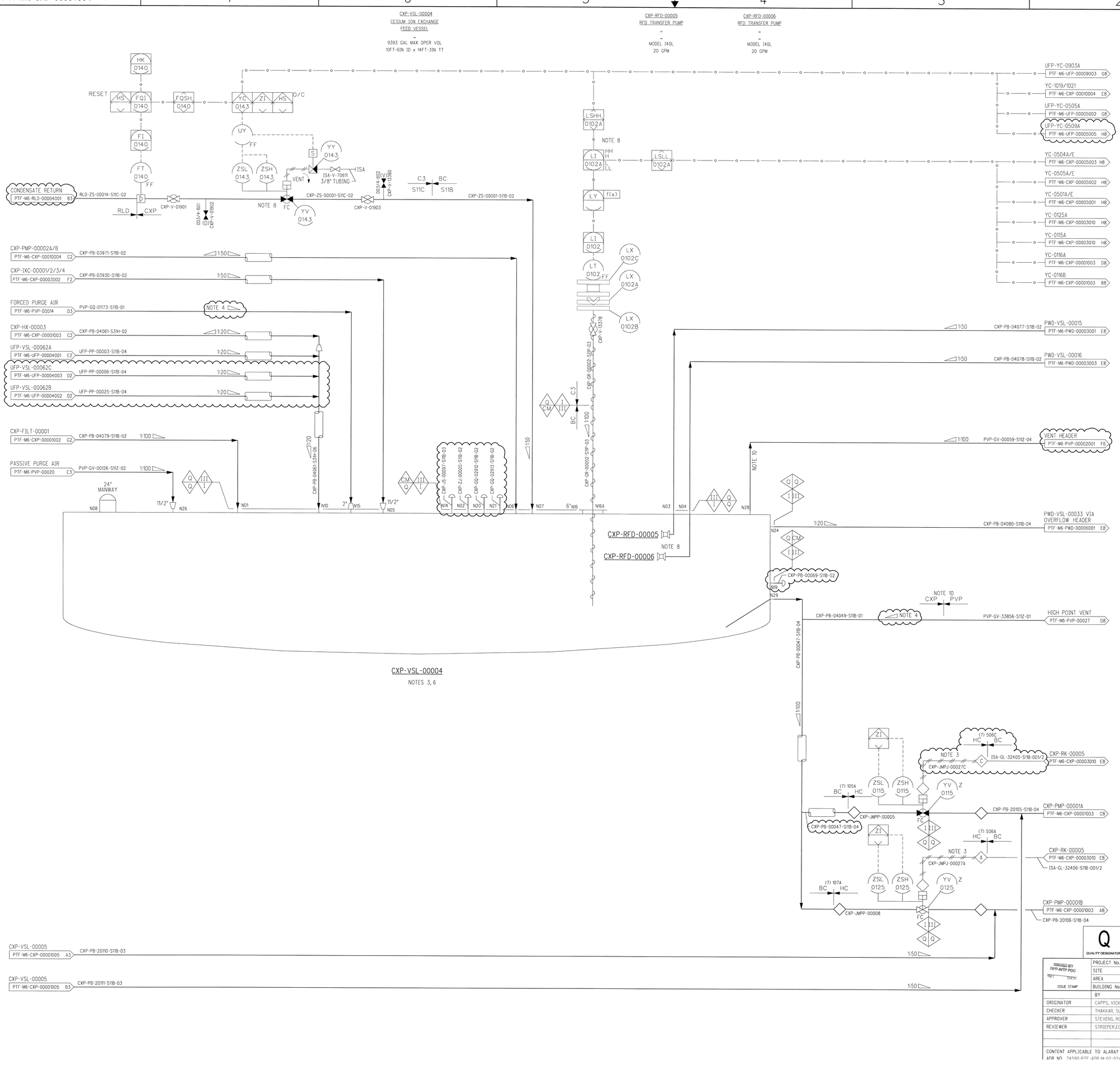
Modification Approved/Concur: [✓] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl 6-5-13 Date

24590-PTF-M6-CXP-00001004



NOTES:

1. SEE DRAWINGS 24590-PTF-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED. RFDS ARE QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III. THE PRESSURE BOUNDARY FOR ALL FLEXIBLE PNEUMATIC JUMPERS IS QUALITY LEVEL CM AND SEISMIC CATEGORY SC-IV, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. FOR REVERSE FLOW DIVERTER/PULSE JET MIXER FLUIDIC DRIVE REPRESENTATION, REFER TO DRAWING 24590-PTF-M6-CXP-00005004.
6. FOR VESSEL WASH RING CONNECTION, SEE DRAWING 24590-PTF-M6-CXP-00007.
7. DELETED
8. HIGH-HIGH LEVEL TRIP CLOSES VALVES CXP-YV-0143. LOW-LOW LEVEL TRIP STOPS REVERSE FLOW DIVERTERS CXP-RFD-00005, AND -00006.
9. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-CXP-00001 REV 4. THIS DRAWING MAY INCLUDE INFORMATION FROM 24590-PTF-M6N-10-00002.
10. MINIMIZE LENGTH OF VENT PIPE FROM VESSEL OUTLET LINE TO ISOLATION VALVE AT PVP HIGH POINT VENT MANIFOLD. SYSTEM PIPE CLASS BREAK IS AT OR ABOVE VESSEL OVERFLOW ELEVATION.
11. REVISION 1: REVISED TO INCORPORATE 24590-PTF-M6LN-M80T-00038 AND 24590-PTF-M6N-M80T-00084. ADDED/DELETED/REVISED NOTES, LINES, INSULATION, JUMPERS, VALVES, AND CONNECTORS. DELETED CXP-FT-0139, CXP-YV-0142, AND CXP-RFD-00004A/B.
12. REVISION 2: REVISED OFF SHEET CONNECTORS, FLUID CODE FOR SPARE LINES, REPLACED CXP-JMPJ-00022B WITH -00027C AND UPDATED PENETRATION.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. 24590-PTF-3YD-CXP-00001, SYSTEM DESCRIPTION FOR THE CESIUM ION EXCHANGE PROCESS - SYSTEM CXP (FUTURE).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
2	REVISED PER NOTE 12	NW	AM	VC/RC	VC/RV	3/12/12
1	REVISED PER NOTE 11	NW	SJ	VC/RC	VC/RV	7/1/2011
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	VLC	ST	ES/CL	RS/JM	9/26/08

REVISION HISTORY

Q QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC INIT DATE ISSUE STAMP

	BY	DATE
ORIGINATOR	CAPPS, VICKIE	9/26/08
CHECKER	THAKKAR, SURENDRA	9/26/08
APPROVER	STEVENS, ROBERT	9/26/08
REVIEWER	STRIEPER,EGBERT	9/26/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-02-024 REV: 5

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
CESIUM ION EXCHANGE PROCESS SYSTEM
CXP-VSL-00004

SCALE: REV

BY: eewebb C:\Work\eewebb\dms03837\PTF\M6\CXP00001004.dgn

24590-PTF-M6-FEP-00001001

FEP-VSL-00017A
WASTE FEED
EVAPORATOR
FEED VESSEL
69,600 GAL MAX OPER VOL
264 IN DIA x 275 IN T-T

CONTAMINATED CONDENSATE RECYCLE FEP-VSL-00005
PTF-M6-FEP-00003003 F2
FEP-ZR-00236-S11B-03 1:50

INLET AIR
PTF-M6-PVP-00020 B5
PVP-GV-00105-S11Z-02

FORCED AIR INLET
PTF-M6-PVP-00015 D3
PVP-GQ-01214-S11B-01

NEUTRALIZED HIGH ACTIVE EFFLUENT PWD-VSL-00015
PTF-M6-PWD-00003001 F2
PWD-ZN-00001-S11B-04 1:20

NEUTRALIZED HIGH ACTIVE EFFLUENT PWD-VSL-00015
PTF-M6-PWD-00003001 F2
PWD-ZN-00002-S11B-04 1:20

SPENT FLUSH LIQUOR RDP-VSL-00002A/B/C
PTF-M6-RDP-00001004 B2
RDP-PA-00030-S12A-03 1:50

PLANT WASH EFFLUENT PWD-VSL-00044
PTF-M6-PWD-00002001 C4
PWD-ZF-01703-S11B-04 1:20

PLANT WASH EFFLUENT PWD-VSL-00044
PTF-M6-PWD-00002001 C4
PWD-ZF-01704-S11B-04 1:20

NEUTRALIZED HIGH ACTIVE EFFLUENT PWD-VSL-00016
PTF-M6-PWD-00003003 F2
PWD-ZN-00008-S11B-04 1:20

NEUTRALIZED HIGH ACTIVE EFFLUENT PWD-VSL-00016
PTF-M6-PWD-00003003 F2
PWD-ZN-00007-S11B-04 1:20

CONCENTRATE RECYCLE UFP-VSL-00001A/B
PTF-M6-UFP-00001007 G2
UFP-PX-00010-S14A-03 1:20

WASTE FEED FRP-VSL-00002A/B/C/D
PTF-M6-FRP-00003005 F2
FRP-PZ-01741-S12A-03 1:20

SAMPLE RETURN ASX-SMPLR-00025
PTF-M6-ASX-00007 C8
FEP-PZ-00255-S12A-02 1:20

HLW FEED HLP-VSL-00022
PTF-M6-HLP-00002002 C2
HLP-PX-00132-S12A-03 1:20

19M SODIUM HYDROXIDE
PTF-M6-SHR-00001003 B2
SHR-JS-17030-S11K-03
SHR FEP
FEP-V-34715
FEP-JS-00001-S11K-03
00314-801 (D)
FEP-V-34716
ZI 0156
ZSL 0156
ZSH 0156
YC 0156 HS O/C
S YY 0156
VENT
3/8" TUBING ISA
ISA-V-72203
FC
IV I CM Q
YV 0156
FEP-JS-00001-S11K-03
FEP-V-34717
BC C.3 S11K S11B
FEP-JS-00001-S11B-03

NOTE 17 FEP-SP-00026
NOTE 17 FEP-SP-00027
SP SP I Q
1:100 FEP-PX-00392-S14A-08 NOTE 16
1:100 FEP-PX-00393-S14A-08 NOTE 16
C.3 BC
FEP-JMPP-00123 HC (26)3084
FEP-PZ-01800-S12A-03 DO NOT POCKET

24" MANWAY NO.3

N16 N11 N36 N14 N26 N50 N52 N53 N63 N64 N66 N67 3" N17 N30 N60 N68 N69 N12 N46 N59 N65

1:50 VESSEL VENT
PTF-M6-PVP-00002002 B7
PVP-GV-00012-S11Z-08

1:20 OVERFLOW PWD-VSL-00033
PTF-M6-PWD-00006 E8
FEP-PZ-00203-S12A-08

FEP-PMP-00007A/B
PTF-M6-FEP-00001003 C8
FEP-PZ-00239-S12A-02

NOTES 2, 3, 7

FEP-VSL-00017A

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE DRAWINGS 24590-PTF-M6-FEP-00006001, -00006002, AND 24590-PTF-M6-FEP-00007001, -00007002 FOR PULSE JET MIXER REPRESENTATION AND NOZZLES UTILIZED.
3. SEE DRAWING 24590-PTF-M6-FEP-00008001 FOR UTILITY PLANT WASH REPRESENTATION AND NOZZLES UTILIZED.
4. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
5. DELETED
6. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
7. DELETED
8. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
9. DELETED
10. SEE DRAWING 24590-PTF-M6-ISA-00008 FOR BUBBLER RACKS AND SYSTEM CONNECTIONS.
11. DELETED
12. DELETED
13. DELETED
14. DELETED
15. THIS DRAWING IS CONVERTED FROM SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00001 REV 4. THIS DRAWING INCLUDES INFORMATION FROM 24590-PTF-M6N-FEP-00089 AND 24590-PTF-M6N-M8OT-00038.
16. PIPING MUST NOT EXCEED 270° OF BENDS FROM INSERTION POINT TO VESSEL. WHERE BENDS ARE REQUIRED, A MINIMUM 5 PIPE DIAMETER BENDS MUST BE USED.
17. PORT ACCESSIBILITY AND COMPONENT DESIGN ARE TO MITIGATE EXPOSURE TO RADIATION AND CONTAMINATION RESULTING FROM ACCESS TO VESSELS.
18. DELETED
19. REVISION 1: PORTION OF THIS DRAWING WAS TRANSFERED TO 24590-PTF-M6-FEP-00001003 AND -00001004 REV 0. INCORPORATED 24590-PTF-M6LN-FEP-00007, 24590-PTF-M6N-10-00011, 24590-PTF-M6N-M8OT-00054, -00062, -00080, -00101, -00107, 24590-PTF-M6PN-FEP-00007, AND 24590-PTF-M6PR-10-00008. ADDED/REVISED/DELETED NOTES, HOLDS, REFERENCES, AND DRAWING INDEX.

HOLD/OPEN ITEMS:

1. DELETED

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

DRAWING INDEX

DWG NO	TITLE
24590-PTF-M6-FEP-00001001	FEP SYS EVAP FEED VESSEL FEP-VSL-00017A
24590-PTF-M6-FEP-00001002	FEP SYS EVAP FEED VESSEL FEP-VSL-00017B
24590-PTF-M6-FEP-00001003	FEP SYS EVAP FEED PUMP FEP-PMP-00007A
24590-PTF-M6-FEP-00001004	FEP SYS EVAP FEED FEP-VSL-00017A BUBBLERS

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 19	CEJ	RST	ES/CL	RS/JM	01/31/08
0	ISSUED FOR CONSTRUCTION SEE NOTE 15	CEJ	RST	ES/CL	RS/JM	01/31/08

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PMC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	01/30/08
CHECKER	TOMETCZAK, RICHARD	01/31/08
APPROVER	STEVENS, R/MONAHAN J	01/31/08
REVIEWER	STRIEPER, E/LASLEY, C	01/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

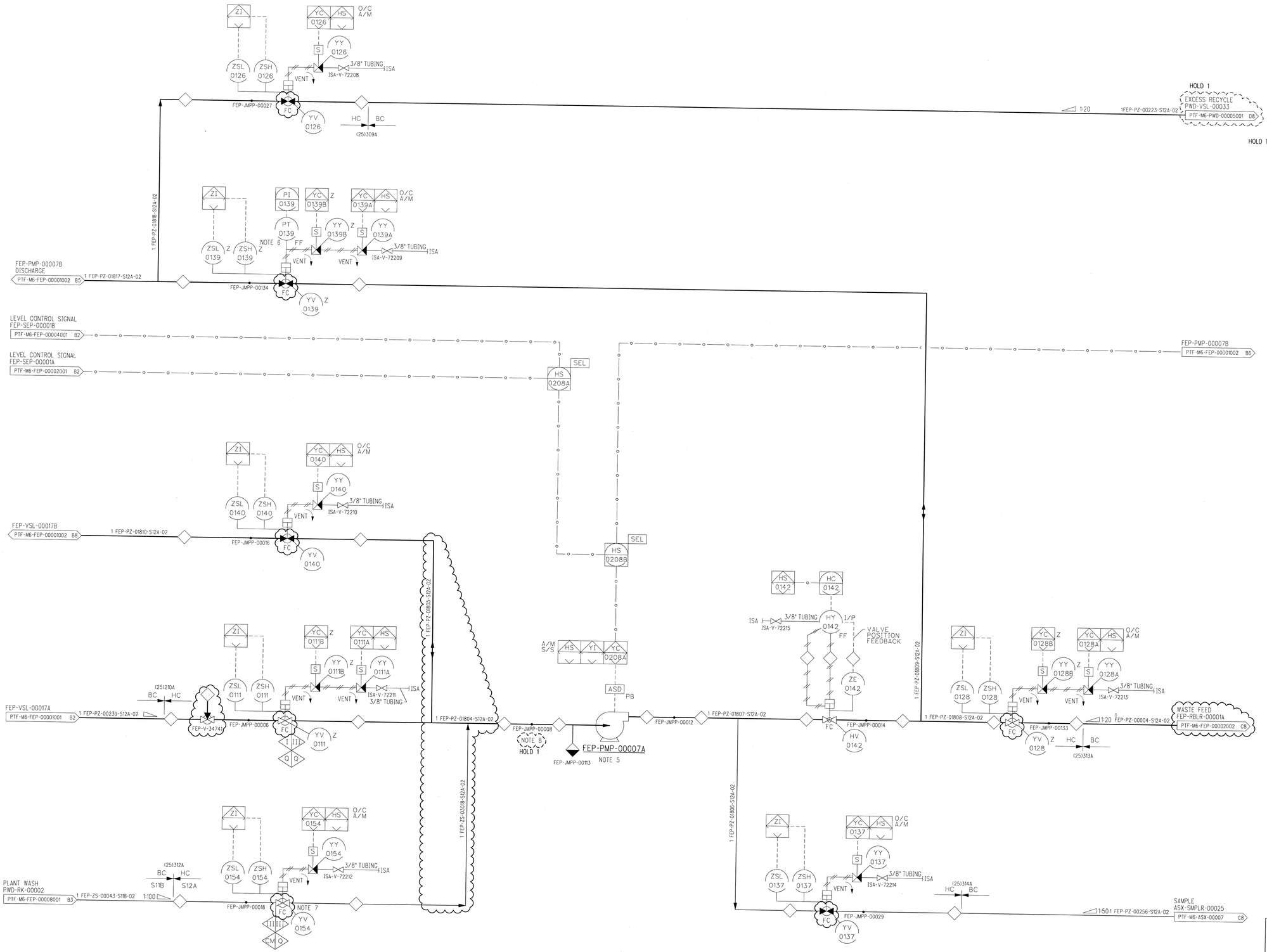
P&ID - PTF
WASTE FEED EVAPORATION PROCESS SYSTEM
EVAPORATOR FEED VESSEL
FEP-VSL-00017A

SCALE: REV

FORM E_SDN.DGN 02/2009

C:\Work\mdrilter\dms03837\PTFMFEP00001001.dgn
BY: mdrilter

FEP-PMP-00007A
WASTE FEED
EVAPORATOR
FEED PUMP
50 GPM @ 163 FT TDH
7.5 HP



NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED
5. SEE DRAWING 24590-PTF-M6-PSW-00009001 FOR PUMP SEAL WATER CONNECTIONS.
6. PRESSURE TRANSMITTER IS LOCATED ON INSTRUMENT RACK IN OUT-CELL AREA. VALVE CONTAINS ITS, QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III LIMIT SWITCHES FOR ITS VALVE POSITION.
7. VALVE IS USED TO CONTROL WATER COLUMN SEPARATION DURING FLUSHING.
8. HOLD 1 REMOVAL OF JUMPER FEP-JMPP-00008 PROVIDES VESSEL HEEL DILUTION/CLEANOUT PUMP (HLP-PMP-00022) SUCTION CONNECTION (VIA FLEXIBLE JUMPER). SEE DRAWING 24590-PTF-M6-FEP-00002003 FOR PUMP DISCHARGE CONNECTION (VIA FLEXIBLE JUMPER). SEE DRAWING 24590-PTF-M6-HLP-00029001 FOR VESSEL HEEL DILUTION/CLEANOUT PUMP DETAILS.
9. THIS DRAWING DEPICTS PORTIONS OF THE SYSTEM THAT WERE TRANSFERRED FROM 24590-PTF-M6-FEP-00001001 REV. 0. THIS DRAWING INCLUDES INFORMATION FROM 24590-PTF-M6N-10-00011, 24590-PTF-M6N-FEP-00131, 24590-PTF-M6N-M80T-00062, -00080, -00107, AND 24590-PTF-M6PN-FEP-00007.

HOLD/OPEN ITEMS:

1. FEP-VSL-00017A/B HEEL REMOVAL AND ROUTE TO PWD-VSL-00033 ON HOLD PENDING HAZARDS EVALUATION.

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	[illegible]	APP	[illegible]	[illegible]	12/2/11

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

ISSUE STAMP

	BY	DATE
ORIGINATOR	[illegible]	11/30/2011
CHECKER	[illegible]	11/30/2011
APPROVER	[illegible]	12/2/11
REVIEWER	[illegible]	12/2/2011
	[illegible]	12/2/2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION PROCESS SYSTEM EVAPORATOR FEED PUMP FEP-PMP-00007A

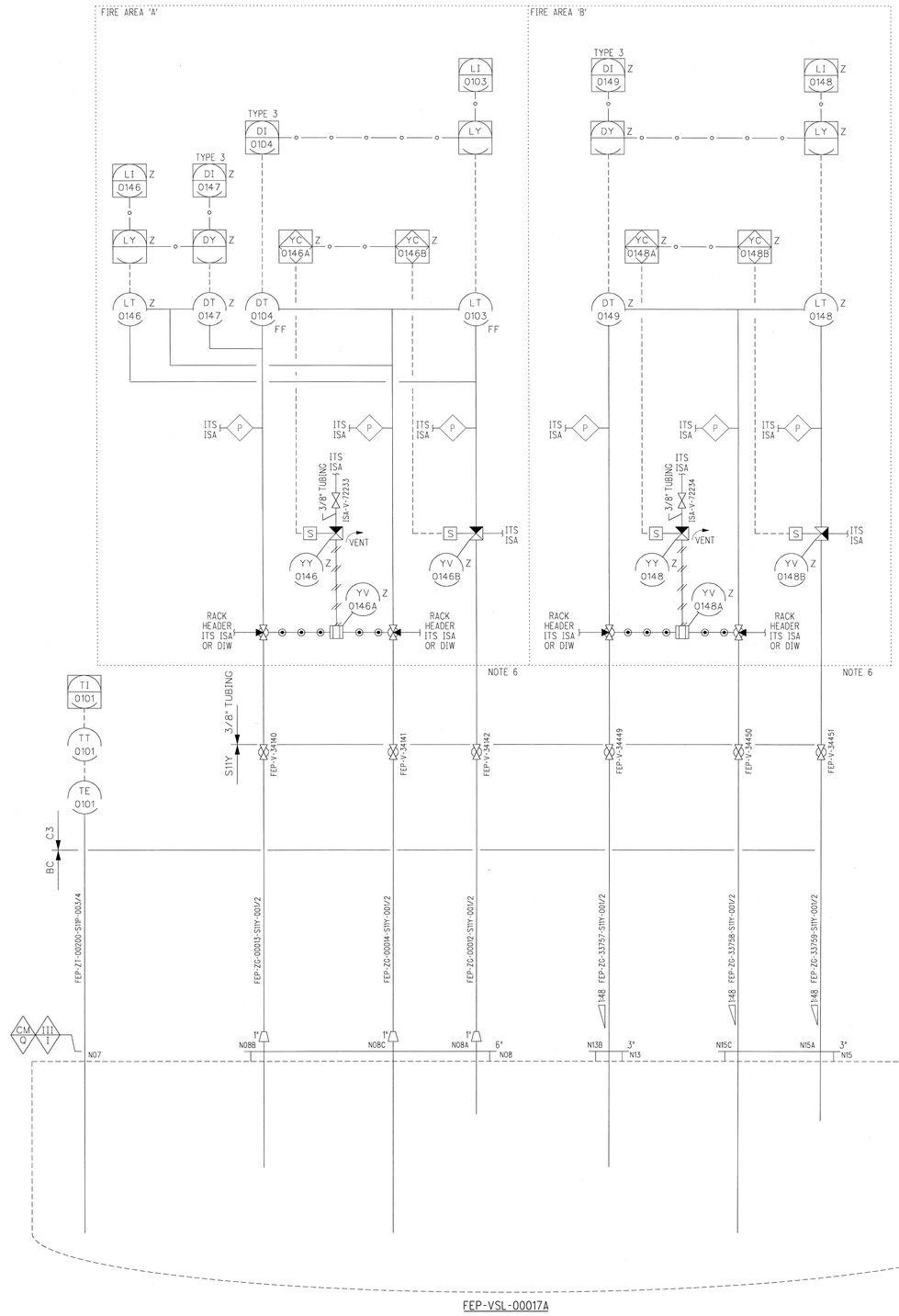
SCALE:

REV

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

FORM E_SDN.DGN 02/2009

BY: mdritter C:\Work\mdritter\dms\5837\PTF\M6\FEP00001003.dgn



FEP-VSL-00017A

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. SEE DRAWING 24590-PTF-M6-ISA-00008 FOR BUBBLER RACKS AND SYSTEM CONNECTIONS.
6. BACKFLOW PREVENTION IS INSTALLED UPSTREAM OF LEVEL INSTRUMENTATION.
7. SEE DRAWING 24590-PTF-M6-FEP-00001001 FOR PROCESS VESSEL FEP-VSL-00017A.
8. SEE DRAWINGS 24590-PTF-M6-FEP-00006001, -00006002, AND 24590-PTF-M6-FEP-00007001, -00007002 FOR PULSE JET MIXER REPRESENTATION AND NOZZLES UTILIZED.
9. THIS DRAWING DEPICTS PORTIONS OF THE SYSTEM THAT WERE TRANSFERED FROM 24590-PTF-M6-FEP-00001001 REV 1. THIS DRAWING INCLUDES INFORMATION FROM 24590-PTF-M6N-M80T-00080.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description

Q
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	EJF	APP	JD/JA	VSH	12/2/11

REVISION HISTORY

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

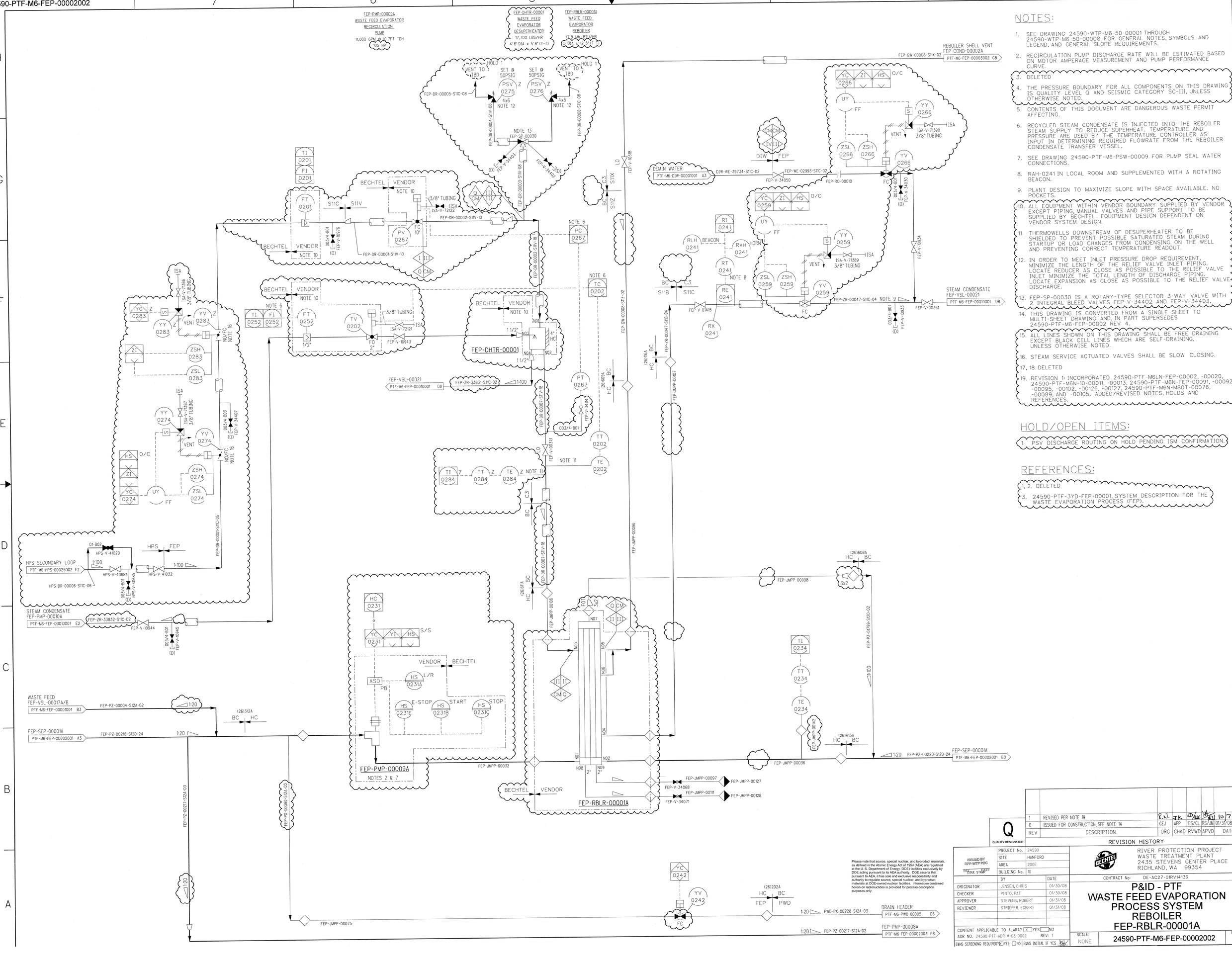
	BY	DATE
ORIGINATOR	Ed Fredrickson	11/29/2011
CHECKER	APPerry	11/30/2011
APPROVER	[illegible]	12/2/11
REVIEWER	Tammi Dare	12/2/2011
	Justin Elliott	12/2/2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1

P&ID - PTF
WASTE FEED EVAPORATION PROCESS SYSTEM
EVAPORATOR FEED VESSEL BUBBLERS

SCALE: REV

BY: mdritter C:\Work\mdritter\dms03837\PTF\M6FEP00001004.dgn



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. RECIRCULATION PUMP DISCHARGE RATE WILL BE ESTIMATED BASED ON MOTOR AMPERAGE MEASUREMENT AND PUMP PERFORMANCE CURVE.
3. DELETED
4. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. RECYCLED STEAM CONDENSATE IS INJECTED INTO THE REBOILER STEAM SUPPLY TO REDUCE SUPERHEAT. TEMPERATURE AND PRESSURE ARE USED BY THE TEMPERATURE CONTROLLER AS INPUT IN DETERMINING REQUIRED FLOWRATE FROM THE REBOILER CONDENSATE TRANSFER VESSEL.
7. SEE DRAWING 24590-PTF-M6-PSW-00009 FOR PUMP SEAL WATER CONNECTIONS.
8. RAH-0241 IN LOCAL ROOM AND SUPPLEMENTED WITH A ROTATING BEACON.
9. PLANT DESIGN TO MAXIMIZE SLOPE WITH SPACE AVAILABLE. NO POCKETS.
10. ALL EQUIPMENT WITHIN VENDOR BOUNDARY SUPPLIED BY VENDOR EXCEPT PIPING, MANUAL VALVES AND PIPE SUPPORT TO BE SUPPLIED BY BECHTEL. EQUIPMENT DESIGN DEPENDENT ON VENDOR SYSTEM DESIGN.
11. THERMOWELLS DOWNSTREAM OF DESUPERHEATER TO BE SHIELDED TO PREVENT POSSIBLE SATURATED STEAM DURING STARTUP OR LOAD CHANGES FROM CONDENSING ON THE WELL AND PREVENTING CORRECT TEMPERATURE READOUT.
12. IN ORDER TO MEET INLET PRESSURE DROP REQUIREMENT, MINIMIZE THE LENGTH OF THE RELIEF VALVE INLET PIPING. LOCATE REDUCER AS CLOSE AS POSSIBLE TO THE RELIEF VALVE INLET MINIMIZE THE TOTAL LENGTH OF DISCHARGE PIPING. LOCATE EXPANSION AS CLOSE AS POSSIBLE TO THE RELIEF VALVE DISCHARGE.
13. FEP-SP-00030 IS A ROTARY-TYPE SELECTOR 3-WAY VALVE WITH 2 INTEGRAL BLEED VALVES FEP-V-34402 AND FEP-V-34403.
14. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWING AND, IN PART SUPERSEDES 24590-PTF-M6-FEP-00002 REV 4.
15. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
16. STEAM SERVICE ACTUATED VALVES SHALL BE SLOW CLOSING.
17. 18. DELETED
19. REVISION 1: INCORPORATED 24590-PTF-M6LN-FEP-00002, -00020, 24590-PTF-M6N-10-00011, -00013, 24590-PTF-M6N-FEP-00091, -00092, -00095, -00102, -00126, -00127, 24590-PTF-M6N-M8OT-00076, -00089, AND -00105. ADDED/REVISED NOTES, HOLDS AND REFERENCES.

HOLD/OPEN ITEMS:

1. PSV DISCHARGE ROUTING ON HOLD PENDING ISM CONFIRMATION.

REFERENCES:

1, 2. DELETED

3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 19	R.J.	JK	JD/BLC	RJM	10/12/14
0	ISSUED FOR CONSTRUCTION, SEE NOTE 14	CEJ	APP	ES/CL	RSJM	01/31/08

REVISION HISTORY

Q QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC

ISSUE STAMP DATE

PROJECT No. 24590
SITE HANFORD
AREA 200E
BUILDING No. 10

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	01/30/08
CHECKER	PINTO, PAT	01/30/08
APPROVER	STEVENS, ROBERT	01/31/08
REVIEWER	STRIEPER, EGBERT	01/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1
E&NS SCREENING REQUIRED? [X] YES [ ] NO E&NS INITIAL IF YES

P&ID - PTF
WASTE FEED EVAPORATION PROCESS SYSTEM
REBOILER
FEP-RBLR-00001A

SCALE: NONE

24590-PTF-M6-FEP-00002002 REV 1

PLOTTED BY: mdrihter C:\Work\mdrihter\dms03837\PTFMEFP00002002.dgn

FEP-PMP-00009B
WASTE FEED EVAPORATOR RECIRCULATION PUMP
11,000 GPM @ 10.7 FT. TDH
105 HP

FEP-DHTR-00002
WASTE FEED EVAPORATOR DESUPERHEATER
17,700 LBS/HR
4'-6" DIA. x 5'-6" (T-T)

FEP-RBLR-00001B
WASTE FEED EVAPORATOR REBOILER
17.8 MM BTU/HR
9'-0" DIA. x 12'-3" (T-T)

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. RECIRCULATION PUMP DISCHARGE RATE WILL BE ESTIMATED BASED ON MOTOR AMPERAGE MEASUREMENT AND PUMP PERFORMANCE CURVE.
3. DELETED
4. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. RECYCLED STEAM CONDENSATE IS INJECTED INTO THE REBOILER STEAM SUPPLY TO REDUCE SUPERHEAT. TEMPERATURE AND PRESSURE ARE USED BY THE TEMPERATURE CONTROLLER AS INPUT IN DETERMINING REQUIRED FLOWRATE FROM THE REBOILER CONDENSATE TRANSFER VESSEL.
7. SEE DRAWING 24590-PTF-M6-PSW-00009 FOR PUMP SEAL WATER CONNECTIONS.
8. RAH-0441 IN LOCAL ROOM AND SUPPLEMENTED WITH A ROTATING BEACON.
9. PLANT DESIGN TO MAXIMIZE SLOPE WITH SPACE AVAILABLE. NO POCKETS.
10. ALL EQUIPMENT WITHIN VENDOR BOUNDARY IS TO BE SUPPLIED BY VENDOR EXCEPT PIPING, MANUAL VALVES, AND PIPE SUPPORT TO BE SUPPLIED BY BECHTEL. EQUIPMENT DESIGN DEPENDENT ON VENDOR SYSTEM DESIGN.
11. THERMOWELLS DOWNSTREAM OF DESUPERHEATER TO BE SHIELDED TO PREVENT POSSIBLE SATURATED STEAM DURING STARTUP OR LOAD CHANGES FROM CONDENSING ON THE WELL AND PREVENTING CORRECT TEMPERATURE READOUT.
12. IN ORDER TO MEET INLET PRESSURE DROP REQUIREMENT, MINIMIZE THE LENGTH OF THE RELIEF VALVE INLET PIPING. LOCATE REDUCER AS CLOSE AS POSSIBLE TO THE RELIEF VALVE INLET. MINIMIZE THE TOTAL LENGTH OF DISCHARGE PIPING. LOCATE EXPANSION AS CLOSE AS POSSIBLE TO THE RELIEF VALVE DISCHARGE.
13. FEP-SP-00031 IS A ROTARY-TYPE SELECTOR 3-WAY VALVE WITH 2 INTEGRAL BLEED VALVES FEP-V-34405 AND FEP-V-34406.
14. THIS DRAWING IS CONVERTED FROM SINGLE SHEET TO MULTI-SHEET DRAWING AND IN PART SUPERSEDES 24590-PTF-M6-FEP-00004 REV. 4.
15. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
16. STEAM SERVICE ACTUATED VALVES SHALL BE SLOW CLOSING.
17. 18. DELETED
19. REVISION 1: INCORPORATED 24590-PTF-M6LN-FEP-00002, -00016, -00019, -00020, 24590-PTF-M6N-10-00011, -00013, 24590-PTF-M6N-FEP-00091, -00092, -00095, -00102, -00126, -00127, 24590-PTF-M6N-M80T-00076, -00089, AND -00105. ADDED/REVISED NOTES, HOLDS AND REFERENCES.

HOLD/OPEN ITEMS:

1. PSV DISCHARGE ROUTING ON HOLD PENDING ISM CONFIRMATION.

REFERENCES:

1, 2. DELETED

3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 19	R.J.	JK	JDR	RJ	10/7/11
0	ISSUED FOR CONSTRUCTION, SEE NOTE 14	CEJ	APP	ES/CL	RS/JM	01/31/08

REVISION HISTORY

Q — QUALITY DESIGNATOR

ISSUED BY (WP-WTP PDC) TMT ISSUE STAGE

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	01/30/08
CHECKER	PINTO, PAT	01/30/08
APPROVER	STEVENS, ROBERT	01/31/08
REVIEWER	STRIEPER, EGBERT	01/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1
ENAS SCREENING REVIEWED? [ ] NO ENAS INITIAL IF YES

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

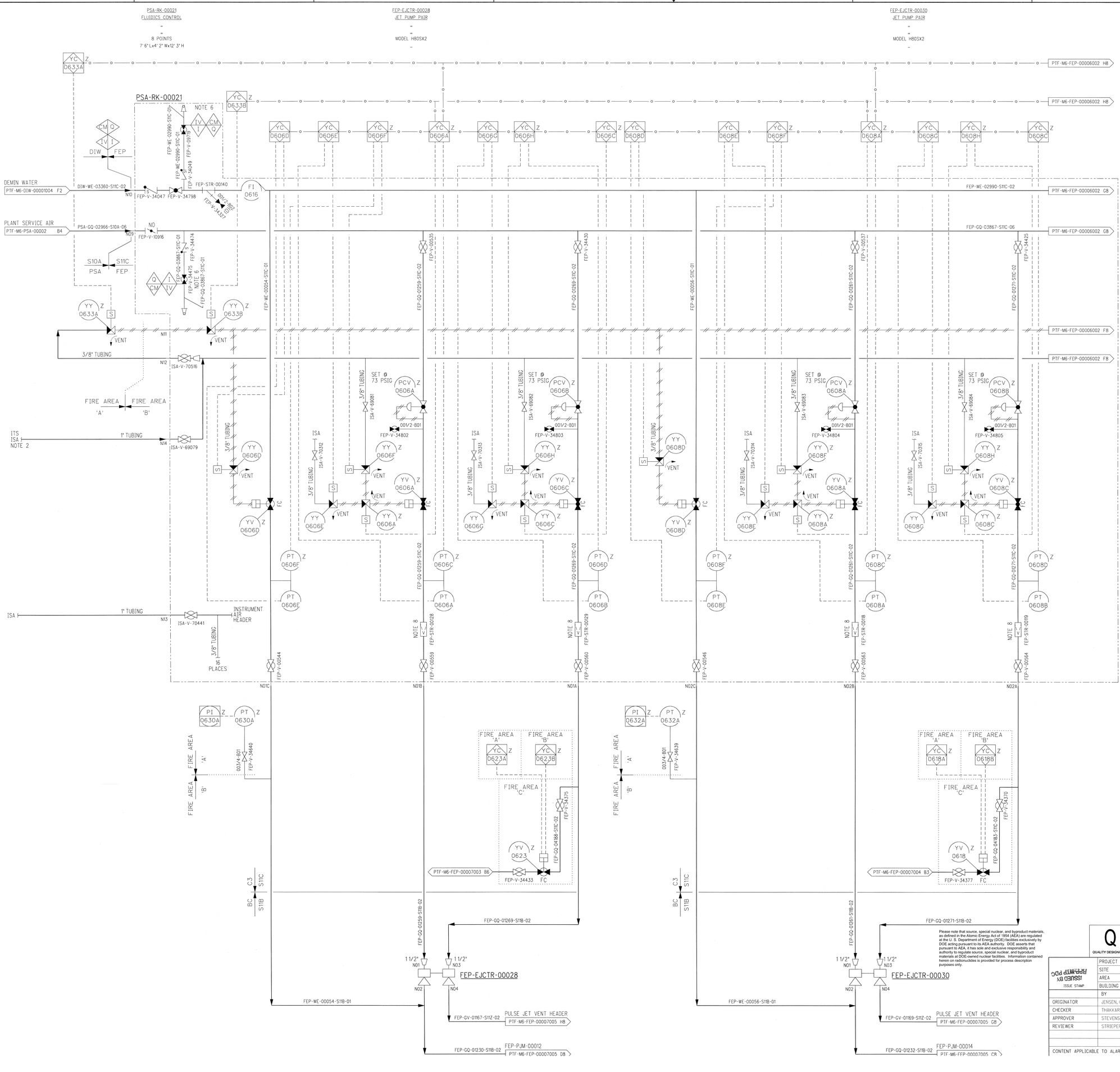
CONTRACT No: DE-AC27-01RV14136

P&ID-PTF
WASTE FEED EVAPORATION PROCESS SYSTEM
REBOILER
FEP-RBLR-00001B

SCALE: NONE

24590-PTF-M6-FEP-00004002 REV 1

TITLED BY: mpritter C:\Work\mpritter\dms0837\PTF\M6\FEP00004002.dgn



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001001.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. CONNECTION PROVIDED FOR REAGENTS, PLANT WASH, AND SERVICE AIR.
7. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
8. STRAINER PERMANENTLY INSTALLED.
9. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00006, REV 3.
10. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
11. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142.
12. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6N-FEP-00103, -00121, 24590-PTF-M6N-10-00004, 24590-PTF-M6LN-FEP-00005, -00009, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6PR-10-00002, 24590-PTF-M6N-M80T-00054, -00055, -00057, -00080, 24590-PTF-M6LN-M80T-00007, -00033, -00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00007005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

DRAWING INDEX	
DWG NO	TITLE
24590-PTF-M6-FEP-00006001	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00006002	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00006003	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00006004	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00006005	WASTE FEED EVAPORATION UTILITY SERVICES

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Q
QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 12	RSW	AH	JD	RLC	3/3/11
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	CEJ	ST	ES/CL	RSJ/JM	1/31/08

REVISION HISTORY

ISSUE STAMP: APPROVED BY CERTIFIED FOR CONSTRUCTION

	PROJECT No.	24590
	SITE	HANFORD
	AREA	200E
	BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

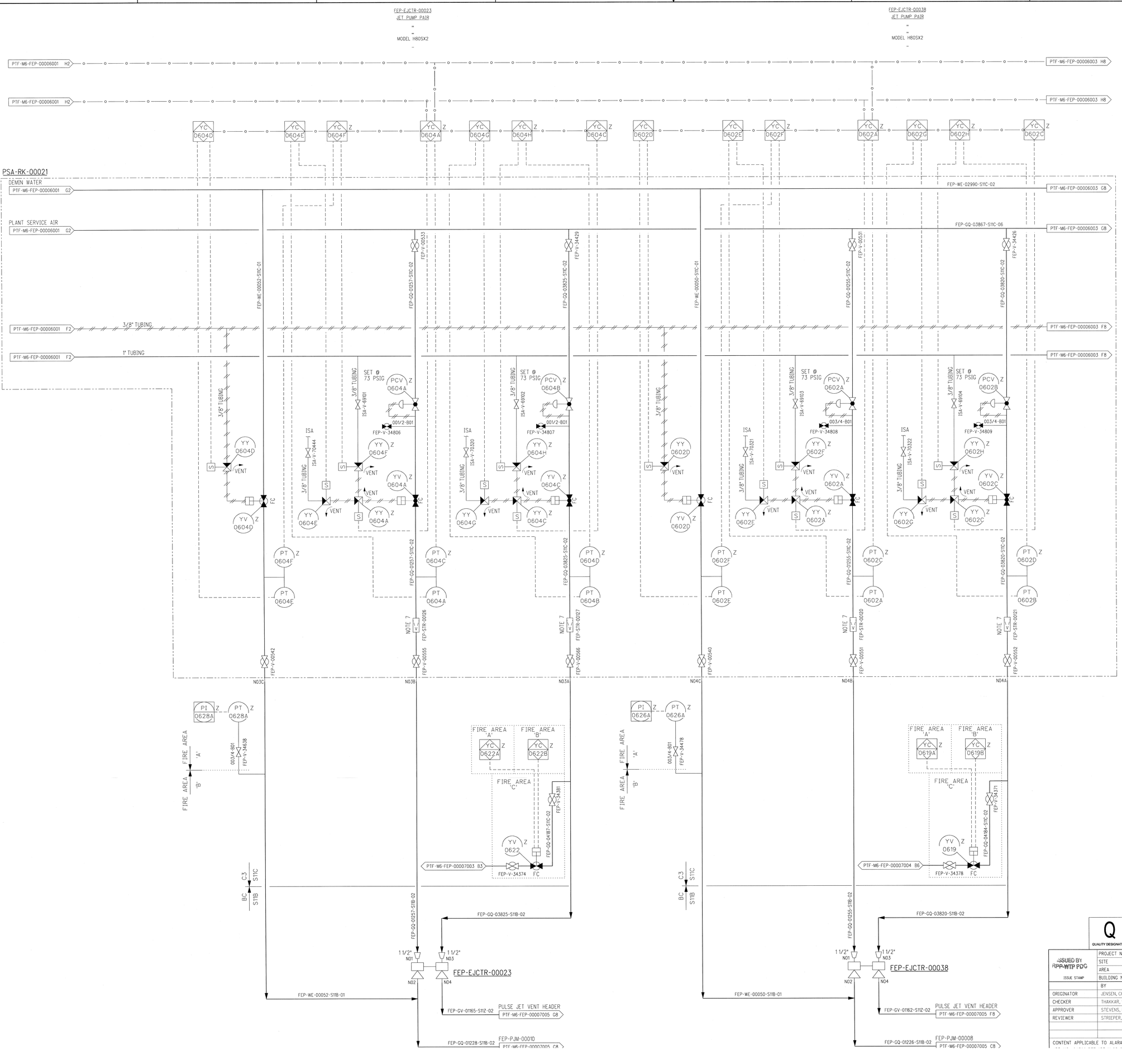
BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

BY: eidorn C:\Work\eidorn\cmo\383.7-PTF\MEP\00006001.dgn

24590-PTF-M6-FEP-00006002



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001001.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
7. STRAINER PERMANENTLY INSTALLED.
8. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00006, REV 3.
9. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
10. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142.
11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6N-FEP-00121, 24590-PTF-M6LN-FEP-00005, -00009, -00010, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6N-M80T-00080, 24590-PTF-M6LN-M80T-00007,-00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00007005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 11	RCW	AH	JB	RLC / YA	3/6/10
0	ISSUED FOR CONSTRUCTION SEE NOTE 8	CEJ	ST	ES/CL	RS/JM	1/31/08

Q
QUALITY DESIGNATOR

REVISION HISTORY

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

BY: eldorn C:\Work\eldorn\dms03837\PTFM6FEP00006002.dgn

24590-PTF-M6-FEP-00006003

FEP-EJCTR-00009
JET PUMP PAIR
=
=
MODEL H80SX2

FEP-EJCTR-00019
JET PUMP PAIR
=
=
MODEL H80SX2

PTF-M6-FEP-00006002 H2

PTF-M6-FEP-00006004 H8

YC 0601D Z | YC 0601E Z | YC 0601F Z | YC 0601A Z | YC 0601G Z | YC 0601H Z | YC 0601C Z | YC 0607D Z | YC 0607E Z | YC 0607F Z | YC 0607A Z | YC 0607G Z | YC 0607H Z | YC 0607C Z

PSA-RK-00021

DEMIN WATER
PTF-M6-FEP-00006002 G2

FEP-WE-02990-S11C-02
PTF-M6-FEP-00006004 G8

PLANT SERVICE AIR
PTF-M6-FEP-00006002 G2

FEP-GQ-03867-S11C-06
PTF-M6-FEP-00006004 G8

PTF-M6-FEP-00006002 F2 3/8" TUBING

PTF-M6-FEP-00006004 F8

PTF-M6-FEP-00006002 F2 1" TUBING

PTF-M6-FEP-00006004 F8

FEP-WE-02978-S11C-01 | FEP-GQ-01281-S11C-02 | FEP-GQ-03848-S11C-02 | FEP-WE-02984-S11C-01 | FEP-GQ-01287-S11C-02 | FEP-GQ-03860-S11C-02

FEP-V-00550 | FEP-V-34424 | FEP-V-00545 | FEP-V-34427

3/8" TUBING

SET @ 73 PSIG

PCV 0601A Z | PCV 0601B Z | PCV 0607A Z | PCV 0607B Z

ISA-V-69907 | ISA-V-69908 | ISA-V-69909 | ISA-V-69910

001/2-B01

FEP-V-34812 | FEP-V-34813 | FEP-V-68472 | FEP-V-68473

ISA

ISA-V-70325 | ISA-V-70326 | ISA-V-70329 | ISA-V-70330

YY 0601D Z | YY 0601F Z | YY 0601A Z | YY 0601H Z | YY 0601C Z | YY 0607D Z | YY 0607F Z | YY 0607A Z | YY 0607G Z | YY 0607C Z

S | VENT | FC

YV 0601D Z | YV 0607D Z

PT 0601F Z | PT 0601C Z | PT 0601D Z | PT 0607F Z | PT 0607C Z | PT 0607D Z

PT 0601E | PT 0601A | PT 0601B | PT 0607E | PT 0607A | PT 0607B

NOTE 7 LV

FEP-STR-00116 | FEP-STR-00117 | FEP-STR-00122 | FEP-STR-00123

FEP-V-00542 | FEP-V-00549 | FEP-V-00550 | FEP-V-00545 | FEP-V-00561 | FEP-V-00562

N05C | N05B | N05A | N06C | N06B | N06A

PI 0625A Z | PT 0625A Z

003/4-B01 FEP-V-34482

FIRE AREA 'A' | FIRE AREA 'B'

FIRE AREA 'A' | FIRE AREA 'B' | FIRE AREA 'C'

YC 0617A Z | YC 0617B Z

FEP-V-34359

YV 0617 Z

PTF-M6-FEP-00007001 B3

FEP-V-34376 FC

1 FEP-GQ-04482-S11C-02

PI 0631A Z | PT 0631A Z

003/4-B01 FEP-V-34484

YC 0620A Z | YC 0620B Z

FEP-V-34372

YV 0620 Z

PTF-M6-FEP-00007002 B6

FEP-V-34379 FC

FEP-GQ-04485-S11C-02

C3 S11C | BC S11B

FEP-GQ-01281-S11B-02 | FEP-GQ-03848-S11B-02 | FEP-GQ-01287-S11B-02 | FEP-GQ-03860-S11B-02

1 1/2" N01 | 1 1/2" N03 | 1 1/2" N02 | 1 1/2" N04

FEP-EJCTR-00009 | FEP-EJCTR-00019

FEP-WE-02978-S11B-01 | FEP-WE-02984-S11B-01

FEP-GV-00299-S11Z-02 PULSE JET VENT HEADER PTF-M6-FEP-00006005 F8

FEP-GV-00311-S11Z-02 PULSE JET VENT HEADER PTF-M6-FEP-00006005 G8

FEP-GQ-01158-S11B-02 FEP-PJM-00001

FEP-GQ-01170-S11B-02 FEP-PJM-00007

NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001001.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
7. STRAINER PERMANENTLY INSTALLED.
8. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00006, REV 3.
9. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
10. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142.
11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6N-FEP-00121, 24590-PTF-M6LN-FEP-00005, -00009, -00010, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6N-M80T-00080, 24590-PTF-M6LN-M80T-00007, -00017, -00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00006005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

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Q QUALITY DESIGNATOR

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 11	RJW	AM	RLC JD	RV JH	3/3/9
0	ISSUED FOR CONSTRUCTION, SEE NOTE 8	CEJ	ST	ES/CL	RS/JM	1/31/08

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

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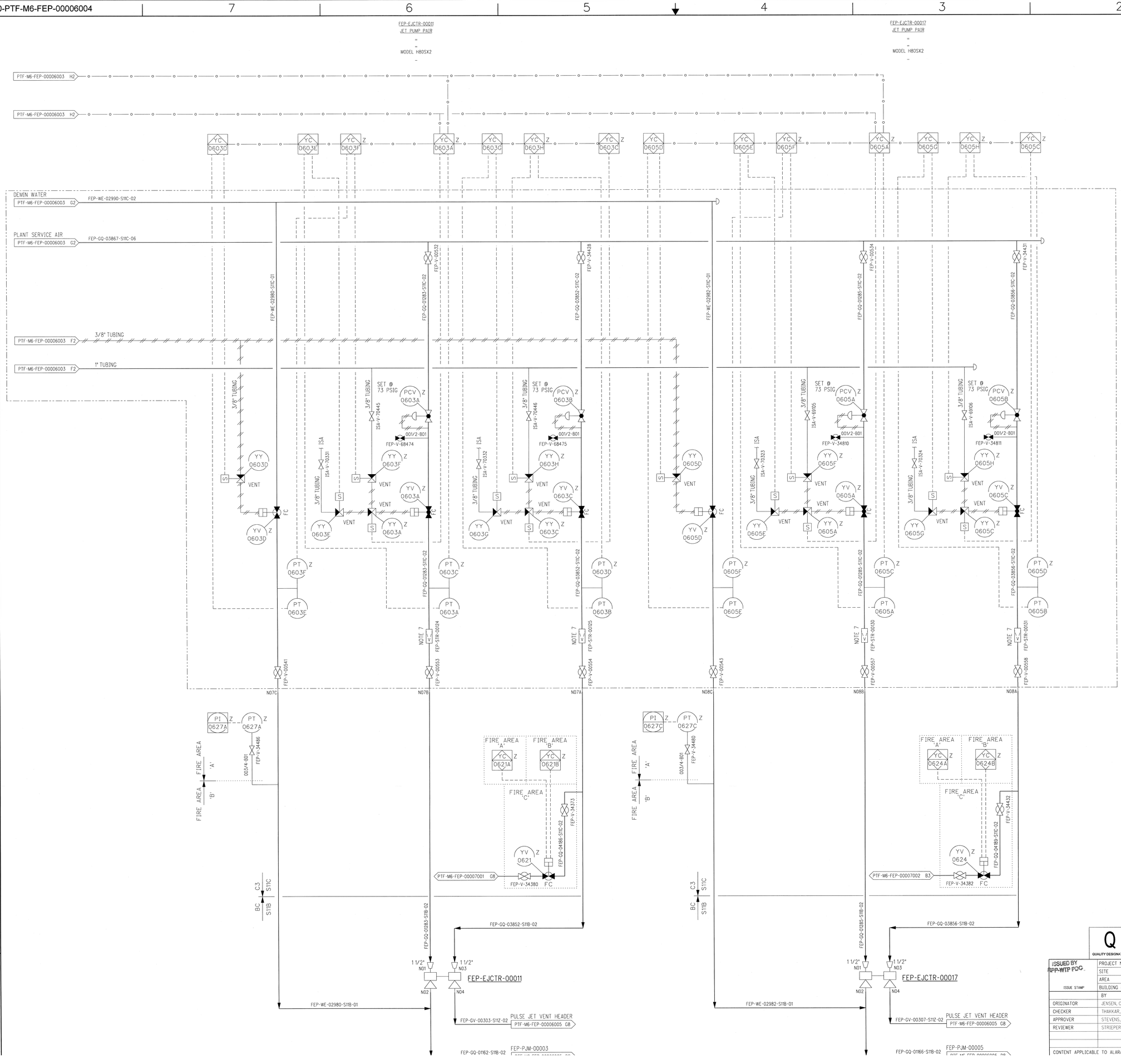

NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001001.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
7. STRAINER PERMANENTLY INSTALLED.
8. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00006, REV 3.
9. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
10. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142
11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6N-FEP-00121, 24590-PTF-M6LN-FEP-00005, -00009, -00010, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6N-M80T-00080, 24590-PTF-M6LN-M80T-00007, -00017, -00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00006005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

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REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 11	RKJ	AM	JD	RJK	3/8/11
0	ISSUED FOR CONSTRUCTION	CEJ	ST	ES/CL	RS/JM	1/31/08

Q
QUALITY DESIGNATOR

REVISION HISTORY

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	
	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

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31: eldorn

24590-PTF-M6-FEP-00006005

7 6 5 4 3 2 1

H G F E D C B A

FEP-PJM-00006 PULSE JET MIXER
FEP-PJM-00017 PULSE JET MIXER
FEP-PJM-00004 PULSE JET MIXER
FEP-PJM-00002 PULSE JET MIXER
FEP-PJM-00005 PULSE JET MIXER
FEP-PJM-00001 PULSE JET MIXER
FEP-PJM-00007 PULSE JET MIXER
FEP-PJM-00003 PULSE JET MIXER
885 GAL

FEP-EJCTR-00017 PTF-M6-FEP-00006004 A3 — FEP-GV-00307-S11Z-02
FEP-EJCTR-00018 PTF-M6-FEP-00007002 A3 — FEP-GV-00309-S11Z-02
FEP-EJCTR-00016 PTF-M6-FEP-00007002 A5 — FEP-GV-00305-S11Z-02
FEP-EJCTR-00011 PTF-M6-FEP-00006004 A5 — FEP-GV-00303-S11Z-02
FEP-EJCTR-00019 PTF-M6-FEP-00006003 A3 — FEP-GV-00311-S11Z-02
FEP-EJCTR-00010 PTF-M6-FEP-00007001 A3 — FEP-GV-00301-S11Z-02
FEP-EJCTR-00039 PTF-M6-FEP-00007001 A5 — FEP-GV-00313-S11Z-02
FEP-EJCTR-00009 PTF-M6-FEP-00006003 A5 — FEP-GV-00299-S11Z-02
PLANT WASH PTF-M6-FEP-00008 C8 — PJV-ZS-06604-S11Z-02

PJV-GV-02889-S11Z-16 → PULSE JET VENT PTF-M6-PJV-00001 D7

FEP-EJCTR-00011 PTF-M6-FEP-00006004 A5 — FEP-GQ-01162-S11B-02
FEP-EJCTR-00019 PTF-M6-FEP-00006003 A3 — FEP-GQ-01170-S11B-02
FEP-EJCTR-00009 PTF-M6-FEP-00006003 A5 — FEP-GQ-01158-S11B-02
FEP-EJCTR-00017 PTF-M6-FEP-00006004 A3 — FEP-GQ-01166-S11B-02
FEP-EJCTR-00010 PTF-M6-FEP-00007001 A3 — FEP-GQ-01160-S11B-02
FEP-EJCTR-00016 PTF-M6-FEP-00007002 A5 — FEP-GQ-01164-S11B-02
FEP-EJCTR-00039 PTF-M6-FEP-00007001 A5 — FEP-GQ-01172-S11B-02
FEP-EJCTR-00018 PTF-M6-FEP-00007002 A3 — FEP-GQ-01168-S11B-02

N47 N51 N32 N29 N45 N28 N49 N31

FEP-PJM-00006 FEP-PJM-00017 FEP-PJM-00004 FEP-PJM-00002 FEP-PJM-00005 FEP-PJM-00001 FEP-PJM-00007 FEP-PJM-00003

FEP-VSL-00017A
NOTE 5

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. FOR PROCESS INFORMATION SEE DRAWING 24590-PTF-M6-FEP-00001001.
6. THIS DRAWING INCLUDES INFORMATION FROM 24590-PTF-M6N-10-00004, 24590-PTF-M6N-M8OT-00055, 24590-PTF-M6LN-M8OT-00036, 24590-PTF-M6PN-FEP-00011, AND 24590-PTF-M6PR-10-00002.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Q
QUALITY DESIGNATOR

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 6	RSW	AM	RLC JD	RW	3/3/11

ISSUED BY APP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	Randall G. Wilson	2/28/11
CHECKER	Miguel A. Sacasa	2/28/11
APPROVER	[illegible] Patrick	3/3/11
REVIEWER	Shrinivas Dave	3/02/11
	Ryan Stolle	3-02-2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained

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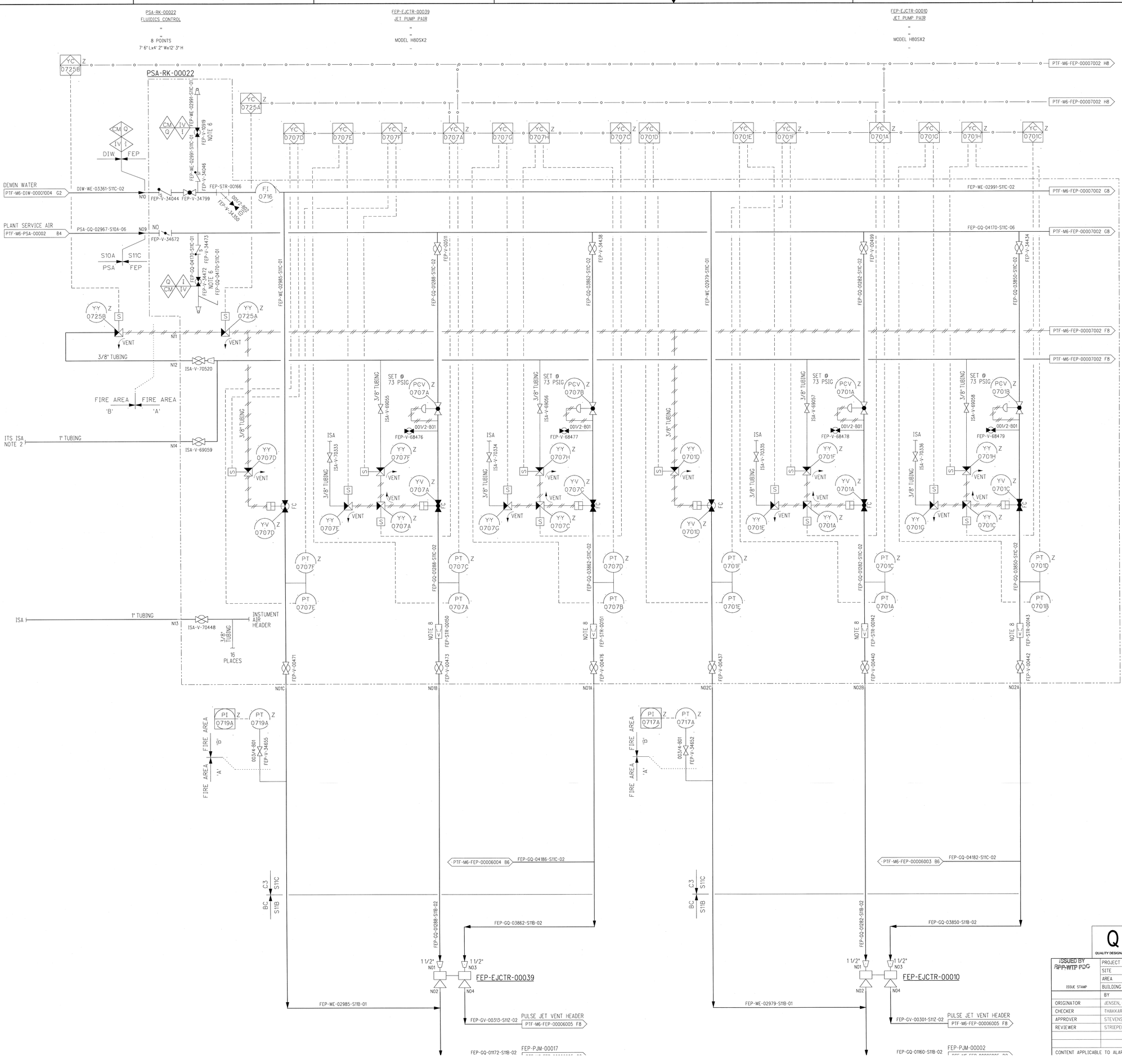
3Y: eldorn

24590-PTF-M6-FEP-00007001



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001001.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. CONNECTION PROVIDED FOR REAGENTS, PLANT WASH, AND SERVICE AIR.
7. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
8. STRAINER PERMANENTLY INSTALLED.
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12. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6N-10-00004, 24590-PTF-M6LN-FEP-00005, -00009, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6PR-10-00002, 24590-PTF-M6N-M80T-00054, -00055, -00057, -00080, 24590-PTF-M6LN-M80T-00007, -00033, -00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00006005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

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DRAWING INDEX

DWG NO	TITLE
24590-PTF-M6-FEP-00007001	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00007002	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00007003	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00007004	WASTE FEED EVAPORATION UTILITY SERVICES
24590-PTF-M6-FEP-00007005	WASTE FEED EVAPORATION UTILITY SERVICES

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 12	BJW	AM	RS-C	RJ	3/8/11
0	ISSUED FOR CONSTRUCTION, SEE NOTE 9	CEJ	ST	ES/CL	RS/JM	1/31/08

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	
	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

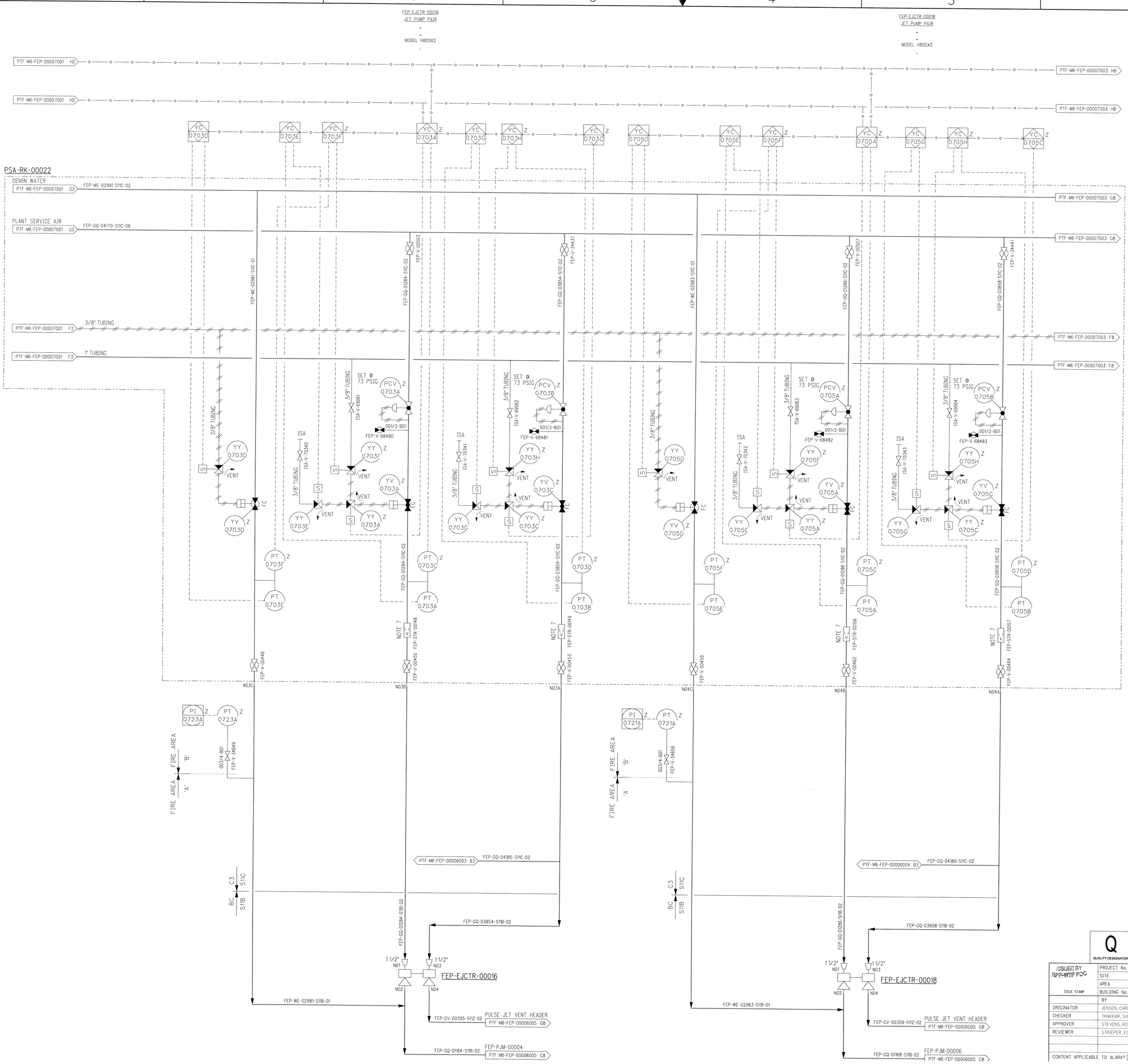
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

C:\Work\ewebb\dms03837\PTFM6FEP00007001.dgn
31- ewebb

24590-PTF-M6-FEP-00007002



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001002.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
7. STRAINER PERMANENTLY INSTALLED.
8. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00007, REV 3.
9. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
10. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142.
11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6LN-FEP-00005, -00009, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6N-M80T-00080, 24590-PTF-M6LN-M80T-00007, -00036, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00006005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 11	RJW	AM	RLC JD	RV	3/3/9
0	ISSUED FOR CONSTRUCTION, SEE NOTE 8	CEJ	ST	ES/CL	RS/JM	1/31/08

REVISION HISTORY

Q
QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC
ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

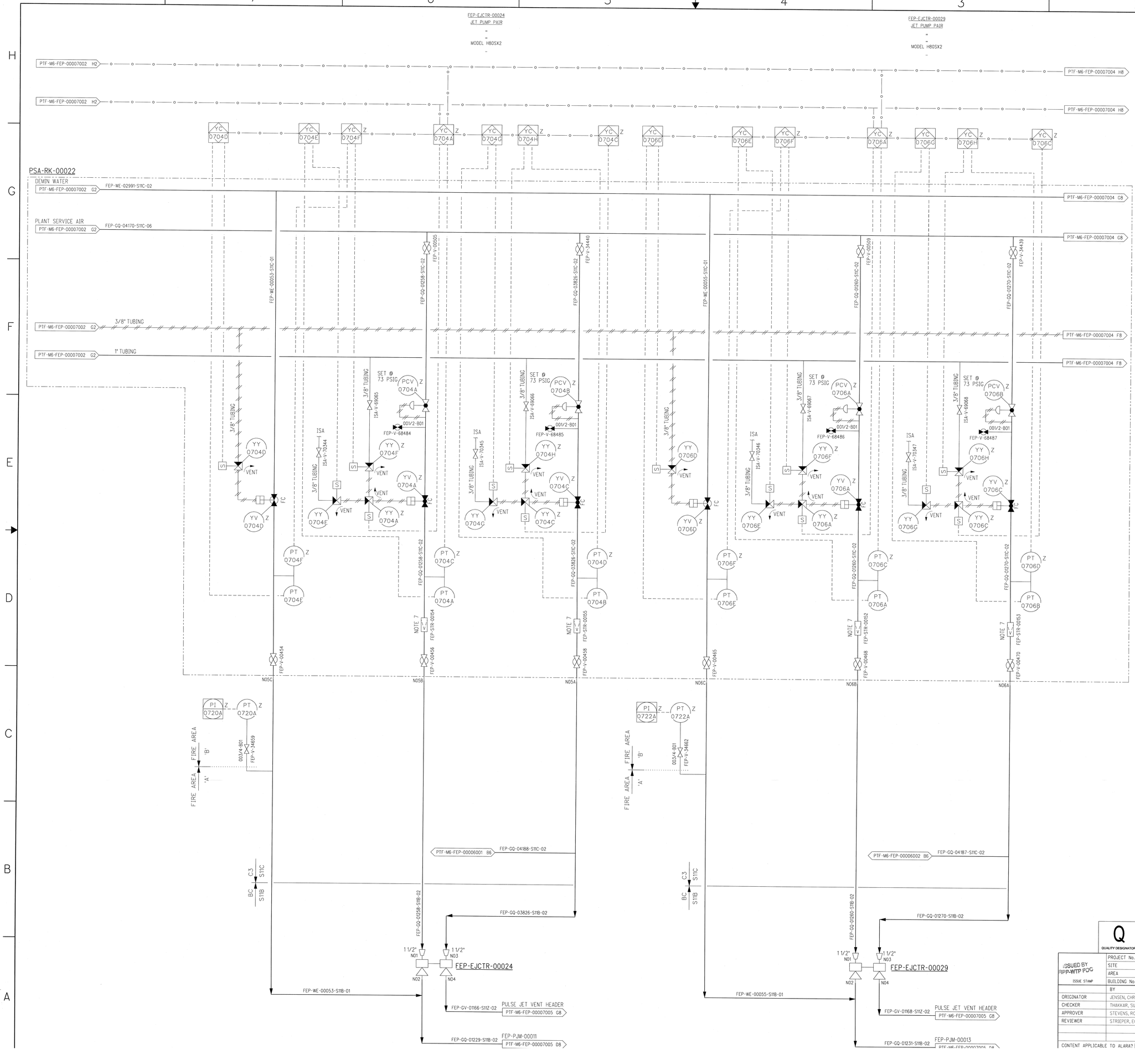
RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

Y: eswebb C:\Work\eswebb\dms03837\PTFM6FEP00007002.dgn

24590-PTF-M6-FEP-00007003



NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001002.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
7. STRAINER PERMANENTLY INSTALLED.
8. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00007, REV 3.
9. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
10. ALL TUBING OUTSIDE RACK TO BE FIELD RUN. TUBING ROUTING, SPECIFICATION OF ADDITIONAL IN-TUBING DEVICES, AND TAGGING OF IN-TUBING DEVICES WITHIN THE RACK TO BE DONE IN ACCORDANCE WITH C&I INSTALLATION DETAILS AND DESIGN GUIDE 24590-WTP-GPG-ENG-0142.
11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6LN-FEP-00005, -00009, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6LN-M8OT-00007, -00036, 24590-PTF-M6N-M8OT-00080, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00007005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
1	REVISED PER NOTE 11	RJW	AM	JD	RJW	3/3/11
0	ISSUED FOR CONSTRUCTION, SEE NOTE 8	CEJ	ST	ES/CL	RS/JM	1/31/08

REVISION HISTORY

Q QUALITY DESIGNATOR

ISSUED BY RPP-WTP PDC — ISSUE STAMP

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

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ewebb

24590-PTF-M6-FEP-00007004

FEP-EJCTR-00031 JET PUMP PAIR – MODEL H80SX2

FEP-EJCTR-00022 JET PUMP PAIR – MODEL H80SX2

PTF-M6-FEP-00007003 H2

PTF-M6-FEP-00007003 H2

YC 0708D · YC 0708E · YC 0708F Z · YC 0708A Z · YC 0708G · YC 0708H Z · YC 0708C Z · YC 0702D · YC 0702E · YC 0702F Z · YC 0702A Z · YC 0702G · YC 0702H Z · YC 0702C Z

PSA-RK-00022

DEMIN WATER — PTF-M6-FEP-00007003 G2 — FEP-WE-02991-S11C-02

PLANT SERVICE AIR — PTF-M6-FEP-00007003 G2 — FEP-GQ-04170-S11C-06

PTF-M6-FEP-00007003 F2 — 3/8" TUBING

PTF-M6-FEP-00007003 F2 — 1" TUBING

FEP-WE-00057-S11C-01 · FEP-V-00515 · FEP-GQ-01262-S11C-02 · FEP-GQ-01273-S11C-02 · FEP-V-34436 · FEP-WE-00051-S11C-01 · FEP-V-00501 · FEP-GQ-01256-S11C-02 · FEP-GQ-03835-S11C-02 · FEP-V-34435

3/8" TUBING · ISA-V-69069 · SET @ 73 PSIG · PCV 0708A Z · 001/2-B01 · FEP-V-68488 · ISA-V-70348 · YY 0708F Z · YY 0708A Z · VENT · S · FC · YY 0708D Z

3/8" TUBING · ISA-V-69070 · SET @ 73 PSIG · PCV 0708B Z · 001/2-B01 · FEP-V-68489 · ISA-V-70349 · YY 0708H Z · YY 0708C Z · YY 0708G Z

3/8" TUBING · ISA-V-69071 · SET @ 73 PSIG · PCV 0702A Z · 001/2-B01 · FEP-V-68490 · ISA-V-70350 · YY 0702F Z · YY 0702A Z · YY 0702E Z

3/8" TUBING · ISA-V-69072 · SET @ 73 PSIG · PCV 0702B Z · 001/2-B01 · FEP-V-68491 · ISA-V-70351 · YY 0702H Z · YY 0702C Z · YY 0702G Z

YY 0702D Z

PT 0708F Z · PT 0708E · PT 0708C Z · PT 0708A · PT 0708D Z · PT 0708B

PT 0702E Z · PT 0702F · PT 0702C Z · PT 0702A · PT 0702D Z · PT 0702B

FEP-GQ-01262-S11C-02 · FEP-GQ-01273-S11C-02 · FEP-GQ-01256-S11C-02 · FEP-GQ-03835-S11C-02

NOTE 7 · FEP-STR-00446 · FEP-V-00477 · FEP-V-00479 · FEP-STR-00447 · FEP-V-00481 · FEP-V-00443 · FEP-STR-00444 · FEP-V-00445 · FEP-STR-00445 · FEP-V-00447

N07C · N07B · N07A · N08C · N08B · N08A

PI 0724A Z · PT 0724A Z · 003/4-B01 · FEP-V-34665 · FIRE AREA 'B' · FIRE AREA 'A'

PI 0718A Z · PT 0718A Z · 003/4-B01 · FEP-V-34668 · FIRE AREA 'B' · FIRE AREA 'A'

BC S11B C.3 S11C

PTF-M6-FEP-00006002 B3 — FEP-GQ-04184-S11C-02

FEP-GQ-01262-S11B-02 · FEP-GQ-01273-S11B-02

1 1/2" N01 · 1 1/2" N03 · N02 · N04 · FEP-EJCTR-00031

FEP-WE-00057-S11B-01

FEP-GV-01170-S11Z-02 — PULSE JET VENT HEADER — PTF-M6-FEP-00007005 F8

FEP-GQ-01233-S11B-02 — FEP-PJM-00015 — PTF-M6-FEP-00007005 D8

PTF-M6-FEP-00006001 B3 — FEP-GQ-04183-S11C-02

FEP-GQ-01256-S11B-02 · FEP-GQ-03835-S11B-02

1 1/2" N01 · 1 1/2" N03 · N02 · N04 · FEP-EJCTR-00022

FEP-WE-00051-S11B-01

FEP-GV-01164-S11Z-02 — PULSE JET VENT HEADER — PTF-M6-FEP-00007005 F8

FEP-GQ-01227-S11B-02 — FEP-PJM-00009 — PTF-M6-FEP-00007005 D8

NOTES:

1. SEE DRAWING 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. SEE JET PUMP PAIR CONTROL DETAILS 5 AND 7 ON DRAWING 24590-WTP-M6-50-00007. ALL TUBING OUTSIDE RACK TO BE FIELD RUN.
3. FOR PROCESS INFORMATION REFER TO DRAWING 24590-PTF-M6-FEP-00001002.
4. DELETED
5. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
6. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
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11. REVISION 1: MAJOR REVISION, NO REVISION CLOUDS REQUIRED. INCORPORATED 24590-PTF-M6LN-FEP-00005, -00009, 24590-PTF-M6PN-FEP-00011, 24590-PTF-M6LN-M80T-00007, -00036, 24590-PTF-M6N-M80T-00080, AND 24590-WTP-M6N-50-00048. MOVED PULSE JET MIXERS, PJV HEADER TO DRAWING 24590-PTF-M6-FEP-00007005. REVISED JET PUMP PAIR MODEL, REVISED/ADDED/DELETED NOTES, AND REFERENCES.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. DELETED
2. DELETED
3. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

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1	REVISED PER NOTE 11	RSC	AM	RSC JD	RW JM	5/3/11	
0	ISSUED FOR CONSTRUCTION, SEE NOTE 8	CEJ	ST	ES/CL	RS/JM	1/31/08	
REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE	

REVISION HISTORY

Q — QUALITY DESIGNATOR

ISSUED BY BPP-WTP PDC — ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	

	BY	DATE
ORIGINATOR	JENSEN, CHRIS	1/30/08
CHECKER	THAKKAR, SURENDRA	1/30/08
APPROVER	STEVENS, ROBERT	1/31/08
REVIEWER	STRIEPER, EGBERT	1/31/08

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

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24590-PTF-M6-FEP-00007005

FEP-PJM-00014 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00008 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00010 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00012 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00011 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00013 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00015 PULSE JET MIXER - - 885 GAL -

FEP-PJM-00009 PULSE JET MIXER - - 885 GAL -

FEP-EJCTR-00028 PTF-M6-FEP-00006001 A5 — FEP-GV-01167-S11Z-02

FEP-EJCTR-00024 PTF-M6-FEP-00007003 A5 — FEP-GV-01166-S11Z-02

FEP-EJCTR-00029 PTF-M6-FEP-00007003 A3 — FEP-GV-01168-S11Z-02

FEP-EJCTR-00030 PTF-M6-FEP-00006001 A3 — FEP-GV-01169-S11Z-02

FEP-EJCTR-00023 PTF-M6-FEP-00006002 A5 — FEP-GV-01165-S11Z-02

FEP-EJCTR-00031 PTF-M6-FRP-00007004 A5 — FEP-GV-01170-S11Z-02

FEP-EJCTR-00022 PTF-M6-FEP-00007004 A3 — FEP-GV-01164-S11Z-02

FEP-EJCTR-00038 PTF-M6-FEP-00006002 A3 — FEP-GV-01162-S11Z-02

PLANT WASH PTF-M6-FEP-00008 C8 — PJV-ZS-06601-S11Z-02

PJV-GV-00006-S11Z-16 → PULSE JET VENT PTF-M6-PJV-00001 D7

FEP-EJCTR-00022 PTF-M6-FEP-00007004 A3 — FEP-GQ-01227-S11B-02

FEP-EJCTR-00031 PTF-M6-FRP-00007004 A5 — FEP-GQ-01233-S11B-02

FEP-EJCTR-00029 PTF-M6-FEP-00007003 A3 — FEP-GQ-01231-S11B-02

FEP-EJCTR-00024 PTF-M6-FEP-00007003 A5 — FEP-GQ-01229-S11B-02

FEP-EJCTR-00028 PTF-M6-FEP-00006001 A5 — FEP-GQ-01230-S11B-02

FEP-EJCTR-00023 PTF-M6-FEP-00006002 A5 — FEP-GQ-01228-S11B-02

FEP-EJCTR-00038 PTF-M6-FEP-00006002 A3 — FEP-GQ-01226-S11B-02

FEP-EJCTR-00030 PTF-M6-FEP-00006001 A3 — FEP-GQ-01232-S11B-02

N49 N28 N31 N45 N32 N47 N51 N29

FEP-PJM-00014 FEP-PJM-00008 FEP-PJM-00010 FEP-PJM-00012 FEP-PJM-00011 FEP-PJM-00013 FEP-PJM-00015 FEP-PJM-00009

FEP-VSL-00017B

NOTE 5

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DOCUMENT ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. FOR PROCESS INFORMATION SEE DRAWING 24590-PTF-M6-FEP-00001002.
6. THIS DRAWING INCLUDES INFORMATION FROM 24590-PTF-M6N-10-00004, 24590-M6N-PTF-M8OT-00055, 24590-PTF-M6LN-M8OT-00036, AND 24590-PTF-M6PR-10-00002.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

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Q QUALITY DESIGNATOR

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 6	RSW	AM	JD	RL DJ	3/3/11

REVISION HISTORY

ISSUED BY BPP-WTP PDC

ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	

	BY	DATE
ORIGINATOR	Russell W. Wyman	2/28/11
CHECKER	Angela L. Hewett	2/28/11
APPROVER	Jeffrey Rikhoff	3/3/11
REVIEWER	Jasmin Dave	3/02/11
	Ryan Wiebe	3-02-2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PSA RACK

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r: edorn

PWD-RK-00002
PLANT WASH RACK
=
16 POINT RACK
13' 4" L x 5' 5" W x 9' 0" H

PWD-RK-00002
NOTE 7

PROCESS CONDENSATE
PTF-M6-RLD-00004 D3
RLD-ZS-06563-S11C-04
N22
PWD-V-13335
PWD-ZS-66961-S11C-04
PWD-V-10007
PWD-STR-00616
PWD-ZS-66961-S11C-03
PWD-V-39776
FEP-V-10922
FEP-V-34722
FEP-ZS-00034-S11C-03

DEMIN WATER
PTF-M6-DIW-00001004 G5
DIW-WE-03499-S11C-03
N23
PWD-V-39774
PWD-WE-01629-S11C-03
PWD-V-10008

PWD-VSL-00150
PTF-M6-PWD-00064 C2
PWD-JS-00032-S11C-02
N24
PWD-V-40319
PWD-JS-00100-S11C-02
PWD-V-40320

AIR FLOW
C3 ROOM
FEP-ZS-03024-S11C-003/4
FEP-VACB-00004
FEP-ZS-03023-S11C-011/2
NOTE 9

FEP-ZS-00034-S11C-04
PROCESS CONDENSATE
PTF-M6-FEP-00008002 F8

PJV-ZS-00067-S11X-02
PJV-ZS-06604-S11X-02
PJV-ZS-06601-S11X-02
PJV-V-00345
PJV-V-00349
PJV-V-00346

N02 N03 N04 N05 N07 N08

1:100 FEP-ZS-00041-S11B-02 → LINE FLUSH FEP-PMP-00008A PTF-M6-FEP-00002003 D8
1:100 FEP-ZS-00043-S11B-02 → LINE FLUSH FEP-PMP-00007A PTF-M6-FEP-00001001 A8
1:100 FEP-ZS-00042-S11B-02 → LINE FLUSH FEP-PMP-00007B PTF-M6-FEP-00001002 A8
PJV-ZS-06601-S11Z-02 → SUB-HEADER PLANT WASH PSA-RK-00022 PTF-M6-FEP-00007005 F8
PJV-ZS-06604-S11Z-02 → SUB-HEADER PLANT WASH PSA-RK-00021 PTF-M6-FEP-00006005 F8
PJV-ZS-00067-S11Z-02 → SUB-HEADER PLANT WASH PSA-RK-00020 PTF-M6-FRP-00005007 E8

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. VALVES INTERLOCKED TO PREVENT MULTIPLE VALVE OPERATION.
6. REAGENT/PLANT WASH/AIR SERVICES PROVIDED AT UTILITY STATION.
7. PWD-RK-00002 STRUCTURE IS QUALITY LEVEL Q AND SEISMIC CATEGORY SC-I.
8. BLACK CELL PIPING TO BE SUPPORTED FOR MAXIMUM WATERFALL AND FOR THE EXPECTED DYNAMIC FORCES DURING THE TRANSITION FROM A DRY PIPE TO A LIQUID-FULL PIPE.
9. PIPE TO BE CONNECTED TO HORIZONTAL RUN OF HEADER PIPE. ROUTE AIR INLET PIPING TO SAFE LOCATION.
10. THIS DRAWING IS CONVERTED FROM A SINGLE SHEET TO MULTI-SHEET DRAWINGS AND, IN PART, SUPERSEDES 24590-PTF-M6-FEP-00008 REV 5. THIS DRAWING INCLUDES INFORMATION FROM: 24590-PTF-M6N-10-00004, 24590-PTF-M6N-FEP-00020, -00092, -00104, 24590-PTF-M6N-M80T-00055, -00059, -00068, AND -00080. ADDED/DELETED/REVISED NOTES, HOLDS, AND SYSTEM/SPECIFICATION.

HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

DRAWING INDEX

DWG NO	TITLE
24590-PTF-M6-FEP-00008001	FEP SYSTEM PWD-RK-00002
24590-PTF-M6-FEP-00008002	FEP SYSTEM PWD-RK-00002

Q
QUALITY DESIGNATOR

REVISION HISTORY

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 10	RSW	MR	JD/RL	DJ	5/10/11

ISSUED BY RPP-WTP PDC INIT DATE ISSUE STAMP

PROJECT No.	24590	
SITE	HANFORD	
AREA	200E	
BUILDING No.	10	

	BY	DATE
ORIGINATOR		5/6/11
CHECKER		5/6/11
APPROVER		5/10/11
REVIEWER		5/10/11
		10-MAY-2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION
UTILITY SERVICES
PLANT WASH RACK
PWD-RK-00002

C:\Work\mdrlter\dms03837\PTF\M6FEP00008001.dgn

NOTES:

1. SEE DRAWINGS 24590-WTP-M6-50-00001 THROUGH 24590-WTP-M6-50-00008 FOR GENERAL NOTES, SYMBOLS AND LEGEND, AND GENERAL SLOPE REQUIREMENTS.
2. CONTENTS OF THIS DRAWING ARE DANGEROUS WASTE PERMIT AFFECTING.
3. THE PRESSURE BOUNDARY FOR ALL COMPONENTS ON THIS DRAWING IS QUALITY LEVEL CM AND SEISMIC CATEGORY SC-III, UNLESS OTHERWISE NOTED.
4. ALL LINES SHOWN ON THIS DRAWING SHALL BE FREE DRAINING, EXCEPT BLACK CELL LINES WHICH ARE SELF-DRAINING, UNLESS OTHERWISE NOTED.
5. FLUSH CONNECTIONS TO EQUIPMENT LOCATED IN C3 AREAS SHALL NOT PENETRATE C5 AREAS.
6. PIPE ROUTING LIMITED TO A MAXIMUM OF AN ELEVEN FEET VERTICAL DROP AT THE CONNECTION TO THE WASH HEADER.
7. BLACK CELL PIPING TO BE SUPPORTED FOR MAXIMUM WATERFALL AND FOR THE EXPECTED DYNAMIC FORCES DURING THE TRANSITION FROM A DRY PIPE TO A LIQUID-FULL PIPE.
8. THIS DRAWING SUPERSEDES 24590-PTF-M6-FEP-00008 REV 5. THIS DRAWING INCLUDES INFORMATION FROM: 24590-PTF-M6LN-FEP-00013, 24590-PTF-M6N-10-00004, 24590-PTF-M6N-FEP-0002D, -00092, 24590-PTF-M6N-M80T-00059, AND -00080. ADDED/REVISED/DELETED NOTES, HOLDS, AND SYSTEMS/SPECIFICATION.

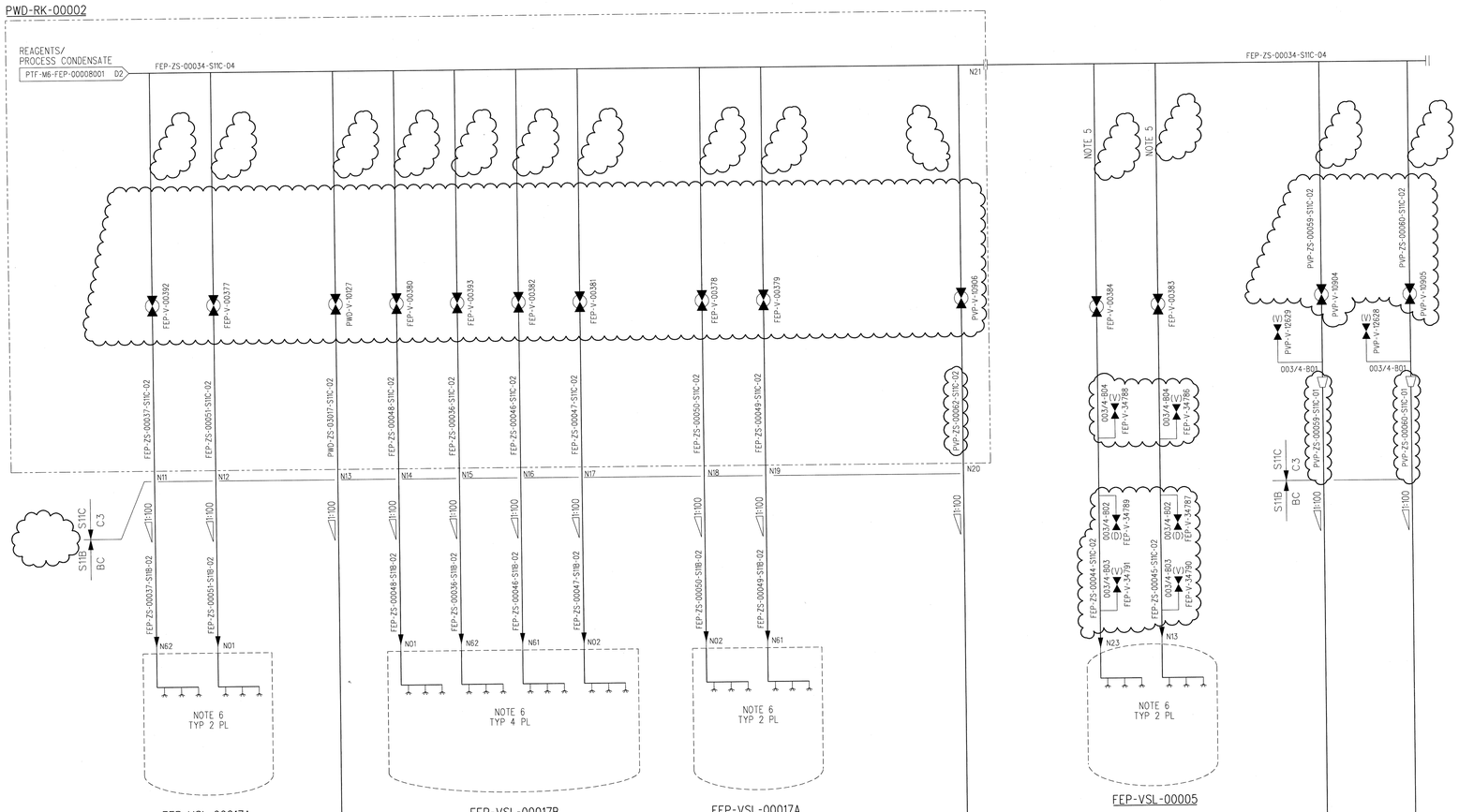
HOLD/OPEN ITEMS:

NONE

REFERENCES:

1. 24590-PTF-3YD-FEP-00001, SYSTEM DESCRIPTION FOR THE WASTE FEED EVAPORATION PROCESS (FEP).

PWD-RK-00002



Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

REV	DESCRIPTION	ORG	CHKD	RVWD	APVD	DATE
0	ISSUED FOR CONSTRUCTION, SEE NOTE 8	RJW		JDK	RW	5/11/11

Q QUALITY DESIGNATOR

REVISION HISTORY

ISSUED BY PIPP-WTP PDC

	BY	DATE
ORIGINATOR		5/6/11
CHECKER		5/6/11
APPROVER		5/4/11
REVIEWER		5/10/11
		10-MAY-2011

CONTENT APPLICABLE TO ALARA? [X] YES [ ] NO
ADR NO. 24590-PTF-ADR-M-08-0002 REV: 1
EMMS SCREENING REQUIRED? [X] YES [ ] NO | EMMS INITIAL IF YES

PROJECT No.	24590
SITE	HANFORD
AREA	200E
BUILDING No.	10

BECHTEL

RIVER PROTECTION PROJECT
WASTE TREATMENT PLANT
2435 STEVENS CENTER PLACE
RICHLAND, WA 99354

CONTRACT No: DE-AC27-01RV14136

P&ID - PTF
WASTE FEED EVAPORATION UTILITY SERVICES PLANT WASH RACK PWD-RK-00002

SCALE: NONE

24590-PTF-M6-FEP-00008002 REV 0

"E" SIZE - 44x34

C:\Work\mpritter-dm\03837\PTF\M6\FEP\00008002.dgn

Table III.10.E.A – Pretreatment Plant Tank Systems Description

Dangerous and/or Mixed Waste Tank Systems Name	System Designation	Engineering Description (Drawing Nos., Specifications Nos., etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
		24590-WTP -3PS-G000-T0002, Rev 8 -3PS-MV00-T0001, Rev 4 -3PS-MV00-T0002, Rev 3 -3PS-MV00-T0003, Rev 3		
Waste Feed Evaporation Process System FEP-VSL-00005 (Waste Feed Evaporator Condensate Vessel) FEP-VSL-00017A (Waste Feed Evaporator Feed Vessel) FEP-VSL-00017B (Waste Feed Evaporator Feed Vessel)	FEP	**24590-PTF** -3PS-MEVV-T0001, Rev 2 -M5-V17T-00004001, Rev 3 -M6-FEP-00001001, Rev ~~0~~1 -M6-FEP-00001002, Rev 0 -M6-FEP-00001003, Rev 0 -M6-FEP-00001004, Rev 0 -M6-FEP-00003001, Rev 0 -M6-FEP-00003002, Rev 0 -M6-FEP-00006001, Rev ~~0~~1 -M6-FEP-00006002, Rev ~~0~~1 -M6-FEP-00006003, Rev ~~0~~1 -M6-FEP-00006004, Rev ~~0~~1 -M6-FEP-00006005, Rev 0 -M6-FEP-00007001, Rev ~~0~~1 -M6-FEP-00007002, Rev ~~0~~1 -M6-FEP-00007003, Rev ~~0~~1 -M6-FEP-00007004, Rev ~~0~~1 -M6-FEP-00007005, Rev 0 ~~-M6-FEP-00008, Rev 4~~ -M6-FEP-00008001, Rev 0 -M6-FEP-00008002, Rev 0 -MVD-FEP-P0001, Rev 2 -MVD-FEP-P0002, Rev 2 -MVD-FEP-~~P~~00003, Rev 1 -MV-FEP-P0001, Rev 0	Section 4.1.2.2; Tables 4-2 and 4-6; and Figures C1-1, C1-2, and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	FEP-VSL-00005 = 5,022 FEP-VSL-00017A = 85,496 FEP-VSL-00017B = 85,496

Table III.10.E.A – Pretreatment Plant Tank Systems Description

Dangerous and/or Mixed Waste Tank Systems Name	System Designation	Engineering Description (Drawing Nos., Specifications Nos., etc.)	Narrative Description, Tables & Figures	Maximum Capacity (gallons)
		24590-WTP -3PS-G000-T0002, Rev 8 -3PS-MV00-T0001, Rev 4 -3PS-MV00-T0003, Rev 3		
Cesium Ion Exchange Process System CXP-VSL-00004 (Cesium Ion Exchange Feed CXP-VSL-00026A (Cesium Ion Exchange Treated LAW Collection Vessel) CXP-VSL-00026B (Cesium Ion Exchange Treated LAW Collection Vessel) CXP-VSL-00026C (Cesium Ion Exchange Treated LAW Collection Vessel) CXP-IXC-00001 (Cesium Ion Exchange Column) CXP-IXC-00002 (Cesium Ion Exchange Column) CXP-IXC-00003 (Cesium Ion Exchange Column) CXP-IXC-00004 (Cesium Ion Exchange	CXP	**24590-PTF** -M5-V17T-00012001, Rev 0 -M5-V17T-00012002, Rev 0 -M5-V17T-00013, Rev 3 -M5-V17T-00025, Rev 1 ~~-M6-CXP-00001001, Rev 0~~ -M6-CXP-00001002, Rev 1 -M6-CXP-00001003, Rev 1 -M6-CXP-00001004, Rev ~~1~~2 -M6-CXP-00001006, Rev 0 -M6-CXP-00001007, Rev 0 -M6-CXP-00002001, Rev 1 -M6-CXP-00002002, Rev 1 -M6-CXP-00003001, Rev 1 -M6-CXP-00003002, Rev 1 -M6-CXP-00003003, Rev 0 -M6-CXP-00005001, Rev 1 -M6-CXP-00005002, Rev 1 -M6-CXP-00005003, Rev 1 -M6-CXP-00005004, Rev 0 -M6-CXP-00007, Rev 2 -M6-CXP-000100001, Rev 0 -M6-CXP-000100002, Rev 0 -M6-CXP-000100003, Rev 0 -M6-CXP-000100004, Rev 0 -M6-CXP-00011001, Rev 0 -M6-CXP-00011002, Rev 0	Section 4.1.2.5; Tables 4-2 and 4-6; and Figures C1-1, C1-2, and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	CXP-VSL-00004 = 10,633 CXP-VSL-00026A = 38,000 CXP-VSL-00026B = 38,000 CXP-VSL-00026C = 38,000 CXP-IXC-00001 = 680 CXP-IXC-00002= 680 CXP-IXC-00003 = 680 CXP-IXC-00004 = 680

1

Table III.10.G.A – Pretreatment Plant Miscellaneous Unit Systems

Miscellaneous Unit System Description[a]	Miscellaneous Unit System Designation	Description Drawings	Narrative Description, Tables, & Figures	Maximum Capacity (gallons)
Waste Feed Evaporation Process System FEP-SEP-00001A (Waste Feed Evaporator Separator Vessel) FEP-SEP-00001B (Waste Feed Evaporator Separator Vessel)	FEP	**24590-PTF** -3PS-MEVV-T0001, Rev 2 -M5-V17T-00004001, Rev 3 -M5-V17T-00004002, Rev 3 -M6-FEP-00001001, Rev ~~0~~1 -M6-FEP-00001002, Rev 0 -M6-FEP-00001003, Rev 0 -M6-FEP-00002001, Rev 0 -M6-FEP-00002002, Rev 0 -M6-FEP-00002003, Rev 0 -M6-FEP-00003001, Rev 0 -M6-FEP-00003002, Rev 0 -M6-FEP-00004001, Rev 0 -M6-FEP-00004002, Rev 0 -M6-FEP-00004003, Rev 0 -M6-FEP-00005001, Rev 0 -MVD-FEP-P0001, Rev 2 -MVD-FEP-P0002, Rev 2 -MVD-FEP-P0003, Rev 1 -MVD-FEP-P0006, Rev 3 -MVD-FEP-P0007, Rev 2 -MV-FEP-P0001, Rev 0 -MV-FEP-P0002, Rev 0 -N1D-FEP-00002, Rev 6 -N1D-FEP-P0003, Rev 1	Section 4.1.2.2.; Table C-8; and Figures C1-1, C1-2 and C1-02A of Operating Unit Group 10, Addendum C of this Permit.	FEP-SEP-00001A = 14,512 FEP-SEP-00001B = 14, 512

Issued by
RPP-WTP PDC

Quarter Ending March 31, 2013

24590-WTP-PCN-ENV-12-004

Hanford Facility RCRA Permit Modification Notification Form

Part III, Operating Unit 10

Waste Treatment and Immobilization Plant

Index

Page 2 of 3: Hanford Facility RCRA Permit, Part III, Operating Unit 10, Waste Treatment and Immobilization Plant
Replace Engineering Specification for Maintenance Decontamination Equipment in Appendix 7.7 of the Dangerous Waste Permit (DWP).

Submitted by Co-Operator:

D. M. Busche — Date: 3/4/13

Reviewed by ORP Program Office:

D. L. Noyes — Date: 4/5/13

Quarter Ending March 31, 2013 24590-WTP-PCN-ENV-12-004

Hanford Facility RCRA Permit Modification Notification Form

Unit:	Permit Part:
Waste Treatment and Immobilization Plant	**Part III, Operating Unit 10**

Description of Modification:

The purpose of this Class 1 prime modification is to update and replace the following Engineering Specification document in Appendix 7.7 of the DWP.

Appendix 7.7			
Replace:	24590-WTP-3PS-HD00-T0001, Rev. 3	With:	24590-WTP-3PS-HD00-T0001, Rev. 4

This modification requests Ecology approval and incorporation into the permit the specific changes to the engineering specification document that are indicated by revision notes and bars. The engineering specification document includes changes provided in applicable document change forms (e.g., DCN, SCN, SDDR, FCN, FCR, etc.) that were submitted to Ecology in accordance with Condition III.10.C.9.h. In addition, the engineering specification document includes changes associated with the resolution to comments on change documents since the issuance of the last revision of the permitted document.

Changes to the engineering specification document are summarized below:

- Revised Sections 1.2 (Equipment, Material, and Services Required) and 3.10.1 (Decontamination Tank Control and Instrumentation System) to incorporate wording to address BNI supplied components
- Revised Section 3.3 (Basic Requirements of Decontamination Tanks) to provide additional clarification and/or requirements for design and operating temperatures
- Updated Section 3.9 (Features of Decontamination Booths and Gloveboxes), 8th bullet to incorporate section 15.6.2 of DOE-STD-1066-97 fire screen requirements
- Deleted sixth sentence in first paragraph of Section 3.10 (Features of HLW Decontamination Tanks and Spray System)
- Revised first and second paragraph in Section 3.10.1 (Decontamination Tank Control and Instrumentation System) to clarify controls and indications to be included in the Control Panel
- Deleted Section 3.10.2 (Chemical Injection Control Panel); information was incorporated into Section 3.10.1
- Updated Section 9.10 (SDDR) to include additional SDDRs
- Added "Dangerous Waste Permit affecting" text to cover sheet and updated table of contents
- Incorporated changes from change documentation identified in the History Sheet

This PCN updates information in Appendix 7.7 to reflect current design. This DWP component may be re-evaluated to confirm design adequacy. If the re-evaluation results in future design changes, the changes will be reviewed by Ecology in subsequent permit modifications.

The following outstanding change documents have been submitted to Ecology pursuant to permit condition III.10.C.9.h and are maintained in the WTP Operating Record.

None

In accordance with Permit Condition III.10.C.2.e, this permit modification sent to Ecology may include page changes to the Permit, attachments, and permit application supporting documentation.

Quarter Ending March 31, 2013 24590-WTP-PCN-ENV-12-004

WAC 173-303-830 Modification Class:	Class 1	Class [1]1	Class 2	Class 3
Please mark the Modification Class:		X		

Enter relevant WAC 173-303-830, Appendix I Modification citation number: NA

Enter wording of WAC 173-303-830, Appendix I Modification citation:

In accordance with WAC 173-303-830(4)(d)(i), this modification notification is requested to be reviewed and approved as a Class [1]1 modification. WAC 173-303-830(4)(d)(ii)(A) states, "Class 1 modifications apply to minor changes that keep the permit current with routine changes to the facility or its operation. These changes do not substantially alter the permit conditions or reduce the capacity of the facility to protect human health or the environment. In the case of Class 1 modifications, the director may require prior approval."

Modification Approved/Concur: [X] Yes [ ] Denied (state reason below)

Reason for denial:

Reviewed by Ecology:

S. Dahl Date Apr 29 2013

ISSUED BY

R11299602

RIVER PROTECTION PROJECT – WASTE TREATMENT PLANT

ENGINEERING SPECIFICATION

FOR

Maintenance Decontamination Equipment

Content applicable to ALARA? ☒ Yes ☐ No

ADR No.
24590-WTP-ADR-M-02-006

Rev
1

Specification changes retroactive? ☐ Yes ☒ No ☐ N/A (alpha revision or revision 0)

NOTE: Contents of this document are Dangerous Waste Permit affecting.

Quality Level
CM
DOE Contract No. DE-AC27-01RV14136

REV	DATE	BY	CHECK	REVIEW	E&NS	DPEM/EM
4	11/22/10	Matthew James	Alfredo Ceja	Travis Semmens	N/A	Julian Leam
3	02/02/2006	ARR	PM	DJ Wilsey		DJ Wilsey
2	12/2/03	ARR	PM	DJ Wilsey		DJ Wilsey for
1	10/21/03	ARR	DL	DJ Wilsey		DJ Wilsey for
0	10/28/02	DAC	GR	DJ Wilsey		DJ Wilsey for

SPECIFICATION No.
24590-WTP-3PS-HD00-T0001

Rev
4

Please note that source, special nuclear, and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA) are regulated at the U. S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts that pursuant to AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

Revision History

Revision	Reason for Revision
0	Issued for Procurement
1	Issued for Purchase; complete revision
2	Issued for Purchase; added TOOL-00031, TOOL-00026 was Low Pressure, revised paragraphs 1.4, 4.1 and 9.7
3	Issued for Purchase; incorporated SCNs 24590-WTP-3PN-HD00-00001 thru -00005
4	Incorporated 24590-WTP-3PN-HD00-00007, 24590-WTP-3PN-HD00-00008, 24590-WTP-3PN-HD00-00009, 24590-WTP-SDDR-MH-07-00149 Incorporated by reference 24590-WTP-SDDR-M-05-00206, 24590-WTP-SDDR-M-05-00241, 24590-WTP-SDDR-M-05-00246.

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1 Scope

1.1 Project Description and Location

Decontamination equipment will be used in four facilities: High Level Waste (HLW), Low Activity Waste (LAW), the Pre-Treatment Facility (PTF), and the Analytical Laboratory (LAB). Decontamination entails the removal of unwanted radiological fixed and loose surface contaminants using various mechanical and chemical processes. Gloveboxes provide containment for manual methods of decontaminating smaller parts prior to repair. Decontamination booths provide containment allowing decontamination of larger pieces of equipment. Tanks and spray systems will accommodate in-cell decontamination of large equipment. Spray lances will be provided through-wall in strategic locations to decontaminate equipment using liquid spray or CO2 blasting methods. Spray lances will also be used inside gloveboxes and decontamination booths. Portable decontamination spray or blast supply equipment will deliver the decontamination media to lances for decontaminating plant equipment. Joggle plugs (by others) will be provided for through wall penetrations of spray and blast unit hoses, to maintain the radiological boundary and allow for future process changes and spraying equipment removal and replacement from out cell. Other miscellaneous decontamination equipment includes parts washers and a crane decontamination system

1.2 Equipment, Material, and Services Required

The Seller shall provide all materials, hardware and labor to design, fabricate, assemble, inspect, functionally test, document and package the listed equipment as provided in this specification, other applicable drawings or documentation referenced.

Mandatory technical requirements and design constraints are typically indicated on data sheets, drawings and specifications by use of terms such as "shall", "required", "mandatory", "maximum", "minimum", or "not to exceed", or by other use of notes. Examples of mandatory technical requirements are dimensions and their associated tolerances, bounding locations of center of gravity (CG) or estimated weight not to be exceeded.

Seller scope of work includes, but is not limited to:

- Seller shall be responsible for the technical adequacy of the design furnished, including constructability, reliability, operability, and maintainability.
- Equipment fabricated and assembled in compliance with this specification, and the referenced codes and standards
- Examination/inspection
- Packaging and preparation for shipping
- Submittals as identified in this specification and summarized on G321-E and G321-V forms.
- Providing the Buyer full access to the Seller's facility for performing inspections or surveillance of any work performed within the scope of the contract
- Installation, Operation, and Maintenance Manuals
- Supporting calculations and analyses, when defined
- Any special tools or handling equipment required for assembly, erecting, maintenance, or disassembly of the gloveboxes, decontamination booths, or other deliverable equipment

- Factory acceptance testing where required
- Loading of equipment on Buyer-arranged conveyances.
- Field support for installation and testing, when required.

The Seller shall submit parts lists and costs for equipment summarized in the G321-E form.

Referenced Design Proposal Drawing (DPD) listed in section 2.5, Mechanical Data Sheets (MDS) listed in Appendix B, and Technical Specification lists details and other requirements of deliverable equipment.

The following deliverable equipment is included within the Seller's scope of work:

Decontamination Tanks

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER
24590-HLW-M0-HSH-00071	DPD, HSH Decontamination Tank Assembly, Melter 1	24590-HLW-MT-HSH-TK-00001
24590-HLW-M0-HSH-00074	DPD, Decontamination Tank Pump Support Package, Melter 1	24590-HLW-MT-HSH-TK-00003
24590-HLW-M0-HSH-00071	DPD, HSH Decontamination Tank Assembly, Melter 2	24590-HLW-MT-HSH-TK-00002
24590-HLW-M0-HSH-00074	DPD, Decontamination Tank Pump Support Package, Melter 2	24590-HLW-MT-HSH-TK-00004
24590-PTF-M0D-PIH-00015	MDS, PTF Decon Tank at PIH	24590-PTF-MT-PIH-TK-00001
24590-PTF-M0-PIH-00019	DPD, PTF Decon Tank at PIH	24590-PTF-MT-PIH-TK-00001

Booths and Gloveboxes

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER
24590-PTF-M0-M17T-00001	PTF Maintenance Decontamination Booth	24590-WTP-MH-10-MHAN-00004
24590-PTF-M0-M10T-00051	PTF Maintenance Decontamination Glovebox	24590-WTP-MH-10-MHAN-00005
24590-LAW-M0-M17T-00001	LAW Maintenance Decontamination Booth	24590-WTP-MH-20-MHAN-00004
24590-LAW-M0-M10T-00003	LAW Maintenance Decontamination Glovebox	24590-WTP-MH-20-MHAN-00005
24590-HLW-M0-M17T-00009	HLW Maintenance Decontamination Booth	24590-WTP-MH-30-MHAN-00004
24590-HLW-M0-M10T-00077	HLW Maintenance Decontamination Glovebox	24590-WTP-MH-30-MHAN-00007
24590-LAB-M0-M10T-00002	LAB Decontamination Glovebox	24590-WTP-MH-60-MHAN-00003

Miscellaneous Equipment

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER
24590-HLW-M0-HSH-00078	Crane Decontamination System, Melter 1	24590-HLW-MH-HSH-MHAN-00011
24590-HLW-M0D-HSH-00150	Parts Washer, Melter 1	24590-HLW-MH-HSH-MHAN-00041
24590-HLW-M0-HSH-00078	Crane Decontamination System, Melter 2	24590-HLW-MH-HSH-MHAN-00055
24590-HLW-M0D-HSH-00212	Parts Washer, Melter 2	24590-HLW-MH-HSH-MHAN-00057
24590-HLW-M0D-30-00266	Pressure Washing Supply System, Unit 1	24590-HLW-30-TOOL-00028
24590-HLW-M0D-30-00267	Pressure Washing Supply System, Unit 2	24590-HLW-30-TOOL-00029
24590-PTF-M0D-M17T-00002	PTF CO2 Decontamination Blast Unit	24590-WTP-MZ-10-MAINT-00001
24590-PTF-M0D-M10T-00007	Roaming CO2 Decontamination Blast Unit	24590-WTP-MZ-10-MAINT-00002
24590-LAW-M0D-M17T-00002	LAW CO2 Decontamination Blast Unit	24590-WTP-MZ-20-MAINT-00001
24590-HLW-M0D-M17T-00017	HLW CO2 Decontamination Blast Unit	24590-WTP-MZ-30-MAINT-00002
24590-HLW-M0D-M10T-00030	Roaming CO2 Decontamination Blast Unit	24590-WTP-MZ-30-MAINT-00004
24590-LAB-M0D-M10T-00003	C3 Workshop CO2 Decontamination Blast Unit	24590-WTP-MZ-60-MAINT-00001
24590-PTF-M0D-PIH-00031	Pressure Washing Supply System, PTF Portable Unit	24590-PTF-PIH-TOOL-00037

Spray Lances

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER
24590-HLW-M0D-HSH-00123	MDS, Maintenance Area Manual Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00027
24590-HLW-M0D-HSH-00124	MDS, Maintenance Area Upper Manual Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00028
24590-HLW-M0D-HSH-00125	MDS, Decontamination Area Manual Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00018
24590-HLW-M0D-HSH-00134	MDS, Decontamination Area Manual CO2 Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00029
24590-HLW-M0D-HSH-00137	MDS, Melter Cave Decontamination Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00031
24590-HLW-M0D-HSH-00126	MDS, Decontamination Pit Lower Remote Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00020
24590-HLW-M0D-HSH-00127	MDS, Decontamination Pit Lower Remote CO2 Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00022
24590-HLW-M0D-HSH-00135	MDS, Decontamination Pit Upper Remote Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00023
24590-HLW-M0D-HSH-00136	MDS, Melter Cave Remote CO2 Spray Lance, Melter 1	24590-HLW-FH-HSH-TOOL-00030
24590-HLW-M0D-HPH-00094	MDS, Spray Lance, Decon Area, Pour Tunnel 1H-B019A	24590-HLW-FH-HPH-TOOL-00010
24590-HLW-M0D-HSH-00217	MDS, Maintenance Area Manual Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00042
24590-HLW-M0D-HSH-00218	MDS, Maintenance Area Upper Manual Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00043
24590-HLW-M0D-HSH-00213	MDS, Decontamination Area Manual Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00039
24590-HLW-M0D-HSH-00219	MDS, Decontamination Area Manual CO2 Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00044
24590-HLW-M0D-HSH-00221	MDS, Melter Cave Decontamination Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00046
24590-HLW-M0D-HSH-00214	MDS, Decontamination Pit Lower Remote Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00040
24590-HLW-M0D-HSH-00215	MDS, Decontamination Pit Lower Remote CO2 Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00048
24590-HLW-M0D-HSH-00216	MDS, Decontamination Pit Upper Remote Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00041
24590-HLW-M0D-HSH-00220	MDS, Melter Cave Remote CO2 Spray Lance, Melter 2	24590-HLW-FH-HSH-TOOL-00045
24590-HLW-M0D-HPH-00238	MDS, Spray Lance, Bogie Decon, Pour Tunnel 2	24590-HLW-FH-HPH-TOOL-00029
24590-HLW-M0D-HPH-00093	MDS, Spray Lance, Decontamination H343 (remote)	24590-HLW-FH-HPH-TOOL-00015
24590-HLW-M0D-HRH-00018	MDS, Spray Lance, Decontamination HB045	24590-HLW-FH-HRH-TOOL-00003
24590-HLW-M0D-HDH-00043	MDS, Canister Rinse Tunnel Spray Lance (CO2)	24590-HLW-FH-HDH-TOOL-00006
24590-HLW-M0D-HDH-00044	MDS, Canister Rinse Bogie Spray Lance	24590-HLW-FH-HDH-TOOL-00007
24590-HLW-M0D-HMH-00002	MDS, Decon Spray Lance (Air Lock Melter Sump 1)	24590-HLW-FH-HMH-TOOL-00001
24590-HLW-M0D-HMH-00003	MDS, Decon Spray Lance (Air Lock Melter Sump 2)	24590-HLW-FH-HMH-TOOL-00002
24590-HLW-M0D-HFH-00045	MDS, Power Manipulator Spray Lance (water)	24590-HLW-FH-HFH-TOOL-00010
24590-HLW-M0D-HFH-00046	MDS, Power Manipulator Spray Lance (CO2)	24590-HLW-FH-HFH-TOOL-00013
24590-HLW-M0D-RWH-00077	MDS, Spray Lance, Remote (CO2)	24590-HLW-FH-RWH-TOOL-00019
24590-HLW-M0D-RWH-00044	MDS, Spray Lance, Manual (CO2)	24590-HLW-FH-RWH-TOOL-00022
24590-HLW-M0D-RWH-00043	MDS, Spray Lance, Remote (liquid)	24590-HLW-FH-RWH-TOOL-00020
24590-PTF-M0D-PFH-00030	MDS, Crane Decon Manual CO2 Spray Lance	24590-PTF-FH-PFH-TOOL-00017
24590-PTF-M0D-PFH-00028	MDS, Decontamination Chamber Remote CO2 Spray Lance	24590-PTF-FH-PFH-TOOL-00015
24590-PTF-M0D-PIH-00014	MDS, Maintenance Area Remote CO2 Spray Lance	24590-PTF-FH-PIH-TOOL-00024
24590-PTF-M0D-RWH-00065	MDS, Spray Lance, P-0121A	24590-PTF-FH-RWH-TOOL-00016
24590-PTF-M0D-RWH-00066	MDS, Spray Lance, P-0122A	24590-PTF-FH-RWH-TOOL-00017
24590-PTF-M0D-RWH-00067	MDS, Spray Lance, P-0223	24590-PTF-FH-RWH-TOOL-00018
24590-PTF-M0D-PIH-00026	MDS, Low Pressure Spray Lance, Maintenance Cave Area	24590-PTF-FH-PIH-TOOL-00028
24590-PTF-M0D-PIH-00027	MDS High Pressure Spray Lance, Maintenance Cave Area	24590-PTF-FH-PIH-TOOL-00026
24590-PTF-M0D-PIH-00028	MDS, Low Pressure Spray Lance, Maintenance Cave Area	24590-PTF-FH-PIH-TOOL-00027
24590-PTF-M0D-PWD-00001	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00001
24590-PTF-M0D-PWD-00002	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00002
24590-PTF-M0D-PWD-00003	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00003
24590-PTF-M0D-PWD-00004	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00004
24590-PTF-M0D-PWD-00005	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00005
24590-PTF-M0D-PWD-00006	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00006
24590-PTF-M0D-PWD-00007	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00007
24590-PTF-M0D-PWD-00008	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00008
24590-PTF-M0D-PWD-00009	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00009
24590-PTF-M0D-PWD-00010	MDS, Low Pressure Spray Lance, Hot Cell Area	24590-PTF-FH-PWD-TOOL-00010

DOCUMENT NUMBER	DESCRIPTION	PLANT ITEM NUMBER
24590-PTF-M0D-PWD-00011	MDS, Low Pressure Spray Lance, P-0119	24590-PTF-FH-PWD-TOOL-00011
24590-PTF-M0D-PFH-00039	MDS, Spray Lance, Remote H2O	24590-PTF-FH-PFH-TOOL-00016

The following items and services, not included in the Seller's scope of work, will be supplied by the Buyer:

- Transportation of products to the jobsite; refer to Section 7 of the purchase order for the Seller's requirements pertaining to packaging and shipping.
- Unloading, storage, installation and field-testing at the jobsite, except where Seller's assistance is required.
- Field installation of fire protection in gloveboxes and decontamination booths
- Embed plates, joggle plugs, and through wall liners
- Exhaust Ventilation equipment for gloveboxes and decontamination booths, (including HEPA filters and ducting). Exhaust demisters are within Seller's scope and shall be supplied by the Seller.
- Two ton hoist for decontamination booths
- Jumper nozzles for decontamination tank piping when specified
- Electrical and instrumentation jumpers for wiring when specified

The following items associated with the HLW Decontamination Tanks and Spray System are not included in the Seller's scope of work, will be supplied by the Buyer:

- Quantity 10 - 115/230 VAC Power Supply, 24 VDC Output, 5A
- Quantity 4 - Power Supply Voting Unit
- Quantity 4 - Profibus Communications Interface (Redundant)
- Quantity 2 - Module Termination Unit for Redundant CI840
- Quantity 2 - Analog Input Module (1x8 ch)
- Quantity 2 - Digital Input Module (2x8 ch)
- Quantity 2 - Digital Output Module (2x8 ch)
- Quantity 6 - 2x8 ch (50V)
- Quantity 4 - Rail Switch Hirschmann
- Quantity 2 - 12-Fiber, 6MT-RJ Fiber Optic Patch Plate, Corning Cable Systems
- Quantity 4 - 18" NEMA 4 Flat Panel Monitor (Computer Dynamics)
- Quantity 4 - SelecTone Horn (Federal Signal)
- Quantity 4 - SelecTone Universal Tone Module (Federal Signal)
- Quantity 4 - SelecTone Horn Knock Out Box (Federal Signal)

1.3 Subcontract Work

The Seller may subcontract any portion of the design, fabrication, or assembly provided it meets the quality assurance requirements of this specification. Unless specified otherwise, the Seller is responsible

for performance of all inspections and testing, including receipt and control of raw material through fabrication, testing, and configuration control to assure conformance with the requirements stated within in this specification. The subcontractor and subcontracted work shall be reviewed by the Buyer prior to starting the work. The Seller will be ultimately responsible for the completeness and quality of all materials included in this specification.

1.4 Definitions, Acronyms and Abbreviations

Glovebox	The Glovebox is a mechanism used for the containment of contaminated equipment during decontamination and repair.
Shall	Indicates a mandatory requirement for all actions of the Seller
AFBMA	Anti-Friction Bearing Manufacturers Association
AGS	American Glovebox Society
ANSI	American National Standard Institute
ASME	American Society of Mechanical Engineers
ASNT	American Society for Non-Destructive Testing
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CFR	Code of Federal Regulations
DPD	Design Proposal Drawing
HEPA	High Efficiency Particulate Air
HLW	High Level Waste
ILAW	Immobilized Low Active Waste
ITS	Important to Safety
LAW	Low Active Waste
LAB	Analytical Laboratory
MDS	Mechanical Data Sheet – Design document that describes equipment specific requirements and conditions.
MSDS	Material Safety Data Sheet
MSM	Master Slave Manipulator
MR	Material Requisition
NACE	National Association of Corrosion Engineers
NEC	National Electric Code
NDE	Non-destructive Examination
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association

OSHA	Occupational Safety and Health Administration
P&ID	Piping and Instrumentation Diagram
PIL	Plant Item List
PQR	Procedure Qualification Record
PTF	Pre-Treatment Facility
QL	Quality Level
QAP	Quality Assurance Program
RPP-WTP	River Protection Project – Waste Treatment Plant
SSC	Structure, System or Component
SSPC	Steel Structures Painting Council
UBC	Uniform Building Code
USCS	U.S. Customary System "inch-pound system"
UNC	Unified National Coarse
WPS	Welding Procedure Specification
w.g.	Water gauge
CG	Center of Gravity
RRC	Risk Reduction Class
CM	Commercial
SC	Seismic Category
PV	Pressure Vessel
RTD	Resistance Temperature Detector
VT	Visual Inspection

1.5 Quality Classifications

1.5.1 General

All equipment shall be purchased as Commercial Quality equipment.

For Quality Assurance requirements refer to Section 8 of this specification.

2 Applicable Documents

2.1 General

Work shall be done in accordance with the referenced codes, standards, and documents listed below, which are an integral part of this specification. If the Seller determines other documents, than those listed, are applicable, the Seller shall refer those documents to the Buyer for evaluating the applicability to the specific component or equipment.

When specific chapters, sections, parts, or paragraphs are listed following a code, industry standard, or reference document, only those chapters, sections, parts, or paragraphs of the document are applicable and shall be applied. When more than one code, standard, or reference document covers the same topic, the requirements for all must be met.

For codes and standards listed below, the specific revision or effective date identified, as well as the specific revision or effective date of codes and standards that they incorporate by reference (daughter codes and standards), shall be followed. If a date or revision is not identified, the last issue, including addenda, at the time of quotation shall apply.

Any known conflicts between the specification or drawings, and the applicable codes and standards, shall be brought to the attention of the Buyer, via a Supplier Deviation Disposition Request (SDDR), for resolution prior to start of work. A blank SDDR form can be found in Section 2.5 of the MR.

The document revision in effect at the time of contract award shall govern, unless specified otherwise. The use of any other edition, revision, or issue of a reference document requires Buyer's approval.

2.2 Codes

NEC (NFPA 70)	National Electric Code
DOE-STD-1066-97, (Chapter 15)	Fire Protection Design Criteria, Glovebox Fire Protection
DOE Order 0 414.1A, 9/29/99	Quality Assurance
NFPA 801, Section 7.4	Standard for Fire Protection for Facilities Handling Radioactive Materials, 2003 Edition

2.3 Industry Standards

2.3.1 Occupational Health & Safety Administration (OHSA)

29 CFR 1910.23	Guarding Floor and Wall Opening and Holes

2.3.2 American Glovebox Society

AGS-G001	Guideline for Gloveboxes, 1998

2.3.3 American National Standard Institute (ANSI)/American Welding Society (AWS)

ANSI/AWS D1.1	Structural Welding Code – Steel
ANSI/AWS D1.6	Structural Welding Code - Stainless Steel
ANSI/AWS D9.1	Sheet Metal Welding Code

2.3.4 American Petroleum Institute (API)

API 620	Design and Construction of Large, Welded, Low Pressure Storage Tanks, 10th edition, Feb. 1, 2002

2.3.5 American Society of Mechanical Engineers (ASME)

ASME B31.3	Process Piping, 1996

ASME Y14.5M	Dimensioning and Tolerancing

2.3.6 American Society for Nondestructive Testing (ASNT)

SNT-TC-1A	Recommended Practice No. SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing, 1980

2.3.7 International Electrotechnical Commission (IEC)

IEC 60529	Degrees of Protection Provided by Enclosures

2.3.8 Underwriters Laboratory (UL)

UL 1776	High Pressure Cleaning Machine

2.3.9 Steel Structures Painting Council (SSPC)

SSPC-SP1	Solvent Cleaning

2.3.10 Pipe Fabrication Institute (PFI)

ES-24	Pipe Bending Methods, Tolerances, Processes and Material Requirements

2.4 Project Documents

The document revision in the associated MR (Material Requisition)/PO package documents shall govern.

The following is a list of other WTP specifications that have been invoked by WTP specifications referenced, or their subsequent daughter specifications that may not have been specifically listed:

- *Engineering Specification for Packaging, Handling, and Storage Requirement,* 24590-WTP-3PS-G000-T0003.
- *General Specification for Supplier Quality Assurance Program Requirements,* 24590-WTP-3PS-G000-T0001.
- *General Specification for Mechanical Handling Equipment Design and Manufacture,* 24590-WTP-3PS-M000-T0002.
- *Engineering Specification for Instrumentation for Package Systems,* 24590-WTP-3PS-JQ07-T0001
- *Engineering Specification for Electrical Requirements for Packaged Equipment,* 24590-WTP-3PS-EKP0-T0001.
- *Specification for Tank Welding*, 24590-WTP-3PS-MTSS-T0001.
- *Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel*, 24590-WTP-3PS-SS00-T0002.
- *Engineering Specification for* Structural *Design Loads for Seismic Category III & IV Equipment and Tanks*, 24590-WTP-3PS-FB01-T0001.
- *Engineering Specification for Piping Material Classes,* 24590-WTP-3PS-P000-T0001.
- *Piping Material Classification, Pipe Class S11B,* 24590-WTP-3PB-P000-TS11B.

- *Engineering Specification for Pressure Vessel Design and Fabrication,* 24590-WTP-3PS-MV00-T0001.
- *Engineering Specification for Welding of Carbon Structural Steel,* 24590-WTP-3PS-SS00-T0001.
- *Engineering Specification for Positive Material Identification,* 24590-WTP-3PS-G000-T0002.
- Technical Supply Condition for Valves, 24590-WTP-3PS-PV00-T0001.
- *Engineering Specification for Shop Fabrication of Piping,* 24590-WTP-3PS-PS02-T0001.
- *Engineering Specification for Actuators for ON/OFF Valves,* 24590-WTP-3PS-JV15-T0001
- *Engineering Specification for Shop Applied Special Protective Coatings to Steel Items and Equipment,* 24590-WTP-3PS-AFPS-T0001

2.5 WTP Drawings

The document revision listed in the MR package for WTP documents shall govern.

2.5.1 Design Proposal Drawings

2.5.1.1 Decontamination Booths and Gloveboxes

Document Number	Document Description
24590-PTF-M0-M17T-00001	PTF Maintenance Decontamination Booth
24590-PTF-M0-M10T-00051	PTF Maintenance Decontamination Glovebox
24590-LAW-M0-M17T-00001	LAW Maintenance Decontamination Booth
24590-LAW-M0-M10T-00003	LAW Maintenance Decontamination Glovebox
24590-HLW-M0-M17T-00009	HLW Maintenance Decontamination Booth
24590-HLW-M0-M10T-00077	HLW Maintenance Decontamination Glovebox
24590-LAB-M0-M10T-00002	LAB Maintenance Decontamination Glovebox

2.5.1.2 Decontamination Tanks and Spray System

Document Number	Document Description
24590-HLW-M0-HSH- 00071	HSH Decontamination Tank Assembly
24590-HLW-M0-HSH- 00072	Decontamination Tank
24590-HLW-M0-HSH- 00073	Decontamination Tank Spray and Sparge System
24590-HLW-M0-HSH- 00074	Decontamination Tank Pump Support Package
24590-HLW-M0-HSH-00075	Decontamination Tank Process Flow Diagram
24590-HLW-M0-HSH- 00076	Decontamination Tank Discharge Filter Assembly
24590-HLW-M0-HSH- 00077	Decontamination Tank Drip Pan
24590-PTF-M0-PIH-00019001	PTF Decon Tank at PIH
24590-PTF-M0-PIH-00019002	PTF Decon Tank at PIH

2.5.1.3 Miscellaneous Decontamination Equipment

Document Number	Document Description
24590-HLW-M0-HSH- 00078	Crane Decontamination System

3 Design Requirements

3.1 General Criteria

It is not the intent to specify herein all details of design and construction. It shall be the responsibility of the Seller to supply equipment that has been designed and fabricated in accordance with specified codes and standards, and to apply a standard of workmanship suitable for the intended purpose. Buyer weight and CG calculations are preliminary and bounding for Buyer's civil/structural use only. Seller shall provide weight and CG calculations and mark deliverable equipment when specified, as noted on associated DPDs.

3.2 Basic Requirements of Decontamination Booths and Gloveboxes

The Seller shall furnish the gloveboxes and decontamination booths complete with required auxiliary systems, instruments, and safety devices to provide efficient and safe operations. This shall include, but is not limited to the following:

- Maximum bounding weight is 2,718 lb. for LAW, HLW and PTF gloveboxes and 20,375 lb. for decontamination booths The LAB Glovebox bounding weight is 6000 lb an the LAB Glovebox Platform bounding weight is 5264 lb.
- Provide required shielding when specified as material thickness on DPDs.
- Provide a means for passing manual swab samples outside the glovebox and decontamination booth.
- The glovebox and decontamination booth lighting shall be external and fluorescent.

Decontamination Booth and Glovebox Seismic Criteria is SCIII. The Safety Class is Not Important to Safety.

3.2.1 Shielding Requirements

For all material thickness requirements refer to the glovebox and decontamination booth DPD listed in Section 2.5.1. Material thickness specified shall be considered minimum.

Recessed areas or internal pockets shall not reduce the required minimum shielding thickness of the glovebox.

3.3 Basic Requirements of Decontamination Tanks

The tank shall be designed and fabricated in accordance with API 620 and 24590-WTP-3PS-MTSS-T0001. Vibro-etching may be used as an alternative to the low stress stamping required in 24590-WTP-3PS-MTSS-T0001 to record welder/weld joint traceability.The tank shall not be a stamped vessel. Tank piping nozzle loads, nozzle reinforcing and nozzle orientation for jumpers shall be in accordance with 24590-WTP-3PS-MV00-T0001, Section 3, *Pressure Vessel Design and Fabrication.*

Process piping shall be designed in accordance with the applicable requirements identified in ASME B31.3 and project specification 24590-WTP-3PS-P000-T0001, *Engineering Specification for Piping Material Classes.* The piping material class for interfacing to the Buyer provided jumper piping shall be in accordance with 24590-WTP-3PB-P000-TS11B, *Piping Material Classification, Pipe Class* S11B. Piping fabrication shall be in accordance with 24590-WTP-3PS-PS02-T0001, *Engineering Specification for Shop Fabrication of Piping.*

Seller shall consider design details and material thickness shown on Drawings as the minimum requirements. Seller shall not scale Drawings.

The decontamination tanks shall have a quality level of "CM", (commercial). The safety class is "RRC". The Seismic Criteria is "SC-III".

Local gamma dose rates in the general area of each decontamination tank shall be 10,000 mrad/hr maximum. Neutron dose rates are negligible.

The temperatures in the rooms housing the decontamination tanks shall be 59°F minimum and 95°F maximum; humidity varies between 5% and 100%. Unless otherwise stated on associated Data Sheets or Design Proposal Drawings, operating temperature controls for each tank shall be capable of being set and maintained at selected temperatures between 59°F and 212°F (full rolling boil).

The chemical delivery and control system (HLW tanks only) shall be designed in accordance to the Pump Support Package DPD (24590-HLW-M0-HSH-00074) and process flow diagram (24590-HLW-M0-HSH-00075). The pump support package shall have a structural frame and stainless steel sheet metal cover. The frame shall provide sufficient rigidity to achieve and maintain illustrated tolerances throughout the working lifetime of the tank. The sheet metal cover shall provide lance overspray, drip and splash protection of internal components and provide a means of pump heat rejection. The requirements of the pump support package include, but are not limited to:

- Tank heating and agitation using steam sparging
- Tank agitation using air sparging
- High volume, high pressure spray
- Injection of chemicals
- Recirculation of fluids
- Neutralization of chemicals
- Sample waste stream
- Transfer of fluids from the tank to radioactive waste disposal system
- Remote disassembly

The Decontamination Tank Spray and Sparge System (HLW tanks only) primary function is to:

- Provide a support structure to deliver and disperse sprays at predetermined levels
- Protect the tank shell from physical damage due to contact with items being cleaned
- Provide a stepped support structure for templates suspending items for cleaning. The maximum suspended load, including tooling (by Buyer) shall not exceed 8,000 lb.

The Decontamination Tank Spray System shall have tested and documented performance provided before shipment. All spray ring nozzles shall be of the flat fan type with low spray angles to maximize impact. The fan of each nozzle shall be oriented vertically with nozzles pointing up , down, and radially inward as required to provide full coverage on a 12" diameter cylinder, throughout the height of the tank. Cleaning configuration 1 is the top ring operating alone with nozzles pointing downward, arranged to preclude spray from exiting the tank. Configuration 2 is the middle pair operating together with nozzles pointing up, down, and radially inward. Configuration 3 is the bottom pair of rings operating together similar to the middle pair, however, the bottom ring shall have no downward pointing nozzles. The Seller shall submit the nozzle type, spray angle, orifice size, operating pressure and flow rates in the above configurations and the expected impact in pounds per square inch on the 12" diameter cylinder stated above.

3.4 Basic Requirements of PTF Decon Tanks

The Pre-treatment Decon Tank (24590-PTF-M0D-PIH-00015 and 24590-PTF-M0-PIH-00019) requirements include, but are not limited to:

- Remote disassembly
- Transfer of fluids from the tank to radioactive waste disposal system

3.5 Basic Requirements of Spray Lances

The Seller shall provide spray lances with all hosing and connections necessary for mechanical and chemical decontamination. This shall include, but is not limited to the following:

- Provide lances compatible with facility equipment such as master slave manipulators (MSMs), power manipulators, and decontamination booths or gloveboxes per listed DPD or datasheet
- Provide compatibility with mechanical spray or blast equipment as well as chemical decontamination
- Provide construction and materials suitable for decontamination of the spray lance
- Provide lances with manually operated controls per datasheet

3.6 Basic Requirements of Decontamination Blast and Spray Equipment

The Seller shall provide decontamination blast and spray equipment for decontamination of plant structures and equipment. This shall include, but is not limited to the following:

- Provide compatibility with spray lance
- Provide remote operation compatibility with a foot pedal per datasheet
- Provide remote operation with all safety features inherent in a handheld spray lance
- Provide portability to move around the plant
- Provide compatibility with the chemicals listed on the Mechanical Data Sheet

- Provide pressure washers that are UL listed

3.7 Basic Requirements of Crane Decontamination Equipment

The crane decontamination equipment (24590-HLW-M0-HSH-00078) is used to decontaminate the exterior of the overhead crane, the overhead mast mounted power manipulator or the interior telescopic mast of power manipulator. The decontamination equipment shall hang from the overhead crane with a bail and direct a nozzle at the manipulator, mast or the crane above. The equipment shall be compatible with liquid spray lances and CO_2 pellet lances and capable of being remotely assembled or disassembled, using MSM or the Power Manipulator hand. The nozzle shall be remotely adjustable with the number of desired angles shown on the design proposal drawing. The lances shall be compatible with the pressure washers or CO_2 blast units described in this technical specification. The Seller shall allow for additional weight to be added. The lance angle shall be remotely adjustable with a power manipulator or MSM. Two hose reel and skid combinations shall be included with the crane decontamination equipment. The skid shall provide additional weight necessary for long payout of hose and remote connection of hoses to a spray lance, the crane decontamination equipment, or when attached directly to the spray manifold on the power manipulator for internal mast decontamination. One hose reel shall be for CO2 and the other shall be for liquid. The hose reels shall be handled remotely. The flow shall be restricted when a hose fails to prevent whipping, and protected from excess flow using a 10 gpm orifice. For each set of the two HSH Crane Decontamination Equipment, provide a 20' length of air hose and 20' length of water hose of the same size and manufactured of the same materials as the existing. Provide Staubli GPL25.1205/IC/TL/JE/SP female with GPL25.6205/IC/TL male connectors on each air line and RBE11.1203/IC/TL/VD/RD/JE female with RBE11.6203/IC/TL male connectors on each liquid line.

The crane decontamination equipment shall have a quality level of "CM". The safety class is "Not Important to Safety". The Seismic Criteria is "SC-V".

3.8 Basic Requirements of Parts Washer

The parts washer (24590-HLW-M0D-HSH-00150 and 24590-HLW-M0D-HSH-00212) shall spray and soak equipment for cleaning and decontamination. The washer shall be operated manually or remotely using the power manipulator. The drain and fill valves shall be capable of being operated manually and remotely. Drain, fill, and recirculation functions shall be full automated for remote operation, but have the capabilities for local manual operation.

3.9 Features of Decontamination Booths and Gloveboxes

Refer to Design Proposal Drawings in Section 2.5.1.

The gloveboxes and decontamination booths are fastened to the floor embeds. Other than material thickness specified on DPD, the gloveboxes will not require any additional shielding for shielding purposes. (see Section 3.2.1). The glovebox components are operated manually. The decontamination booth and glovebox shall have a sloped floor in the bottom draining into a sump provided by the Seller. The sump shall be drained through a 2 in. nominal pipe stub-out. The stub-out shall be pre-filtered with a minimum screen open area of 3.5 in.2 with a maximum of ¼ in. square clear openings. The screen shall withstand a flow of 25 gallons/min. Fire protection hardware is the responsibility of the Buyer's fire protection contractor. The Seller is required to coordinate design interfaces for the fire protection system with the Buyer's fire protection contractor. Coordination shall occur as part of the detail design.

Other features are noted as follows:

- The ports require metal hatch covers.
- The gloveports shall be of the quick change style that allows for timely conversion to pass-through ports
- The glove material shall be specified by the Seller, see AGS-G001-1998.
- The decontamination booth shall have a two ton manually operated turntable.
- The turntable shall be manually operated with a shaft through the wall of the decontamination booth and a crank on the outside at the operating station.
- The decontamination booth shall have a W 10 × 19 monorail beam for a 2 ton chain hoist
- The decontamination booth shall have an Exhaust demister
- Provide grilles (or screens) with meshes from 8 to 16 openings per inch, stainless steel, on the exhaust plenum on each of the Gloveboxes and 3 Booths. Locate the screens at least 4 to 5 feet upstream from all prefilters and at least 20 feet upstream from all final filter plenum enclosures.
- Provide HEPA filters with counterbalance backdraft dampers on the inbleeds into the airlock portion of the 3 Decontamination Booths. Provide HEPA filters between the airlock portion and the workcenter portion. Provide counterbalance backdraft dampers with each of the 3 Glovebox inbleeds.
- Provide 8"-10" dia. emergency exhaust flanges and inbleed filter housings with each Decontamination Booth and Glovebox.
- Provide a leak-tight seal on the inner air lock doors on the 3 Decontamination Booths.
- Provide a flange and removable end plate on the inbleed portion of each of the 3 Gloveboxes.
- Provide a flanged horizontal exhaust tee on the LAB Glovebox exhaust centered at 117" above the floor. The south facing outlet shall be 8" dia. and the north facing 14" square.

3.10 Features of HLW Decontamination Tanks and Spray System

Tanks shall have lifting features to allow installation of the tank using an overhead crane. When tank and associated equipment are serviced by overhead power manipulator, the maximum jaw opening shall be 5". Equipment being decontaminated is suspended inside the tank on Buyer supplied tooling supported on steps inside the spray ring assembly. A strainer unit shall be located at the bottom of the tank. The strainer unit shall be remotely removable using the overhead power manipulator without prior removal of the spray and sparge system. When specified, Resistance Temperature Detectors (RTD) shall be dual sensor, fully sheathed in T316L stainless steel and spring loaded bayonet connector, see Section 3.4 of Engineering Specification for Instrumentation for Package Equipment, 24590-WTP-3PS-JQ07-T0001. Plant wash and drain shall be connected to the tank through jumpers specified on the design proposal drawing. The Buyer will confirm to the Seller details of the crane hook prior to final design.

The spray system inside the HLW tank shall be removable from the tank using a remotely operated lifting feature for nozzle adjustment and repair. Jumper connections shall be located at the top of the tank and readily accessible within the crane approach area to allow remote disconnection and removal of the spray system and pump support package. All valves shall be on/off Flowserve® Durco® Mach 1 valves, or Buyer approved equal. All valves shall comply with 24590-WTP-3PS-PV00-T0001, Engineering Specification for Technical Supply Condition for Valves. All valves involved with emptying the decontamination tank shall comply with 24590-WTP-3PS-JV15-T0001, Engineering Specification for Actuators for On/Off Valves. Actuators containing electronics shall be sealed to IP66 according to IEC 60529. Valves shall withstand solids that may pass through the finest screen on the outlet of the tank.

The tank piping and internal components shall be designed to minimize contamination traps and maximize contamination removal through rinsing.

Unless noted otherwise, specified HLW tank jumpers are 2" nominal pipe size. Pipe sizes for the various spray ring circuits, as well as for air and steam may be reduced as required to achieve specified design performance parameters provided size reduction is on the tank side of 2" jumper connectors. The tank discharge jumper to Radioactive Liquid Drain shall have a remotely actuated Drain Valve, check valve, and flow restricting device to maintain flow at or below 30 gpm.

The HLW tank chemical injection, air piping, and all other sizes less than ¾" shall incorporate Staubli (or approved equal) remotely operated connectors where engaged by MSMs.

Remote operated electrical power, control, and instrumentation connectors, where engaged by MSMs, shall be provided by the Buyer. Mounting and terminating is the responsibility of the Seller. If Buyer is incapable of providing electrical or instrument jumper connectors at the time required by the Seller, The Seller shall provide temporary cables as necessary to facilitate testing and provide terminal strips and bulkhead connectors to terminate and mount buyer provided jumpers at a later date.

Major features of the pump support package include, but are not limited to:

- Entire system remotely operable to facilitate liquid recirculation for decontamination of radioactive equipment
- Jumpered connections between the pump, tank, plant wash and drain
- Entire system capable of being flushed and rinsed
- Cover and panels, when specified, shall be remotely removable
- Control panel out-cell on cell wall accessible to operators
- Remotely removable electrical, plant air, and jumpered connections
- Chemical injection equipment shall be provided with spill pallet or other spill containment

3.10.1 Decontamination Tank Control and Instrumentation System

The HLW tank control and instrumentation shall be integrated with the Buyer's ICN. Buyer will provide ABB hardware and programming for Seller installation. The system shall consist of a Decon Tank Control Panel, Chemical Injection Control Panel, and all associated sensing, indicating, interlocks, and control elements required to provide a functional decontamination system. See Appendix A for a pictorial representation of the HLW Decontamination Tank Instrumentation and Control System.

The Decon Tank Control Panel and Chemical Injection Control Panel shall house all controls and indication associated with Decon Tank operations. The panel shall be provided with the I/O points required for the Buyer's control system to generate the on/off controls and/or indication for the following:

- Recirculating Pump
- Temperature Controller
- Plant Wash Supply Valve position
- Plant Steam Supply Valve position

- Top Spray Ring Supply Valve position
- Middle Spray Ring Supply Valve position
- Bottom Spray Ring Supply Valve position
- Recirculating/Drain 3-way Valve position
- Chemical Injection Pump

Via Buyer provided software, the tank control panel shall have the following indication for the Buyer instrumentation:

- Tank Level
- Tank Liquid Density
- Tank Temperature

The control panel shall be supplied with required I/O and wiring to support indication and interlock enable/disable functions and remote panel enable/disable for the following:

- Drain Valve interlock with plant RLD Tank Level
- Chemical Injection Control Panel remote control for Recirculating Pump

3.10.2 Deleted

3.11 Major features of the PTF Decon Tank include, but are not limited to:

- Jumpered connections between plant wash and the tank
- Entire system remotely operable
- A steam operated ejector is used to transfer the vessel contents to plant wash and drain
- A removable and reusable sediment screen is installed at the tank drain/ejector inlet
- A steam sparge system is fitted to provide agitation of contents

3.12 Design Life

All hardware, less consumables shall have a design life of 40 years.

3.13 Environmental Conditions

The equipment shall be designed and manufactured to be suitable for operation within the environment of the LAW, HLW, PTF, and LAB building operating areas as shown on the Mechanical Data Sheets or otherwise specified.

3.14 Mechanical Requirements For Decontamination Booths and Gloveboxes

Equipment subject to maintenance shall be broken down into convenient sub-assemblies to effect ease of replacement per section 5.2.2 of 24590-WTP-3PS-M000-T0002, General Specification for Mechanical Handling Equipment Design and Manufacture.

3.14.1 Bearings

See General Specification for Mechanical Handling Equipment Design and Manufacture 24590-WTP-3PS-M000-T0002, Section 4, Bearings and Bushings.

3.14.2 Fasteners

The use of hexagon headed bolts with sufficient clearance for socket wrenches is required. The range of bolt sizes shall be kept to a minimum in order to limit the number of tools required for maintenance. All bolt types shall be of USCS (inch) units.

Set screws used for locking purposes do not require mechanical locking, but require the use of a removable thread locking compound similar to Loctite Threadlock 242.

Washers, plain or spring, shall not be used except where specifically required and shown on Seller drawings.

Fasteners that might have to be removed for maintenance purposes will be accessible from the worker side of the glovebox.

See "*General Specification for Mechanical Handling Equipment Design and Manufacture*", 24590-WTP-3PS-M000-T0002, Section 4, Fasteners, for additional information.

3.14.3 Lift Points and Lifting Hardware

The glovebox and decontamination booth shall have designated lift points clearly identified in accordance with section 3.4 of 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*. The gross weights of the equipment shall be noted on the external packaging.

3.15 Mechanical Requirements For Decontamination Tanks

3.15.1 Corrosion Allowance

Corrosion allowance for decontamination tanks is specified on the MDS or DPD and shall be applied to each surface exposed to process vapor or liquid. Internal piping and charge tanks (if used) shall have the specified corrosion allowance applied to both internal and external surfaces, in accordance with 24590-WTP-3PB-P000-TS11B, *Piping Material Classification, Pipe Class* S11B.

- Unless otherwise specified, corrosion allowance shall not be applied to external tank surfaces.

3.15.2 Supports and Anchors

- Seller shall provide tank supports as illustrated on the associated DPD.
- For vertical tanks, the minimum anchor bolt diameter shall be 1 inch UNC unless otherwise specified on the Buyer DPD.
- A minimum of four bolts is to be used. Larger numbers are to be multiples of four.
- Supports and anchors shall be designed to secure a buoyant tank in case the tank is empty and fully submerged.

- Supports for piping and jumper nozzles.

3.16 Mechanical Requirements For Spray Lances

Seller shall verify spray lance compatibility with Master Slave Manipulator (MSM) and power manipulator when compatibility is noted on the MDS. The MSM's jaws shall have the dimensions of ½ in. wide and 1 ¾ in. long. The Buyer will provide the Seller details of the power manipulator jaws prior to the final design. The maximum thrust of the spray lance shall not exceed 20 lbs, measured at the MSM grip point.

3.17 Mechanical Requirements For Decontamination Blast and Spray Equipment

Seller shall verify compatibility with Master Slave Manipulator (MSM) when using out cell controls during remote in-cell operated spray lances in accordance with 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture, Section 5.2.6.* The force produced by the blast and spray equipment shall not inhibit remote operation of the lance. Pressure Washing Supply System steam temperature shall not exceed 350°F and 1500 psig.

3.18 Mechanical Requirements For Crane Decontamination Equipment

The crane decontamination equipment shall be designed in accordance with 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture, Section 5.2,* and relevant proposal drawings 24590-HLW-M0-HSH-00078. Nozzle adjustment and hose reel connections shall be done remotely before use with either the power manipulator or MSM.

3.19 Seismic Loading

Seismic loads associated with decontamination tanks shall be determined from 24590-WTP-3PS-FB01-T0001, *Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks* Refer to the Design Proposal Drawing and the Basic Requirements section of this specification for the appropriate seismic classification. Through a seismic event, the decontamination tanks shall remain upright, intact and structurally sound, preventing any liquid loss through rupture or failure, and retain all mechanical contents housed in them,

3.20 Electrical Requirements

Refer to 24590-WTP-3PS-JQ07-T0001, *Engineering Specification for Instrumentation for Package Systems* for requirements for instrumentation and control of deliverable equipment.

Refer to 24590-WTP-3PS-EKP0-T0001, *Engineering Specification for Electrical Requirements for Packaged Equipment* for electrical requirements for deliverable equipment.

Wiring diagrams for all electrical connections shall be submitted to the Buyer for all the decontamination booths and gloveboxes as well as the Decontamination Tank and Chemical Injection Control and Instrumentation Systems. These submittals are summarized in the G321-E form.

The decontamination booths, decontamination gloveboxes, HSH decontamination tanks and spray system, and parts washer shall be designed for permanent grounding per NFPA 70. Grounding shall comply with the Grounding Section 6.6 of the *Engineering Specification for Electrical Requirements for Packaged Equipment*, 24590-WTP-3PS-EKP0-T0001.

The layout of components and wiring shall be such as to afford easy access for operation and maintenance.

3.21 Accessibility and Maintenance

The unit shall be configured so that standard maintenance techniques and practices can be utilized during maintenance.
Seller shall provide special tooling if required. Tooling shall meet requirements of MSMs if used in a Hot Cell in accordance with 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture, Section 5.2.6.*

4 Materials

4.1 Construction

Materials of construction shall be as specified on the DPD and MDSs. If Seller desires to use alternative materials, a change request shall be processed via the Supplier Deviation Disposition Request (SDDR) form.

Selection of commercial components indicated on the DPD is for proposal purposes only. The Seller is responsible for full validation of the components selected for the contracted application whether identical to the proposed items or otherwise.

All materials installed or used shall be used in accordance with MSDS requirements in 29 CFR 1910. Gloveboxes/Decontamination Booths, their incorporated windows, and hoods shall be of noncombustible materials.

Do not use materials containing Teflon or zinc during manufacture or testing of any deliverable equipment that is subject to acids or high radioactive environments.

Marking or packing materials containing chlorides shall not be used on stainless steel components. Cleaning agents or solutions that can adversely affect the materials shall not be used. The Seller shall take suitable precautions during all stages of construction to prevent carbon steel contamination of stainless steels.

Material Test Reports (MTR) for all structural load bearing stainless steel and carbon steel shall be submitted to Buyer per this specification and as summarized in G321-V form.

Where special requirements or restrictions are applied to standard commercial items, these will be specified on the drawings or in accompanying documentation.

Materials shall meet the requirements listed in section 4.11 of *General Specification for Mechanical Handling Equipment Design and Manufacture, (*24590-WTP-3PS-M000-T0002) unless otherwise specified such as for radiation requirements.

Materials shall be new and free from defects. Classification of fabrication materials shall be in accordance with ASTM. For structural mechanical tubing. ASTM A554 may be substituted for ASTM A511.

Seller shall perform a positive identification of materials test in the fabrication of each tank per 24590-WTP-3PS-G000-T0002, *Engineering Specification for Positive Material Identification*. This is applicable to all alloys higher than Type 304L and wetted by process or acidic decontamination liquids or vapors.

4.1.1 Pipe Fittings

Pipe fittings shall conform to the appropriate ASME and ANSI standards for materials and dimensions unless otherwise stated in the purchase order, see 24590-WTP-3PS-P000-T0001 *Engineering Specification for Piping Material Classes.* The piping material class for interfacing to the Buyer provided jumper piping shall be S11B.

4.2 Spray Lances

All external surfaces shall be resistant to oxidation and compatible with chemicals listed on the MDSs. Anodizing and coating procedures proposed for normally readily oxidized materials shall be approved by the Buyer. Components transporting liquid decontamination liquids, that are to be welded, shall be made of 316L stainless steel. Un-welded components may be made using 316 stainless steel.

4.3 Equipment Subject to Radiation:

See Section 5, *General Specification for Mechanical Handling Equipment Design and Manufacture*, 24590-WTP-3PS-M000-T0002, for materials approved for radiation environments.

4.4 Prohibited Materials

See Section 4, under *Materials, Prohibited Materials, General Specification for Mechanical Handling Equipment Design and Manufacture*, 24590-WTP-3PS-M000-T0002 for those materials not to be used.

5 Fabrication

5.1 General

Fabrication shall be undertaken using USCS "inch-pound" units, unless otherwise approved by the Buyer. Manufacture shall conform to the requirements of drawings and specifications. The Seller shall inform the Buyer if any aspect of the drawing or specification content is incorrect, or if the application could have an adverse effect on the operation or reliability of equipment. Changes to Buyer requirements cannot be made except with the written consent of the Buyer via the Supplier Deviation Disposition Request (SDDR) form.

5.1.1 Welding

- All welding procedure processes and consumables for carbon steel or stainless steel shall be to AWS D1.1, AWS D1.6, AWS D9.1, subject to the limitations and requirements of 24590-WTP-3PS-SS00-T0001, *Engineering Specification for Welding Carbon Structural Steel and* 24590-WTP-3PS-SS00-T0002, *Engineering Specification for Welding of Structural Stainless Steel and Welding of Structural Carbon Steel to Structural Stainless Steel.*
- Reports of weld inspections shall be submitted to the Buyer for information as part of the data package.

- Buyer retains the right to require weld procedure tests to be conducted when deemed necessary.
- Welder qualifications shall be preformed in accordance with AWS D1.1, and AWS D1.6.

5.1.2 Assembly

Unless otherwise specified on the drawing, fabrications shall be free of pockets or traps where water may lodge, and totally enclosed box specifications shall be leak tight to prevent the ingress of fluid, for example water, during decontamination.

5.1.3 Heat Treatment

Seller shall determine if special heat treatment processes are required during fabrication. If required, procedures shall be submitted for review as summarized in the G321-E form. Vibratory stress relief is not acceptable.

5.1.4 Surface Finish

See 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*, Section 5, Finish Aspects and Coatings for finishing requirements.

5.1.5 Miscellaneous Requirements

- Jigs and fixtures shall be retained by the Seller until written authority to scrap is received from the Buyer.
- See 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*, Section 5 for additional fabrication requirements.
- Glovebox and Decontamination Booth shall be constructed in sections. For accessibility restrictions during installation, the maximum envelope dimensions of an individual section shall not exceed 5' × 6'-6" × 7'-6".

5.2 Decontamination Tanks

5.2.1 General

Seller shall, if necessary, provide temporary stiffening and jigging to prevent shell distortion during fabrication, welding processes, heat treatment, hydrostatic testing, or shipment.
Fabrication tolerances shall be in accordance with DPDs.
The sequence of fabrication shall be planned to permit maximum access to the internal surfaces to enable examination of all welds. Internal welds shall be inspected and signed off prior to continued fabrication.

Plates and pipes shall be cut to size and shape by machining, grinding, shearing, plasma, laser, or water jet cutting. All thickness of plate or pipe cut by air plasma cutting shall have the edges dressed to a smooth, bright finish. Material cut by the inert gas shielded plasma, laser or water jet process will not require further dressing other than deburring. All lubricants, burrs, and debris shall be removed after cutting.

If a butt-welded seam is required between materials of different thickness, the thicker material shall normally be machined on the side away from the process liquid. Machining shall ensure a smooth finished profile with no sharp corners.

When rolling any austenitic stainless plate, care shall be taken to prevent carbon pickup or contamination of rolled material. The work area shall be free of carbon steel grindings and general cleanliness shall be maintained to preclude carbon contamination.

Only stainless steel brushes, clean iron-free sand, ceramic or stainless steel grit shall be used for cleaning stainless steel or non-ferrous alloy surfaces. Cleaning tools or materials shall not have been previously used on carbon steel.

Internal piping bends shall have a center line radius of four times the pipe nominal diameter. In confined spaces, the center line radius may be reduced to three times the outside diameter of the pipe. The pipe shall not be terminated or butt-welded within the bend, a straight length of 4 inches prior to the weld is recommended, see 24590-WTP-3PS-P000-T0001 *Engineering Specification for Piping Material Classes.* The piping material class for interfacing to the Buyer provided jumper piping shall be S11B.

Pipe bending methods, tolerances, processes, and material requirements shall comply with PFI Standard ES-24 and require Buyer's review. These requirements shall apply equally to tube bending processes.

5.2.2 Layout

Plate size shall be chosen to minimize welding.
The longitudinal seams of adjacent shell courses shall be staggered by a minimum length (measured from the toe of the welds) of 5 times the plate thickness, or 4 inches whichever is greater. Where it is considered impractical to meet this requirement, Seller shall submit a proposed layout to the Buyer for review.

Saddles shall be continuously welded to the shell. Welded seams under the saddle or wear plate are not permitted. Longitudinal weld seams in the shell should not be located within 15° of the horn of the saddle.

Plate layouts shall be arranged so that longitudinal and circumferential weld seams clear all nozzles, and their reinforcing pads to the maximum extent possible. A minimum clearance of eight times the plate thickness from the toes of the welds is required.

Structural attachment welds such as internal support rings or clips, external stiffening rings, insulation support rings, and ladder, platform or pipe support clips shall clear weld seams by a minimum of 2 inches. If overlap of pad type structural attachments and weld seams is unavoidable, the portion of the seam to be covered shall be ground flush and radiographically examined before the attachment is welded. The seam shall be radiographed per API 620.. Radiographic examination of longitudinal weld seams is not required when single-plate edge type attachments such as tray support rings, stiffening rings, insulation support rings, ladder, platform, or pipe support clips cross such weld seams.

5.2.3 Nozzles, and Reinforcing Pads

When applicable, nozzles that require field welds during equipment installation shall be prepared for field welding by fitting with a protective cover of the same material, tack welding in place and sealed to prevent dirt and water from entering the tank.

All jumpers are 2" nominal pipe size unless noted otherwise, see 24590-WTP-3PS-P000-T0001 *Engineering Specification for Piping Material Classes.* The piping material class for interfacing to the Buyer provided jumper piping shall be S11B. Jumper nozzles will be provided by the Buyer. Nozzle materials of construction are different from the remainder of the mating piping yet are compatible. The Seller will be required to generate a specific weld procedure. Nozzle materials of construction will be available to the Seller after the purchase order is awarded.

5.2.4 Welding

All welding shall be continuous. Stitch welding is prohibited.

Joints shall be assembled and retained in position for welding. The use of manipulators or other devices to permit welding in the flat position should be employed where practical.

All attachments e.g. lugs, brackets, nozzles, pads and reinforcements around openings (when permitted) and other members shall follow the contour and shape of the surface to which they will be attached. The gap at all exposed edges to be welded shall not exceed 1/16 inch or one-twentieth of the thickness of the attachment at the point of attachment whichever is greater.

Where fillet welds only are used, the maximum fit-up gap between the components being joined shall be 1/8 inch. The components shall be clamped or otherwise maintained together during welding.

Attachment point of spiders, braces, or other temporary attachments shall match the material of the tank.

All welding involving decontamination tanks shall be completed according to API 620.

5.3 Crane Decontamination Equipment

5.3.1 Miscellaneous Requirements

See 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture*, Section 5.1 for any additional fabrication requirements. The lifting bail shall be constructed according to Appendix D, Remote Hook and Bail Configuration. The lifting bail shall be constructed for 3 ton rotating hook applications using the 3 ton lifting bail dimensions.

6 Tests and Inspections

6.1 General

6.1.1 Standard/Commercial Manufacture Items

Standard commercial items such as fasteners, gearboxes, actuators, and electric motors shall in general be inspected and tested against manufacturers specifications and industry standards.

6.1.2 Sub-Assemblies

Where sub-assemblies erected at the shop have to be dismantled for transport to the site, the fasteners holding them together shall be inspected. Fasteners exhibiting distortion, galling, permanent set, or other damage shall, at the discretion of the Buyer, be replaced.

6.1.3 Inspection and Test Plan

The Seller shall submit an inspection and test plan as summarized in the G321-E form. The inspection and test plan shall summarize the manufacturing sequences, including Seller and Buyer test points and hold or notification points for Buyer's inspection as indicated in the Buyer's surveillance plan.

This plan shall include provisions for increased hold and notification points as the project progresses. The Seller shall submit an inspection report to the Buyer as summarized in the G321-E form.

6.1.4 Hardness Testing

- Hardness testing is required when austenitic stainless steel plate is cold formed to make sections such as angles and channels.
- Hardness testing is required when austenitic stainless steel pipe is cold formed for bends with a centerline radius less than three times the nominal pipe diameter.
- Any cold forming process, which may significantly increase hardness, shall be in accordance with an approved procedure, which contains hardness testing. The procedure and report shall be submitted in the mechanical test procedure and report as summarized in the G321-E and G321-V form.
- Hardness testing shall be performed on areas subject to the greatest deformation after cold working or any re-work. The maximum permitted hardness is HRB 92.
- If the maximum permitted hardness is exceeded, the Seller shall heat treat and test the component to meet this requirement. Seller shall submit a written procedure and report for suitable heat treatment and testing as summarized in the G321-E and G321-V form.

6.1.5 Surface Finish Inspection

Included in the inspection and test plan summarized in the G321-E form shall be procedures for visually inspecting the surface finish of each manufactured item. The inspections shall be performed after completion of all fabrication, cleaning, finish coating (where applicable), and testing.

Inspection of mill finished, ground, or machined surface finishes shall confirm that design requirements have been met.

Inspection of weld surface finishes, shall confirm that design requirements have been met, and shall take place prior to finish coating (where applicable).

Following inspection, the Seller shall verify acceptance of surface finishes in an inspection report as summarized in the G321-V form.

6.1.6 Visual Weld Inspection

The Seller shall develop and implement a procedure to perform visual weld inspections (visual tests, VT) to inspect 100% of each weld. The inspection shall be developed in accordance with AWS D1.1 and AWS D1.6.

The Seller shall submit a visual weld inspection report and weld map for each fabricated item. The report shall record inspection results, the date and time of inspection, and signatures of certified inspection personnel performing the inspection.

The visual weld inspection report and weld map shall be submitted as summarized in the G321-V form.

6.2 Decontamination Booths and Gloveboxes

6.2.1 Leak Testing

The glovebox and decontamination booth shall be leak tested per Section 5.11.3 in the AGS-G001 standard. The decontamination booth leak rate shall be applied to the outer boundary of the decontamination booth/airlock assembly. The leak rate (volume per hour) shall not exceed .5% of the volume at 4 in. w.g. as specified in the AGS-G001 standard. The leak rate procedures and test results shall be submitted to the Buyer as summarized in the G321-E and G321-V forms.

6.3 Decontamination Tanks and Spray System

6.3.1 Shop Tests

Submit an atmospheric hydrostatic leak test procedure and report of the tank, pump, and associated piping as summarized on the G321-E and G321-V form by:

- Filling the tank with water to the overflow and holding for a minimum of one (1) hour.

6.3.2 Performance Testing

Upon completion of the hydrostatic testing, the Seller shall run performance testing on the spraying system by circulating the water used for hydrostatic testing in the three configurations described in paragraph 3.3. Actuate each configuration using the control panel and associated valves. Measure and record the following parameters in each of the three configurations:

- Circulating pump discharge pressure
- Total flow rate
- Spray pattern (video recording is preferred)

Upon completion of performance testing, run the circulating pump until all water is discharged from the tank by actuating the 3-way valve in the discharge configuration.

Demonstration of the removal and installation of the spray ring assembly can be accomplished as planned using the lifting device and shop crane. Demonstration of the removal and installation of the pump support package can be accomplished as intended using the lifting equipment and shop crane. Demonstration of the installation and removal of the discharge filter screen. Demonstrate the

interchangeability of the Melter 1 Pump Support Package on Melter 2 Decontamination Tank and vise versa. Mechanical test procedures used to perform these tests shall be submitted to the Buyer as summarized in the G321-E form. The results of the test procedures shall be submitted to the Buyer as summarized in the G321-V form.

6.3.3 Non-Destructive Examinations (NDE)

Main shell seams on all tanks shall be in accordance with API 620. Seams shall have the root weld back-gouged and dressed and radiograph inspected per API 620. All welds joining the nozzle neck to the shell, bottom, or heads, shall be dye-penetrant tested. Dye-penetrant testing shall be performed in accordance with section 7.15.4 of API 620. Manufacturer's radiograph and dye penetrant test methods shall be submitted to the Buyer as summarized in the G321-E form. Records of the dye penetrant and radiograph tests shall be submitted to the Buyer as summarized in the G321-V form. Submit radiograph film as summarized on the 321-E form.

All mandatory NDE (visual) of the tank surface shall be carried out after the completion of fabrication, including any heat treatment. The NDE work must be performed by an inspector certified to the requirements of SNT-TC-1A. The interpretation of the results shall be done by either Level II or Level III inspectors certified to SNT-TC-1A.

6.3.4 Final Inspection of Completed Tank

All external and, where access permits, internal examinations will be carried out by the Seller according to test and inspection procedures submitted to the Buyer as summarized in the G321-E form. The finished dimensions and cleanliness of the tanks shall comply with the relevant Drawings and specifications after completion of all tests. The results of the test and inspection plan shall be submitted to the Buyer as summarized in the G321-V form.

6.4 Spray Lances

6.4.1 Shop Tests

The Seller shall submit a mechanical test procedure as summarized in the G321-E form. The mechanical test procedure shall verify the operability of the equipment in accordance to the requirements of the datasheet. Specifically, the equipment shall operate over the entire pressure range, and work correctly with the MSM or power manipulator being supplied to the Buyer. The results of the test procedures shall be submitted to the Buyer as summarized in the G321-E form.

6.5 Decontamination Blast or Spray Equipment

The Seller shall submit a mechanical test procedure as summarized in the G321-E form. The mechanical test procedure shall verify the operability of the equipment in accordance to the requirements of the datasheet. Specifically, the equipment shall operate over the entire pressure range, and work correctly with the Seller supplied foot pedal. The results of the test procedure shall be submitted to the Buyer as summarized in the G321-E form.

6.6 Crane Decontamination Equipment

6.6.1 Shop Tests

The Seller shall submit a mechanical test procedure as summarized in the G321-E form. The mechanical test procedure shall include the angles of which the lance can be operated at, a functionality test using a pressure washer at 1500 psi and approximately 2.5 gallons/minute, and a functionality test using the maximum blast pressure and ice consumption of the CO_2 blast unit. The results of the mechanical test procedure test shall be submitted to the Buyer as summarized in the G321-V form.

6.7 Parts Washer

6.7.1 Shop Tests

The Seller shall submit a mechanical test procedure to the Buyer outlining the functionality test as summarized in the G321-E form. The results of the mechanical test report shall be submitted to the Buyer as summarized in the G321-V form.

7 Preparation for Shipment

7.1 General

Packaging, handling, and storage will be performed in accordance with project specification 24590-WTP-3PS-G000-T0003, *Engineering Specification for Packaging, Handling, and Storage Requirements*. The Seller shall submit all documents listed in Section 11 of *Engineering Specification for Packaging, Handling, and Storage Requirements* as summarized in G321-E form.

7.2 Surface Preparation

Remove all dirt, oil, grease, loose mill scale, rust, weld splatter, and other foreign matter on surfaces to be painted. Solvent clean surfaces to SSPC-SP1 as the minimum or to the manufacture's recommended criteria if equal or better for the following equipment: crane decontamination equipment, decontamination booths, and gloveboxes.

7.3 Painting and Coatings

Seller shall paint or coat items in accordance with 24590-WTP-3PS-M000-T0002, *General Specification for Mechanical Handling Equipment Design and Manufacture, Section 4.13.* This requirement applies to the following equipment: crane decontamination equipment, tanks, pump support package, decontamination booths, and gloveboxes.

7.4 Tagging

The deliverable equipment shall be tagged in accordance with Section 7 of the Purchase Order.

Each piece of equipment shall be tagged or labeled with its Plant Item Number in accordance with the *General Specification for Mechanical Handling Equipment Design and Manufacture* (24590-WTP-3PS-M000-T0002) Human Factors Table. Refer to MDS or DPD for further details on nameplates as specified.

Tagging requirements for the tanks and other deliverable equipment are shown on the DPD. A stainless steel nameplate in characters not less than ¼ inch high shall be attached to the decontamination booths and gloveboxes showing the plant item number in a normally visible location. A stainless steel tag plate shall be attached with a stainless steel wire to all other equipment listed in this specification. Separate or loose items shall be tagged with the plant item number for which they are intended. Instruments shall be tagged according to the *Engineering Specification for Instrumentation for Package Systems*, 24590-WTP-3PS-JQ07-T0001, Section 8.

7.5 Packaging

The equipment shall be packaged in accordance with Section 7 of the MR.

The Seller shall verify, by calculation if necessary, that the tank and internals will withstand loads occurring during shipping for the chosen mode of transportation.

Threaded connections shall be cleaned and protected with metal or plastic caps and plugs.

All equipment shall be adequately packed, braced, supported, and securely anchored such that the equipment is fully protected for shipment.

All separate or loose items shall be boxed, individually protected as required and packed in a plywood container for shipment. Each container shall include a complete copy of the Bill of Materials identifying each item in the container.

Equipment enclosed in boxes shall have the Buyer's purchase order number and equipment number affixed on the outside of the box per Section 7 of the Purchase Order.

The Seller shall be solely responsible for the adequacy of the preparation for shipment. In addition, the Seller will provide detailed instructions for storage and handling.

Loads shall be securely fastened to pallets, stillages, timber spacers, or skids as reviewed by the Buyer, to facilitate handling. If the equipment does not posses the inherent strength to be handled using fork lift or crane, then strong backs or other bracing devices shall be provided. Loads to be handled by cranes shall be furnished with lifting eyes.

Lifting instructions shall be plainly indicated on the equipment or cases containing the equipment. Each package shall be clearly marked with the contract number, job number, plant item number and site location, together with the gross weights. For packaged equipment or equipment skids, center of load markers shall be permanently attached to the equipment to assist in lifting, removing, handling and setting the equipment.

7.5.1 Decontamination Tanks and Spray System

All flanged openings, which are not provided with a cover, shall be protected by a carbon steel blind flange of the same rating as the flange, a full-faced rubber gasket with a minimum thickness of 1/8 inch and carbon steel bolts with stainless steel washers.

For spray rings and other internal parts, suitable supports shall be provided to avoid damage during shipment. Temporary internal bracing shall be painted yellow and a label, located near the nameplate, shall state that the tank contains temporary bracing that must be removed.

When tanks are shipped in the horizontal position, the Seller shall take all necessary precautions in loading by blocking and bracing the tank and furnishing all necessary material to prevent damage to the tank or any internal component.

The Seller shall verify, by calculation if necessary, that the tank and internals will withstand loads occurring during shipping for the chosen mode of transportation.

7.6 Documentation

The Seller shall submit Material Safety Data Sheet (MSDS) for information in accordance with Section 7 of the Purchase Order. The Seller shall submit paint identifying information for the following equipment: crane decontamination equipment, tanks, pump support package, decontamination booths, and gloveboxes. MSDS and paint identifying information shall be submitted as material descriptions as summarized in the G321-E form.

8 Quality Assurance

8.1 QA Requirements Specific to Items or Services

The Seller's Quality Assurance Program (QAP) Requirements are included in 24590-WTP-3PS-G000-T0001, *General Specification for Supplier Quality Assurance Program Requirements.*

Seller's QAP Manual shall be submitted to Buyer for review in accordance with 24590-WTP-3PS-G000-T0001.

For SSC's indicated in this specification as Non-ITS, or Commercial Quality, the Seller shall have and maintain a Buyer approved Quality Assurance Program meeting the applicable sections of DOE Order O 414.1A, as per 24590-WTP-3PS-G000-T0001, and the Supplier Quality Assurance Program Requirements Data Sheet, 24590-WTP-3PD-HDYR-00005.

Should any portion of the work defined within this specification be subcontracted, these requirements shall be passed on to the sub-contractor as applicable to the work being performed.

8.2 Program QA Elements

Seller's QAP, as a minimum, shall contain the requirements detailed in the Seller Quality Assurance Program Requirements Data Sheets listed in Section 2 of the Material Requisition.

9 Configuration Management

9.1 General

Section 3 Drawings and Data Requirements of the Material Requisition lists all documentation and submittals required. The G321-V form lists all the documents required for quality verification and the G321-E form lists those engineering documents required. SDDRs shall be approved by the project prior to shipping of the item.

9.2 Meeting Minutes

The Seller shall document all discussions held in meetings between the Seller and the Buyer, or Buyer's representative, unless otherwise directed by the Buyer. The Seller shall send meeting minutes to the Buyer within 5 working days following the meeting.

9.3 Design Compliance Matrix

The Seller shall develop a matrix that tabulates the design requirements of this specification and the method of compliance. The matrix shall describe how each requirement is met including narrative as well as references to drawings, calculations, and other specific documentation that demonstrates compliance.

The matrix shall be included as a preliminary document in the 50% design review package. The preliminary document shall form the template for the final document.

The matrix shall be included as a final document in the 90% design review package.

9.4 Submittals

General requirements and submittal procedures are also covered in Section 3 of the Material Requisition. Each document to be submitted must be listed on the 15EX form. This form tracks the scheduled and actual delivery of each submittal. It will be completed at the time of award.

9.5 Quality Assurance Plan

Seller's Quality Assurance Plan (QAP) shall be submitted to the Buyer with the sellers proposal if not presently on record per this specification and as summarized in the Section 3 G-321-E form. Afterward, the QAP shall be re-submitted for project records tracking.

9.6 Drawings

Any proposed changes to Buyer drawings or documents shall be submitted to the Buyer via a Supplier Deviation Disposition Request (SDDR) in accordance with Section 2 of the Purchase Order. All drawings shall be fully dimensioned with the dimensions in USCS (inch–pound) units, showing all critical interface dimensions and their tolerances as specified. Critical interface dimensions shall be identified, including a note explaining how to distinguish these dimensions.

The Seller shall prepare and submit drawings in accordance with the American National Standards Institute/American Society of Mechanical Engineers (ANSI/ASME) Standard Y-14 series, *Drafting Standards*. The Seller shall provide wiring diagrams consistent with Buyer's *Engineering Specification for Electrical Requirements for Packaged Systems*, Section 10, 24590-WTP-3PS-EKP0-T0001. All drawings shall have an associated bill of materials that lists

- item number for each individual part
- quantity of each item listed
- description for each item listed
- reference code (ASTM, ANSI, etc.) when required for an item
- Material callout or Seller part number

As summarized in the G321-E form, Engineering Document Requirements, the Seller shall submit all shop detail drawings, assembly drawings, and foundation and mounting detail drawings for the decontamination booths and gloveboxes, the decontamination tank and spray system, and the pump support package.

The Seller shall submit all shop and detail drawings and assembly drawings for the crane decontamination equipment.

9.7 Design Reviews and Meetings

Design review shall be conducted in accordance with the method outlined in this section. The number of design reviews may be changed at the Buyer's discretion.

The Seller shall provide to the Buyer, a minimum of five (5) working days prior to the scheduled meeting, copies of documentation or information that is expected to be discussed and presented in the meeting. Documentation may be provided as either hard copies or as electronic files sent via the email (if not previously submitted in accordance with the submittal schedule).

The Seller shall participate in the design review, present the design including discussion of the provided submittals, and shall be prepared to discuss any comments.

Following the 90% design review meeting, the Buyer will formally transmit comments or other requests on the design submittals. The Seller is required to provide response/resolution to the Buyer's comments in accordance with the submittal schedule, or request deviation from the Buyer's requirements through use of the Buyer's SDDR form.

The resolved/corrected submittals shall be provided in the final design report in accordance with the submittal schedule.

9.7.1 Contract Award Design Kick-Off Meeting

The contract award kick-off meeting will be an informal discussion conducted at the Buyer's facility to ensure the newly awarded contract is clear and concise, and that the Seller has a clear understanding of the scope of the contract.

9.7.2 20% Design Review

The first interim review will be an informal review conducted at the Seller's facility after approximately 20% of the design is completed. Preliminary design media, including arrangement and assembly drawings, drawings containing maintenance envelopes, calculations and analyses will be reviewed by the Buyer.

The Seller shall be prepared to discuss any Seller-recommended changes to the approaches indicated on the Buyer's DPD and identify any conflicts with the equipment envelope dimensions.

9.7.3 50% Design Review

The second interim review will be an informal review conducted at the Buyer's facility after approximately 50% of the design is completed. Preliminary design media, including arrangement and assembly drawings, electrical design and load list, calculations and analysis, and the Design Compliance Matrix shall be provided to the Buyer for review.

The preliminary design media shall be provided to the Buyer at a mutually agreed time prior to the scheduled meeting.

9.7.4 90% Design Review

At the conclusion of definitive design, a formal 90% design review will be conducted at the Buyer's facility in accordance with the RPP-WTP procedures. The (draft) final design report, including all design media, supporting calculations and analysis, Design Compliance Matrix and other required submittals which documents the design shall be provided to the Buyer.

9.7.5 Final Design Closeout Meeting

The Seller shall provide a corrected, completed final design report (and any other submittals requiring changes) that resolves any issues associated with the 90% review. An informal meeting shall be held to accept the revised design media and resolve any remaining open items.

9.8 Procedures

For fabrication processes requiring welding, welding procedures as summarized in the G321-E form shall be submitted to the Buyer if pre-qualified welds are not used.

9.9 Manuals

Seller shall provide a clearly written instruction manual, prepared on good quality paper and suitably bound; manual shall be submitted to Buyer per this specification and as summarized in the G321-E form.

The manual shall include:

1. Installation instructions.
2. Complete parts list, recommended spare parts list, names of manufacturers with OEM model or; part numbers, and special ordering instructions (if applicable) for replaceable parts.
3. Description of the equipment, special tools, and sub-assemblies. As applicable, significant technical characteristics, test and adjustment information, and safety/warning notices.
4. Operating instructions, referencing drawings/diagrams as appropriate.
5. Maintenance and operational instructions.
6. Recommended inspection points if any, with procedures and period for inspection (preventative maintenance).
7. Site storage instructions.
8. In-storage maintenance requirements.
9. Rigging and lifting instructions.
10. Special handling requirements.

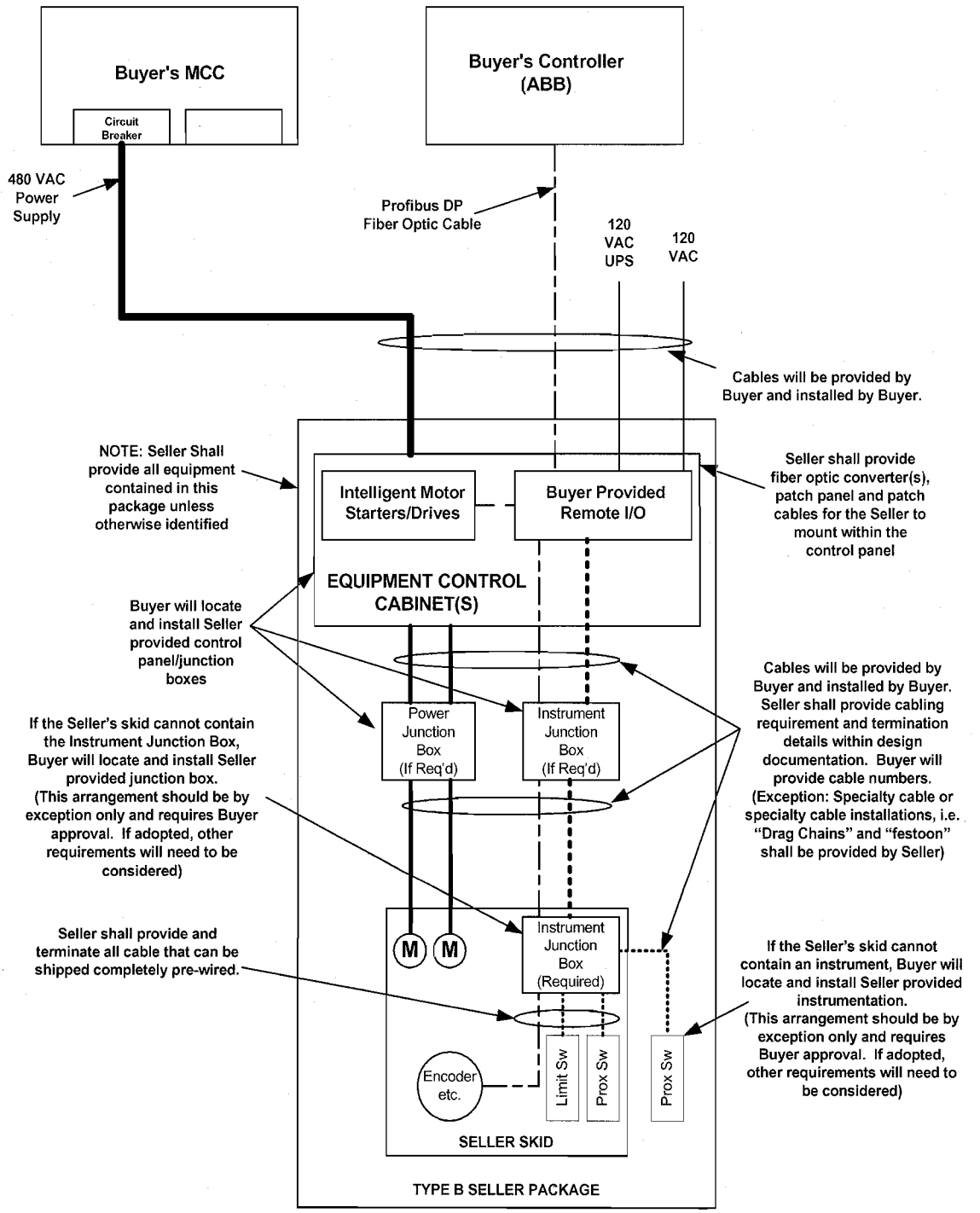
9.10 SDDRs

The following SDDRs have been incorporated by reference:

- 24590-WTP-SDDR-PROC-04-00590
- 24590-WTP-SDDR-PROC-05-00092

- 24590-WTP-SDDR-PROC-05-00193
- 24590-WTP-SDDR-PROC-05-00482
- 24590-WTP-SDDR-M-05-00008
- 24590-WTP-SDDR-M-05-00092
- 24590-WTP-SDDR-M-05-00177
- 24590-WTP-SDDR-M-05-00242
- 24590-WTP-SDDR-M-05-00778
- 24590-WTP-SDDR-M-05-00206
- 24590-WTP-SDDR-M-05-00241
- 24590-WTP-SDDR-M-05-00246

Appendix A
HLW Decontamination Tank Instrumentation and Control System



This "Type B" package is unique to equipment that contains Buyer provided Remote I/O.
The Controller and Software for controlling will be provided by the Buyer.

TYPE B - HSH DECON OPTION

DATE	REV.
01/31/05	A

Appendix B
Equipment Plant Item Numbers and Datasheet Numbers

PIL Number	Datasheet Number	Document Description
24590-PTF-MT-PIH-TK-00001	24590-PTF-M0D-PIH-00015	Pretreatment Facility Decontamination Tank
24590-HLW-HSH-MHAN-00041	24590-HLW-M0D-HSH-00150	Parts Washer (Melter 1)
24590-HLW-HSH-MHAN-00057	24590-HLW-M0D-HSH-00212	Parts Washer (Melter 2)
24590-HLW-FH-HSH-TOOL-00027	24590-HLW-M0D-HSH-00123	Maintenance Area Manual Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00028	24590-HLW-M0D-HSH-00124	Maintenance Area Upper Manual Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00018	24590-HLW-M0D-HSH-00125	Decontamination Area Manual Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00029	24590-HLW-M0D-HSH-00134	Decontamination Area Manual CO2 Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00031	24590-HLW-M0D-HSH-00137	Melter Cave Decontamination Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00020	24590-HLW-M0D-HSH-00126	Decontamination Pit Lower Remote Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00022	24590-HLW-M0D-HSH-00127	Decontamination Pit Lower Remote CO2 Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00023	24590-HLW-M0D-HSH-00135	Decontamination Pit Upper Remote Spray Lance (Melter 1)
24590-HLW-FH-HSH-TOOL-00030	24590-HLW-M0D-HSH-00136	Melter Cave Remote CO2 Spray Lance (Melter 1)
24590-HLW-FH-HPH-TOOL-00010	24590-HLW-M0D-HPH-00094	Spray Lance, Decon Area, Pour Tunnel 1 H-B019A
24590-HLW-FH-HSH-TOOL-00042	24590-HLW-M0D-HSH-00217	Maintenance Area Manual Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00043	24590-HLW-M0D-HSH-00218	Maintenance Area Upper Manual Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00039	24590-HLW-M0D-HSH-00213	Decontamination Area Manual Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00044	24590-HLW-M0D-HSH-00219	Decontamination Area Manual CO2 Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00046	24590-HLW-M0D-HSH-00221	Melter Cave Decontamination Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00040	24590-HLW-M0D-HSH-00214	Decontamination Pit Lower Remote Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00048	24590-HLW-M0D-HSH-00215	Decontamination Pit Lower Remote CO2 Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00041	24590-HLW-M0D-HSH-00216	Decontamination Pit Upper Remote Spray Lance (Melter 2)
24590-HLW-FH-HSH-TOOL-00045	24590-HLW-M0D-HSH-00220	Melter Cave Remote CO2 Spray Lance (Melter 2)
24590-HLW-FH-HPH-TOOL-00029	24590-HLW-M0D-HPH-00238	Spray Lance, Bogie Decon, Pour Tunnel 2
24590-HLW-FH-HPH-TOOL-00015	24590-HLW-M0D-HPH-00093	Spray Lance, Decontamination H343 (Remote)
24590-HLW-FH-HRH-TOOL-00003	24590-HLW-M0D-HRH-00018	Spray Lance, Decontamination HB045
24590-HLW-FH-HDH-TOOL-00006	24590-HLW-M0D-HDH-00043	Canister Rinse Tunnel Spray Lance (CO2)
24590-HLW-FH-HDH-TOOL-00007	24590-HLW-M0D-HDH-00044	Canister Rinse Bogie Spray Lance
24590-HLW-FH-HMH-TOOL-00001	24590-HLW-M0D-HMH-00002	Decon Spray Lance (Air Lock Melter Sump 1)
24590-HLW-FH-HMH-TOOL-00002	24590-HLW-M0D-HMH-00003	Decon Spray Lance (Air Lock Melter Sump 2)
24590-HLW-FH-HFH-TOOL-00010	24590-HLW-M0D-HFH-00045	Power Manipulator Spray Lance (Water)
24590-HLW-FH-HFH-TOOL-00013	24590-HLW-M0D-HFH-00046	Power Manipulator Spray Lance (CO2)
24590-HLW-FH-RWH-TOOL-00022	24590-HLW-M0D-RWH-00044	Spray Lance, Manual (CO2)
24590-HLW-FH-RWH-TOOL-00020	24590-HLW-M0D-RWH-00043	Spray Lance, Remote (Liquid)
24590-PTF-FH-PFH-TOOL-00017	24590-PTF-M0D-PFH-00030	Crane Decon Manual CO2 Spray Lance
24590-PTF-FH-PFH-TOOL-00015	24590-PTF-M0D-PFH-00028	Decontamination Chamber Remote CO2 Spray Lance
24590-PTF-FH-PIH-TOOL-00024	24590-PTF-M0D-PIH-00014	Maintenance Area Remote CO2 Spray Lance
24590-PTF-FH-RWH-TOOL-00016	24590-PTF-M0D-RWH-00065	Spray Lance P-0121A
24590-PTF-FH-RWH-TOOL-00017	24590-PTF-M0D-RWH-00066	Spray Lance P-0122A
24590-PTF-FH-RWH-TOOL-00018	24590-PTF-M0D-RWH-00067	Spray Lance P-0223
24590-PTF-FH-PIH-TOOL-00028	24590-PTF-M0D-PIH-00026	Low Pressure Wash Lance, Maintenance Cave Area

PIL Number	Datasheet Number	Document Description
24590-PTF-FH-PIH-TOOL-00026	24590-PTF-M0D-PIH-00027	High Pressure Wash Lance, Maintenance Cave Area
24590-PTF-FH-PIH-TOOL-00027	24590-PTF-M0D-PIH-00028	Low Pressure Wash Lance, Maintenance Cave Area
24590-PTF-FH-PWD-TOOL-00001	24590-PTF-M0D-PWD-00001	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00002	24590-PTF-M0D-PWD-00002	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00003	24590-PTF-M0D-PWD-00003	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00004	24590-PTF-M0D-PWD-00004	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00005	24590-PTF-M0D-PWD-00005	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00006	24590-PTF-M0D-PWD-00006	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00007	24590-PTF-M0D-PWD-00007	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00008	24590-PTF-M0D-PWD-00008	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00009	24590-PTF-M0D-PWD-00009	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00010	24590-PTF-M0D-PWD-00010	Low Pressure Wash Lance, Hot Cell Area
24590-PTF-FH-PWD-TOOL-00011	24590-PTF-M0D-PWD-00011	Low Pressure Wash Lance, P-0119
24590-WTP-MZ-30-MAINT-00002	24590-HLW-M0D-M17T-0017	HLW CO2 Decontamination Blast Unit
24590-WTP-MZ-30-MAINT-00004	24590-HLW-M0D-M10T-0030	Roaming HLW CO2 Decontamination Blast Unit
24590-HLW-FH-30-TOOL-00028	24590-HLW-M0D-30-00266	Pressure Washing Supply System, Unit 01
24590-HLW-FH-30-TOOL-00029	24590-HLW-M0D-30-00267	Pressure Washing Supply System, Unit 02
24590-WTP-MZ-10-MAINT-00001	24590-PTF-M0D-M17T-00002	PTF CO2 Decontamination Blast Unit
24590-WTP-MZ-10-MAINT-00002	24590-PTF-M0D-M10T-00007	Roaming PTF CO2 Decontamination Blast Unit
24590-WTP-MZ-20-MAINT-00001	24590-LAW-M0D-M17T-00002	LAW CO2 Decontamination Blast Unit
24590-WTP-MZ-60-MAINT-00001	24590-LAB-M0D-M10T-00003	LAB CO2 Decontamination Blast Unit
24590-HLW-FH-RWH-TOOL-00077	24590-HLW-M0D-RWH-00019	Spray Lance, Remote (CO2)
24590-PTF-FH-PIH-TOOL-00037	24590-PTF-M0D-PIH-00031	Liquid Pressure Washing Supply System, PTF Portable Unit
24590-PTF-FH-PFH-TOOL-00016	24590-PTF-M0D-PFH-00039	Spray Lance, Remote H2O

Permit Equivalency Notice

PDC Number:	24590-LAB-PEN-ENV-13-0001		
PEN Title:	Replace P-version drawing 24590-LAB-M5-V17T-P0029 with the equivalent source drawing 24590-LAB-M5-V17T-00029		
Date Prepared:	March 4, 2013	Originator:	Barbara Dubiel

Source Document Driving Equivalency Determination (If Applicable)

Source Document Number	Rev	Source Document Name
24590-LAB-M5-V17T-00029	3	WTP Analytical Laboratory Process Flow Diagram Radioactive Liquid Disposal

Affected Permit Information

Permit Number:	WA7890008967, Part III, Operating Unit Group 10, Condition III.10.C.10	Revision:	8c dated August 2012

Permit Equivalence Information

Specific Section(s)/Condition(s) Affected:

DWP Operating Unit Group 10 Table III.E.D. and Appendix 11.1

Description of Substitution/Equivalence: (Attach supplemental information)

This Permit Equivalency Notice (PEN), submitted in accordance with DWP Condition III.10.C.10, replaces the permit (P-version) process flow diagram (PFD) with equivalent source drawing 24590-LAB-M5-V17T-00029 Rev 3. The P-version drawing (24590-LAB-M5-V17T-P0029 Rev 1) is located in DWP Operating Unit Group 10 Appendix 11.1.

This PEN also includes a redline of DWP Table III.10.E.D where the P-version PFD is currently referenced.

WTP Environmental Manager Approval

Signer: Brad G. Erlandson *Print/Type Name* — *Signature* — 3/8/13 *Date*

Permit Equivalency Notice

PDC Number:	24590-LAW-PEN-ENV-12-0001		
PEN Title:	Replace IQRPE Report in Permit to Reflect Change in Document Numbering		
Date Prepared:	March 4, 2013	Originator:	Barbara Dubiel

Source Document Driving Equivalency Determination (If Applicable)

Source Document Number	Rev	Source Document Name
24590-CM-HC4-HXYG-00240-02-00001	00A	IQRPE Structural Integrity Assessment Report for LAW LVP Activated Carbon Bed Adsorbers (LBP-ADBR-00001A/B)

Affected Permit Information

Permit Number:	WA7890008967, Part III, Operating Unit Group 10, Appendix 9.11	Revision:	8c dated August 2012

Permit Equivalence Information

Specific Section(s)/Condition(s) Affected:

DWP Operating Unit Group 10 Appendix 9.11

Description of Substitution/Equivalence: (Attach supplemental information)

This Permit Equivalency Notice (PEN) is submitted in accordance with DWP Condition III.10.C.10.

BNI assigned a new document tracking number for the LAW IQRPE assessment report addressing the Activated Carbon Adsorbers. Ecology is requested to replace 24590-CM-HC4-HXYG-00240-01-00004, Rev 00A, *IQRPE Structural Integrity Assessment Report for LAW LVP Activated Carbon Bed Adsorbers (LVP-ADBR-00001A/B)*, located in DWP Operating Unit Group 10 Appendix 9.11 with 24590-CM-HC4-HXYG-00240-02-00001, Rev 00A, *IQRPE Structural Integrity Assessment Report for LAW LVP Activated Carbon Bed Adsorbers (LVP-ADBR-00001A/B)*.

WTP Environmental Manager Approval

Signer: Brad G. Erlandson — *Print/Type Name*; *Signature*; 3/8/13 — *Date*