

ATTACHMENT PP

Process Engineering Description for
Stabilization Building

MIXED WASTE FACILITY
RCRA/TSCA PERMIT

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ATTACHMENT 5

Process Engineering Description

Stabilization Building

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1	Acronyms	
2		
3	AEA	Atomic Energy Act
4	CAM	continuous air monitoring
5	CARBN	treatment standard for carbon adsorption
6	CFR	Code of Federal Regulations
7	CHOXD	chemical oxidation
8	CHRED	chemical reduction
9	DEACT	deactivation
10	DOT	Department of Transportation
11	EPA	Environmental Protection Agency
12	fpm	feet per minute
13	GASVIT™	gasification/vitrification
14	GPH	gallons per hour
15	GVB	gasification/vitrification building
16	HAZMAT	hazardous materials
17	HEPA	High-Efficiency Particulate Air
18	Hg	Mercury
19	HVAC	Heating, Ventilation, and Air Conditioning
20	ICB	intermediate bulk container
21	ICS	Inventory Control System
22	ISO	International Standards Organization
23	LDR	Land Disposal Restriction
24	LEL	Lower Explosive Limit
25	LLMW	low-level mixed wastes
26	MACRO	specified technology treatment for macro-encapsulation
27		
28	MPC	main process control
29	MWF	mixed waste facility
30	NEUTR	specified treatment technology for neutralization
31	OVM	organic vapor meter
32	P&P	preventative and preparedness
33	PCB	Polychlorinated Biphenyl
34	PDS	process data sheet
35	ppm	parts per million
36	RCRA	Resource Conservation and Recovery Act
37	STABL	specified technology treatment for stabilization
38	STB	stabilization building
39	TDS	total dissolved solids
40	TIC	transportable in-process container
41	TOC	total organic carbon
42	TSCA	Toxic Substances Control Act
43	UV	ultra violet
44	WAC	Washington Administrative Code
45	WAP	waste analysis plan
46	w.g.	water gauge
47	WSB	waste storage building

1.0 OVERALL PROCESS DESCRIPTION

1.1 Process Overview

The stabilization building (STB) is equipped with systems and processes to treat and stabilize a wide variety of low-level mixed wastes (LLMW). Materials treated may contain both organic and inorganic matter.

The functions of the processes in the STB are to perform:

1. the initial staging and inspection of the incoming waste;
2. the pretreatment of the waste, including sorting, size reduction, drying, and chemical adjustment;
3. the treatment of the waste, according to the Resource Conservation Recovery Act (RCRA) Land Disposal Restriction (LDR) regulations, encompassing: a) stabilization by mixing/chemical reactions with either cement or polymer-based reagents; b) immobilization by macro-encapsulation; c) physical extraction by abrasive blasting; or d) washing, rinsing and grouting of wastes (e.g., metal turnings).
4. the handling, treatment, and disposal of secondary waste; and
5. the final packaging and certification of the treated waste according to LDR regulations.

The STB final product is a stabilized, macro-encapsulated or decontaminated waste suitable for either: 1) burial at a mixed waste disposal facility licensed under RCRA Subtitle C and the Atomic Energy Act (AEA); or 2) burial at a low-level waste (LLW) disposal site regulated under the AEA. Wastes treated by a physical extraction method may be sent to be free-released by a facility regulated pursuant to the AEA for further decontamination and free-release for re-use.

The system will be designed, constructed, operated, and closed under the standards required by Washington State Dangerous Waste Regulation (Washington Administrative Code [WAC] 173-303-600)

The STB houses four treatment lines (100, 200, 300, and 400) each designed for treating a given waste stream. Line 100 treats soils and inorganic debris; line 200, liquids and slurries; line 300, bulk lead and metals; and line 400, heterogeneous solids and debris. Each treatment line is designed to pre-treat and treat the waste to meet RCRA LDR requirements. Table 1.1 contains a listing of the subsystems included in each of the four treatment lines, key reference documents and their classification according to WAC 173-303-600.

All normal and fugitive emissions generated during waste inspections, pretreatment, treatment, secondary waste handling, and final certification are collected and treated in the STB process vent system. The exhaust from the process vent system is discharged through the building high-efficiency particulate air (HEPA)/charcoal filter ventilation system. The building exhaust is monitored for radioactivity before it is released to the atmosphere.

1 The following table depicts the current status of the treatment units that were constructed following
 2 approval of the RCRA Part B Permit Application.

3

<u>Description</u>	<u>Unit Designation</u>	<u>Constructed</u>
Size Reduction and Screening System	TP-01	Yes
Cutting and Shearing System	TP-02	Yes
Sorting System	TP-03	Yes
Liquid Holding Tank Systems	TP-04/TP-06	No
Compaction/ Macro-encapsulation System (In-Drum Compactor)	TP-07	Yes
Compaction/ Macro-encapsulation System (Super Compactor)	TP-07	Yes
Dryer System	TP-08	No
Liquid Consolidation System	TP-09	No
Aerosol Can Puncture Device	TP-15	Yes
High-Capacity Mixing System	TT-01	No
Extraction Mixers	TP-10	Yes
Low-Capacity Mixing System	TT-02	Yes
In-Container Mixing System	TT-03	Yes
Polymer Mixing System	TT-04	No
Decontamination Unit (Physical Extraction)	TT-05	No
Container Rinse System (Drum Rinse Assembly)	TT-06	No
Container Rinse System (Container Rinse Assembly)	TT-06	No
STB Process Vent System	SB-09	Yes

4

5

6 An overview of the facilities, processes, and operations at each of the four treatment lines is presented in
 7 this section.

1.2 Stabilization Building (STB) Description

The STB will house four of the five treatment lines included in the mixed waste facility (MWF). These treatment lines include primarily non-thermal operations and the processing of dangerous wastes. The STB will include an existing building (building 13) and a new annex. The existing building 13 has a floor area of 15,000 square foot divided into three 5,000 square foot rooms. Each room is separated from the other by a fire wall. The new annex building will have 6,820 square feet. The configuration of the fire walls in building 13 will be kept intact, but additional partitions and access doors will be added inside one of the three rooms as needed to support the new functions. The existing building 13 slab will be modified to provide equipment foundation support and secondary containment features. All, but three, of the STB systems will be located in building 13. The remaining three systems (the size reduction and screening system [TP-1], the STB confinement [building ventilation], and the bulk reagent handling system) will be housed in the new annex. The configurations of the various rooms, including the access doors within the STB, are shown on the simplified layout on drawing 31001-M-100. Brief descriptions of what is located in each room, the main function, ingress/egress, typical operations, and safety and protective equipment are presented immediately below.

Room 1, Main Access Corridor: The access corridor serves as the main entrance to the STB, the gasification/Vitrification building (GVB) and the GVB control room. The access corridor will have an outside double door for personnel entry. A staircase will lead to the second floor area where the control room access door is located. Personnel access doors to the STB and the GVB are located on the east side of this room. A personnel radiation monitoring station will be installed in this room. Before leaving the GVB or the STB, personnel will be monitored for radiation contamination in this room. Both portable and fixed personnel monitoring equipment will be installed in this room.

Room 2, Containerized Waste Staging: The staging and storage room will be used for receiving and inspecting incoming containerized wastes. The room will have a hooded station for operations involving open containers, container storage cabinets, and bar-code scanners and a computer terminal used during inspection operations. Material handling equipment, such as fork lift trucks and carts, will also be stored in this room, as well as a folk lift charging station.

Room 3, Bulk Container Staging: The bulk container staging room will house the container skip-hoist device that will be used for transferring bulk material (such as soils and other solids) into the size reduction and screening system (TP-1). A drum skip hoist will also be installed in this room. The drum skip hoist will dump the contents of drums into a box to be transported to the size reduction and screening system. Material handling equipment such as fork lift trucks and carts will also be stored in this room.

Room 5, Cutting & Shearing: The cutting and shearing room will house work benches, tables, an electric saw, a shear cutter, and hand tools such as hydraulic, pneumatic, or electrically-operated grinders, drills, hammers, chisels, and cutting torches. All operations in this room will be conducted under a portable hood.

Room 6, Size Reduction and Screening: The size reduction and screening system (TP-1) will be located on the western end of the STB. The system will include a skip hoist, a feed conveyor with an intake hopper, a shredder, and a transportable in-process container (TIC) filling station.

Room 7, Sorting and Stabilization: The sorting and stabilization room will house systems and equipment for the treatment of solid wastes. These will include: 1) a high-capacity mixing system (TT-1) and a low-capacity mixing system (TT-2) in treatment line 100; 2) a polymer mixing system (TT-4) in treatment line 300; 3) a sorting system (TP-3) in treatment line 400; and 4) a washing and rinsing system

1 (TP-10). The high-capacity mixing system (TT-1) will include a pug-mill type mixer and two feeders
2 mounted on a steel framing assembly. The low-capacity mixing system (TT-2) will also include a pug-
3 mill type mixer and two feeders mounted on a steel framing assembly. The polymer mixing system
4 (TT-4) will include an extruder, a solids blender, and two bulk material feeders. The sorting system (
5 TP-3) will include a container dumping device, a feed conveyor, and a sorting table.
6

7 Repackaging, inspection, sampling, decontamination and grouting activities may also take place in this
8 room utilizing various container transport equipment, temporary containment system(s) (TCS) and
9 processing equipment, as required.
10

11 Radiological fugitive emissions are regulated pursuant to WAC 246-247 and to mitigate radiological
12 airborne emissions a TCS may be use for processing items which cannot physically managed in other
13 areas of the MWF. Typically, TCSs are constructed of PVC piping to serve as the support structure and
14 then by attaching poly-sheeting to create the floor, walls and roof. All TCS structures in this room will be
15 regulated by a portable HEPA ventilation unit, if necessary, for proper air flow with the exhaust flow
16 from the TCS connected to the process ventilation system to ensure exhausting air is in accordance with
17 Washington State Department of Health (WDOH) operating air permits. The criteria to use a TCS are
18 largely driven by the radiological characteristics of the waste and the physical size of the waste.
19
20

21 **Room 8, Compaction and Liquid Handling:** The compaction and liquid handling room will house
22 systems and equipment for the treatment of liquid wastes. The compaction equipment is also located in
23 this room. The system installed in room 3 will include: 1) a dryer system (TP-8) in treatment line 100; 2)
24 a liquid consolidation system (TP-9), a liquid treatment system (TP-4), a liquid holding system (TP-6),
25 and an in-container mixing system (TT-3) in treatment line 200; 3) a physical extraction system (TT-5) in
26 line 300; and 4) a compaction system (TP-7) in treatment line 400. The dryer system (TP-8) will include
27 a heating enclosure with hot air re-circulation fans and electrical heating coils that provide the heating
28 source for the re-circulated hot air. The liquid consolidation system consists of a hooded enclosure. The
29 liquid treatment system (TP-4) has two 1,200 gallon tanks, two sets of pumps, piping and valves, two bag
30 filters, and associated control instruments and electrical piping. The system will also include a small (25
31 gallon) chemical metering tank/pump package. The liquid holding system (TP-6) has two 1,200 gallon
32 tanks, two sets of pumps, piping and valves, a carbon filter, an ion exchange filter, an ultra-violet light ray
33 (UV) oxidation treatment device and associated control instruments and electrical piping. The in-
34 container mixing system (TT-3) will include a telescoping mixer that will be mounted above a metal
35 frame. A bulk feeder will also be mounted on this frame. The physical extraction system (TT-5) will
36 include an abrasive blasting enclosure, a feed table, and a solids re-circulation and filtration assembly.
37 The compaction systems (TP-7) will include an in-drum compactor, and a super-compactor.
38

39 Repackaging, inspection, sampling, decontamination and grouting activities may also take place in this
40 room utilizing various container transport equipment, temporary containment system(s) (TCS) and
41 processing equipment, as required.
42

43 Radiological fugitive emissions are regulated pursuant to WAC 246-247 and to mitigate radiological
44 airborne emissions a TCS may be use for processing items which cannot physically managed in other
45 areas of the MWF. Typically, TCSs are constructed of PVC piping to serve as the support structure and
46 then by attaching poly-sheeting to create the floor, walls and roof. All TCS structures in this room will be
47 regulated by a portable HEPA ventilation unit, if necessary, for proper air flow with the exhaust flow
48 from the TCS connected to the process ventilation system to ensure exhausting air is in accordance with
49 Washington State Department of Health (WDOH) operating air permits. The criteria to use a TCS are
50 largely driven by the radiological characteristics of the waste and the physical size of the waste.

1
2 **Room 9 -Empty Container Rinsing/Special Projects (SB-09)**

3
4 **Primary Use:**

5
6 Housing of TP-10 the extraction and grouting mixers and TT-06, (not constructed) container rinse
7 systems for EHW waste containers. In addition, the final grouting processes for macroencapsulation
8 waste may occur in SB-09.
9

10 **Physical Description:**

11
12 SB-09 has three access points. Personnel and containers may enter SB-09 from the Sorting and
13 Stabilization, Room 7, through the north rollup door for SB-09. Access to the outside of SB-09 is through
14 the south rollup door, with personnel entry from the STB Ventilation, Room 10 located on the east wall of
15 SB-10.
16

17 **Process/Equipment Description:**

18
19 The extraction system (TP-10) will include two extraction mixers and one grout mixer. The grout mixing
20 unit will not receive or contain RCRA or TSCA regulated hazardous/dangerous waste and is therefore not
21 a RCRA regulated container.
22

23 This room houses the container rinse system (TT-06) [not constructed] which will include two separate
24 pieces of rinsing equipment. The first one set will be an automatic drum rinse unit within an enclosure
25 complete with rinsing nozzles, recirculation pumps and piping, and a storage reservoir. The second
26 rinsing unit will have the same equipment as the first one but it will be larger and able to clean containers
27 of various sizes and shapes. Untreated empty waste containers will be stored in this room for short
28 periods, typically less than seven days.
29

30 Repackaging, inspection, sampling, decontamination and grouting activities may also take place in this
31 room utilizing various container transport equipment, temporary containment system(s) (TCS) and
32 processing equipment, as required.
33

34 Radiological fugitive emissions are regulated pursuant to WAC 246-247 and to mitigate radiological
35 airborne emissions a TCS may be use for processing items which cannot physically managed in other
36 areas of the MWF. Typically, TCSs are constructed of PVC piping to serve as the support structure and
37 then by attaching poly-sheeting to create the floor, walls and roof. All TCS structures in this room will be
38 regulated by a portable HEPA ventilation unit, if necessary, for proper air flow with the exhaust flow
39 from the TCS connected to the process ventilation system to ensure exhausting air is in accordance with
40 Washington State Department of Health (WDOH) operating air permits. The criteria to use a TCS are
41 largely driven by the radiological characteristics of the waste and the physical size of the waste.
42

43 **Room 10, STB Ventilation:** This room will house the STB confinement (ventilation) system that will
44 provide negative air pressure and filtration for the entire STB. Major pieces of equipment to be installed
45 in this room are two banks of HEPA/charcoal filters, two induced draft (ID) fans and two building vent
46 exhaust stacks. Stack monitoring instruments, including radiation monitoring units, will also be located
47 here. The STB process vent filters and ID fan will also be in this room.
48

49 **Room 11 – Oversize Container/Special Projects Room (SB-11)**

1 **Primary Use:**
2

3 Repackaging of waste shipped in oversize containers which cannot physically fit into the room 5,
4 typically greater than 8 feet wide, 10 feet long or 6 feet tall. Waste inspection and grouting activities may
5 also take place in this room.
6

7 **Physical Description:**
8

9 There are two rollup doors and one personnel door in this room. The south rollup door provides access to
10 the outside while the north rollup door provides access to the Room 7 process area. The personnel door is
11 located in east side of the room allowing access to the outside of the facility. This door is used for
12 emergency egress only.
13

14 A concrete curb, provided around the room perimeter, serves as a secondary containment system for this
15 room. This system is isolated from the STB base that constitutes the secondary containment system for
16 the mixed waste handling area. Stack monitoring instruments including radiation-monitoring units are
17 located in Room 11.
18

19 **Process/Equipment Description:**
20

21 Primary activities will include repackaging and sizing of oversize containers into suitable pre-treatment or
22 disposal containers. Repackaging, inspection, sampling, decontamination and grouting activities will
23 utilizing various container transport equipment, temporary containment system(s) (TCS) and processing
24 equipment, as required.
25

26 Radiological fugitive emissions are regulated pursuant to WAC 246-247 and to mitigate radiological
27 airborne emissions a TCS may be use for processing items which cannot physically managed in other
28 areas of the MWF. Typically, TCSs are constructed of PVC piping to serve as the support structure and
29 then by attaching poly-sheeting to create the floor, walls and roof. All TCS structures in this room will be
30 regulated by a portable HEPA ventilation unit, if necessary, for proper air flow with the exhaust flow
31 from the TCS connected to the process ventilation system to ensure exhausting air is in accordance with
32 Washington State Department of Health (WDOH) operating air permits. The criteria to use a TCS are
33 largely driven by the radiological characteristics of the waste and the physical size of the waste.
34

35 **Room 12, Interconnection Corridor:** This room connects the GVB and the STB for the fork lifts and
36 personnel. This room will have not processing equipment.
37

38 **Room 13, STB Control Room:** The STB control room will be located above the main access corridor,
39 (room 1). The room is accessible through the stair case in room 1. The centralized process alarm and the
40 fire alarm system will be located in this room.
41

42 **Portable Treatment Equipment:** The aerosol can puncturing device (TP-15) is a small puncturing
43 device and carbon filter cartridge that mounts into bungs of various sized containers. This small device is
44 portable and will need to have the flexibility to be used in different rooms for its intended purpose. Due
45 to the simplicity of this equipment, an engineering evaluation was not required as found in Module V,
46 Section C of the Permit. Permit condition V.F.5.b lists an Aerosol Can Puncturing device from the
47 Sorting System (TP-03). The aerosol can puncturing device to be used would be similar to a replacement-
48 in-kind equipment change. The puncturing device and carbon cartridge screw in to various sized bungs
49 and opening of varying container tops. A description of the equipment can be found in Attachment XX.
50

1 **1.3 Waste Staging and Storage**
2

3 The MWF will be designed to safely receive, stage, and store bulk and containerized dangerous wastes
4 and containerized PCB wastes. The following structures, equipment, and operations will be provided and
5 employed for staging and storage of waste containers.
6

7 **Yard Area:** The yard area has a truck loading area which will serve as a loading and unloading area for
8 the incoming or outgoing trucks. Fork lift trucks and/or cranes will be used for all loading, unloading, and
9 transfer operations from the shipping vehicles in the truck loading area to the STB, the GVB, and the
10 waste storage building (WSB). The truck loading area has been constructed with permanent containment.
11 Accumulated liquids in the containment area will be inspected for the presence of an oily sheen prior to
12 discharge. If an oily sheen is detected, the accumulated liquid will be containerized and characterized for
13 proper disposal. If there is a liquid spillage accident, the spilled liquids will be collected in the
14 containment system and the contingency plan will be made active to start the spill response actions.
15 Actions include the removal of the spilled liquids and the execution of the subsequent remediation
16 activities according to the procedures established by the contingency plan (See Attachment 15).
17

18 **Rail Loading Area:**
19

20 The rail loading area will serve as a loading and unloading area for incoming or outgoing rail vehicles.
21 Fork lift trucks and/or cranes will be used for all loading, unloading and transfer operations between rail
22 cars and trucks at the rail loading area. The rail loading area has been constructed with permanent
23 containment. Accumulated liquids in the containment area will be inspected for the presence of an oily
24 sheen prior to discharge. If an oily sheen is detected, the accumulated liquid will be containerized and
25 characterized for proper disposal. If there is a liquid spillage accident, the spilled liquids will be
26 collected in the containment system and the contingency plan will be made active to start the spill
27 response actions. Actions include the removal of the spilled liquids and the execution of the subsequent
28 remediation activities according to the procedures established by the contingency plan (Attachment 15).
29
30

31 **Containerized Waste Staging Area (STB Rooms 2 and 4):** The containerized waste staging area in the
32 STB will have two rooms and will be equipped with storage racks, a vent-hooded inspection station, bar-
33 code sensors, and a computer terminal connected to the plant inventory and record management computer
34 system. One of the rooms, room 2, will be maintained under negative pressure by the STB confinement
35 system. The other room, room 4, will be maintained under negative pressure by the STB process vent
36 system. Containerized dangerous wastes will be unloaded in the yard by a fork lift truck and sent to the
37 STB containerized waste staging room where they will be inspected. Containers will be opened either
38 under the vent hood or will be taken to the inspection room (room 4). Inspections will involve
39 maintaining negative ventilation in the hooded area or in the room, removing the container cap,
40 conducting a visual inspection and, if necessary, obtaining a sample from the waste.
41

42 If the containers are formally accepted after inspection, they will be capped and transported by a fork lift
43 truck to WSB for interim storage. Time frames for formally accepting wastes are discussed in the Waste
44 Analysis Plan. See Attachment CC, Attachment 1.
45

46 When a container is scheduled for treatment, the fork lift truck will transport it from the WSB either
47 directly to the designated treatment system or to the STB containerized waste staging area for pre-sorting
48 and transfer operations. Transfer operations will be accomplished under the hood or in the inspection
49 room (i.e., room 4). Transfer operations may include removing the waste overpack material and
50 transferring waste objects from containers into TICs, or removing large objects from a container and

1 placing them in a TIC. When a transfer operation is complete, TICs containing wastes will be sent to the
2 designated treatment system. All treated wastes will be packaged and brought back to STB containerized
3 waste staging area (room 2) for final inspection and certification. When final inspection and certification
4 is completed, the fork lift will transport the treated waste containers back to the WSB.

5
6 **Bulk Waste Staging Area (STB Room 3):** The bulk waste staging area in STB will have one room that
7 is maintained under negative pressure by the process vent system. The bar-code sensors and the computer
8 terminal located in the containerized waste staging area will be shared by the bulk waste staging area
9 during inspections involving access to the plant inventory and record management computer system.
10 Bulk solid dangerous waste containers (International Standards Organization [ISO] containers), boxes and
11 intermediate bulk containers (ICBs) will be handled in this room.

12
13 Containers will be off-loaded in the yard by a fork lift truck or crane and sent to the STB where it will be
14 inspected for acceptance in the bulk waste staging area. In a typical operation, B-25 boxes and
15 intermediate bulk containers (IBCs) will be taken inside the room. ISO containers (20 feet and 40 feet)
16 will be placed outside the TS-2 truck entrance gate and a flexible boot seal will be mounted around the
17 ISO container access door and the room 3 access roll-up door. Before opening the ISO container door, all
18 other room 3 access doors will be closed to allow establishing a negative ventilation pressure in the work
19 area.

20
21 Inspections of containers will involve maintaining negative ventilation in the area, opening container
22 doors or caps, conducting a visual inspection, and, if necessary, obtaining a sample from the waste. If
23 the bulk containers are formally accepted after inspection, its door will be closed and transported by a
24 fork lift truck to the WSB for interim storage. Time frames for formally accepting wastes are discussed in
25 the Waste Analysis Plan. See Attachment CC, Attachment 1.

26
27 When a container is scheduled for treatment, the fork lift truck will transport it from WSB to the bulk
28 staging room for pre-sorting and transfer operations. Transfer operations will include removing waste
29 objects from the container and transferring them to a TIC. As with the inspection operations, the transfer
30 operations will be conducted when a negative air pressure is established in the work areas. When a
31 transfer operation is complete, TICs containing wastes will be sent to the designated treatment system.

32
33 **1.4 Waste Shipment Inspection and Receipt**

34
35 Incoming trucks will enter facility through the access road off of Battelle Boulevard parking just west of
36 the MWF access gate and outside of the Radiological Control Area (RCA). The trucks will be inspected
37 and surveyed for compliance with the Department of Transportation regulation and shipment
38 documentation review. If the truck does not pass the initial inspection, it will be dealt with according to a
39 “reject process” as described in Attachment 1 (Waste Analysis Plan). As part of the initial inspection, the
40 containers in shipment will be visually inspected for any evidence of damage, leakage or loss of integrity.
41 Any leaking or failed container will be addressed in accordance with the procedures described in the
42 Contingency Plan. Once the shipment passes the initial inspection, the shipment will be allowed to enter
43 the RCA through the MWF access gate. Trucks may be loaded or unloaded inside the MWF, on the truck
44 loading area (TLA) or the rail loading area (RLA). Typically, containers will be unloaded and placed in
45 container staging areas either in STB or in GVB. Occasionally, large bulky containers will be unloaded
46 using an overhead crane.

47
48 If staging areas in Stabilization Building (STB) or GASVIT™ Building (GVB) are occupied, containers
49 in the shipment will be unloaded from trailer and placed directly in WSB while the staging areas being
50 vacated. After unloading, a duly authorized MWF representative will sign the shipping manifest

documents acknowledging “formal receipt” of the waste as per WAC 173-303-370.

Rail Loading Area (RLA) Waste Receipt and Acceptance

Incoming rail vehicles will enter the facility through the access gate on the south border of the facility and will be parked outside of the RCA. The rail vehicles will be inspected and surveyed for compliance with the Department of Transportation regulation and shipment documentation review. If the rail vehicle does not pass the initial inspection, it will be dealt with according to a “reject process” as described in Attachment 1 (Waste Analysis Plan). As part of the initial inspection, the containers in the shipment will be visually inspected for any evidence of damage, leakage or loss of integrity. Any leaking or failed container will be addressed in accordance with the procedures described in the Contingency Plan. Within 24 hours of initial receipt, the shipment will be transferred to a truck (via fork lift truck or crane) and moved inside the RCA through the MWF access gate and unloaded. Containers will be unloaded either in the MWF or at the TLA and placed in the MWF pending inspection and verification prior to “formal acceptance”. After unloading, a duly authorized MWF representative will sign the shipping manifest documents acknowledging “formal receipt” of the waste as per WAC 173-303-370.

1.5 Waste Confirmation Inspection and Formal Acceptance

Incoming waste containers will be subjected to a confirmation inspection process prior to “formal acceptance” by the MWF. The confirmation inspection process, described in MWF WAP (see Attachment CC, Attachment 1), will consist of placing the incoming containers in the designated container staging areas. Bulk and containerized dangerous wastes are inspected at staging areas in the STB. In the staging areas, the containers are either moved under a ventilation hood or inside an enclosure and their caps are removed. Some containers may be formally accepted if a visual inspection confirms that their contents match the description in the appropriate shipping manifest and profile documents. Others will be accepted if a detailed sampling and analysis for “finger print” or other waste characteristic parameters show that the waste in container meets the descriptions given in the container manifest/profile documents. During confirmation inspection, the containers are handled as follows:

1. The containers will be capped after sampling and inspection operations are complete and will be moved to an appropriate storage area, as described in the following paragraphs. At no time during the sampling and inspection will the container be kept uncovered for more that 2 hours.
2. Containers that pass the confirmation inspection will be returned back to the designated storage area and their generator will be notified in writing that the container is formally accepted by the MWF. Any container that has been received but not formally accepted will be kept either in the designated staging areas or in the designated “segregated storage” areas.
3. Containers that will require additional time before they are formally accepted will be placed in a “segregated area” until all of the data needed for their acceptance is obtained. The time allowed for completing the confirmation inspection process and formally accepting a container is 30 calendar days from the date of “formal receipt”. If the confirmation inspection process exceeds the allowed 30 days, the container will be removed from the “segregated storage” area and placed in the “container reject” area.
4. A container that does not pass the confirmation inspection process will be moved and placed in the “container reject” area as soon as a discrepancy is discovered. The rejected container will be kept there during the resolution process which will include notifying the generator and attempting to resolve the discrepancy. If it becomes evident that the container can not be

1 processed by the MWF, arrangements will be made for returning the container back to the
2 generator or another facility, as authorized by the generator. If the discrepancy is successfully
3 resolved, the container will be formally accepted and it will be moved to designated storage areas.
4

5 **1.6 System Description Summary**
6

7 Dangerous wastes received at the MWF are initially grouped according to the five streams and are further
8 sub-categorized according to their treatment needs. The STB will incorporate all systems, subsystems,
9 and ancillary equipment needed for the safe and reliable operation of the pretreatment and treatment
10 processes used in treatment lines 100, 200, 300 and 400 which include solids stabilization, liquids
11 stabilization, physical extraction, and macro-encapsulation, respectively. The GVB will encompass all of
12 the subsystems needed to ensure safe and reliable operation of treatment line 500, the
13 gasification/vitrification (GASVIT™) process.

14 A brief description of the equipment, system, and sub-system included in each treatment line is described
15 hereinafter.
16

17 **Treatment Line 100:** Treatment line 100 will treat waste stream 100 using the following equipment and
18 systems: 1) size-reduction and screening; 2) a dryer; 3) low volume solids mixing (stabilization); and, 4)
19 high-volume solids mixing. Each of these systems is described hereinafter:
20

21 **Size Reduction and Screening System (designated as TP-01):** This system will have a
22 container skip hoist, a transfer conveyor and intake hopper, an integrated shredder and screening
23 device, and a TIC filling station. The system will be designed to reduce the size of the input solid
24 wastes to approximately 3/8 inch. Boxes and drums will be placed in the skip hoist which will
25 unload the waste contents into the hopper located at the conveyor intake. The conveyor transfers
26 the waste to the shredder intake housing. The shredder will granulate the waste to the desired
27 size. A screen located beneath the shredder ensures that all wastes are granulated to the desired
28 size. The granulated waste will flow to a TIC placed in the filling station under the shredder.
29 When full, the TIC will be transported to one of two mixing systems (designated as TT-01 or
30 TT-02) for stabilization. All operations conducted by the size reduction and screening system
31 will be confined within airtight enclosures or ventilation hoods. The vents from the enclosures
32 and hoods will be sent to a dust collection baghouse and then to the stabilization process vent
33 system. This process vent system will be equipped with carbon filters for treatment of fugitive
34 organics generated during size reduction and screening operations.
35

36 **Dryer System (designated as TP-08):** This system will be equipped with an enclosure, a hot air
37 re-circulation line, and an exhaust treatment line. It is designed to accept a B-25 box or six 55
38 gallon drums. The drying occurs at an average temperature of approximately 250° Fahrenheit.
39 The moisture in the waste will be removed in the dryer system by placing a container in the
40 enclosure, removing the container cap, and closing the enclosure door. Next, the dryer system's
41 hot air re-circulation line will be turned on and hot air will be allowed to heat the container and
42 evaporate water contained in the drum. To remove the moisture accumulated in the dryer
43 enclosure, a small side stream from the air re-circulation line will be removed by an exhaust fan
44 and passed through an air condenser. Air discharged from the condenser will be discharged to the
45 STB process vent system. This system will treat the dryer exhaust with charcoal filtration and
46 discharge the cleansed exhaust to the building confinement system which further treats the air
47 with a HEPA/charcoal filtration technique. As the drying cycle continues, the dryness level of
48 the waste will be measured by detecting the moisture content in the exhaust line. When, the
49 waste in the container reaches the desired dryness, the drying system will be turned off and the
50 enclosure will be allowed to cool off. Next, the enclosure door will be opened and the containers

1 will be tested, if needed, re-capped, and then transported to the next designated treatment system.

2
3 **High-Capacity Mixing System (designated as TT-01):** The output solid waste from the size
4 reduction/screening and the dryer systems will be stabilized in the high-capacity mixing system to
5 meet the LDR treatment standards. This stabilization is performed by mixing solid waste with
6 reagents, such as cement, or fly ash, in either a high-capacity or a low-capacity mixing system.
7 Prior to stabilization, treatability tests will be performed to establish a formulation that ensures
8 the stabilization process will reduce the leachability of toxic and hazardous contaminants in the
9 final product to a level that meets the LDR requirements. After the initial preparation, solid
10 wastes requiring stabilization will be placed in a TIC and weighed. An appropriate amount of
11 reagent, as determined by the pre-established formulation, will be prepared in the bulk reagent
12 system and placed in another TIC. The TIC containing waste will be placed on top of a feeder
13 that discharges the waste into the designated mixer. The TIC containing reagent will be placed
14 on top of another feeder that also discharges the reagent into the designated mixer. When ready,
15 the two feeders will be started to add the waste and the reagent to the mixer. Next, the mixer will
16 be started to run for a set period of time. When the mixing cycle is complete, the bottom
17 discharge valve will be opened and the mixture will be discharged into a disposal container
18 placed under the mixer. When a mixing batch or a campaign is complete, the mixer will be
19 cleaned by introducing a predetermined quantity of abrasive solids (gravel). The abrasive solids
20 will remove material that has accumulated on the blades or around the mixer housing. When the
21 cleaning cycle is complete, the abrasive solids are discharged on top of the stabilized waste in the
22 disposal container. The mixture in the disposal container is allowed to cure. Next, the waste is
23 checked for compliance with LDR standards and sent to the WSB if it passes the inspection.
24 Waste not passing the inspection is re-processed by sending it to the size reduction and screening
25 unit.

26
27 **Low-Capacity Mixing System (designated as TT-02):** Both the high-capacity and the low-
28 capacity mixing systems use the same basic equipment and processing method for stabilizing
29 solids, with the exception that the size of the mixer used in the low-capacity mixing system is
30 smaller than that used in the high-capacity system. The selection of a mixing system is made by
31 the operator based on the overall workload at the MWF and the quantity of waste to be processed
32 in the given processing campaign or batch.

33
34 **Treatment Line 200:** This line treats stream 200 using the following systems: 1) liquid consolidation; 2)
35 liquid treatment; 3) liquid holding; 4) in-container mixing (stabilization) and 5) washing/rinsing and
36 grouting system.

37
38 **Liquid Consolidation System (designated as TP-09):** The liquid consolidation tank will be
39 used for pretreatment and treatment of liquids received in bottles and small containers (usually
40 less than 5 gallons). Chemical adjustments will be performed to meet the specified treatment
41 technology for neutralization (NEUTR); chemical oxidation (CHOXD); chemical reduction
42 (CHRED); or deactivation (DEACT). Operations will include: 1) receiving containers; 2)
43 opening containers; 3) transferring liquid from small containers to a large container (i.e.,
44 consolidation); 4) chemically adjusting the waste; 5) stabilizing small quantity unique wastes; 6)
45 rinsing containers and tools; and 7) transferring the waste to outgoing TICs. The system will
46 include a laboratory-scale hood, a sink, bench-scale laboratory tools and instruments. All
47 operations will be conducted inside a hood that will be connected to the STB process vent system.
48 The consolidated waste will be collected in the TICs located under the hood. The chemical
49 adjustments will include neutralization, chemical oxidation, chemical reduction or deactivation.
50 Before starting any chemical adjustment in this system, all safety aspects of the operations,

1 including compatibility of the chemicals and compatibility with the material of construction of
2 the receiving containers and processing equipment, will be thoroughly examined and considered
3 in the procedures. Waste streams that are not compatible will not be mixed, but treated
4 individually and stabilized under the hood using a bench-scale stabilization mixer. When the
5 waste transfer and consolidation are complete, a small amount of rinse water will be added to
6 rinse empty containers, the sink, and the associated bench-scale tools. The rinsate will be sent to
7 the same container receiving the consolidated waste. Following completion of consolidation and
8 treatment, the waste will be sent to other pretreatment or treatment units. The empty containers
9 will be sent either to the empty container rinse system or to the containerized waste staging area
10 for cleanliness inspection and release for re-use or disposal.

11
12 **Liquid Treatment System (designated as TP-04):** This system has two sets of 1,200 gallon
13 tanks with mixers, pumps, strainer/filters, piping, controls, and instrumentation needed to perform
14 the specified filtration and chemical adjustments. The latter function, chemical adjustment, will
15 be performed for treatment of liquid waste streams requiring compliance with NEUTR, CHOXD,
16 CHRED, or DEACT. Other major operations conducted in the treatment tank system will include
17 receiving incoming liquid waste, filtering the incoming or treated wastes, transferring the treated
18 waste to a TIC for transport to other tank systems, and tank rinsing. Liquid waste will include
19 shipped liquid waste and waste received from other treatment systems. One of the tanks serves to
20 hold the incoming waste while the other provides the required treatment. Treated liquids from
21 this tank system are pumped to TICs which will be sent either to the liquid holding system (TP-6)
22 or to one of the stabilization systems (TT-1, TT-2, or TT-3). Solids bearing aqueous dangerous
23 wastes not having listed waste codes may be sent to the dryer system (TP-8). The dryer will
24 concentrate the waste to a level that will reduce the volume of the final stabilized waste. In this
25 case, the condensate from the dryer will be collected and sent to the holding tank system (TP-6)
26 for polishing and re-use. After treatment, the tanks are rinsed. The rinsate is either mixed with
27 the original waste in the tank or placed in a separate TIC to be processed in a batch.

28
29 **Holding Tank System (designated at TP-06):** The system consists of two tanks with mixers
30 and discharge pumps including piping and valve manifolds, a granular activated carbon adsorber,
31 an ion exchange unit, and a UV oxidation unit. The carbon filtration in this system will meet the
32 treatment standard for carbon adsorption CARBN while UV oxidation will meet the treatment
33 standard CHOXD. Operations conducted in this tank will include: 1) transferring incoming
34 waste to the tank; 2) treating the waste by a combination of ion-exchange, carbon adsorption or
35 UV oxidation; 3) transferring the treated waste to an outgoing TIC; 4) rinsing the tank system;
36 and 5) discharging spent media out of the treatment units. Transfer of wastes from TICs to the
37 tank will be performed under a negative vacuum pressure. The vent from the TIC and the tank
38 will be collected and treated by the STB process vent system. A candidate waste stream for
39 treatment by this tank is a dangerous waste subject to the prohibition of dilution by combustion
40 (WAC 173-303-140 [40 CFR 268.3(c)]). Other candidate input waste streams are condensate
41 from the dryer system or high-purity rinse water from on-site equipment flushing operations. The
42 holding tank system is designed to treat high-purity characteristics wastes requiring treatment for
43 removal of dissolved metals or organic compounds (e.g., hydrocarbons, alcohol, ketones, organic
44 vapors, and/or aromatics). The removal level will be such that the treated liquid waste will meet
45 the LDR treatment standards. Hence, after treatment the liquid wastes will be re-used as rinsing
46 water or as an additive for the stabilization process. Treatment of a liquid stream bearing listed
47 waste code(s) will complicate the re-use and recycling options. Therefore, treatment of listed
48 wastes by this system will be minimized to the extents possible. Any listed wastes treated by this
49 system which are not suitable for re-use will be stabilized in the in-container stabilization system.
50 The three treatment units (carbon filters, ion-exchange and UV oxidation) will be installed such

1 that they can be used individually or in series for treating a given waste stream. Waste streams
2 containing low concentrations of dissolved organics will be treated by using carbon adsorption,
3 oxidation, or both trains. Waste streams containing low concentrations of dissolved metals will
4 be treated by the ion exchange unit. If both organics and dissolved metals are present in a liquid
5 waste stream, organics will be removed first, followed by a dissolved metals removal step.
6 Treating waste will begin by transferring incoming waste from an incoming TIC to one of the two
7 holding tanks. The procedure used for this transfer operation will be the same as that described
8 for the treatment tank system (TP-4) above. When all of the waste is transferred to the tank, the
9 tank discharge valve manifolds will be secured in such a manner that liquid will flow from the
10 input waste tank through the pumps and the desired treatment unit and into the second holding
11 tank. When ready, the tank mixer and discharge pump will be turned on. Liquid waste flows
12 from the first holding tank to the selected treatment unit(s) and back to the second holding tank.
13 The process is repeated until the dissolved organic and metal concentration levels, as periodically
14 measured by sampling and analysis, will meet the LDR treatment standards. Then, the treatment
15 system is turned off and the treated liquid will be kept in the holding tank until needed for re-use
16 in rinsing or stabilization. When the treated water must be transferred to other systems for re-use,
17 the tank contents will be discharged to a TIC using the same procedure described for the
18 treatment tanks system (TP-4), above. At the end of each waste treatment batch, rinse water will
19 be used to flush the previous wastes out of the tanks, equipment, and piping. The rinse water will
20 be collected in a TIC and sent to the in-container mixing system for stabilization. To remove the
21 spent media (carbon and ion exchange resins), an empty TIC container (suitable for use in-
22 container stabilization or feed to the GASVIT™ system) will be placed under the treatment unit
23 discharge port. Next, the treatment unit discharge port valve manifold will be secured to drain the
24 spent media into the TIC. If needed, the carbon, ion exchange, and UV oxidation units will be
25 rinsed with water and the rinsate will be discharged to another TIC. The filled TIC containing
26 spent media will be sent for final treatment either to the in-container stabilization system (TT-3)
27 or the GASVIT™ system. The filled TIC containing rinse water will be sent for stabilization to
28 the in-container mixing system (TT-3).
29

30 **In-Container Mixing System (designated as TT-03):** This system will be used to provide in-
31 container neutralization (NEUT) and stabilization (STABL) by mixing liquid, slurry, and solid
32 wastes in a container that serves both as the mixing vessel and the final disposal container.
33 Operations conducted by this system will include: 1) receiving containerized waste from
34 pretreatment tank systems, 2) receiving stabilization reagents from the reagent storage tank
35 system, 3) mixing waste with reagents, 4) capping stabilized waste containers, and 5) transporting
36 filled containers to the containerized waste staging area for certification and shipping. The in-
37 container stabilization system will use a mixer blade mounted on a vertical telescoping shaft. A
38 drum-loading flange will be provided to seal the container during stabilization and mixing
39 operations. A vent from the container will be connected to the STB process vent system. Mixing
40 is accomplished inside a mixing enclosure mounted to a steel frame. The system will be designed
41 to mix waste with reagents either in 55 gallon drums or larger cylindrical containers. Batches of
42 incoming solid, slurry, or liquid waste, will be pretreated in the container in accordance with
43 requirements established by the treatability tests. The mixing will be accomplished by placing
44 the waste container under the mixing station, clamping down the containers, lowering the mixing
45 blade and loading flange to mate and seal with the top of the container, feeding the desired
46 reagent mixture to the container while the mixer is turned on, and allowing the mixing to continue
47 until the desired cycle mixing is complete. Next, the mixer will be stopped and raised out of the
48 container and the container will be capped and set aside for curing. Since an in-container concept
49 is used, only the mixer blade will require rinsing. The mixer blade is cleaned by placing an
50 empty drum in the mixing station, lowering the loading flange, clamping the container, turning on

1 the mixer, and spraying water on the impeller. After cleaning is complete, the mixer is turned off,
2 the clamps are released, the loading flange is raised, and the drum containing rinse water is
3 removed from the mixing station. The drum containing rinsate is filled with waste and stabilized
4 in the next waste stabilization campaign.

5
6 **The Extraction System (designated as TP-10):** This system will be used to decant liquids from
7 solids followed by washing and rinsing of solids. Operations conducted by this system will
8 include: 1) receiving containerized waste, 2) receiving stabilization and washing reagents,
9 3) separating liquids from the solid waste via decanting, 4) washing the solids with appropriate
10 solutions, 5) grouting the washed solids, 6) capping stabilized waste containers, and
11 7) transporting filled containers to a containerized waste staging area for shipping. The extraction
12 system is comprised of two electric mixer units mounted to individual mobile steel frames.
13 Decanting is accomplished by rotating the extraction unit from the horizontal position or the
14 upright position to vertical position. Washing is accomplished inside a mixing unit. Batches of
15 incoming solid/liquid waste, will be treated by washing the solids twice in the two extraction
16 mixers. Following the decanting off of the first washing solution the solids will be transferred to
17 the second extraction mixer for the second washing step. [One mixer will be dedicated for high
18 concentrations of PCBs. The second mixer will be dedicated for low concentration of PCBs.]
19 The solids will be sampled and if grouting is not going to occur within one (1) hour the solids will
20 be placed in mineral oil. If grouting is going to occur immediately the solids will be transferred to a
21 final disposal container already pre-grouted on the bottom and grout mixture poured over the
22 solids. The mixers will be decontaminated by either triple rinsing or double wash/rinse procedure.
23

24 **Treatment Line 300:** This line treats waste streams 301 through 304 using the following systems: 1)
25 cutting and sheering; 2) physical extraction; 3) polymer mixing (macro-encapsulation/stabilization); and
26 4) container rinsing.

27
28 **Cutting and Shearing System (designated as TP-02):** The cutting and shearing system will
29 have work benches, tables, an electric saw, a shear cutter and hand tools such as pneumatic, air,
30 and electrically operated grinders, drills, hammers, chisels, and cutting torches. All operations
31 will be conducted under a portable hood which will be provided for this system. The function of
32 the cutting and shearing system will be to reduce large waste objects to a size suitable for further
33 processing in other pretreatment and treatment systems. Objects that may require shearing
34 include metal, wood, plastic, and construction debris such as discarded tanks, piping, and
35 paneling. Containers of cemented wastes that do not pass the required LDR treatment standards
36 will also be brought to this room, their container metal skin will be cut and removed, and the
37 cemented waste will be sent to the size reduction and screening system (TP-1) for re-shredding.
38 Waste requiring size reduction will be brought to the cutting and shearing area in TICs or in their
39 original containers. They will be manually removed from the incoming containers and placed in
40 an appropriate size reduction tool table. The size reduction operation will be performed inside
41 enclosures or under vent hoods. The vent lines will be connected to the stabilization process vent
42 system. The size reduced waste will be placed in a TIC which will be transported to an
43 appropriate pretreatment and treatment system.
44

45 Mercury Amalgamation (AMLGM) is another treatment process that may be performed in glove
46 box positioned outside of TP-02. The glove box will be connected to process vent system inside of
47 TP-02. The treatment process includes a bench-top catch pan, a tumbler, small containers for
48 mixing, and various amalgamation and stabilization reagents. Waste contaminated with >260
49 ppm total elemental mercury is stored in the WSB or SB-02 cabinets and then brought to this unit
50 for amalgamation of the elemental mercury. The waste is mixed with an amalgamating reagent

1 and then with supplemental amalgamation and/or stabilization reagents. The amalgamated
2 mercury is then analyzed by TCLP to verify that it meets universal treatment standards (UTS)
3 prior to shipment offsite for disposal. The treated waste is then stored in the WSB until
4 compliance with UTS is confirmed and shipment to a disposal facility can be arranged.
5

6 **Physical Extraction System (designated as TT-05):** This system will be provided to treat bulk
7 metal and non-metal solids by physical extraction to meet the specified alternative treatment
8 standards for debris utilizing abrasive blasting. The physical extraction system will consist of a
9 decontamination enclosure, a work table, a turntable/trolley assembly, an abrasive media blasting
10 pump and piping, a re-circulation and filtration unit, and the related accessories. The physical
11 extraction process will remove surface contamination. The extraction process will be conducted
12 inside the booth and the booth vent will be connected to the STB process vent system. The
13 system will primarily use CO₂ pellet (dry-ice) abrasive blasting media, but other media such as
14 silica or alumina beads, will be used depending on the nature of contamination. Treated waste
15 will be placed in containers and sent to the containerized waste staging area for final inspection
16 and certification. Abrasive media and contaminants together with rinse spray water will be
17 collected in a sump in the booth. The rinse water will be recycled through a media filter. The
18 solids and water will be separated. The water will be returned to the spray system. The filtered
19 solids will be collected in a TIC. When full, the TIC will be sent to the in-container mixing tank
20 system (TT-03) for treatment. Excess liquid produced by the extraction process operation is
21 transferred to the in-container stabilization system (TT-03).
22

23 **Polymer Mixing System (designated as TT-04):** The polymer mixing system is used to
24 stabilize dangerous waste to meet the specified treatment technology for specified technology
25 treatment for stabilization, including nitrated salts, that cannot be stabilized by pozzuolanic or
26 grout type stabilization. The system will also be used for macro-encapsulation of bulk lead waste
27 streams to meet the specified treatment technology for macro-encapsulation. The system will
28 consist of a polymer feeder, a waste feeder, a bulk material blender, an extruder, a filling station
29 enclosure, a container turntable, and associated equipment. Operations performed by this system
30 for a stabilization process will include: 1) receiving size reduced waste from pretreatment tanks;
31 2) receiving reagents and polymer from the reagent storage system; 3) mixing reagents, polymer,
32 and waste in a blender; 4) feeding the blend to the plastic extruder to produce a stabilized waste
33 form; 5) discharging the waste into a disposal container; and 6) stopping the extruder, when the
34 container is full and allowing the container to cool down, capping the container, and sending it to
35 the containerized waste staging area for final inspection and certification. Typical operations
36 involving a macro-encapsulation process will include: 1) receiving bulk lead material in a
37 container and placing it on top of the turntable in the enclosed filling station under the extruder;
38 2) receiving a plastic pellet container and placing it on the pellet feeder; 3) feeding the pellets to
39 the extruder and allowing molten plastic to flow into the container and cover the bulk lead surface
40 while the cart is rotating; 4) when the lead is macro-encapsulated, stopping the extruder, allowing
41 the container to cool down, capping the container and sending it to the containerized waste
42 staging area for final inspection and certification. A vent from the filling station will be
43 connected to the STB process vent system.
44

45 **Container Rinse System (designated as TT-06):** The container rinse system will be provided to
46 clean and triple rinse empty containers to comply with WAC 173-303-160 and 40 CFR 761.79 for
47 container re-use. Non-reusable drums will also be cleaned in this area and discarded. The system
48 will consist of a large container rinse enclosure and a drum wash enclosure. The insides and, if
49 needed, the outsides of containers will be cleaned as necessary to meet the regulatory definition
50 for a clean container. The system is designed to wash drums, ICB containers, and B-25 boxes.
51

1 The drum and container washing units will be equipped with a high-pressure hot-water spray
2 system, vacuum-operated siphon, and a sump. The rinse operations will be contained inside an
3 atmosphere-controlled enclosure. The contents of the waste water sumps will be pumped into a
4 TIC and transported to the liquid waste treatment system for treatment.

5
6 **Treatment Line 400:** This line treats stream 400 using the following systems: 1) sorting; and 2)
7 compaction.

8
9 **Sorting System (designated as TP-03):** The sorting system will have a container dump
10 mechanism, a feed conveyor, and a sorting table. The waste handling area of the system will be
11 covered either by an enclosure or a hood assembly. Vents from the hood will be sent to a dust
12 collection baghouse and then to the stabilization process vent system for treatment. The sorting
13 system will segregate heterogeneous and debris wastes into several sub-stream categories so that
14 they can receive the appropriate pretreatment or treatment step. Boxes and drums of wastes
15 requiring segregation will be delivered to the system dumping mechanism by a fork lift truck or a
16 cart. The dumping mechanism will unload the containers and feed the waste into the feed
17 conveyor. At the feed conveyor, a visual inspection will be conducted and large objects and other
18 items not requiring detailed sorting will be removed and placed in an appropriate TIC. Next, the
19 feed conveyor will transfer the remaining objects to the sorting table. In a typical operation at the
20 sorting table, the operators will manually remove the objects from the sorting table and place
21 them into five sorting TICs according to the following categories: 1) debris waste requiring
22 super-compaction and immobilization in the compaction system (TP-7); 2) bulk lead requiring
23 macro-encapsulation in the polymer mixing system (TT-4); 3) metal debris requiring surface
24 decontamination in the physical extraction system (TT-5); and 5) waste requiring the GASVIT™
25 treatment in the GVB. Other non-routine waste types that may be sorted, if found during the
26 sorting operations, are: 1) wastes requiring stabilization in one of the stabilization systems (TT-1,
27 TT-2, TT-3, or TT-4); 2) waste not compatible with any of the MWF treatment systems and that
28 will require repackaging for its return to the generator. Sorted waste will be placed in plastic bags
29 inside the TICs adjacent to the turntable. When full, each plastic bag will be closed and tied.
30 Waste streams requiring GASVIT™ may be placed inside cardboard canisters suitable for
31 processing by the GASVIT™ system batch feeders. The TIC containing bags of waste will be
32 transported to the designated pretreatment and treatment system by a hand-operated fork lift,
33 power-assisted fork lift or manual cart.

34
35 **Compaction and Macro-encapsulation System (designated as TP-07):** The system will
36 include an in-drum compaction, a super-compaction, and a grouting tank/pump assembly. The
37 main function of the system is to provide macro-encapsulation treatment of debris waste.
38 Transfer of wastes from open TICs to the in-drum compactor will be performed under a hooded
39 area. The air from the hood, the in-drum compactor and the super-compactor will be collected
40 and treated by the STB process vent system. Operating steps to accomplish this function will be
41 performed according to the following description. Debris wastes will be brought to the
42 compaction area. Drums containing debris that have already been compacted by the generator
43 will be transported to the compaction area. Debris will be removed from the containers
44 (e.g., TIC) and placed in a 55 gallon drum placed under the in-drum compactor. The in-drum
45 compactor will be turned on to compress the debris. The in-drum filling-compression cycle will
46 be repeated several times until the drum is full. The filled drum will be capped and transported to
47 the super-compaction area. When a sufficient number of compacted drums are in hand, the
48 super-compactor will be started. The drums will be placed in the super-compactor chamber one-
49 by-one. The super-compactor will squeeze each drum until the drum contents approach their
50 absolute density. Next, the squeezed drums (referred to as pucks) will be taken out of the super-

1 compactor and placed inside an overpack container (drum or a box). When the overpack
2 container is filled with a sufficient number of pucks, the void spaces are filled by either sand or a
3 grout mixture. After allowing the grout in the overpack container to be cured, the container will
4 be capped and sent to final inspection and certification.

5
6 **Air Emissions, Fugitive Emissions and Confinement Systems:** All fugitive emissions
7 generated during waste handling, pretreatment, and treatment operations in the STB will be
8 collected and treated in process vent systems. The process vent systems will be equipped with
9 particulate removal and charcoal filters designed to treat organic gases and to maintain a slightly
10 negative air pressure (with respect to the room atmosphere) inside the equipment and its
11 enclosures and vents. In addition, the STB will have confinement (building ventilation) systems
12 equipped with HEPA/ charcoal filters designed to maintain a slightly negative air pressure (with
13 respect to the outside atmosphere) within the buildings. The process vent system will serve as the
14 primary confinement device and will collect all normal and routine vents containing particulates,
15 fumes, vapors, fugitive emissions. The vent systems will discharge the treated exhaust into the
16 building confinement systems. The building confinement systems will serve as secondary
17 confinement devices and capture and treat any incidental airborne particulates, fumes, and vapor
18 contamination not collected by the process vent systems. The building confinement system will
19 discharge the treated exhaust into the atmosphere. Emission monitoring instruments are provided
20 to monitor both the vent system and the building confinement system exhausts. A description of
21 each of the process vent and building confinement systems is presented described hereinafter.

22
23 **STB Process Vent System (designated as SB-09):** Routine and normal fugitive emissions,
24 fumes, particulates, and process vents in the STB will be controlled by the STB process vent
25 system. The system collects gases from the pretreatment and treatment system vent lines, process
26 hoods, and enclosures where there is a potential for generating fugitive emissions. The vent gases
27 will first be filtered, if necessary, to remove dust and particulates. After the initial particulate
28 filtration, the vent gases will be sent to two carbon filter banks, installed in series, to remove any
29 organic vapor constituents in the gas. An organic vapor monitoring instrument will be installed
30 between the two filter banks to monitor the carbon filter performance. When an organic vapor
31 breakthrough occurs in the first carbon filter, the instrument alarm will be activated which will
32 require the operator to proceed with filter replacements. An operator will replace the spent
33 carbon in the first filter with the carbon from the second filter and fill the second filter with a new
34 batch of fresh carbon. This method of monitoring and carbon replacement ensures that a highly
35 reliable system is in place for the treatment of process vent exhausts. After treatment, the exhaust
36 from the process vent system is discharged into the building confinement system’s ventilation
37 ducts.

38
39 **STB Confinement System (designated as SB-02):** The stabilization building ventilation
40 system, referred to as the “STB confinement system,” has a pre-filter bank, a HEPA filter bank,
41 and a carbon filter bank. A redundant set of ID fans will have sufficient suction force to convey
42 the building exhaust through the intake ducts, the pre-filter/HEPA/carbon filters and the facility
43 discharge stack. In addition, the fans will be able to maintain a negative pressure inside the
44 stabilization building while providing a minimum of seven air changes per hour. Fresh air
45 entering the building will be filtered, heated, or cooled by an air-handling unit. The STB process
46 vent system exhaust will be discharged directly into the building confinement inlet ducts. Before
47 release to the atmosphere, the building exhaust will be passed through a set of pre-filters, HEPA
48 filters, and charcoal filter banks.

49 **STB Exhaust Monitors (designated as SB-05):** The STB confinement system will exhaust

1 outside the stabilization building and will be equipped with radiation monitors and flow meters.

2
3 **Ancillary Systems:** The STB will be equipped with all of the ancillary systems needed to support safe
4 and reliable operation of the dangerous waste pretreatment and treatment units. A description of key
5 ancillary systems and equipment are presented below.

6
7 **STB Main Control System (designated as SB-04):** The STB will use a centralized main
8 process control (GVB MPC) system encompassing a centralized operator alarm system. All other
9 operations will be conducted using local control panels.

10
11 **STB Area Monitors System (designated as SB-08):** Radiation air sampling stations will be
12 provided at strategic locations in the stabilization building.

13
14 **Storage Racks and Cabinets:** Waste storage racks and cabinets will be provided at designated
15 areas in the STB.

16
17 **Buildings and Structures:** Buildings and structures will include the STB, the GVB, the WSB, and
18 secondary containment features as needed. A description of each individual unit is given below.

19
20 **STB Building and Structures System (designated as SB-07):** The STB equipment will be
21 housed inside existing building 13. The slab in this building will be modified to include
22 equipment support pads, secondary containment, and protective coating. An annex adjoining
23 building 13 will be built to house the size reduction/screening system, the GVB confinement
24 system, and the bulk reagent storage system.

25
26 **STB Containment System (designated as SB-06):** Secondary containment is included in the
27 stabilization building to collect any potential liquids spilled during the handling and processing of
28 material in the stabilization building. The secondary containment will include a concrete curb
29 constructed around the building perimeter. Additional secondary containment plans will be
30 placed under the tanks and the individual systems as necessary.

31
32 **Utility and Miscellaneous Subsystems:** The STB will share the GVB utility systems to provide
33 ancillary service for proper operation of the systems. Utility systems include: service/instrument air
34 (GV-13), nitrogen supply (GV-15), process water supply (GV-16), reverse osmosis water supply (GV-
35 17), steam (GV-18), process cooling water (GV-19), chilled water (GV-20), and propane/natural gas
36 supply (GV-29). These systems have a set of monitors and alarms that measure various parameters
37 regarding the availability and condition of utility services and supply. These monitors and alarms will be
38 sound off in the GVB main process control panel for operator action.

39
40 **Electrical Supply Systems:** The STB electrical power distribution (SB-03) will include, main breakers,
41 transformers, motor control centers, and lighting for each building.

42
43 **Inventory Control System (SB-10):** A computerized inventory control system equipped with bar-code
44 hardware and a software package will be installed to provide cradle-to-grave tracking of the waste
45 shipped to the MWF. Waste characteristics, including all shipments data, will be entered into the
46 computer system. Each container will be assigned a unique numbering system before it is shipped to the
47 facility. The numbering system will be used to track the waste through: 1) the initial release for shipment
48 by the generator; 2) transportation from the generator's site to the MWF; 3) receipt inspection, acceptance
49 inspection, treatment line designation, storage, treatment, packaging, and certification at the MWF;
50 4) shipment from the MWF to the generator or disposal site; 5) and the final disposal by the disposal site

1 facility.

2
3 **2. Process Throughput and Mass Balance**

4
5 **2.1 Input Waste Streams**

6 Depending on its characteristics, the accepted waste will be assigned a waste stream number and will be
7 sent to one of the five treatment lines in either the STB or the GVB. The STB will have systems and
8 equipment to receive the following four waste streams for treatment: solids and inorganic debris (stream
9 100); inorganic liquids (stream 200); metals and lead (stream 300); and heterogeneous solids/debris
10 (stream 400). The GVB will be equipped with systems and equipment for treating organic liquids and
11 solids (stream 500). The five treatment lines will encompass integrated systems and equipment provided
12 to treat the five waste streams is described hereinafter.

13
14 Depending on characteristics of the waste, containers will be sent for treatment to either the STB or the
15 GVB. Containers with waste streams requiring non-thermal treatment (Treatment Lines 100 through 400)
16 will be removed from the storage areas in the WSB and brought to the designated treatment system in the
17 STB. Wastes requiring thermal treatment (Treatment Line 500) will be removed from the WSB and
18 brought to the GVB for treatment. At the designated treatment systems, the containers will be staged,
19 opened, inspected, and their contents will be placed into the treatment unit.

20
21 Dangerous wastes received at the MWF are initially assigned a waste stream according to their treatment
22 needs. The five major waste streams and their typical physical characteristics are shown in Tables 2-1
23 through 2-5. The anticipated order and combination of the pretreatment and treatment systems used for
24 treating each waste stream is described below. The actual sequence used for treating each waste stream will
25 be established at the time waste is formally accepted. This will be based upon a review of the waste
26 characteristics including any treatability tests performed for the given waste stream.

27
28 **Waste Stream 101:** This stream will consist of wastes containing moisture that must be removed prior to
29 size reduction or stabilization. Upon the initial inspection, waste containers will be sent to the dryer
30 system for pretreatment. After drying, the waste will be brought to the size reduction/screening system.
31 Next, the waste will be fed to the shredder where it will be granulated to less than 3/8 inch. The
32 granulated solids will be collected in a TIC. Once the TIC is full, it will be transported to one of the two
33 (high-capacity or low-capacity) mixing systems. The two mixing systems use similar mixing techniques
34 and the choice of one or the other will depend on the overall volume of the waste involved in the given
35 processing campaign (or batch) and the production rates needed to meet the incoming waste loads. At the
36 selected mixing system, the granulated waste and reagent(s) will be fed to the mixer unit using a
37 predetermined formulation that is defined through a treatability test. After the mixing cycle is complete,
38 the waste/reagent moisture will be discharged from the mixer into a disposal container. The final waste
39 form in the disposable container will meet the LDR requirements if it passes the necessary confirmation
40 steps defined in the MWF WAP. If the waste form does not pass the LDR requirements, it will be
41 brought back to the size reduction/screening system, re-granulated, and processed through the mixing
42 system for a second time.

43
44 **Waste Stream 102:** This stream will consist of solid wastes requiring pretreatment by size reduction
45 prior to stabilization. Upon the initial inspection, waste containers are brought to the size
46 reduction/screening system. Next, the waste is fed to the shredder where it is granulated to less than 3/8
47 inch. The granulated solids are collected in a TIC and transported to one of the two (high-capacity or
48 low-capacity) mixing systems. The selection of the mixing system and the processing of the waste for
49 stabilization are performed in the same manner as that described for stream 101 above.

1 **Waste Stream 103:** This stream will consist of wastes that can be sent directly to the stabilization
2 systems. Upon the initial inspection, waste containers of solids are transported to one of the two (high-
3 capacity or low-capacity) mixing systems. The selection of the mixing system and the processing of the
4 waste for stabilization are performed in the same manner as that described for waste stream 101 above.
5

6 **Waste Stream 201:** This stream will include liquid waste shipped to the facility in small containers (less
7 than 5 gallons). This waste stream is first consolidated and chemically treated in the liquid consolidation
8 system (TP-09), and/or stabilized in the in-container mixing system (TT-03). If the facility receives
9 several small containers that are chemically compatible, they will be consolidated into a single drum. If
10 the liquid waste is in such a small quantity that consolidation is not required (stream 201E), it will be
11 chemically treated and stabilized in a container inside the consolidation system (TP-09) enclosure.
12 Sub-stream designations for waste requiring different types of chemical treatment before stabilization are:
13 NEUTR (201 A); CHOXD (201 B); CHRED (201 C); and DEACT (201 D). Liquid wastes requiring
14 bench-scale chemical treatment and/or stabilization in a small container are designated as stream 201E.
15

16 **Waste Steam 202:** Bulk liquid waste (greater than 5 gallons) requiring chemical treatment neutralization
17 (neutralization, chemical oxidation, chemical reduction, or deactivation) before stabilization (STABL) are
18 sent to the liquid treatment system (TP-4) and then to the in-container mixing system (TT-03). Streams
19 requiring different types of chemical adjustments will have a sub-category designation the same as stream
20 201 above.
21

22 **Waste Steam 203:** This stream consists of liquid waste requiring concentration before stabilization. This
23 operation is accomplished by sending the waste to the dryer system (TP-8) for concentration. The
24 concentrates from the dryer will be sent for stabilization to the in-container mixing system (TT-3) while
25 the condensate will be sent to the liquid holding tank for polishing and reuse.
26

27 **Waste Steam 204:** This stream includes liquid wastes requiring in-container neutralization and/or
28 stabilization. This operation is accomplished by sending the waste to the in-container mixing system
29 (TT-03). After accomplishing the initial chemical adjustment, the waste is mixed with reagents and
30 stabilized.
31

32 **Waste Stream 205:** This stream includes liquid waste with low concentration (less than 1 percent)
33 dissolved metals, and organics. These wastes will be sent to liquid holding tank (TP-06) and will be
34 treated by carbon adsorption (CARBN), UV oxidation (CHOXD) and/or ion exchange. The treated waste
35 will either be stabilized with in-container mixing (TT-03) or reused.
36

37 **Waste Stream 206:** This stream includes solid waste that may be contaminated with liquid organics
38 solvents or TSCA-regulated PCBs that require washing and rinsing to reduce the solvent concentration to
39 LDR restrictions or to non-TSCA concentrations. These wastes will be sent to extraction mixers and will
40 be decanted followed by washing and rinsing with appropriate solvents and detergent/water. The treated
41 solid waste will be stabilized with grout and then sent for disposal. The wash and rinse liquids will be
42 characterized to determine the appropriate disposal unit.
43

44 **Waste Steam 301:** This waste stream includes metals requiring size reduction prior to physical
45 extraction or macro-encapsulation. Size reduction will be accomplished in the cutting and shearing
46 system (TP-01). After size reduction, metals will be sent either to the physical extraction system (TT-05),
47 packaged, and sent to disposal or super-compacted, macro-encapsulated in the compaction system (TP-
48 07) and then sent to disposal.
49

50 **Waste Steam 302:** This waste stream includes bulk lead requiring size reduction prior to macro-

1 encapsulation. Size reduction will be accomplished in the cutting and shearing system (TP-1). After size
2 reduction, bulk lead will be sent to the polymer mixing system (TT-04) for macro-encapsulation.

3
4 **Waste Steam 303:** This waste stream consists of metal classified as debris (under the Environmental
5 Protection Agency (EPA) Debris Rule) requiring physical extraction. This treatment will be provided by
6 the physical extraction system (TT-05).

7
8 **Waste Steam 304:** This waste stream consists of bulk lead requiring macro-encapsulation. This
9 treatment will be provided by the polymer mixing system (TT-04).

10
11 **Waste Stream 305:** This waste stream consists of radioactively contaminated elemental mercury
12 (i.e., >260 ppm) requiring amalgamation (AMLGM).

13
14 **Waste Steam 401:** This waste stream consists of debris that does not require pre-sorting and segregation.
15 Upon receipt, the containers will be sent directly to the compaction system (TP-07), encapsulated and
16 immobilized in compliance with the EPA debris rule.

17
18 **Waste Steam 402:** This stream will consist of heterogeneous waste requiring sorting prior to processing.
19 Upon receipt, the waste will be sent to the sorting system (TP-03), segregated into several in-process
20 streams, and then sent to the designated treatment unit. Potential treatment lines could include lines, 100,
21 200, 300, 500, or immobilization according to the EPA debris rule requirements. The latter treatment will
22 be accomplished in the compaction system (TP-03).

23
24 **Waste Stream 403:** This stream will consist of debris classified waste requiring sorting prior to
25 processing. Upon receipt, the waste will be sent to the sorting system (TP-03) and segregated into several
26 in-process streams and the segregated wastes will be sent to the designated treatment unit. Since the
27 waste is debris, the potential treatment lines could include lines 300, 500, or immobilization according to
28 the alternative treatment standards for dangerous debris (WAC 173-303-140 [40 CFR 268.45]). The latter
29 treatment will be accomplished in the compaction system (TP-03).

30
31 **Waste Steam 501:** This waste stream consists of solids requiring box sorting and GASVIT™ processing.
32 Waste defined under this category could include alpha-contaminated solid wastes (less than 100 nCi/g)
33 requiring sorting and the GASVIT™ treatment. Upon inspection and acceptance, this waste stream will
34 be sent to the GASVIT™ feed prep system (GV-01) in the GVB. The waste will be transferred to a box
35 sorting station where the objects will be sorted to remove bulk lead and metal objects not suitable for
36 GASVIT™ processing. The bulk metals and lead will be sent to treatment line 300 for treatment and
37 wastes requiring GASVIT™ will be sorted and placed in cardboard canisters or sent to the feed prep
38 system shredder and repackaged in plastic bags. The canistered and bagged wastes will be surge stored
39 and fed to the GASVIT™ process chamber for treatment.

40
41 **Waste Steam 502:** This waste stream consists of PCB-contaminated solids requiring box sorting and
42 GASVIT™ processing. This stream will be treated in the same process units as that described for stream
43 501 above.

44
45 **Waste Steam 503:** This waste stream consists of solids requiring table sorting and GASVIT™
46 processing. Upon inspection and acceptance, this waste stream will be sent to the GASVIT™ feed prep
47 system (GV-01) in the GVB. The waste will be transferred from the container to a table sorting station
48 where the objects will be sorted to remove bulk lead and metal objects not suitable for GASVIT™
49 processing. The bulk metals and lead will be sent to treatment line 300 for treatment and wastes requiring
50 GASVIT™ will be sorted and placed either in cardboard canisters or sent to the feed prep system

1 shredder and repackaged in plastic bags. The canistered and bagged wastes will be surge stored and fed
2 to the GASVIT™ process chamber for treatment.

3
4 **Waste Stream 504:** This waste stream consists of PCB-contaminated solids requiring table sorting and
5 GASVIT™ processing. This stream will be treated in the same process units as that described for stream
6 503.

7
8 **Waste Stream 505:** This waste stream consists of liquids/sludge requiring GASVIT™ processing. Upon
9 inspection and acceptance, this waste stream will be sent to the hazardous materials (HAZMAT)
10 enclosure in the GVB. The waste will be transferred from the container to the feed tank in the
11 GASVIT™ feed system (GV-02) and pumped to the GASVIT™ process chamber for treatment.

12
13 **2.2 Estimated Annual Flow Rates**

14
15 Estimated flow rates are calculated and presented in Tables 2-1, 2-2, 2-3, 2-4, and 2-5.

16
17 **2.3 Throughput Capacity**

18
19 Throughput capacity for each system and the basis for calculating each throughput are included in
20 description of each system in Section 3.

21
22 **3.1 System TP-01, Size Reduction and Screening System**

23
24 **1. General Function**

25
26 The function of the size reduction and screening system (TP-01) is to produce uniformly sized particles
27 that meet the requirements of the given stabilization process. Bulk solid waste is prepared here for
28 stabilization. Stabilization must meet LDR requirements as defined in the WAP.

29
30 **2. Reference Documents**

- 31
32 – **Process Flow Diagram:** See drawings 31001-P-003 in Attachment 7 of MWF Part B Permit
33 – **Piping and Instrumentation Diagram:** See drawings 31001-P-013 in Attachment 7 of MWF
34 Part B Permit
35 – **Key Components List:** See Table TP-01 in the equipment and instrument list in Attachment 8 of
36 MWF Part B Permit
37 – **Key Components Technical Specification:** See the technical specification package enclosed in
38 Attachment 11 of MWF Part B Permit.
39 – **Key Control Devices:** See Table TP-01 in the equipment and instrument list in Attachment 8 of
40 MWF Part B Permit
41 – **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment
42 11 of MWF Part B Permit
43 – **Interfacing Subsystems:** stabilization process vent (SB-09); containerized waste staging (STB
44 rooms 2 and 4); bulk waste receiving system (STB room 3); dryer system (TP-08); container rinse
45 system TT-06; sorting system (TP-03); and cutting & shearing system (TP-02).

46
47 **3. Equipment and Process Description**

48
49 System TP-01 consists of a single stage quad-shear size reduction and screening system and the

1 associated conveyors. Wastes received by TP-01 are those specified for treatment by line 100 and can
2 come from the bulk waste receiving area (STB room 3); the containerized waste staging area (STB room
3 2); the sorting system (TP-03); and the cutting and shearing system (TP-02). The size reduction and
4 screening system consists of the following: 1) a waste container skip hoist (E-0102); 2) an enclosed
5 metering conveyor/skip loader (CV-0103); 3) a single-stage high-torque quad-shear shredder with
6 internally mounted screen (SHR-0105); and; 4) a waste transfer auger.

7
8 The size reduction and screening system (TP-01) provides the size reduction needed by the stabilization
9 process which requires that the particle size of the waste matrix be less than 3/8 inch (9 mm) and that the
10 particles be uniformly distributed throughout the waste form. Size reduction is a physical process which
11 is accomplished in a low speed shredder. A screen mounted directly below the shredder teeth allows
12 passage of the material that is granulated below 3/8 inch size. Material larger than 3/8 inch is returned to
13 the top of the shredder teeth and re-ground. Due to the physical design of the shredder, only particles
14 below 3/8 inch pass the screen and, hence, nearly all of the solid materials are ground to the selected size.
15

16 An enclosed waste container skip hoist (E-0102) is designed to accept waste in B-25 box containers. The
17 skip hoist automatically secures the B-25 container and dumps it directly onto the enclosed metering
18 conveyor (CV-0103). Drummed waste is consolidated in an empty B-25 box. This operation is
19 conducted in an enclosed space which is vented to the STB process vent system to minimize fugitive
20 emissions during dumping. The loaded B-25 box then automatically delivers the waste to the conveyor
21 inlet hopper. The conveyor then meters the waste into the shredder inlet housing.
22

23 The entire system, beginning at the B-25 box skip hoist, is completely enclosed with atmospheric
24 protection to control fugitive dust emissions. A process vent line connected to the enclosure maintains
25 the space within the enclosure at a slightly negative pressure with respect to the atmosphere pressure in
26 the room. Any fugitive emissions and dust generated during size reduction and screening operations are
27 collected by the process vent line and conveyed to the process vent system (SB-09). The process vent
28 system treats the vent with a central dust collector and a bank of carbon filters.
29

30 Following size reduction and classification, waste particles conforming to the required size (less than 3/8
31 inch) pass the screen and are conveyed through the feeder (F-0106) into a receiving TIC. Waste particles
32 larger than the specified size are re-circulated in the shredder until reduced to less than 3/8 inch size.
33 Waste collected in the TIC is transported to the appropriate pretreatment and treatment systems.
34

35 **4. Operation and Controls Description**

36
37 The size reduction and screening process are provided by system TP-01. Operations in this system
38 include: 1) container preparation; 2) establishing system confinement; 3) container unloading; 4) size
39 reduction and screening; 5) TIC filing; 6) system cleaning; and, 7) empty container handling. These
40 operations are described immediately below.
41

42 **Container Preparation:** Waste drums or B-25 boxes to be processed during a size reduction campaign
43 are transferred and placed in the bulk waste staging room (STB room 4). When all of the containers
44 covered under a campaign are accumulated in the room, the room entrance doors are closed and negative
45 ventilation in the room is established. Next, the container caps are removed one-by-one and a visual
46 inspection of the waste in the containers is performed (see requirements in the WAP). The examinations
47 review container profile documentation to ensure that waste types prohibited in the system (e.g., ignitable,
48 reactive, and incompatible wastes) are not processed. After inspection, the cap is immediately placed
49 back on the container. When all of the containers in the room are inspected and accepted, the operator
50 proceeds with the next step, establishment system confinement.

1
2 **Establishing System Confinement:** Prior to starting the size reduction system and conducting size
3 reducing operations, process ventilation to this system is established and confirmed. The process
4 ventilation system (SB-09) provides airspace confinement of waste-bearing equipment and maintains
5 such equipment at a negative air pressure relative to the immediate room environment. Local differential
6 pressure alarms (PDI-0102, PDI-0105, and PDI-0106) provide the operator with a positive indication that
7 the process ventilation system is operating.
8

9 **Container Unloading:** The size reduction unit is turned on from a local control panel. Next, waste
10 drums or B-25 box containers are delivered to the B-25 skip hoist enclosure by a fork lift truck. B-25 box
11 containers are loaded directly into the enclosed skip hoist. Drummed wastes are first unloaded and
12 consolidated into an empty B-25 box container by a drum skip hoist (E-0101). The receiving B-25
13 container is positioned inside the skip hoist enclosure during the consolidation operations. The
14 consolidated waste is then lifted by the skip hoist and dumped into the conveyor (CV-0103) inlet hopper.
15 All consolidation and dumping operations are conducted inside an enclosure and any dust and fugitive
16 emissions generated during the dumping step are collected by a vent line that is connected to the
17 stabilization process vent system.
18

19 **Size Reduction and Screening:** The enclosed conveyor transfers the bulk waste from its inlet hopper to
20 the shredder inlet hopper at a controlled rate which is established based on the waste material, size, and
21 shredder capacity. The bulk waste flows to the inlet of the shredder (SHR-0105). The shredder reduces
22 the waste into granular form. The granulated waste flows to the surface of a screen mounted under the
23 shredder. Any granulated material not passing through the screen returns back to the shredder teeth and is
24 re-ground to the appropriate size (less than 3/8 inch) that passes through the screen. Any possible
25 temperature rise (due to the conversion of grinding friction force) within the shredder is controlled to
26 below 200° Fahrenheit by a combination of a temperature sensor and a nitrogen inerting valve. When the
27 set point of 200° Fahrenheit is detected by the temperature sensor, the shredder metering conveyor (CV-
28 0103) is automatically stopped and the nitrogen valve is energized to open and allow nitrogen inside the
29 shredder. The valve is de-energized to close within 60 seconds after the start. The shredder feed
30 conveyor re-starts when the temperature inside the shredder drops below 120° Fahrenheit.
31

32 **TIC Filling:** As the reduced solid waste passes through the shredder screen, it flows down into a
33 conveying feeder (F-0106). The feeder then dumps the waste into a locally positioned TIC. A vent hood
34 is provided above the TIC filling station. Any dust and fugitive emissions generated during the TIC
35 filling operation are collected by the hood vent line which is connected to the stabilization process vent.
36 When a TIC is full, the feeder is turned off, the feeder discharge isolation gate (FV-0106) is closed, and
37 the full TIC is replaced with another empty TIC. The full TIC is capped while still under the vent hood
38 and sent to the appropriate pretreatment and/or treatment systems.
39

40 **System Cleaning:** At the end of each campaign, the system is allowed to operate for a minimum of 15
41 minutes so that all of the solid material is discharged from the hoppers, conveyors, and shredder. Next,
42 the equipment access doors are opened and solid residues are removed by a vacuum unit to the extent
43 practical. The floor area adjacent to the system components is also vacuumed. Residues collected during
44 cleaning operations are discharged inside a container and sent for processing with the rest of the waste in
45 the campaign.
46

47 **Empty Container Handling:** Empty drums and B-25 box containers are sent to the container rinse
48 system (TT-06) where they are cleaned either by wiping or with triple rinse methods (as determined by
49 the regulatory requirements applicable to the waste codes in the container). The cleaned containers are no
50 longer subject to RCRA Subtitle C controls. They are inspected for integrity. Containers passing the

1 integrity inspection test are either stored onsite, or sent back to the generator, for reuse. Defective
2 containers are: 1) sent to a free-release facility that has an appropriate permit for radioactive material
3 decontamination and free-release; or 2) compacted and sent to a low-level waste disposal site for burial.

4
5 **5. Air Emissions**

6
7 For both worker safety and contamination control, process ventilation to this system will be established
8 and confirmed prior to conducting liquid consolidation operations. The process ventilation system
9 (SB-09) provides airspace confinement of waste-bearing equipment and maintains the equipment and/or
10 area at a negative air pressure relative to the immediate room environment. The control of fugitive
11 emissions is provided for: 1) the B-25 box skip hoist (E-0102); 2) the enclosed conveyor (CV-0103); 3)
12 the shredder (SHR-0105); and 4) the feeder (F-0106). Local differential pressure alarms (PDI-0102, PDI-
13 0105, and PDI-0106) provide a positive indication to the operator that the process ventilation system is
14 operating. Treatment of dust and fugitive emissions generated during the operation of this system are
15 described in the system's STB process vent system (SB-09) in Section 3.18.

16
17 **6. Compliance with Process and Safety Performance Requirements**

18
19 Process performance requirements for the system are:

- 20
21 1. Size of concrete debris, rocks, and clay clumps are limited to 1.5 inch x 1.5 inch x 0.5 inch
22 2. Metals in the feed are limited to less than 1% (by visual inspection)
23 3. Size reduction: less than 3/8 inch
24 4. Acceptable containers: This system accepts waste in 55 gallon drums, 85 gallon drums, and B-25
25 waste containers (e.g., L x W x H = 4 inch x 6 inch x 4 inch). B-25 waste containers are the largest
26 packaged generator waste containers to be accepted at the MWF.

27
28 Safety performance requirements for the system are:

- 29
30 1. Any potential temperature rise (due to grinding operations) in the shredder must be kept below
31 200 Fahrenheit to prevent a potential fire.
32 2. The system must be kept at a minimum of 0.05 inch water gauge (w.g.), negative pressure to provide
33 confinement and control of dust and fugitive emissions.
34 3. Ignitable and reactive wastes (waste codes D001 and D002) are not accepted.
35 4. Incompatible wastes are not accepted.

36
37 The following design and administrative features are provided for compliance of the system with the
38 process and safety performance requirements.

39
40 **Controlling Input Waste Size:** The incoming waste containers are visually inspected and any bulk item
41 larger than 1.5 inch x 1.5 inch x 0.5 inch and metals found in the container are sorted and sent for
42 processing in the cutting and shearing system (TP-02) or other systems in treatment line 300 or line 400.

43
44 **Controlling Output Waste Size:** The design of the shredder includes a rugged screen that ensures all of
45 the size reduced waste is less than 3/8 inch.

46
47 **Limiting Container Size:** Waste profile data is used to limit the size of waste containers received by the
48 size reduction and screening to 55 gallon drums, 85 gallon drums, or B-25 containers.

49
50 **Preventing a Potential Fire:** Design features encompassing inerting operations are included to prevent a

1 potential fire in the shredder housing. The temperature in the shredder is controlled by a sensor. When
2 the temperature reaches the set point of 200° Fahrenheit, the shredder housing is automatically flooded
3 with nitrogen.
4

5 **Minimizing Fugitive Emissions:** Enclosures and hoods are provided and maintained under negative
6 ventilation. The exhaust from the size reduction and screening system vents is treated by the STB process
7 vent system (SB-09) carbon filters to remove organic vapors.
8

9 **Prevention of Reaction of Ignitable, Reactive, and/or Incompatible Wastes:** Incoming wastes
10 characterization data is used to eliminate incompatible wastes from processing in the size reduction and
11 screening system wastes that are incompatible, ignitable, and/or reactive.
12

13 **Corrosion Protection:** The shredder bowl thickness is designed and documented for corrosion
14 protection. The design basis is a minimum of two years life when processing highly acidic (pH greater
15 than 2) and alkaline (pH less than 11) dry salts at a process throughput of approximately 250 tons per
16 year.
17

18 **7. Preventative and Preparedness (P&P) Procedures and Inspection Plan**

19
20 Equipment inspection, maintenance, and calibration are performed on this system based on the
21 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
22 MWF P&P procedures.
23

24 **Temperature Control:** The temperature sensor and nitrogen inerting valve are checked for operability.
25 The nitrogen inerting line is visually checked for clogging by manually turning on the nitrogen inlet
26 valve. The temperature measurement instrument is removed and checked for proper indications and is
27 calibrated. Inspection frequency is at least once every 90 days when in use.
28

29 **System Confinement:** System confinement is checked by reading the negative pressure in the
30 differential pressure indicators. If the system internal pressure is greater than -0.05 inch w.g. then the
31 system is shut down. Inspection frequency is daily at the beginning of the morning shift when in use.
32

33 **Differential Pressure Indicators (PDI-0102, PDI-0105, and PDI-0106):** These instruments are
34 inspected for problems relative to the proper indication of the desired differential pressure in the system.
35 Both the sensing device and the indication dial are checked for operability and calibration. Inspection
36 frequency is at least once every 90 days when in use.
37

38 **Spill Control:** The box dumping area and TIC filling areas are inspected for spills of solid waste. Any
39 spilled material is cleaned by a vacuum device and placed inside a container for processing along with the
40 given waste processing campaign. Inspection frequency is daily at the end of the last shift when in use.
41

42 **Equipment Leaks:** The system housing and enclosures are visually inspected for indications of any
43 corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
44 once every 90 days when in use.
45

46 **8. Process Throughput**

47
48 Throughput for this system is 2,000 lbs/hour of construction debris (such as soil and concrete), and non-
49 construction type debris (such as packaging materials). The average unprocessed density for construction
50 type debris is estimated to be approximately 60 lbs/cubic feet. The average unprocessed density for other

1 types of debris is estimated to be approximately 30 lbs/cubic feet. The average processed density
2 following size reduction will be 80 lbs/cubic feet. The inlet hopper for the shredder conveyor provides
3 100 cubic feet surge capacity which is approximately two to four hours of throughput.
4

5 **9. Secondary Containment**

6
7 Liquids are not processed by this system during normal operation. Any spill of liquids from this system
8 during an abnormal event are contained in the secondary containment system that is provided for the
9 entire STB by a continuous concrete curb that surrounds the STB slab.
10

11 Metal catch pans are placed under the shredder hopper and shredder unit to collect any material released
12 during operations. The pans are designed to have a free volume greater than the entire internal volume of
13 the equipment.
14

15 **3.2 System TP-02, Cutting and Shearing System**

16
17 **1. General Function**
18

19 The function of the cutting and shearing system (TP-02) is to cut large waste objects to a size that can be
20 handled by the required pretreatment and treatment systems. Objects that might require cutting and
21 shearing are metal, wood, plastic, and construction debris such as discarded tanks, piping, and paneling.
22 The cutting and shearing system is capable of accepting waste in 55 gallon drums or B-25 boxes.
23

24 Mercury Amalgamation (AMLGM) is another treatment process performed outside of TP-02 in a glove
25 box. It includes a bench-top catch pan, a tumbler, small containers for mixing, and various amalgamation
26 and stabilization reagents. Waste contaminated with >260 ppm total elemental mercury is stored in the
27 WSB or SB-02 cabinets and then brought to this unit for amalgamation of the elemental mercury. The
28 waste is mixed with an amalgamating reagent and then with supplemental amalgamation and/or
29 stabilization reagents. The amalgamated mercury is then analyzed by TCLP to verify that it meets
30 universal treatment standards (UTS) prior to shipment offsite for disposal. The treated waste is then
31 stored in the WSB until compliance with UTS is confirmed and shipment to a disposal facility can be
32 arranged.
33

34 **2. Reference Documents**
35

- 36 – **Process Flow Diagram:** See drawings 31001-P-005 in Attachment 7 of MWF Part B Permit
- 37 – **Piping and Instrumentation Diagram:** See drawings 31001-P-014 in Attachment 7 of MWF
38 Part B Permit
- 39 – **Key Components List:** See Table TP-02 in equipment and instrument list in Attachment 8 of
40 MWF Part B Permit
- 41 – **Key Components Technical Specification:** See technical specification package enclosed in
42 Attachment 11 of MWF Part B Permit.
- 43 – **Key Control Devices:** See Table TP-02 in equipment and instrument list in Attachment 8 of
44 MWF Part B Permit
- 45 – **Instrument Data Sheets:** See technical specification package that is enclosed in Attachment 11
46 of MWF Part B Permit
- 47 – **Interfacing Subsystems:** stabilization process vent subsystem (SB-09); containerized waste
48 staging system (TS-01); bulk waste receiving system (TS-02); GASVIT™ feed preparation (GV-
49 01); compaction system (TP-07); container rinse system (TP-06); in-container mixing (TT-03);

1 physical extraction system (TT-05); and polymer mixing system (TT-04).
2
3
4

5 **3. Equipment and Process Description**

6
7 The cutting and shearing system will have work benches, tables, an electric saw, a shear cutter, a high-
8 pressure water cutter, and hand tools such as hydraulic, pneumatic, or electrically-operated grinders,
9 drills, hammers, chisels, and cutting torches. These tools are only used in the concrete curbed
10 containment area which surrounds the system. Processing occurs on either the disassembly table, metal
11 cutting saw, or torch cutting table. The sheared and size reduced metal waste is placed in a 55 gallon
12 drum(s) or a B-25 container(s) and is transported to the appropriate pretreatment and treatment systems
13 throughout the facility.
14

15 **4. Operations and Control Description**

16
17 Operations conducted in the shearing and cutting system consist of transporting incoming waste material,
18 cutting of waste objects by torch, saw, or hydraulic shears, and transferring the size reduced objects to
19 other systems. Both portable and table mounted tools are installed in this room.
20

21 Waste requiring size reduction is brought to the cutting and shearing area in TICs or in their original
22 containers. They are manually removed from the incoming containers and placed on an appropriate size
23 reduction tool table. The shear cutter and high pressure water cutting tool are used to the extent possible.
24 Torch cutters are used only when cutting can be accomplished in a safe manner. Water from the high
25 pressure cutter (about 2 gallons per hour [GPH]) is recycled.
26

27 The cutting and shearing system reduces large waste objects to a size suitable for further processing in
28 other pretreatment and treatment systems. Objects that may require shearing include metal, wood, plastic,
29 and construction debris such as discarded tanks, piping, and paneling.
30

31 Containers of stabilized (cement or polymer base processes) wastes that do not pass the required LDR
32 treatment standards are also brought to this room, their container metal skin cut and removed, and the
33 cemented waste sent to the size reduction and screening system (TP-1) for re-shredding.
34

35 Mercury Amalgamation (AMLGM) is another treatment process being performed in the TP-02. It
36 includes a bench-top catch pan, a tumbler, small containers for mixing, and various amalgamation and
37 stabilization reagents. Waste contaminated with >260 ppm total elemental mercury is stored in the WSB
38 or SB-02 cabinets and then brought to this unit for amalgamation of the elemental mercury. The waste is
39 mixed with an amalgamating reagent and then with supplemental amalgamation and/or stabilization
40 reagents. The amalgamated mercury is then analyzed by TCLP to verify that it meets universal treatment
41 standards (UTS) prior to shipment offsite for disposal. The treated waste is then stored in the WSB until
42 compliance with UTS is confirmed and shipment to a disposal facility can be arranged.
43

44 The size reduction operation is performed inside enclosures or under vent hoods. The vent lines are
45 connected to the stabilization process vent system. The size reduced waste is placed in a TIC which is
46 transported to an appropriate pretreatment and treatment system.
47

48 **5. Fugitive Emissions Control**

49 For both worker safety and contamination control, process ventilation to this system is established and
50

1 confirmed prior to conducting any cutting treatment operations. The process ventilation system (SB-09)
2 provides airspace confinement of waste-bearing equipment and maintains that equipment and/or area at a
3 negative air pressure relative to the immediate room environment. The control of fugitive emissions is
4 provided for: 1) the torch cutting table (TT-0202); 2) the shearing table (SER-0205); 3) the disassembly
5 table (T-0206); and 4) the metal cutting saw (MC-0207) and high-pressure water cutting saw (MC-0209).
6 Local differential pressure alarms (PDI-0210, PDI-0211, PDI-0212, and PDI-0213) provide the operator
7 with a positive indication that the process ventilation system is operating.
8

9 **6. Compliance with Process and Safety Performance Requirements**

10 Process performance requirements for the system are to size reduce the material as required by the
11 subsequent treatment system such as size reduction and screening (TP-01), physical extraction (TT-05),
12 sorting (TP-03), or compaction and macro-encapsulation (TP-07).
13

14 Safety performance requirements for the system are fire prevention during torch operations and fugitive
15 emissions control during cutting and size reduction operations.
16

17 The following design and administrative features are provided for the compliance of the system with the
18 process and safety performance requirements.
19

20 **Controlling Output Waste Size:** The design of the shredder includes a rugged screen that ensures all of
21 the size reduced waste is less than 3/8 inch.
22

23 **Equipment Safety:** The cutting torch, shearing table, ferrous/non-ferrous cutting tools, and associated
24 controls are purchased to meet OSHA and industrial safety requirements. Control features and automatic
25 safety stop switches are included for all tools.
26

27 **Preventing A Potential Fire:** OSHA and standard industrial safety rules and procedures are strictly
28 enforced to prevent a potential fire during the torch cutting operations. Before proceeding with the torch
29 cutting operation, the waste objects are visually inspected to ensure that they do not contain combustible
30 material. Ignitable and reactive wastes (waste codes D001 and D002) are not accepted. Incompatible
31 wastes are not accepted
32

33 **Minimizing Fugitive Emissions:** Enclosures and hoods are provided and maintained under negative
34 ventilation. The exhaust from the system vents are treated by the STB process vent system (SB-09)
35 carbon filters to remove organic vapors.
36

37 **7. P&P Procedures and Inspection Plan**

38 Equipment inspection, maintenance, and calibration are performed on this system based on the
39 manufacturer's recommendations. The following additional inspections are conducted as a part of the
40 MWF P&P procedures.
41

42 **System Confinement:** System confinement is checked by reading the negative pressure in the
43 differential pressure indicators. If system internal pressure is greater than -0.05 inch w.g., then the system
44 is shut down. Inspection frequency is daily at the beginning of the morning shift when in use.
45

46 **Differential Pressure Indicators (PDI-0210, PDI-0211, PDI-0212, and PDI-0213):** These instruments
47 will be inspected for problems relative to the proper indication of the desired differential pressure in the
48 system. Both the sensing device and the indication dial are checked for operability and calibration.
49

1 Inspection frequency is at least once every 90 days when in use.

2
3 **Spill Control:** The cutting and shearing area and TIC filling areas are inspected for excessive dust and
4 debris. Any spilled material is cleaned by a vacuum device and placed inside a container for processing
5 along with the given waste processing campaign. Inspection frequency is daily at the end of the last shift
6 when in use.

7
8 **Equipment Leaks:** Duct housing, hoods, and enclosures are visually inspected for indications of any
9 corrosion, weld cracks, and/or loose connections. Inspection frequency is at least once every 90 days
10 when in use.

11
12 **8. Process Throughput**

13
14 Throughput for this system is highly variable and depends on the physical size of the incoming waste. A
15 nominal capacity of 500 lbs/hour is used for this system.

16
17 **9. Secondary Containment**

18
19 Liquids are not processed by this system during normal operation. Only hydraulic oil or water used for
20 high-pressure cutting is present. Any accidental discovery and spill of liquid during an abnormal event is
21 contained by the secondary containment system that is provided for the entire STB by a continuous
22 concrete curb that surrounds the STB slab.

23
24 Metal catch pans are placed under the cutting and shearing system equipment to collect any material
25 released during operations. The pans are designed to have a free volume greater than the entire internal of
26 the equipment.

27
28 Metal catch pans are placed under the dust collectors located in TP-02. The pans are designed to have a
29 free volume equal to the entire internal volume of the dust collectors.

30
31 **3.3 System TP-03, Sorting System**

32
33 **1. General Function**

34
35 The function of the sorting system (TP-03) is to segregate incoming waste items into designated groups
36 for pretreatment or treatment. The sorted waste is placed in TICs which will consist of 55 gallon drums or
37 B-25 box containers. System TP-03 is capable of accepting waste in 55 gallon drums or B-25 boxes.

38
39 **2. Reference Documents**

- 40
41 _ **Process Flow Diagram:** See drawings 31001-P-006 in Attachment 7 of MWF Part B Permit.
42 _ **Piping and Instrumentation Diagram:** See drawings 31001-P-017 in Attachment 7 of MWF
43 Part B Permit.
44 _ **Key Components List:** See Table TP-03 in the equipment and instrument list in Attachment 8 of
45 MWF Part B Permit.
46 _ **Key Components Technical Specification:** See the technical specification package enclosed in
47 Attachment 11 of MWF Part B Permit.
48 _ **Key Control Devices:** See Table TP-03 in the equipment and instrument list in Attachment 8 of
49 MWF Part B Permit.

1
2 **5. Air Emissions**
3

4 Ventilation to this system is established and confirmed, prior to conducting sorting operations. The
5 process ventilation system (SB-09) provides airspace confinement of waste-bearing equipment and
6 maintains that equipment and/or area at a negative air pressure relative to the immediate room
7 environment. The control of fugitive emissions is provided for: 1) the drum skip hoist (E-0302) and the
8 B-25 box skip hoist (E-0301); 2) the feed conveyor (CV-0303); and 3) the sort table (Z-0304). Local
9 differential pressure alarms (PDI-00306, PDI-0308, and PDI-0305) provide the operator with a positive
10 indication that the process ventilation system is operating.
11

12 **6. Compliance with Process and Safety Performance Requirements**
13

14 Process performance requirements for the system are for sorting heterogeneous wastes so that they are
15 acceptable by other treatment systems such as GASVIT™ system, size reduction and screening (TP-01),
16 physical extraction (TT-05), or compaction and macro-encapsulation (TP-07).
17

18 Safety performance requirements for the system are for controlling fugitive emissions during sorting
19 operations.
20

21 The following design and administrative features are provided for compliance of the system with the
22 process and safety performance requirements.
23

24 **Controlling Output Waste:** Visual inspection methods are used to sort out waste objects according to
25 the waste acceptance criteria by the receiving treatment system. If a suspicious object is found, it is
26 placed in a container and a sample is obtained and sent for analysis. This waste is handled appropriately
27 after receiving results from the sampling and analysis efforts.
28

29 **Equipment Safety:** The skip hoists, conveyor, and sorting table meet OSHA and industrial safety
30 requirements. Control features and automatic safety stop switches are included for all equipment.
31

32 **Preventing A Potential Fire.** Ignitable and reactive wastes (waste codes D001 and D002) are not
33 accepted in this system. The operations are conducted at room temperature and there are no routine fire
34 potentials.
35

36 **Minimizing Fugitive Emissions:** Enclosures and hoods are provided and maintained under negative
37 ventilation. The exhaust from the system vents are treated by the STB process vent system (SB-09)
38 carbon filters to remove organic vapors.
39

40 **7. P&P Procedures and Inspection Plan**
41

42 Equipment inspection, maintenance, and calibration are performed on this system based on the
43 manufacturer's recommendations. The following additional inspections are conducted as a part of the
44 MWF P&P procedures.
45

46 **System Confinement:** System confinement is checked by reading the negative pressure in the
47 differential pressure indicators. If the system internal pressure is greater than -0.05 inch w.g., then the
48 system is shut down. Inspection frequency is daily at the beginning of the morning shift when in use.
49

50 **Differential Pressure Indicators (PDI-0210, PDI-0211, PDI-0212, and PDI-0213):** These instruments

1 are inspected for problems relative to the proper indication of the desired differential pressure in the
2 system. Both the sensing device and indication dial are checked for operability and calibration.
3 Inspection frequency is at least once every 90 days when in use.

4
5 **Spill Control:** The sorting and TIC filling areas are inspected for excessive dust and debris. Any spilled
6 material is cleaned by a vacuum device and placed inside a container for processing along with the given
7 waste processing campaign. Inspection frequency is daily at the end of the last shift when in use.

8
9 **Equipment Leaks:** Duct housing, hoods, and enclosures are visually inspected for indications of any
10 corrosion, weld cracks, and/or loose connections. Inspection frequency is at least once every 90 days
11 when in use.

12
13 **8. Process Throughput**

14
15 Throughput for this system is highly variable and depends on the physical size of the incoming waste. A
16 nominal capacity of 1000 lbs/hour is used for this system.

17
18 **9. Secondary Containment**

19
20 Liquids are not processed by this system during normal operation. Any discovery and accidental spill of
21 liquid during an abnormal event is contained by the secondary containment system that is provided for the
22 entire STB by a continuous concrete curb that surrounds the STB slab and is designed to have a free
23 volume greater than the entire internal volume of the equipment. Metal catch pans beneath the conveyor
24 and the sort table are an integral part of the design of the sorting system. These pans collect any material
25 that falls off of the conveyor belt or the sort table during operation. The free volume of the pans is greater
26 than the maximum volume of the waste that will be placed on either the conveyor or the sort table at one
27 time.

28
29 **3.4 System TP-04, Liquid Treatment System**

30
31 **1. General Function**

32
33 The function of the liquid treatment system (TP-04) is to receive liquid waste for treatment by filtration,
34 neutralization, or deactivation. Deactivation includes neutralization, chemical oxidation, or chemical
35 reduction. Liquid waste includes offsite generated waste and waste received from other onsite treatment
36 systems.

37
38 The pretreatment processes provided by system TP-04 will comply with the RCRA LDR treatment
39 standards of NEUTR as described in federal regulations 40 CFR 268.42 and 268.45 and incorporated by
40 reference in WAC 173-303-140(2)(a). Other purposes of pretreatment are to provide ease of waste
41 handling, reducing hazards to the worker, reducing corrosion and damage to equipment, protect
42 corrosion-resistant floor coatings, and facilitating the subsequent treatment step.

43
44 **2. Reference Documents**

- 45
46 – **Process Flow Diagram:** See drawings 31001-P-004 in Attachment 7 of MWF Part B Permit
47 Application.
48 – **Piping and Instrumentation Diagram:** See drawings 31001-P-016 in Attachment 7 of MWF
49 Part B Permit Application.
50 – **Key Components List:** See Table TP- 04 in the equipment and instrument list in

Attachment 8 of MWF Part B Permit Application.

- **Key Components Technical Specification:** See the technical specification package enclosed in Attachment 11 of MWF Part B Permit Application.
- **Key Control Devices:** See Table TP-04 in the equipment and instrument list in Attachment 8 of MWF Part B Permit Application.
- **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment 11 of MWF Part B Permit Application.
- **Interfacing Subsystems:** stabilization process vent subsystem (SB-09); containerized waste staging system (TT-01); liquid holding subsystem (TP-06); physical extraction subsystem (TT-05); container rinse subsystem (TT-06); and in-container mixing (TT-03).

3. Equipment and Process Description

Equipment Description: The liquid treatment system (TP-04) will have a container pump (PMP-0401), two 1,200 gallon stainless steel tanks (TK-0403 and TK-0406) two liquid filters (FLT-0404 and FLT-0410), two tank mixers (MX-0402 and MX-0405), two pumps (PMP-0409 and PMP-0411), associated piping, instrumentation, and controls.

The system is operated from a local control panel. For a campaign having numerous containers of similar compatible waste, one of the liquid treatment tanks may serve to hold the incoming waste while the other provides treatment. In this manner, the combined waste can be blended and an integrated sample can be extracted for analysis and treatment planning. Treated liquids from this tank system are pumped to local TICs.

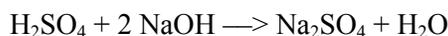
Neutralization is accomplished by adding waste and either acidic or alkaline chemicals in the tank to adjust the pH of the waste. The second method (deactivation) is accomplished by neutralization, chemical reduction, or chemical oxidation of water-reactive wastes. Reduction of oxidizers (such as sodium sulfate, sodium bisulfate, sodium trisulfate, or potassium hypochlorite), is accomplished by adding waste and reducing agents in the tank while the contents are being agitated. Oxidation of reducing agents is conducted in the same manner as the reduction process, with the exception that an oxidant is added to the tank in place of a reducing agent.

The specific pretreatment process for each waste stream is specified in a “process data sheet” (PDS) which is developed after careful consideration of the waste characteristics. If necessary, some properties of the waste are tested to evaluate the compatibility of the wastes for mixing (see WAP for compatibility tests procedure) or verifying the safety and effectiveness of a given chemical adjustment process. The PDS lists: 1) waste characteristics used for the decision making process including the volume, weight, and identification number of the waste subject to pretreatment; 2) LDR treatment requirements; 3) disposal requirements; 4) MWF treatment line designations; 5) batch size selection; 6) equipment inspection; 8) preventative measure requirements including equipment protection, reaction control, and worker protective equipment; 9) equipment and consumable requirements; 10) container selection; 11) process performance parameters and measurement methods; 12) reagent requirements; 13) transfers of waste to smaller reaction containers; 14) waste treatment operating procedures; 15) treatment verification procedures; 16) equipment cleaning and rinsing; and 17) disposition of the spent rinse solutions and secondary wastes. The PDS is prepared by the plant technical group. Before being implemented, the PDS is approved by the technical group and the operations group supervisors or their designated representatives.

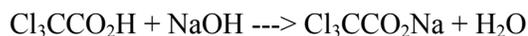
Neutralization (NEUTR): Liquid wastes having corrosivity characteristics are neutralized in a two step operation. First, a small quantity (less than or equal to 5 gallons) is diluted to a less corrosive condition

1 (pH greater than 3 and less than 11) in the liquid consolidation system (TP-09). The diluted liquid is
2 discharged into a TIC located beneath the hood sink. Next, the diluted solution is either further adjusted
3 in the TIC by adding additional reagents to the TIC or is sent to the liquid treatment tank for chemical
4 adjustment. The decision to use the TIC or the liquid treatment system (TP-04) for the second step of
5 chemical treatment depends on the size of the liquid batch being processed. If the total volume of the
6 batch, after chemical adjustment, is less than approximately 40 gallons, then it is treated in the TIC
7 located under the hood enclosure. If the volume of the batch is more than 40 gallons, then the liquid
8 treatment system (TP-04) may be used. This involves transferring the liquid from the TIC to one of the
9 two 1,200 gallon tanks in the liquid treatment system (TP-04) and adding reagent(s) directly to the tank
10 while the tank mixer is turned on.

11
12 Neutralization is performed by reaction with an appropriate acidic or alkaline reagent. For example, the
13 chemistry for neutralization of sulfuric acid (an inorganic acid with an acid strength of 98%) is achieved
14 by adding the acid to an alkaline solution, such as sodium hydroxide. Alternatively, calcium hydroxide
15 may be used in place of sodium hydroxide, with calcium salts being less soluble and more suitable for
16 stabilization/solidification, if that is the ultimate treatment. Other inorganic acids (also called mineral
17 acids) that can be similarly neutralized include hydrochloric, hydrobromic, nitric, and phosphoric acids.
18 The following is an example of the reaction for neutralizing a high pH alkaline solution (such as sodium
19 hydroxide) with an acid such as sulfuric acid.



21
22
23 Organic acids may be similarly neutralized, as needed for treatment by the subsequent process (e.g.,
24 stabilization). Most simple organic acids are not strong acids in and of themselves (pH value of
25 approximately 5) and would not be regarded as corrosive characteristic wastes. Strong organic acids that
26 are characteristic wastes include concentrated solutions of trichloroacetic, trifluoroacetic, and oxalic
27 acids, which are neutralized by alkaline solutions according to the following reaction.



29
30
31 In order to minimize the waste volume, neutralization by the use of acids and alkaline solutions are
32 pursued whenever it is safe to do so. Water dilution alone to achieve pH adjustment is pursued as the last
33 resort because of the excessive increase in the volume of waste requiring treatment and disposal (e.g.,
34 dilution of an acid or base with water alone to achieve the desired pH will result in approximately 10 fold
35 volume increase for changing the pH value by one unit).

36
37 **Deactivation (DEACT):** As with the neutralization process, liquid wastes having reactivity
38 characteristics are deactivated in a two-step operation. First, a small quantity (5 gallons or less) is diluted
39 to a less reactive state in the liquid consolidation system (TP-09). The diluted liquid is discharged into a
40 TIC and brought to the liquid treatment system (TP-04). Deactivation by neutralization was discussed
41 above. Other deactivation processing examples are described in the liquid consolidation system (TP-09)
42 descriptions in section 3.9.

43 44 **4. Operation and Control Description**

45
46 In addition to filtration and deactivation, other major operations conducted in TP-4 include receiving
47 incoming liquid waste, transferring the treated waste to other tank systems, and tank rinsing.

48
49 **Receiving Incoming Liquid Waste:** Liquid waste in containers or TICs is brought to the holding tank in
50 TP-04 by fork lift. A pallet with secondary containment is placed under the container during the transfer

1 operations. If the container is a standard drum (up to 85 gallons), a modified cart with secondary
2 containment features is used to transport the liquid waste. A portable container pump (PMP-0401) is then
3 mounted on the container and the assembly is positioned immediately beneath a vented hood. A flexible
4 pipe is used to connect the pump outlet to the holding tank inlet line. Quick-disconnect fittings are used.
5 These are dry quick-disconnect fittings which prevent dripping during connection and disconnection of
6 the flexible pipe.

7
8 One of the two liquid tanks (TK-0403 or TK-0406) is selected as the holding tank and valve alignment is
9 adjusted accordingly. The container pump (PMP-0401) is then turned on to transfer liquid waste from the
10 incoming container to the holding tank. When the container is empty, a small amount of clean water
11 (approximately 5% by volume) is added to the container to flush residual waste out of the container,
12 pump, and flexible lines. To the fullest extent possible, the rinse water remaining in the container, pump,
13 and flexible line is drained into the holding tank. The pump and the flexible lines are disconnected above
14 an area protected by a drip pan. The pump and flexible pipe are placed in their storage location, equipped
15 with a pan to catch any possible drips from the pipe or pump. The empty waste container is then sent to
16 the container rinse system (TT-06) for cleaning.

17
18 **Filtration:** As the raw liquid is pumped out of the in-coming container and into the holding tank, the
19 waste is filtered if specified by the PDS. If filtration is specified, the waste is pumped through a tank inlet
20 filter (FLT-0404) to filter out suspended solids. A filter bag, or a strainer with the specified filtration
21 efficiencies, is inserted into the filter housing. A local differential pressure gauge (PDI-0404) is used to
22 prompt filter replacement. Spent filter bags are removed and packaged into canisters and forwarded to
23 other systems for treatment (e.g., GASVIT™ system).

24
25 A second liquid bag filter (FLT-0410), of equivalent dimensions and design, is placed downstream of the
26 liquid treatment pumps. This filter, which is also an optional step, is operated in the same manner as the
27 tank inlet filter (FLT-0404), mentioned in the previous paragraph.

28
29 **In-Process Sampling:** In-process sampling and analysis can be performed once the waste (or a
30 combination of compatible wastes) has been transferred into the liquid treatment tanks. To accomplish
31 this, the liquid treatment pump (PMP-0409 or 0411) and system valves are aligned to re-circulate the
32 liquid. The tank mixer (MX-0402 or 0405) is then powered to agitate the raw waste solution. The liquid
33 treatment pump is then powered to re-circulate the waste to obtain a homogeneous batch. A representative
34 sample is then extracted from the sample port on the re-circulation line and sent to the lab for analysis.

35
36 **Treatment:** When an approved PDS is in hand, the operator connects a portable chemical pump (PMP-
37 0412) to the appropriate reagent drum. The liquid treatment tank mixer (MX-0402 or MX-0405) is turned
38 on and the neutralization reagent is metered into the tank through the container pump (PMP-0412).
39 Sodium hydroxide (or another similar reagent) is used as an additive for neutralizing acidic waste and
40 sulfuric acid is used for alkaline waste. Treatment by deactivation is performed by water reactive
41 processing operations. The reagents used for deactivation are determined on a case-by-case basis. The
42 tank temperature is closely monitored using a temperature sensor (TI-0403 or TI-0406) and the pH is
43 measured by a pH monitor. The addition of neutralization or other reagents is manually-controlled based
44 on these process parameters. The addition of the reagents is slowed if the temperature of the tank exceeds
45 100° Fahrenheit. The reagent is added to the waste batch for a predetermined quantity or until the waste
46 is rendered neutralized, whichever comes first. Additional waste sampling can be performed to confirm a
47 neutral pH level.

48
49 **Transferring Output Waste:** Following treatment, the treated liquid waste is pumped from the liquid
50 treatment tank(s) into a TIC. If filtration of the output waste is specified by the PDS, the operator aligns

1 the system valves to re-circulate the waste through the downstream liquid bag filter (FLT-0410) and back
2 to the originating liquid treatment tank. The tank mixer is then powered to re-suspend any settled solids
3 in the waste. The liquid treatment pump (PMP-0409 or PMP-0411) then re-circulates the waste solution.
4 The filter (FLT-0410) is valved in if filtration of suspended reagent solids is specified by the PDS. Once
5 the waste solution has been filtered, the system valves are re-aligned to transfer the waste to a receiving
6 TIC next to the tank. Once a TIC has been filled, it can be quickly isolated from the system and
7 disconnected using dry disconnects. Additional TICs can then be quickly connected and filled until the
8 entire liquid waste batch is transferred out of the liquid treatment tanks.

9
10 **Tank Rinse:** When the liquid treatment tank(s) are completely emptied of the waste batch, fresh water is
11 carted into the system in a 55 gallon drum. The container pump (PMP-0401) is connected to the drum
12 and is used to spray fresh water onto the internal liquid treatment tank walls to rinse the tank(s). Liquid
13 treatment pump (PMP-0409 and/or PMP-0411) then re-circulates the rinsate through the system. If the
14 PDS requires chemical adjustment of the rinsate a sample can be extracted from the re-circulation line and
15 analyzed. The rinsate is then combined with its original treated waste batch. Rinsing is repeated as
16 required to remove detectable traces of waste constituents from the liquid treatment system.

17
18 **5. Air Emissions**

19
20 For both worker safety and contamination control, process ventilation to this system is established and
21 confirmed prior to conducting liquid treatment operations. The process ventilation system (SB-09)
22 provides airspace confinement of waste-bearing equipment and maintains that equipment and/or area at a
23 negative air pressure relative to the immediate room environment. The control of fugitive emissions is
24 provided by venting the airspace above the incoming waste container and liquid treatment tanks (TK-
25 0403 and 0406). Local differential pressure alarms (PDI-0418, PDI-0403, PDI-0406, and PDI-0417)
26 provide the operator with a positive indication that the process ventilation system is operating.

27
28 **6. Compliance with Process and Safety Performance Requirements**

29
30 The process performance requirement during the neutralization operations is adjusted to a pH range
31 greater than 6 and less than 8. The design of the system is to receive incoming waste with a pH of greater
32 than 2, but less than 12. Liquid wastes in this pH range do not typically fall under the RCRA definition of
33 corrosivity characteristics wastes. The waste stream performance requirements specified in the PDS
34 consider the regulatory performance requirements as well as additional parameters that may be needed for
35 proper stabilization of the waste. For example, the desired pH for most stabilization reagents is in the 6-8
36 range.

37
38 The temperature of the solution is the process safety parameter. In the treatment tank, the tank
39 temperature of the liquids is constantly monitored and the chemical addition pump is automatically
40 stopped when the temperature reaches 140° Fahrenheit. Other safety performance requirements are
41 preventing potential spills and preventing mixing of incompatible chemicals and reagent. The system
42 operates at temperatures below 140° Fahrenheit and a fire potential is not a key safety concern.

43
44 To ensure a safe and reliable treatment operation, a PDS is developed and the required performance and
45 detailed processing procedures are specified for the given waste stream. The process data sheet is
46 prepared before proceeding with the treatment. The performance specification and operating procedures
47 take into account the specific characteristics of the given waste stream and treatability tests may be
48 performed if deemed necessary.

49
50 The following design and administrative features are provided for compliance of the system with the

1 process and safety performance requirements.

2
3 **Reagent Quality Control:** The composition of the reagents and the required quality control will be
4 specified by the PDS. Reagent quality is controlled by obtaining from the supplier a certificate of
5 conformance attesting that the supplied product meets the specified composition and properties.

6
7 **Process Parameter Control:** Process chemistry control requirements are established by reviewing waste
8 characteristics and, if needed, performing treatability tests. Process controls parameters such as pH and
9 temperature are specified in the PDS. In the liquid treatment system (TP-04), the temperature and pH are
10 measured by a continuous monitor installed at the tank and the tank discharge pump outlet, respectively.
11 In addition, the treatment tanks can be sampled to measure the pH by litmus or analytical methods.

12 **Temperature:** The maximum temperature in the tank is controlled to remain below 140° Fahrenheit.
13 The temperature is controlled by the design of the waste reagent formulation. A high temperature alarm
14 will automatically cut-off the waste and reagent feed pumps.

15
16 **Feed Rate and Sequence of Water and Reagent Mixing:** The mixing requirements are carefully
17 reviewed and specified by the PDS. The PDS instructions are used during the treatment step and
18 documented.

19
20 **Minimizing Emissions:** Emissions from the system are minimized by venting the tank and the transfer
21 containers to the STB process vent system. The tank and container spaces are kept under negative
22 pressure (-0.05 inch w.g. maximum). This process vent system uses a carbon filter to treat any particulate
23 and organic vapors that may be generated during the stabilization operation. The vent from the tank is
24 treated for a second time by discharging the STB process vent system exhaust to the STB confinement
25 system, which has HEPA filters and carbon filters.

26
27 **Minimizing Overfill and Spills:** Level controllers are provided and mounted above the tanks and
28 receiving TICs. A high-level alarm stops all of the feed lines to the tank and the container. Also, the
29 system is installed above a secondary containment pan which is designed to capture the entire liquid in
30 the tank in the event of a spill. TICs are placed on top of a portable secondary containment pallet during
31 the transport, unloading, and filling operations.

32
33 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste
34 characterization and compatibility evaluations per WAP.

35
36 **Corrosion Protection:** The tank system is designed and certified for a pH range of greater than 2 and
37 less than 12.5. Only wastes in this pH range are allowed in the tank system. A corrosion chart is used to
38 check the construction material of the tank system and any TIC used in the operations against the
39 corrosion properties of the waste. Wastes not compatible with the tank are not processed.

40
41 **7. P&P Procedures**

42
43 Equipment inspection, maintenance, and calibration are performed on this system based on the
44 manufacturer's recommendations. The following additional inspections are conducted as a part of the
45 MWF P&P procedures.

46
47 **Reagent Feeder Calibrations:** The reagent feeders are checked for calibration and proper operation.
48 Inspection frequency is at least once every 90 days when in use.

49
50 **Instruments Measuring Process Parameters:** The temperature and pH sensors and indicating devices

1 are checked for proper operation and calibration. Inspection frequency is every 90 days. Calibration
2 frequency of these instruments is once every 180 days or as recommended by the manufacturer,
3 whichever is shorter.

4 **System Confinement:** System confinement is checked by reading the negative pressure in the
5 differential pressure indicator alarms (PDI-0418, PDI-0403, PDI-0406, and PDI-0417). If the system
6 internal pressure is greater than -0.05 inch w.g., then the system is shut down. Inspection frequency is
7 daily at the beginning of the morning shift when in use.

8
9 **Differential Pressure Indicators (PDI-0418, PDI-0403, PDI-0406, and PDI-0417):** These instruments
10 are inspected for problems relative to the proper indication of the desired differential pressure in the
11 system. Both the sensing device and the indication dial are checked for operability and calibration.
12 Inspection frequency is at least once every 90 days when in use.

13
14 **Spill Control:** The waste feed, reagent feed, and the tank areas are inspected for spills of liquid waste.
15 Any spilled material is cleaned by a vacuum device and placed inside a container for processing along
16 with the given waste processing campaign. Inspection frequency is daily at the end of the last shift when
17 in use.

18
19 **Equipment Leaks:** Tank system, pumps, piping, and valves are visually inspected for indications of any
20 corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
21 once every 90 days when in use.

22
23 **8. Process Throughput**

24
25 This pretreatment system is designed for an operating capacity of 2 gallons per minute. The tank system
26 is designed to receive a total of 8,000 lbs/day of aqueous waste.

27
28 **9. Secondary Containment**

29
30 The two tanks are mounted above a metal pan. The pan-free volume is designed to hold the entire volume
31 of one tank.

32
33 A portable secondary containment pallet is placed under any liquid containing TIC or any liquid waste
34 container that is brought to the system for liquid transfer operations.

35
36 The free volume in the secondary containment space takes into account the space occupied by the
37 container or any equipment that is placed inside the containment area during the normal operation of the
38 system.

39
40
41 **3.5 System TP-10, Extraction System**

42
43 **1. General Function**

44
45 The function of the extraction system TP-10 is to decant/separate liquids from solid wastes and also
46 perform the treatment activities of solvent extraction, chemical oxidation, chemical reduction,
47 deactivation, precipitation or washing/rinsing. Operations conducted by this system include: receiving
48 containerized waste, receiving various reagents, separating liquids from the solid waste via
49 decanting/pumping, washing the solids with appropriate solutions, grouting the washed solids, closing the
50 waste containers and transporting the filled containers to a waste storage area. For washing operations,

1 this system is used to decant/pump out liquids followed by washing and rinsing of solids and
2 decanting/pumping out of the solutions. The treated or washed solids are placed into containers which are
3 grouted (or undergo further treatment), capped and transported a containerized waste storage or inspected
4 for shipment off-site. The extraction system uses two electric mixer units mounted on to mobile steel
5 frames equipped with pumps, instrumentation, and controls. A mixer is shown on drawing DWG-TP10-
6 001, included in Section 5.3 of this attachment. After a waste containing a mixture of solids and liquids is
7 received in the mixer, decanting is accomplished by tilting the extraction unit to a position angled from
8 the vertical. A screen may be secured to the mixer opening to allow the liquids to drain into a container
9 while the solids are retained inside the mixer as shown in section 5.2.

10
11 Batches of incoming solid/liquid TSCA-regulated PCB waste (DU chips or metal turnings, for example),
12 are treated by washing the solids in the two extraction mixers. Before washing, liquids will be decanted
13 off of the solids and tested for PCB content, containerized and shipped off-site for disposal as appropriate.
14 Following washing and the decanting off of the first washing solution, stored on-site until the solids are
15 transferred to the second extraction mixer for the second washing step. [One mixer is dedicated for the
16 first wash or high concentrations of PCBs. The second mixer is dedicated for the second wash, or low
17 concentrations of PCBs.] The wash liquids are tested for PCB content and either recycled within the
18 system for use again or containerized and shipped off-site for appropriate disposal. During the
19 washing/rinsing activities when the mixer is agitating the solid/liquid mixture, a lid is closed over the
20 opening of the mixer, preventing emissions.

21
22 The extraction system (TP-10) also includes one grout mixer. The grout mixing unit is not a RCRA or
23 TSCA regulated unit since it will be used for mixing appropriate raw materials to produce a grout. No
24 waste materials will be handled in the grout mixer.

25
26 If the treated waste is a pyrophoric material, the material may be covered in mineral oil before further
27 treatment. The mineral oil will later be removed and retained for further use as practicable and the treated
28 waste may be further treated. If grouting of the wastes is going to occur, the solids will be transferred to a
29 final disposal container already containing grout on the bottom. A grout mixture will then be poured over
30 the solids. After allowing the grout in the container to be cured, the container is capped and transported
31 to a waste container storage area for inspection for shipment off-site. TP-10 may be used to process
32 TSCA-regulated wastes. Non-TSCA-regulated PCB wastes and non-PCB wastes can also undergo
33 treatment in these two extraction mixers. If TSCA-regulated wastes are treated in the mixers, they will be
34 cleaned by either triple rinsing or double wash/rinse procedure prior to processing non-TSCA wastes.

35
36 Due to the reactive nature of the material, strict precautions will be taken per WAC 173-303-395(1) to
37 prevent accidental ignition or reaction, including taking precautions to separate and protect the waste
38 from sources or ignition or reaction such as open flames, smoking, cutting and welding, hot surfaces,
39 frictional heating, sparks, spontaneous ignition, and radiant heat. In accordance with WAC 173-303-
40 630(8)(b), all pyrophoric, ignitable, or reactive wastes will be managed in accordance with conditions of a
41 current City of Richland fire permit in accordance with MWOP 302, Temporary Operating Instructions.

42
43
44 The treatment process would consist of the following steps:

45
46 **Decant of Packing Oil:** An up to twelve (12) cubic feet (~90 gallons) extraction mixer would be
47 positioned vertically and using a fork-lift mounted drum dumper, the drum containing the waste
48 would be poured into the mixer. A screen would be secured onto the opening of the mixer and the
49 mixer would be turned to allow the liquids to drain out into a container (e.g., 55-gallon poly drum or
50 poly tote.)

1
2 **First Wash:** Following the decanting of the packing oils the mixer would be turned to vertical
3 position and then approximately 20 to 25 gallons of a solvent would be placed into the mixer. The
4 mixer would be started and allowed to rotate for a pre-determined amount of time to allow for the
5 washing of the waste. Upon completion of the washing of the waste, a screen would be secured onto
6 the opening of the mixer and the mixer would be turned to allow the first wash of the waste to drain
7 out into a container (e.g., 55-gallon poly drum or poly tote.) The solvent utilized for the first wash
8 would have a PCB solubility is at least five (5) percent by weight. A majority of sludge-like materials
9 (i.e., fines) will remain with the first wash. Upon completion of the decanting of the liquid the
10 extraction mixer will be turned to the upright position and the screen will be removed from the
11 extraction mixer. The extraction will once again be turned to the vertical position and the solids will
12 be poured into a container (e.g., 55-gallon poly drum or poly tote.) The residual solids in the
13 extraction mixer will be manually removed by scraping out of the extraction mixer using non-
14 sparking tools and into the container. The container will be transported to next extraction mixer unit
15 for the second wash. The solids will be placed into the extraction mixer by using a standard fork lift
16 mounted drum dumping device.

17
18 **Second Wash:** Then approximately 20 to 25 gallons of water and detergent would be placed into the
19 mixer. The mixer would be started and allowed to rotate for a pre-determined amount of time to allow
20 for the second washing of the waste. Upon completion of the washing of the waste, the screen would
21 be secured onto the opening of the mixer and the mixer would be turned to allow the second wash of
22 the waste to drain out into a container (e.g., 55-gallon poly drum or poly tote.) Upon completion of
23 the second wash draining from the mixer, the screen would be removed from the opening of the mixer
24 and the mixer would be turned allowing the washed waste to be poured into a container. The residual
25 solids in the extraction mixer will be manually removed by scraping out of the extraction mixer using
26 non-sparking tools and into the container. The container will be transported to a pre-grouted disposal
27 container (e.g., 55-gallon drum, B-12, or B-25). Or if grouting operations will not take place within
28 one (1) hour the waste will be covered with mineral oil.

29
30 **Grouting:** The waste would be removed from the container using non-sparking tools and placed into
31 prepped container. The waste will be raked out to evenly spread the cleaned waste uniformly over
32 prepped disposal container with a minimum of two inches grout on the bottom. Then the disposal
33 container may be transported by fork-lift to the grout mixer and the disposal container would be
34 grouted. This layering of grout and solids is performed until the disposal container is filled. Or if
35 grouting operations will not take place within one (1) hour the waste will be covered with mineral oil.

36
37 **Characterization:** Based on the verification analyses, the contents of mineral oil, solvent, and wash
38 water containers will be characterized for disposal purposes. Each container of these liquids would be
39 sampled and analyzed for PCB concentration. Liquids with greater than 50 ppm of PCBs would be
40 sent off-site to an appropriate disposal facility in accordance with 40 CFR 761.60(a). Prior to grouting
41 a sample of the washed waste would be taken and analyzed for organic and metal underlying
42 hazardous constituents (UHCs). If washed waste indicates organic UHCs above the land ban
43 standards, it would be rewashed until the washed waste meets land ban standards for organic UHCs.
44 If the washed waste has metal UHCs above the land ban standards, an appropriate recipe would be
45 included in the grout to stabilize the metals. A sample of grouted waste would be taken to ensure that
46 it meets land ban standards for the metals UHCs. Grouted waste will be disposed of at a permitted
47 landfill off-site. All sampling will be performed in accordance with the WAP.

1 **2. Reference Documents**

- 2
- 3 – **Process Flow Diagram:** See process flow diagram included in this Attachment (Section 5.1)
- 4 – **Key Components Technical Specification:** See Section 5.3 of this Attachment
- 5 – **Interfacing Subsystems:** Waste Inspection in STB.
- 6

7 **3. Equipment and Process Description**

8

9 **Equipment Description:** The extraction system (TP-10) will have a three container pumps, two
10 90-gallon carbon steel extraction mixers (EX-01 and EX-02), and associated piping, instrumentation, and
11 controls.

12

13 Each extraction mixer is operated from a local control panel. For a campaign having numerous containers
14 of similar compatible waste, the two extraction mixers will campaign the waste in a cascade manner. In
15 this manner, one extraction mixer will be dedicated to handle waste with concentrated organics and the
16 second extraction mixer will be dedicated to handle waste with dilute concentrations of organics. A
17 sample of the solids can be extracted for analysis and treatment planning after the rinsing the solids. The
18 first and second wash liquids from these extraction mixers will be kept segregated for disposal purposes.

19

20 The first wash is accomplished by adding waste, decanting off the packaging oil and washing the
21 remaining solids with an appropriate solvent. The wash solution is decanted and then the washed solids
22 are manually transferred to the second extraction mixer for the second wash. Washing in the second
23 extraction mixer will be performed with detergent and water. The second wash will be decanted and
24 remaining solids sampled. All sampling will be performed in accordance with the WAP.

25

26 The specific pretreatment process for each waste stream is specified in a “process data sheet” (PDS)
27 which is developed after careful consideration of the waste characteristics. If necessary, some properties
28 of the waste may be tested to evaluate the compatibility of the wastes for disposal (see WAP for
29 compatibility tests procedure) or verifying the safety and effectiveness of a given chemical properties for
30 washing/rinsing. The PDS may list the following: 1) waste characteristics used for the decision making
31 process including the volume, weight, and identification number of the waste subject to treatment;
32 2) LDR treatment requirements; 3) disposal requirements; 4) MWF treatment line designations; 5) batch
33 size selection; 6) equipment inspection; 7) equipment calibration; 8) preventative measure requirements
34 including equipment protection, reaction control, and worker protective equipment; 9) equipment and
35 consumable requirements; 10) container selection; 11) process performance parameters and measurement
36 methods; 12) reagent requirements; 13) transfers of waste to smaller reaction containers; 14) waste
37 treatment operating procedures; 15) treatment verification procedures; 16) equipment cleaning and
38 rinsing; and 17) disposition of the spent rinse solutions and secondary wastes. The PDS is prepared by
39 the appropriate operations group. Before being implemented, the PDS is approved by supervisors or their
40 designated representatives.

41

42 **4. Operation and Control Description**

43

44 **Receiving Incoming Liquid Waste:** Waste in containers will be brought to the extraction mixers by fork
45 lift. A pallet with secondary containment is placed under the container(s) during the transfer operations.
46 If the container is a standard drum (up to 85 gallons), a modified cart with secondary containment features
47 is used to transport the waste. One of the two extraction mixers (EX-01 or EX-02) will have been
48 selected as the extraction mixer to receive the concentrated liquid (i.e., packing oil) and solid waste for
49 washing. The other extraction mixer will be used for rinsing of the solids. A standard drum dumping

1 device mounted to forklift will be use to transfer the waste into the extraction mixer.
2

3 The two extraction mixers will be modified by welding a flange to the opening of the mixer. This will
4 allow the screen to be secured by bolting the screen on to the mixer. The screens will be fashioned out of
5 solid plate of steel with three-eighth inch perforations on a one-half inch center-to-center triangular
6 spacing. The design of the screen will allow the sludge-like materials and liquids to be separated from the
7 larger particles during decanting.
8

9 **Decanting:** The liquid is poured out of the extraction mixer and into a container, positioned underneath
10 the extraction mixer leaving the large solids behind. Due to construction of the screen a majority of the
11 sludge-like materials (i.e., fines) will remain with the liquids during the decanting step.
12

13 **Washing:** The first wash of the solids will be accomplished by using an appropriate solvent. The second
14 wash of the solids will be accomplished by using an appropriate solution such as industrial water soluble
15 detergents.

16 **Transferring Output Waste:** Following decanting of liquids (e.g., packing oils, first wash, second
17 wash) solids will be removed from the extraction mixers into appropriate containers pending further
18 processing. Removal of solids will occur by first removing the screen and then turning the extraction
19 mixers from the upright to the horizontal position and allowing the solids to pour into a container. Any
20 remaining solids will be scraped out of the extraction mixers using non-sparking tools.
21

22 **In-Process Sampling:** In-process sampling and analysis can be performed once the waste has been
23 rinsed with detergent and water. To accomplish this, a grab sample of solids can be extracted. All
24 sampling will be in accordance with the WAP.
25

26 **Staging/Storage of waste following sampling:** Depending on analytical results staging of waste near
27 processing units may occur for up to seven days. If the analytical results are expected to exceed seven
28 days the containers will be transported to Covered Storage Pad (Room 4) for the storage of waste.
29

30 **Grouting:** When characterization data is available supporting LDR requirement, the operator prepares an
31 appropriate grout mixture for encapsulating the washed solids. The grout mixer (EX-03) will be used and
32 the grouting reagent will be prepared and will be poured onto the washed solids in the disposal container.
33 Next the solids are transferred into the disposal container and ‘raked’ out as layer on top of the grout.
34 Then a grout layer is poured over the solids encapsulating them. This layering of grout and solids is
35 performed until the disposal container is filled.
36

37 **Extraction Mixer Decontamination:** Prior to campaigning with non-TSCA waste (i.e., mixed waste
38 meaning RCRA only waste) the extraction mixer(s) may be tripled rinsed with an appropriate solvent
39 comprising of ten (10) percent by volume of the extraction mixer(s) volume. Triple rinsing does not
40 require confirmatory sampling. Or decontamination may be performed by double washing and rinsing
41 procedure. Following a double wash/rinse procedure confirmatory sampling may be performed.
42 Decontamination for TSCA may be repeated as required to remove detectable traces of constituents from
43 the extraction units. The rinsate will be characterized in accordance with WAP in order to determine the
44 appropriate disposal requirements.
45

46 **5.0 Air Emissions**
47

48 Little or no emissions are expected from open containers or the extraction mixers. Nonetheless, for
49 worker safety ambient air monitoring will be performed for PCBs per the sampling and analysis plan

1 attached to the WAP (Attachment CC, Attachment 1).
2

3 **6.0 Compliance with Process and Safety Performance Requirements**
4

5 The temperature of the solids is a process safety parameter. Temperature of the uncovered solids will be
6 handled administratively and through monitoring of the temperature. Operations are automatically
7 stopped when the temperature exceeds 130° Fahrenheit. Other safety performance requirements are
8 preventing potential spills and preventing mixing of incompatible chemicals. The system operates at
9 temperatures below 130° Fahrenheit hence the fire potential should be minimal. To ensure a safe and
10 reliable treatment operation, a PDS is developed and the required performance and detailed processing
11 procedures are specified for the given waste stream. The process data sheet is prepared before proceeding
12 with the treatment. The performance specification and operating procedures take into account the specific
13 characteristics of the given waste stream and recipe development tests may be performed if deemed
14 necessary. The following design and administrative features are provided for compliance of the system
15 with the process and safety performance requirements.
16

17 **Reagent Quality Control:** The composition of the reagents and the required quality control will be
18 specified by the PDS. Reagent quality is controlled by obtaining from the supplier product that meets the
19 specified composition and properties.
20

21 **Process Parameter Control:** Process chemistry control requirements are established by reviewing waste
22 characteristics and, if needed, performing recipe development tests. Process controls parameters such as
23 pH and temperature are specified in the PDS. In the extraction system (TP-10), the temperature of the
24 uncovered solids will be measured with a hand held infrared temperature indicator.
25

26 **Temperature:** The maximum temperature of the solids is controlled to remain below 130° Fahrenheit.
27 The temperature is controlled administratively by minimizing the timeframes the solids are uncovered
28 during processing. A temperature exceeding 130° Fahrenheit will automatically suspend operations.
29 Additionally, if the solids are going to be uncovered for more than one (1) hour the solids will be covered
30 with mineral oil.
31

32 **Feed Rate and Sequence of Water and Reagent Mixing:** The mixing requirements are carefully
33 reviewed and specified by the PDS. The PDS instructions are used during the washing and grouting steps
34 and documented.
35

36 **Minimizing Overfill and Spills:** The extraction system is installed temporarily mounted in room 9 at a
37 height that will allow the extraction mixers to discharge into containers. Secondary containment is
38 provided for by a metal pan. The pan-free volume is designed to hold the entire volume of one extraction
39 mixer.
40

41 A portable secondary containment pallet is placed under any liquid containing TIC or any liquid waste
42 container that is brought to the system for liquid transfer operations.
43

44 The free volume in the secondary containment space takes into account the space occupied by the
45 container or any equipment that is placed inside the containment area during the normal operation of the
46 system.

47 Containers (e.g., 55-gallon drums or poly totes) are placed on top of a portable secondary containment
48 pallet during the transport, unloading, and filling operations.
49

50 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste

1 characterization and compatibility evaluations per WAP. The organic solvent(s) and detergents to be used
2 will be or have been demonstrated to be compatible with processing of the waste.

3
4 **Corrosion Protection:** Wastes not compatible with the extraction mixers will not be processed.

5
6 **7. P&P Procedures**

7
8 Equipment inspection, maintenance, and calibration are performed on this system based on the
9 manufacturer's recommendations. The following additional inspections are conducted as a part of the
10 MWF P&P procedures.

11
12 **Instruments Measuring Process Parameters:** The temperature indicating devices are checked for
13 proper operation and calibration. Calibration frequency of these instruments is once every 180 days or as
14 recommended by the manufacturer, whichever is shorter.

15
16 **Spill Control:** Areas around the extraction mixers are inspected for spills of liquid waste. Any spilled
17 materials are removed and placed inside a container for processing along with the given waste processing
18 campaign. Inspection frequency is daily at the end of the last shift when in use.

19
20 **Equipment Leaks:** Extraction mixer system, pumps, and piping are visually inspected for indications of
21 any corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
22 once every 90 days when in use.

23
24 **8. Process Throughput**

25
26 This extraction system is a batch system designed for approximately 78,500 gallons or 1400 drum
27 equivalents per year.

28
29 **9. Secondary Containment**

30
31 The two extraction mixers are temporarily mounted in room 9 in the STB building. Any spillage of
32 liquids from this system is held in the secondary containment system by a metal pan.

33
34 A portable secondary containment pallet is placed under any liquid waste container that is brought to the
35 system for liquid transfer operations.

36
37 The free volume in the secondary containment space takes into account the space occupied by the
38 container or any equipment that is placed inside the containment area during the normal operation of the
39 system.

40
41 **3.6 System TP-06, Liquid Holding Tank System**

42
43 **1. General Function**

44
45 The function of the liquid holding tank system (TP-06) is to receive and treat liquid wastes containing low
46 concentrations (less than 1%) of dissolved metals and organic compounds. The system is capable of
47 removing metal and organic contaminants including the final polishing of liquid wastes treated by other
48 systems. Other purposes of the treatment are to provide opportunities for reuse of the treated liquid waste
49 when such a reuse is practical, cost effective, and allowed by the MWF part B permit. The pretreatment
50 processes comply with the RCRA LDR treatment standards of chemical oxidation (CHOXD) by UV

1 oxidation and carbon filtration (CARBN) as described in federal regulations 40 CFR 268.42 and 268.45
2 and incorporated by reference in WAC 173-303-140(2)(a).

3
4 **2. Reference Documents**

- 5
- 6 **Process Flow Diagram:** See drawings 31001-P-004 in Attachment 7 of the Part B Permit
- 7 Application.
- 8 **Piping and Instrumentation Diagram:** See drawings 31001-P-018 in Attachment 7 of the Part
- 9 B Permit Application.
- 10 **Key Components List:** See Table TP-06 in the equipment and instrument list in Attachment 8 of
- 11 the Part B Permit Application.
- 12 **Key Components Technical Specification:** See the technical specification package in
- 13 Attachment 11 of the Part B Permit Application.
- 14 **Key Control Devices:** See Table TP-06 in the equipment and instrument list in Attachment 8 of
- 15 the Part B Permit Application.
- 16 **Instrument Data Sheets:** See the technical specification package that is enclosed in
- 17 Attachment 8 of the Part B Permit Application.
- 18 **Interfacing Subsystems:** STB process vent subsystem (SB-09); containerized waste staging
- 19 system (TT-01); liquid treatment system (TP-04); dryer system (TT-05); container rinse system
- 20 (TP-08); in-container mixing (TT-03).
- 21

22 **3. Equipment and Process Description**

23
24 The liquid treatment system (TP-06) has two 1,200 gallon tanks, two tank mixers, two pumps, a carbon
25 filter, an ion-exchange unit, and a UV oxidation unit including all of the related piping, valve,
26 instrumentation, controls, and instrumentation needed to perform the specified treatment.

27 Wastes are brought to this system by a TIC or in their original containers. The liquid holding system
28 employs a granular activated carbon adsorber, an ion-exchange unit, and UV oxidation for removal and/or
29 destruction of small amounts of organic material (e.g., hydrocarbons, alcohol, ketones, volatile organic
30 compounds, and aromatics) followed by the removal of dissolved metals and ionic compounds in the
31 incoming liquid waste. Treatment by the different processing methods is optional and is selected based
32 on the input waste characteristics and the ultimate waste treatment objectives which are as follows:

- 33
- 34 1. Removal of organic or inorganic contaminants to allow the waste to meet the LDR treatment
- 35 standards of CARBN or CHOXD.
- 36 2. Removal of organic or inorganic contaminants so that the waste meets the leachability
- 37 requirements after it is stabilized.
- 38 3. Removal of contaminants to a cleanliness level that allows for the reuse of the waste.
- 39

40 **Carbon Adsorption:** The activated carbon filter is provided to remove chlorine and some organics in the
41 feed water. The removal is an adsorption process. There are two carbon beds, each having one layer of
42 filter media and several layers of carbon media with the least dense carbon layer on top and the most
43 dense (quartz) layer at the bottom. The carbons are used in regeneration or non-regenerative modes,
44 which ever is most effective for the given waste stream.

45
46 **UV Oxidation:** UV oxidation is used as a polishing step to reduce total organic carbon. Low-pressure
47 mercury discharge lamps are used to generate the UV energy. The UV light rays produced by each lamp
48 efficiently pass through the lamp housing and into the surrounding light flowing through the UV
49 treatment chamber. This UV energy is sufficient for the effective reduction of the oxidizable carbon in

1 the waste. The UV energy promotes free radicals in varying degrees of photo-chemical excitation. The
2 hydroxyl (OH-) free radicals break various chemical bonds of organic matter which in turn produce chain
3 reactions oxidizing most organic matter into CO₂ and H₂O.

4 **Ion Exchange:** A double-bed ion exchange, one anion and one cation, is provided for the removal of
5 metals in the waste. The cation resin at the initial operation is in sodium form and the anion is in chlorine
6 form. The beds are used in series.

7
8 **4. Operating and Control Description**
9

10 Operations conducted in this system include: 1) preparing process data sheets (PDS); 2) receiving
11 incoming liquid wastes; 3) in-process sampling; 4) carbon filtration; 5) UV oxidation; 6) ion-exchange
12 filtration; 7) liquid holding; 8) transferring output waste; 9) tank rinsing; and 10) secondary waste
13 handling.

14
15 **Preparing Process Data Sheets (PDS):** The specific treatment process for each waste stream is
16 specified in a PDS which is developed after careful consideration of the waste characteristics. If
17 necessary, a treatability test is conducted to evaluate the compatibility of the wastes for the filtration
18 techniques. The format and content of the PDS are described in the waste analysis plan (WAP).
19

20 **Receiving Incoming Liquid Waste:** Liquid wastes in containers are brought to the liquid holding tanks
21 in TP-06 by fork lift. A pallet with secondary containment is placed under the container during the
22 transfer operations. If the container is a standard drum (up to 85 gallons), a modified cart with secondary
23 containment is used to transport the liquid waste. A portable container pump (PMP-0601) is then
24 mounted on the container and the assembly is positioned immediately beneath a vented hood. A flexible
25 pipe is used to connect the pump outlet to the holding tank inlet line. Dry quick-disconnect fittings that
26 prevent dripping during connection and disconnection of the flexible pipe, are used. One of the two
27 liquid tanks (TK-0603 or TK-0606) is selected as the receiving tank and valve alignment is adjusted
28 accordingly. The container pump (PMP-0601) is then turned on to transfer the liquid waste from the
29 incoming container to the holding tank. When the container is empty, a small amount of clean water
30 (approximately 5% by volume) is added to the container to flush residual waste out of the container,
31 pump, and flexible pipes. To the extent possible, the rinse water remaining in the container, pump, and
32 flexible pipe is drained into the designated liquid holding tank. The pump and flexible pipes are
33 disconnected above an area protected by a drip pan. The pump and flexible pipe are placed in their
34 storage location which is equipped with a pan to catch any possible drippings from the pipe or pump. The
35 empty waste container is then sent to the container rinse system (TT-06) for cleaning.
36

37 **In-Process Sampling:** In-process sampling is performed by turning on the liquid holding pump (PMP-
38 0609 or PMP-0611) and system valves are aligned to re-circulate the liquid. Then the tank mixer (MX-
39 0602 or MX-0605) is powered to agitate the liquid waste. Next, the liquid holding pump is powered to
40 re-circulate the waste to obtain a homogeneous batch. A representative sample is extracted from the
41 sample port on the re-circulation line and sent to the lab for analysis.
42

43 **Carbon Filtration:** If the waste has chlorine and organic compounds, carbon filtration is used by
44 circulating the waste through the activated carbon filters (FLT-0612). The operator aligns the liquid
45 holding pump (PMP-0609 or PMP-0611) and system valves to pump the liquid waste through the carbon
46 filters and immediately back to the originating holding tank. The liquid waste is re-circulated in this
47 manner for a predetermined time. At the end of the filtration step, an in-process sample is obtained to
48 assess the treatment performance. If additional removal is desired, the liquid is re-circulated through the
49 filters and sampled again. The skid-mounted carbon adsorption equipment provides automatic backwash
50 based on differential pressure, as well as automatic regeneration on either an electromechanical timer or

1 volume. The process is repeated until the desired removal levels are achieved.

2
3 **UV Oxidation:** When UV oxidation is desired, the liquid waste is routed through the UV oxidation
4 chamber (Z-0607) to oxidize/remove trace organic compounds that are dissolved in the liquid waste.
5 Once again, the operator aligns the liquid holding pump (PMP-0609 or PMP-0611) and system valves to
6 pump the liquid waste through the UV oxidizer and immediately back to the originating holding tank.
7 The liquid waste is re-circulated in this manner for a predetermined amount of time as defined in the
8 treatment procedure. At the end of the treatment step, an in-process sample is obtained to assess the
9 treatment performance. If additional removal is desired, the liquid is re-circulated through the filters and
10 sampled again. The process is repeated until the desired removal levels are achieved.

11
12 **Ion-Exchange Filtration:** When a waste stream must be treated by ion-exchange filters (FLT-0613), the
13 operator aligns the liquid holding pump (PMP-0609 or PMP-0611) and system valves to pump the liquid
14 waste through the ion-exchange bed and immediately back to the originating holding tank. The liquid
15 waste is re-circulated in this manner for a predetermined amount of time, as defined in the treatment
16 procedure. At the end of the filtration step, an in-process sample is obtained to assess the treatment
17 performance. If additional removal is desired, the liquid is re-circulated through the filters and sampled
18 again. The process is repeated until the desired removal levels are achieved. The skid mounted ion-
19 exchange system has automatic regeneration capability which can be initiated manually by the operator.

20
21 **Liquid Holding:** The incoming waste is stored in the holding tank until needed for reuse or for
22 stabilization. At the completion of a waste campaign, any unused liquid, including tank rinsate,
23 remaining in the holding tank(s) is forwarded to the in-container mixing system (TT-03) or other tank
24 systems for stabilization.

25
26 **Transferring Output Waste:** Following treatment, the treated liquid waste is pumped from the liquid
27 holding tank(s) to a TIC. Once a TIC has been filled (approximately 55 gallons), it will be quickly
28 isolated from the system and disconnected using dry quick-disconnects. Additional TICs can then be
29 quickly connected and filled until the entire liquid waste batch has been transferred out of the liquid
30 treatment tanks.

31
32 **Tank Rinsing:** When the liquid treatment tank(s) are completely emptied of the waste batch, fresh water
33 is carted into the system in a 55 gallon drum. Container pump (PMP-0601) is connected to the drum and
34 is used to spray fresh water onto the internal liquid treatment tank walls to rinse the tank(s). A liquid
35 treatment pump (PMP-0609 and/or PMP-0611) then re-circulates the rinsate through the system. If the
36 treatment plan requires chemical adjustment of the rinsate, a sample can be extracted from the re-
37 circulation line and analyzed. The rinsate is then combined with its original treated waste batch. Rinsing
38 is repeated as required to remove detectable traces of waste constituents from the liquid treatment system.

39
40 **Secondary Waste Handling:** Spent backwash and regenerative solutions from this system are pumped
41 to a TIC for use in either the stabilization operations in systems TT-01 or TT-02 or direct stabilization in
42 the in-container mixing system (TT-01). Options for the reuse of the treated water in other systems such
43 as the container rinse (TT-06) or physical extraction (TP-07) are also considered and pursued only if
44 allowed by the MWF Part B permit conditions. Spent carbon and ion-exchange media are removed from
45 filter vessels, containerized, and sent to one of the stabilization mixer systems (TT-02 or TT-03) or the
46 GASVIT™ system for treatment.

47
48 **5. Air Emissions**

49
50 The process ventilation system (SB-09) provides airspace confinement for waste-bearing equipment and

1 maintains that equipment and/or area at a negative air pressure relative to the immediate room
2 environment. The control of fugitive emissions is provided for the in-coming waste container pump
3 (PMP-0601) and the liquid holding tanks (TK-0603 and TK-0606). Local differential pressure alarms
4 (PDI-0618, PDI-0603, PDI-0606, and PDI-0617) provide the operator with a positive indication that the
5 process ventilation system is operating. Prior to conducting liquid treatment operations, process
6 ventilation to this system is established and confirmed.

7
8 **6. Compliance with Process and Safety Performance Requirements**
9

10 The process performance requirement during the carbon adsorption and UV oxidation is the level of
11 organic constituents in the treated liquid. The ion-exchange process performance is measured by the
12 conductivity level in the outlet. The performance is measured by in-process sampling and analysis. The
13 design of the system is based on reducing contaminants to below the EPA's maximum permissible
14 concentration limits for discharging waste waters. This is based on the assumption that the incoming
15 waste will have a total organic carbon (TOC) concentration of less than 500 parts per million (ppm) and a
16 total dissolved solids (TDS) concentration of less than 500 ppm. The design of the system is to receive
17 incoming waste with a pH of greater than 2 but less than 12. Liquid wastes in this pH range do not
18 typically fall under the RCRA definition of corrosivity characteristic wastes. The waste stream
19 performance requirements specified in the PDS consider the regulatory performance requirements, as well
20 as additional parameters that may be needed for the proper stabilization of the waste.
21 The safety performance requirements are preventing potential spills and the mixing of incompatible
22 chemicals. The system operates at temperatures below 140° Fahrenheit and fire potential is not a key
23 safety concern.

24
25 To ensure a safe and reliable treatment operation, a PDS is developed and the required performance and
26 detailed processing procedures are specified for the given waste stream. The process data sheet is
27 prepared before proceeding with the treatment. The performance specifications and operating procedures
28 take into account the specific characteristics of the given waste stream and treatability tests that may be
29 performed if deemed necessary.

30
31 The following design and administrative features are provided for compliance of the system with the
32 process and safety performance requirements.

33
34 **Process Parameter Control:** Process parameters (the concentration of the contaminants) are determined
35 by in-process sampling and analysis.

36
37 **Minimizing Emissions:** Little or no emissions are expected from this tank. Any potential emissions
38 from the system are minimized by venting the tank and the transfer containers to the STB process vent
39 system. The tank and container spaces are kept under negative pressure (-0.05 inch w.g. maximum). This
40 process vent system uses a carbon filter to treat any particulate and organic vapors that may be generated
41 during the stabilization operation. The vent from the tank is treated for a second time by discharging the
42 STB process vent system exhaust to the STB confinement system, which has HEPA and carbon filters.

43
44 **Minimizing Overfill and Spills:** Level controllers are provided and mounted above the tanks and
45 receiving TICs. A high-level alarm stops all of the feed lines to the tank and the container. Also, the
46 system is installed above a secondary containment pan which is designed to capture the entire liquid in
47 the tank in the event of a spill. TICs are placed on top of a portable secondary containment pallet during
48 the transport, unloading, and filling operations.

49
50 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste

1 characterization and compatibility evaluations per the WAP.
2

3 **Corrosion Protection:** The tank system is designed and certified for a pH range of greater than 2 but
4 less than 12.5. Only wastes in this pH range are allowed in the tank system. A corrosion chart is used to
5 check the construction material of the tank system and any TIC used in the operations against the
6 corrosion properties of the waste. Wastes that are incompatible with the tank are not processed.
7

8 **7. P&P Procedures.**
9

10 Equipment inspection, maintenance, and calibration are performed on this system based on the
11 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
12 MWF P&P procedures.
13

14 **Instruments Measuring Tank Level:** The tank level sensors and indicating devices are checked for
15 proper operation and calibration. Inspection frequency is every 90 days. The calibration frequency of
16 these instruments is once every 180 days or as recommended by the manufacturer, whichever is shorter.
17

18 **System Confinement:** System confinement is checked by reading the negative pressure in the
19 differential pressure indicator alarms (PDI-0618, PDI-0603, PDI-0606, and PDI-0617). If the system’s
20 internal pressure is greater than -0.05 inch w.g. the system is shut down. Inspection frequency is daily, at
21 the beginning of the morning shift, when in use.
22

23 **Differential Pressure Indicators (PDI-0618, PDI-0603, PDI-0606, and PDI-0617):** These instruments
24 are inspected for problems relative to the proper indication of the desired differential pressure in the
25 system. Both the sensing device and the indication dial are checked for operability and calibration.
26 Inspection frequency is at least once every 90 days when in use.
27

28 **Spill Control:** The waste feed, reagent feed, and the tank areas are inspected for spills of liquid waste.
29 Any spilled material is cleaned by a vacuum device and placed inside a container for processing along
30 with the given waste processing campaign. Inspection frequency is daily, at the end of the last shift, when
31 in use.
32

33 **Equipment Leaks:** Tank system, pumps, piping and valves are visually inspected for indications of any
34 corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
35 once every 90 days when in use.
36

37 **8. Process Throughput**
38

39 This pretreatment system is designed for an operating capacity of 2 gallons per minute, based on filtration
40 process limitations. The tank system is designed to receive a total of 8,000 lbs/day.
41

42 **9. Secondary Containment**
43

44 The two tanks are mounted above a metal pan. The pan’s free volume is designed to hold the entire
45 volume of one tank.
46

47 A portable secondary containment pallet is placed under any liquid containing TICs or any liquid waste
48 container that is brought to the system for liquid transfer operations. The free volume in the secondary
49 containment space takes into account the space occupied by the container or any equipment that is placed
50 inside the containment area during the normal operation of the system.
51

1 **3.7 Subsystem TP-07, Compaction/Macro-encapsulation System**

2
3 **1. General Function**

4
5 The function of the compaction/macro-encapsulation system (TP-07) is to provide volume reduction and
6 macro-encapsulation (MACRO) treatment for debris. Macro-encapsulation of hazardous or mixed debris
7 in a sealed jacket of inert material meets the EPA Alternative Debris Treatment Standard and thereby
8 qualifies the debris for disposal in a mixed waste, Subtitle C, landfill.
9

10 **2. Reference Documents**

- 11
- 12 – **Process Flow Diagram:** See drawings 31001-P-006 in Attachment 7 of MWF Part B Permit
- 13 Application.
- 14 – **Piping and Instrumentation Diagram:** See drawings 31001-P-019 in Attachment 7 of MWF
- 15 Part B Permit Application.
- 16 – **Key Components List:** See Table TP-07 in the equipment and instrument list in Attachment 8 of
- 17 MWF Part B Permit Application.
- 18 – **Key Components Technical Specification:** See the technical specification package in
- 19 Attachment 11 of MWF Part B Permit Application.
- 20 – **Key Control Devices:** See Table TP-07 in the equipment and instrument list in Attachment 8 of
- 21 MWF Part B Permit Application.
- 22 – **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment
- 23 11 of MWF Part B Permit Application.
- 24 – **Interfacing Subsystems:** stabilization process vent system (SB-09); sorting system (TP-03);
- 25 physical extraction system (TT-05); containerized waste staging system (TS-01).
- 26

27 **3. Equipment and Process Description**

28
29 **Equipment:** The compaction and macro-encapsulation system (TP-07) consists of an in-drum compactor
30 (CPR-0705), and a super-compactor. The system receives waste in drums and B-25 boxes (up to 4 feet
31 wide by 6 feet tall by 8 feet long). The in-drum compactor has a 50,000 lbs compaction force and is used
32 for in-container compaction of debris. The super-compactor provides a compaction force of
33 approximately 350,000 lbs. and is used for squeezing the in-drum compacted containers. The average
34 volume reduction capability of the combined in-drum compaction and super-compaction unit is expected
35 to be approximately 6-7 times less than the original volume.
36

37 **Macro-encapsulation (MACRO) Process:** Compacted debris will be macro-encapsulated in sealed
38 jackets according to the EPA Alternate Treatment Standards for mixed waste debris. Three different
39 jacket designs are used: 1) welded polyethylene tubes or containers; 2) a welded stainless steel drum or
40 tube; and 3) a welded stainless steel B-25 box. The jackets for macro-encapsulation are shown in Figures
41 6A, 6B, and 15 in the container management plan in Attachment 2 of the MWF RCRA/TSCA Permit
42 Application. The material of construction of the jackets will be 304 stainless steel or high density
43 polyethylene tubes. Both the stainless steel and polyethylene jackets will meet the EPA treatment
44 standard for debris wastes. The choice of a polyethylene or a stainless steel jacket for a given debris
45 waste will be based on the generator's preference and the requirements imposed by the selected disposal
46 site.
47

48 The jackets will be delivered to the TP-07 system pre-formed and/or constructed with the sides and base
49 plate already formed and sealed to make the unit. After the compacted debris (puck) is placed and

1 stacked in the units through the top opening, the jacket is filled with sand or grout to minimize void space
2 in the container, then a lid is placed on top and welded on. If required void space filling (e.g., sand or
3 grout) operations may occur in SB-08, SB-09 or SB-11.
4

5 In the stainless steel type jackets, the weld is continuous and is performed according to a welding
6 procedure qualified per the American Welding Society standards. In the polyethylene type jackets, the
7 weld is continuous and is formed by heating and fusion of the high density polyethylene.
8

9 **4. Operations and Control Description**

10 Operations conducted in system TP-07 include: 1) drum preparation; 2) receiving and preparing
11 incoming waste; 3) in-drum compaction; 4) super-compaction; 5) placing the compressed drum (puck)
12 into the macro-encapsulation jacket; and 6) sealing the jacket. The jacket will serve as the final disposal
13 container. Waste containers that have already been in-drum compacted at the generator site will be sent
14 directly to the super-compaction step. Also, containers that are not suitable for super-compaction will be
15 placed inside a jacket for macro-encapsulation according to the procedures described in this section.
16
17

18 **Drum Preparation:** An empty 55 gallon is placed under the in-drum compactor ram. The compactor
19 drum clamp is secured, the door is closed, and the ventilation is turned on.
20

21 **Receiving and Preparing Incoming Waste:** Debris-classified waste is brought to the compaction area
22 either in its original container or in a TIC.
23

24 **In-Drum Compaction:** The operator removes waste articles from the TIC or container sent by the
25 generator and places the articles in the drum. The operator repeats this operation until the drum is full.
26 Next, the operator turns on the compactor ram and compresses the waste in the drum. The operator
27 repeats the fill/compression cycle several times until the drum is filled with compressed debris. After in-
28 drum compaction, the operator caps the drum and uses a drum dolly to transfer the drum to a staging area
29 for super-compaction.
30

31 **Super-compaction:** The operator employs an overhead lift device to load a drum of compacted debris on
32 to the super-compactor conveyor. Next, the operator starts the super-compaction cycle. The super-
33 compactor automatically compresses the drum and returns it to the conveyor. The operator then uses the
34 overhead lift device to move the super-compacted drum to the macro-encapsulation staging area.
35

36 **Macro-encapsulation:** The super-compacted drum (puck) is collected in the staging area. When
37 sufficient pucks are generated, the operator stages up to ten empty polyethylene or stainless steel macro-
38 encapsulation jacket units in the compaction area. Next, using the overhead jib-crane, the operator fills
39 the jacket with pucks.
40

41 **Jacket Sealing:** Prior to sealing, jackets are filled with fine sand or grout to minimize void space inside
42 the jacket. The macro-encapsulation jackets are sealed by placing a cap on top of the jacket. A
43 polyethylene cap is placed on the polyethylene jacket and welded to form a continuous seal.
44 Similarly, a stainless steel cap is placed on top of a stainless steel jacket and the seam is welded to form a
45 continuous seal. After being sealed, the jacket units are inspected, cleaned if required, labeled, weighed,
46 and staged for transport offsite.
47

48 **Super-compactor Liquid Collection:** A small sump in the super-compactor chamber collects any
49 liquids that may be generated as a result of compacting the material inside the drums. The liquid is
50 pumped out of the sump, absorbed and added to the final disposal container prior to flood grouting of the

1 container.

2
3 **5. Air Emissions**

4
5 For both worker safety and contamination control, process ventilation to this system is established and
6 confirmed prior to conducting treatment operations. The process ventilation system (SB-09) provides
7 airspace confinement for waste-bearing equipment and maintains that equipment and/or area at a negative
8 air pressure relative to the immediate room environment. The control of fugitive emissions is provided
9 for: 1) the in-drum compactor (CPR-0705); 2) the super-compactor (CPR-0707); and 3) the overpack
10 with basket (C-0708) and filter bank system (FLT-0712). Local differential pressure alarms (PDI-0705,
11 PDI-0707, PDI-0714, and PDIS-0712) provide the operator with a positive indication that the process
12 ventilation system is operating.

13
14 **6. Compliance with Process and Safety Performance Requirements**

15
16 Process performance requirements for the system are that the macro-encapsulation seal must be visually
17 inspected and be free of cracks.

18 Safety performance requirements for the system are as follows.

- 19
20 1. The system must be kept at a maximum of 0.05 inch w.g. negative pressure to provide
21 confinement and control of dust and fugitive emissions.
22 2. Ignitable and reactive wastes (waste codes D001 and D002) are not accepted.
23 3. Incompatible wastes are not accepted.

24
25 The following design and administrative features are provided for compliance of the system with the
26 process and safety performance requirements.

27
28 **Minimizing Fugitive Emissions:** Enclosures and hoods are provided and maintained under negative
29 ventilation. The exhaust from the compactor vents is treated by the STB process vent system (SB-09)
30 carbon filters to remove organic vapors.

31
32 **Prevention of Reaction of Ignitable, Reactive, and/or Incompatible Wastes:** Incoming waste
33 characterization data is used to eliminate from processing the in-drum compactor wastes that are
34 incompatible, ignitable, and/or reactive.

35
36 **7. P&P Procedures and Inspection Plan**

37
38 Equipment inspection, maintenance, and calibration are performed using this system based on the
39 manufacturer's recommendations. The following additional inspections are conducted as a part of the
40 MWF P&P procedures.

41
42 **System Confinement:** System confinement is checked by reading the negative pressure in the
43 differential pressure indicators. If the system's internal pressure is greater than -0.05 inch w.g., the
44 system is shut down. Inspection frequency is daily, at the beginning of the morning shift, when in use.

45
46 **Differential Pressure Indicators (PDI-0705, PDI-0707, PDI-0714, and PDIS-0712):** These
47 instruments are inspected for problems relating to the proper indication of the desired differential pressure
48 in the system. Both the sensing device and the indication dial are checked for operability and calibration.
49 Inspection frequency is at least once every 90 days when in use.

50 **Spill Control:** The compaction areas and TIC filling areas are inspected for spills of solid waste. Any

1 spilled material is cleaned by a vacuum device and placed inside a container for processing along with the
2 same waste processing campaign. Inspection frequency is daily at the end of the last shift when in use.

3
4 **8. Process Throughput**

5
6 Throughput for the in-drum compaction system is 60 drum equivalents per shift.

7
8 **9. Secondary Containment**

9
10 Liquids are not processed by this system during normal operation. A small amount of liquid is expected
11 when the drums are squeezed by the super-compactor. Any spillage of liquids from this system during an
12 abnormal event is held in the secondary containment system that is provided for the entire STB by a
13 continuous concrete curb that surrounds the STB slab.

14
15 **3.8 System TP-08, Dryer System**

16
17 **1. General Function**

18
19 The function of the dryer system (TP-08) is to provide evaporation of liquids contained in RCRA-
20 contaminated wet solids and liquids (e.g., wet debris, wet soils, wet sludges, wet salts, and liquids with
21 high total dissolved solids [TDS]). The moisture is separated and collected, as a distillate, in a TIC which
22 can then be forwarded to a subsequent treatment system.

23
24 **2. Reference Documents**

- 25
26 – **Process Flow Diagram:** See drawings 31001-P-03 in Attachment 7 of MWF Part B Permit
27 – **Piping and Instrumentation Diagram:** See drawings 31001-P-020 in Attachment 7 of MWF
28 Part B Permit.
29 – **Key Components List:** See Table TP-08 in the equipment and instrument list in Attachment 8 of
30 MWF Part B Permit.
31 – **Key Components Technical Specification:** See the technical specification package enclosed as
32 Attachment 11 of MWF Part B Permit.
33 – **Key Control Devices:** See Table TP-08 in the equipment and instrument list in Attachment 7 of
34 MWF Part B Permit
35 – **Instrument Data Sheets:** See the technical specification package that is enclosed as an
36 Attachment 11 of MWF Part B Permit.
37 – **Interfacing Systems:** stabilization process vent system (SB-09); containerized waste staging
38 (STB rooms 2 and 4); liquid holding system (TP-06); low-capacity solids mixing (TT-02);
39 polymer mixing system (TT-04); size reduction and screening system (TP-01); container rinse
40 system (TT-06); in-container mixing (TT-03); process cooling water supply (GV-19).

41
42 **3. Equipment and Process Description**

43
44 The dryer system includes: 1) an enclosure (oven); 2) a transfer cart; 3) an air re-circulation fan; 4)
45 electrical heating coils; 5) an exhaust fan; and 6) an exhaust condenser. The system is designed to
46 process a maximum of either six 55 gallon drums or one B-25 box (4 feet high by 4 feet wide by 6 feet
47 long container of RCRA-contaminated waste. The designed evaporation rate is 25 lbs./hour (for a
48 continuous 48-hour period). The designed condensate recovery efficiency is up to 90 percent. The type
49 of feed material to be processed by the system is the same as that specified for treatment line 100.

1 Liquids/slurry specifications are the same as those specified for line 200 with the exception that ignitable
2 and reactive waste streams are not accepted in this system.

3
4 The dryer is operated at a temperature between 180° and 250° Fahrenheit to provide adequate heat to
5 vaporize the moisture content of the waste in the container and at the same time minimize the
6 vaporization of toxic organics. Water evaporation is provided by electrically-heated hot air that re-
7 circulates through the dryer enclosure (Z-0805). The electric heater (HT-0803) is intrinsically safe and
8 designed to operate in a National Fire Protection Association (NFPA) section 7, National Electric Code
9 (NEC) Hazard Class I, Division II environment. A portion of the re-circulated air, having entrained water
10 vapor, is purged to a separate condenser (CD-0806). The condensate is then recovered and collected in a
11 TIC. When full, the TIC is staged for treatment by either the liquid holding system (TP-06) or the in-
12 container mixing system (TT-03). The dried waste is sent to the appropriate pretreatment or treatment
13 system. The air exiting the condenser is discharged to the stabilization process vent system (SB-09)
14 where it is filtered by a carbon filter bank that removes the organic vapors.

15
16 **4. Operation and Controls Description**

17
18 Operations conducted in the dryer system consist of: 1) incoming waste transfer; 2) the drying cycle
19 3) process performance verification; and 4) outgoing waste transfer.

20
21 **Incoming Waste Transfer:** Waste contained in B-25 boxes is delivered to system TP-08 by fork lift.
22 The waste contained in 55 gallon drums can be transported by either a fork lift or a drum cart. Portable
23 secondary containment pallets are placed under liquid containers during the transfer operations. A
24 maximum of either six 55 gallon drums or one B-25 box are then transferred onto the dryer system cart
25 and the cart is rolled into the dryer enclosure (Z-0805). Waste drums entering the dryer system may
26 contain as much as 100% liquids. However, as a maximum, the B-25 container may be full of moist
27 solids with no more than 7.5 cubic feet of free liquids, by volume. The maximum size and weight limit
28 for any B-25 container used in the design is 4 feet wide by 6 feet long by 4 feet high. The maximum
29 weight of all of the containers placed in the dryer is 10,000 lbs.

30
31 After the waste containers are positioned and secured inside the dryer enclosure, the enclosure door is
32 closed to provide an airtight seal and the system is ready to operate.

33
34 **Drying Cycle:** Once the waste containers have been secured inside the dryer enclosure, the operator then
35 dials in the selected drying cycle and starts the operation. An induced draft (ID) fan (BLO-0802)
36 provides the motive force for suction of the air from the dryer enclosure. This air is then routed to an
37 intrinsically safe electric heater (HT-0803) and re-circulated back to the dryer enclosure. The dryer
38 enclosure temperature is measured by a temperature sensor (TE-0803) and is regulated by a voltage
39 controller (SCR-0803) to operate within a preset temperature of 180°-250° Fahrenheit. This hot air then
40 vaporizes the moisture in the waste containers. A second fan (BLO-0812) is used to purge a portion of
41 the re-circulating air and route it to a condenser (CD-0806). The condenser recovers the moisture
42 entrained in the air stream as a condensate which is then collected in a connected TIC. A high-level alarm
43 (LAH-0808) alerts the operator when the TIC is full. The operator then proceeds to isolate the condensate
44 drain line and replaces the full TIC, using dry quick-disconnects. The full TICs are then transported to
45 either the liquid holding system (TP-06) or the in-container mixing system (TT-03) for further treatment.

46
47 **Process Performance Verification:** The drying cycle continues until an alarm notifies the operator that
48 the cycle is complete. The operator shuts off the dryer heating system but keeps the exhaust system
49 running either for a minimum of 30 minutes or until the dryer enclosure airspace temperature reaches
50 below 90° Fahrenheit, whichever is longer. After the enclosure is properly ventilated and cooled off, the

1 operator opens the enclosure door and visually inspects the containers to verify that the desired dryness is
2 achieved. If required by the MWF WAP, the operator obtains a sample of the waste to verify that the
3 specified level of dryness has been achieved. The containers are covered immediately after inspection
4 and sampling. If upon visual inspection or sampling it is found that more drying is needed, the
5 containers will be allowed to go through another drying cycle.

6
7 **Outgoing Waste Transfer:** After the waste has reached the desired dryness and the enclosure is properly
8 ventilated and cooled off, the operator opens the enclosure door, covers the waste container(s), and
9 removes them from the enclosure. The waste container(s) are then transported to the next designated
10 pretreatment or treatment system.

11
12 **5. Air Emission Controls**

13
14 Control of fugitive emissions is provided for the waste dryer enclosure (Z-0805) and the container-
15 handling operations involving visual inspection or sampling. These are discussed immediately below.

16
17 **Dryer Enclosure:** For both worker safety and contamination control, the dryer enclosure is closed and
18 process ventilation to this system is established and confirmed prior to conducting dryer system
19 operations. An exhaust fan (BLO-0812) is used to purge air out of the dryer and maintain a negative
20 pressure in the enclosure. The exhausts from the fan are discharged to the STB process vent system (SB-
21 09). Any organic vapors in the exhaust air are treated by the carbon filters in the STB process vent
22 system. A local differential pressure alarm (PDIT-0805) provides the operator with a positive indication
23 that the process ventilation system is operating. A pressure differential alarm (PDAL-0805) alerts the
24 operator if the measured reading falls outside of the pre-set operating range.

25
26 **Container Handling:** Containers are opened only when they are inside the dryer enclosure. When the
27 dryer enclosure door is open, containers are capped or are covered by a tarp or a plastic sheet cover.

28
29 **6. Compliance with Process and Safety Performance Requirements**

30
31 Moisture concentration in dried solids and liquids must be reduced as follows:

- 32
33 1. Down to 1 percent if a waste stream requires stabilization by a polymer process.
34 2. Down to a range of approximately 75 percent if a liquid/slurry waste stream requires stabilization by
35 a cement process.

36
37 The following are the safety performance requirements for the system:

- 38
39 1. Concentration of volatile organics in the dryer enclosure space is kept below the lower explosive limit
40 (LEL) limits to prevent a potential fire. Maximum operating temperature is limited to 250°
41 Fahrenheit.
42 2. The system is kept at a negative pressure (-0.05 inch. w.g. maximum) to provide confinement and
43 control of fugitive emissions.
44 3. Ignitable and reactive wastes (waste codes D001 and D002) are not to be accepted.
45 4. Wastes are dried while in a container.

46
47 The following design and administrative features are provided for compliance of the dryer system with
48 the process and safety performance requirements.

49
50 **Drying Performance Measurement:** The drying cycle is calculated based on the drying efficiency of

1 the system. When the drying cycle is over, the dryness level is either accepted by visual means or based
2 on physical sampling and analysis, as specified by the WAP. If the desired dryness has not been achieved
3 in the first drying cycle, the waste is subjected to another cycle.

4
5 **Operating Temperature Control:** The dryer system’s temperature is regulated by the SCR-0803, to
6 operate within a preset temperature of 180°-250° Fahrenheit. A temperature of greater than 250°
7 Fahrenheit activates the dryer system’s high temperature alarm (TAH-0803) and shuts down the heater.

8
9 **Flammability Level Control:** A flammability meter (AET-0815) continually measures the re-circulated
10 air flammability level and sounds an alarm at a preset 25% LEL. If this level is exceeded, the high-
11 flammability alarm (AAH-0815) shuts down the power to the electric heater (HT-0803). This design
12 feature establishes a Class I, Division II hazard location, according to National Electric Code (NEC)
13 section 501. As a contingency, all electrical components in direct contact with the air-stream are of an
14 intrinsically safe design (e.g., meeting the requirements of NEC-504).

15
16 **Preventing Airborne Contamination:** To prevent the potential of airborne contamination, the dryer
17 enclosure is designed to be airtight and is vented to the stabilization process vent system (SB-09).

18
19 **Prevention of Reaction of Ignitable, Reactive, and/or Incompatible Wastes:** Wastes are not mixed in
20 the dryer system. Also, the processing of ignitable and reactive wastes (D001 and D002) is prohibited in
21 this system.

22
23 **Spill Control:** The dryer system design includes a secondary containment which is provided by the dryer
24 cart. The containers are placed on the dryer cart during the drying cycle. This cart’s secondary
25 containment pan is designed to retain 7.5 cubic feet (one drum) of spilled liquid. Spillage during the
26 condensate filling operations is prevented by placing a portable secondary containment pallet under the
27 TIC used for collecting liquids discharged from the air exhaust condenser. A spill during container
28 transfer operations is prevented by placing a portable secondary containment pallet under liquid waste
29 containers during transfer operations.

30
31 **7. P&P Procedures and Inspection Plan**

32
33 Equipment inspection, maintenance, and calibration are performed on this system based on the
34 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
35 MWF P&P procedures.

36
37 **Temperature Control:** The temperature sensors (TE-0803) are checked for operability and
38 measurement accuracy. This temperature sensor and its indicator are removed and checked for accuracy
39 of measurement and are calibrated, if needed. Inspection frequency is at least once every 90 days when in
40 use.

41
42 **System Confinement:** System confinement is checked by reading the negative pressure in the
43 differential pressure indicators. If system internal pressure is greater than -0.05 W.C., then the system is
44 shut down. Inspection frequency is daily at the beginning of each shift when in use.

45
46 **Differential Pressure Indicator (PDIS-0805):** These instruments are inspected for problems relative to
47 proper indication of the desired differential pressure range in the system. Both the sensing device and the
48 indication dial are checked for operability and calibration. Inspection frequency is at least once every 90
49 days when in use.

50 **Spill Control:** The dryer cart and TIC portable secondary containment unit are inspected for spills of

1 liquid waste. Any spilled material is cleaned by a vacuum device and placed inside the TIC or the
2 original waste container for processing along with the given waste processing campaign. Inspection
3 frequency is daily at the end of the last shift when in use.
4

5 **Equipment Leaks:** Dryer enclosures, enclosure door seals, air re-circulation duct and heater housing, air
6 exhaust ducts, and condensers are visually inspected for indications of any corrosion, weld cracks, and/or
7 loose bolts at the flanged connections. Inspection frequency is at least once every 90 days when in use
8

9 **8. Process Throughput**

10
11 The dryer system design is based on receiving and processing up to six 55 gallon drums (58 cubic feet) or
12 one B-25 box (96 cubic feet maximum) of RCRA-contaminated waste streams. The design assumes each
13 drum contains a maximum of 200 lbs. of water (1,200 lbs. total). The system is then capable of
14 vaporizing all the moisture in a closed system within a 48-hour period (i.e., an evaporation rate of
15 approximately 25 lbs/hour). The actual throughput depends on the composition and density of the solids
16 and its moisture content of the waste as well as the final moisture content performance requirement.
17

18 **9. Secondary Containment**

19
20 The dryer system secondary containment is provided by a cart that includes a secondary containment pan
21 designed to hold spillage from the containers. The free volume in the secondary containment is greater
22 than one 55 gallon drum (7.5 cubic feet) of liquid or one B-25 box (96 cubic feet maximum) with a free
23 liquid of no more than 7.5 cubic feet. A portable secondary containment pallet is placed under the TIC
24 used for collecting condensate from the air exhaust condenser. The free volume in the secondary
25 containment space takes into account the space occupied by the container or any equipment that is placed
26 inside the containment area during the normal operation of the system.
27

28 **3.9 System TP-09, Liquid Consolidation System**

29
30 **1. General Function**

31
32 The main function of the liquid consolidation system (TP-09) is to facilitate bench-scale type chemistry
33 operations involving: 1) the transfer of wastes in small containers to a larger container, usually 55 gallon
34 TICs; 2) chemical treatment of the waste; 3) adsorbing of wastes in an adsorbent media; and 4) the
35 proportioning of wastes in smaller containers; and 5) the stabilizing of small quantity/one-of-a-kind waste
36 streams.
37

38 The chemical and stabilization treatment techniques employed comply with the RCRA LDR treatment
39 standards of 1) NEUTR; 2) DEACT; which includes CHOXD; CHRED or NEUTR; and 3) stabilization
40 (STABL) as described in federal regulations 40 CFR 268.42 and 268.45 and incorporated by reference in
41 WAC 173-303-140(2)(a). Other purposes of the pretreatment and treatment operations conducted in this
42 system are to provide ease of waste handling, reducing hazards to the worker, reducing corrosion and
43 damage to processing equipment, protecting chemical-resistant floors coatings, and facilitating the
44 subsequent treatment steps
45

46 **2. Reference Documents**

47
48 – **Process Flow Diagram:** See drawings 31001-P-004 in Attachment 7 of MWF Part B Permit
49 Application.

50 – **Piping and Instrumentation Diagram:** See drawings 31001-P-021 in

- 1 Attachment 7 of MWF Part B Permit Application.
- 2 – **Key Components List:** See Table TP-09 in the equipment and instrument list in Attachment 8 of
- 3 MWF Part B Permit Application.
- 4 – **Key Components Technical Specification:** See the technical specification package enclosed in
- 5 Attachment 11 of MWF Part B Permit Application.
- 6 – **Key Control Devices:** See Table TP-09 in the equipment and instrument list in Attachment 8 of
- 7 MWF Part B Permit Application.
- 8 – **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment
- 9 11 of MWF Part B Permit Application.
- 10 – **Interfacing Subsystems:** stabilization process vent subsystem (SB-09); in-container mixing
- 11 subsystem (TT-03); and dryer subsystem (TP-08).
- 12

13 **3. Equipment and Process Description**

14
15 The liquid consolidation tank system (TP-09) consists of a hooded enclosure (Z-0901), with adjoining
16 airlock, to consolidate and treat small quantities (less than 5 gallons) of wastes, such as lab packs and
17 other bottled liquids, sent to the MWF. The consolidated waste is collected in TICs that are positioned
18 immediately under the consolidation box. In addition to consolidation, the tank system is used to pretreat
19 the input waste by NEUTR, CHOXD, CHRED, or DEACT. The chemical pretreatment steps are similar
20 to those described for the liquid treatment system (TP-04) with the exception that the pretreatment
21 operations here are performed on a small scale using bench-scale equipment. The consolidated waste is
22 then transferred to an appropriate system for the next step of processing.

23
24 NEUTR is accomplished by adding waste and either acidic or alkaline chemicals in the container to adjust
25 the pH of the waste. The second method (DEACT) is accomplished by NEUTR, CHRED, or CHOXD of
26 water-reactive wastes. The third method (STABL) is accomplished by mixing liquid and slurries with a
27 stabilization reagent. These processes are described next.

28
29 **Neutralization Process:** Liquid wastes having corrosivity characteristics (i.e., liquids with a pH of less
30 than 2 or greater than 12.5) are neutralized in a two-step operation. First a small quantity (five gallons or
31 less) is diluted to a less corrosive condition (pH greater than 2 and less than 12.5) in the liquid
32 consolidation system (TP-09). The diluted liquid is discharged into a TIC located beneath the hooded
33 enclosure sink. Next, the diluted solution is either further adjusted in the TIC by adding additional
34 reagents to the TIC or is sent to the liquid treatment system (TP-04) for chemical adjustment. The
35 decision to use the TIC or the liquid treatment system (TP-04) for the second step of chemical treatment
36 will depend on the size the liquid batch being processed. If the total volume of the batch, after chemical
37 adjustment, is less than approximately 40 gallons, it is then treated in the TIC located under the hood
38 enclosure. If the volume of the batch is more than 40 gallons, then the second-step neutralization may be
39 done in the liquid treatment system (TP-04). This involves transferring the liquid from the TIC to one of
40 the two 1,200 gallon tanks in the liquid treatment system (TP-04) and adding reagent(s) directly to the
41 tank while the tank mixer is turned on. The neutralization process chemistry used in this system is similar
42 to that described for the liquid treatment system (TP-04) in section 3.4.

43
44 **Deactivation:** Hydrolysis and neutralization of acetyl chloride is presented as an example of the
45 chemistry and reactions involved in a deactivation process involving water reactive waste. Acetyl
46 chloride is an organic chemical used in chemical synthesis and is purchased as a high purity organic
47 chemical liquid from suppliers. Acetyl chloride (CH₃COCl) reacts rapidly with water to produce acetic
48 acid (CH₃CO₂H) and hydrochloric acid. Neutralization of the acids can be effected after the hydrolysis
49 process, but is more efficiently conducted by use of an alkaline solution for hydrolysis. The following
50 reaction chemistry is appropriate for treating this characteristic waste.

1
2 The acetic acid product is a weak organic acid and is no longer considered a characteristic waste based on
3 reactivity (D003) or corrosivity (D002), and could be subsequently treated by the thermal process.



6
7 Deactivation of hydrogen peroxide (an oxidizing agent) constitutes a deactivation reaction by a chemical
8 reduction process. Hydrogen peroxide is commonly available in solutions of 50% and 30% for laboratory
9 uses. Reaction chemistry of the hydrogen peroxide wastes is as follows:



12
13 Deactivation by oxidation processes will also be considered applicable to many reactive wastes. For the
14 purpose of removing the reactive characteristic, partial oxidation of the reactive constituent usually
15 suffices.

16
17 **Stabilization:** Stabilization process is employed for the treatment of small quantity/one-of-a-kind waste
18 streams. The process employs a bench-scale technique based on an in-container mixing method.
19 Reagents used are based on a cement process similar to that described for the in-container mixing system
20 (TT-03) in Section 3.11.

21
22 **4. Operation and Control Description**

23
24 Operations in TP-09 include: 1) preparing the PDS; 2) receiving incoming liquid wastes; 3) in- process
25 sampling; 4) consolidation; 5) chemical treatment; 6) stabilization; 7) proportioning waste into smaller
26 containers; 8) absorbing liquids; 9) emptying container rinsings; 10) equipment rinses; and 11)
27 transferring output waste. All operations are bench-scale and manual. The equipment used inside the
28 enclosure is lab-scale and are mostly consumables.

29
30 **Preparing The Process Data Sheet (PDS):** The specific treatment process for each waste stream is
31 specified in a PDS which is developed after careful consideration of the waste characteristics. If
32 necessary, a treatability test is conducted to evaluate the compatibility of the wastes for mixing with
33 reagents and absorbents or for verifying the safety and effectiveness of a given chemical treatment or
34 stabilization process. The format and content of the PDS is described in the waste analysis plan (WAP).

35
36 **Receiving Incoming Liquid Wastes:** Prior to conducting liquid treatment operations, process ventilation
37 to this system is established and confirmed. The process ventilation system (SB-09) provides airspace
38 confinement of waste-bearing equipment and maintains that equipment at a negative air pressure relative
39 to the immediate room environment. Local differential pressure alarms (PDI-0901 and PDI-0902)
40 provide the operator with a positive indication that the process ventilation system is operating.

41
42 Liquid waste containers are brought to the liquid consolidation system by a fork lift on a hand cart. A
43 pallet with secondary containment is placed under the container during the transfer operations. The
44 containers (e.g., carboys, lab packs, etc.) are then opened by hand. The bottled waste is transferred into
45 the glove box through an adjoining airlock. Chemical reagents and sampling equipment are inserted into
46 the glove box in the same manner. Absorbent packing material (e.g., vermiculite) is kept in its original
47 container and is transferred to the sorting system (TP-03). Empty containers (e.g., waste bottle
48 containers, carboys) are sent to the container rinse system (TT-06).

49
50 **In-Process Sampling:** Once the waste is inside the enclosure, in-process samples may be obtained from

1 the incoming or consolidated batch. The sample is packaged, taken out of the enclosure and sent to a
2 laboratory for analysis.

3
4 **Consolidation:** A 55 gallon TIC is positioned immediately under the consolidation box (Z-0109). The
5 TIC is equipped with a removable loading flange and dry quick-disconnects for easy mating to the
6 process vent system (SB-09) and the gravity-fed waste stream from the consolidation box. A level
7 detector/alarm (LAH-0902), set at 80% container volume, is mounted on the TIC to inform the operator
8 when the TIC is full.

9
10 **Chemical Treatment:** Both the neutralization and deactivation operations are accomplished in the same
11 manner. The first step is the completion of the preparatory steps including provision of equipment and
12 consumables specified by a PDS. A beaker with the predetermined batch size is filled with the given
13 reagent. A vari-speed (bench-scale) pump with suction and discharge tubing is assembled on top of the
14 counter in the hooded enclosure. The suction tubing is placed in the incoming waste container and the
15 discharge piping is placed in the reaction beaker containing reagent. Next, the pump is turned on and the
16 waste is slowly added to the reagent while monitoring performance parameters with portable instruments
17 (e.g., pH meter and thermometer). The desired performance is maintained by controlling the pumping
18 rate. When the desired process performance is achieved, the pump is turned off and the treated liquid is
19 poured into a funnel leading to a TIC located under the hood. When the first batch is complete, additional
20 batches of waste are treated and poured into the TIC.

21
22 **Stabilization:** Stabilization is performed by placing the waste inside an open-top disposal container. The
23 waste and reagents are introduced into the container and a hand-held mixer is used to mix the two
24 products in the container. After a predetermined period of mixing, the mixer is turned-off. Next, the
25 container is capped, inspected, cleaned, and taken out of the hooded enclosure. The container is placed
26 on a cart and sent to the containerized waste staging area for curing, final inspection, and certification.

27
28 **Proportioning Wastes into Smaller Containers:** Liquid waste streams received in quantities larger than
29 five gallons may be transferred to smaller containers in order to allow for adjustments (e.g., NEUTR,
30 CHOXD or CHRED) in the hooded environment in the liquid consolidation system (TP-09). The transfer
31 operation is specified in detail in the PDS and accomplished according to the following general
32 procedures.

33
34 First, the incoming container is placed on a pallet with the chemically resistant secondary containment
35 system. Next, the container cap is removed and a flexible exhaust tube is inserted into the container
36 opening; just below the cap, but not in the waste liquid. The other end of the tube is connected to an
37 exhaust line (which is connected to the STB process vent) in the consolidation system's hooded
38 enclosure. Next, the intake tubing of a portable chemical transfer pump is inserted through the container
39 opening cap and is lowered to approximately 3 inches from the bottom. The portable pump with an
40 approximate variable flow rate of between 80 to 800 milliliters (ml)/minute is placed in the hooded
41 enclosure. The discharge tube from the pump is placed inside the receiving container in the hood. When
42 the portable pump and the vent line installations are complete, the pump is turned on to transfer the
43 required quantity of liquids from the incoming container to the receiving container in the hooded
44 enclosure. The previous steps are repeated until all of the liquids are drained out of the incoming waste
45 container. Each receiving container is capped and prepared for treatment as defined by the PDS.

46
47 **Absorbing Liquids:** Wastes received at the MWF in small quantities which require adsorption prior to
48 stabilization or the GASVIT™ treatment are pretreated as follows.

49
50 First, an absorbent (e.g., sawdust) compatible with the waste and treatment process is selected. The

1 absorbent is placed inside a container and the liquid waste is slowly added to the absorbent media. If the
2 waste is suitable for GASVIT™ processing, a cardboard canister, with a plastic (e.g., polyethylene) liner
3 is used. Next, the cardboard canister is capped, marked, logged, and sent to the GVB. This procedure
4 allows small quantities of liquids to be combined in a solid matrix and then be thermally or non-thermally
5 stabilized. This procedure avoids the direct mixing of different chemicals that could undergo exothermic
6 reactions from more toxic chemicals or form intractable chemicals (polymers or sludges) that would be
7 difficult to stabilize.

8
9 **Empty Container Rinse:** The empty waste container is triple rinsed and the rinsate is either soaked up
10 in a container with an absorbent or drained into the TIC under the hooded enclosure. The quantity of
11 fresh water, cleaning solution, and/or reagents is defined in the PDS.

12
13 **Equipment Rinsings:** When treatment or consolidation of a predetermined batch of waste has been
14 completed, a small amount of fresh water (or decontamination solutions, if needed) is introduced into the
15 consolidation box to clean and rinse the consolidation box and any bench-scale tools and equipment used
16 during the campaign. The rinsate drains into the last TIC of consolidated waste. The quantity of fresh
17 water, cleaning solution, and/or reagents is defined in the PDS.

18
19 **Transferring Output Waste:** Once a TIC has been filled (approximately 40 gallons), it is quickly
20 isolated from the system and disconnected using dry quick-disconnects. Additional TICs are then quickly
21 connected and filled until the entire liquid waste batch has been consolidated. Full TICs are then
22 transferred to the in-container mixing system (TT-03) to be stabilized for disposal. If system TT-03 is
23 unable to accept the consolidated waste at that time, the TIC is sent to the containerized waste staging
24 area (TS-01). Consolidated sludge waste having solids greater than 25% by volume are transferred to the
25 dryer system (TP-08) to be dehydrated and processed as solid waste.

26 27 **5. Air Emissions**

28
29 For both worker safety and contamination control, process ventilation to this system is established and
30 confirmed prior to conducting liquid consolidation operations. The process ventilation system (SB-09)
31 provides airspace confinement of waste-bearing equipment and maintains that equipment and/or area at a
32 negative air pressure relative to the immediate room environment. The control of fugitive emissions is
33 provided for the consolidation enclosure (Z-0901) and the TIC. Local differential pressure alarms (PDI-
34 0901 and PDI-0902) provide the operator with a positive indication that the process ventilation system is
35 operating.

36 37 **6. Process and Safety Performance Parameters**

38
39 Process parameters for reactive characteristics are: 1) pH; 2) oxidative capacity; or 3) reductive capacity of
40 the reaction solutions. For treatment of reactive wastes, a reverse addition procedure will be employed in
41 which the waste is slowly added to a volume of treating solution. This procedure allows for heat
42 dissipation by the larger solution volume and for a more facile monitoring of the treating agent (such as a
43 reductant used to treat an oxidizing waste.) As part of planning the treatment of reactive wastes, the
44 stoichiometry of the reaction will be determined and then the exact amounts of treating agents will be
45 used to avoid generating another characteristic waste.

46
47 The process performance requirement during the neutralization operations is to adjusted to a range of
48 greater than 6 and less than 8 range. The design of the system is to receive incoming waste with a pH of
49 less than 2, but greater than 12.5. Liquid wastes in this pH range do not typically fall under the RCRA
50 definition of corrosivity characteristics wastes. The waste stream performance requirements specified in

1 the PDS in WAP considers the regulatory performance requirements as additional parameters that may be
2 needed for proper stabilization of the waste. For example, the desired pH for most stabilization reagents
3 is in the 6-8 range.

4
5 Key process safety performance requirements are minimizing the accumulation of an explosive gas
6 mixture in the enclosure, preventing reactions accompanied by an uncontrolled temperature rise, and
7 controlling vapor and other gases generated during the treatment process. Other safety performance
8 requirements are preventing potential spills and preventing the mixing of incompatible chemicals and
9 reagent.

10
11 To ensure a safe and reliable treatment operation, a PDS is developed and the required performance and
12 detailed processing procedures are specified for the given waste stream. The process data sheet is
13 prepared before proceeding with the treatment. The performance specification and operating procedures
14 take into account the specific characteristics of the given waste stream and treatability tests may be
15 performed if deemed necessary.

16
17 The following design and administrative features are provided for compliance of the system with the
18 process and safety performance requirements.

19
20 **Treatment Verification:** For reactive wastes, rigorous attention to the stoichiometry of the reactive
21 materials coupled with careful observations (such as the absence of evolving gases) along with
22 measurements of pH and the use of test papers is the method to demonstrate that the reactivity
23 characteristic is no longer present.

24
25 **Process Parameter Control:** Process chemistry control requirements are established by reviewing waste
26 characteristics and, if needed, performing treatability tests. Process controls parameters such as pH and
27 temperature are specified in the PDS. In the liquid treatment system (TP-09), the temperature and pH are
28 measured by a portable monitor inside the hooded enclosure. In addition, the pH may be measured on
29 litmus paper or by analytical methods.

30
31 **Temperature Control:** The reaction temperature is the primary safety performance factor when treating
32 corrosive and reactive wastes because of the exothermic reactions involved. The temperature is primarily
33 controlled by placing the reaction container inside an ice bath. Also, a reverse addition procedure is
34 employed in which the waste is slowly added to a volume of treating solution; this procedure allows for
35 heat dissipation by the larger solution volume.

36
37 **Inerting:** Nitrogen gas is used for inerting the enclosure when strong oxidizing or reducing agents are
38 processed. Inerting prevents the accumulation of explosive mixes of hydrogen and/or oxygen gases.

39
40 **Reagent Quality Control:** The composition of the reagents and the required quality control are specified
41 by the PDS. Reagent quality is controlled by obtaining from the supplier a certificate of conformance
42 attesting that the supplied product meets the specified composition and properties.

43
44 **Feed Rate and Sequence of Water and Reagent Mixing:** The mixing requirements are carefully
45 reviewed and specified by the PDS. The PDS instructions are used during the treatment step and
46 documented.

47
48 **Minimizing Emissions:** Emissions from the system are minimized by venting the tank and the transfer
49 containers to the STB process vent system. The tank and container spaces are kept under negative
50 pressure (-0.05 inch w.g. maximum). This process vent system uses a carbon filter to treat any particulate

1 and organic vapors that may be generated during the stabilization operation. The vent from the tank is
2 treated for a second time by discharging the STB process vent system exhaust to the STB confinement
3 system which has HEPA and carbon filters.

4
5 **Minimizing Overfill and Spills:** Level controllers are provided and mounted above the tanks and
6 receiving TICs. A high-level alarm stops all of the feed lines to the tank and the container. Also, the
7 system is installed above a secondary containment pan which is designed to capture the entire liquid in
8 the tank, in the event of a spill. TICs are placed on top of a portable secondary containment pallet during
9 the transport, unloading, and filling operations.

10
11 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste
12 characterization and compatibility evaluations according to the WAP.

13
14 **Corrosion Protection:** Glass containers or highly chemical-resistant plastics are used as a reaction
15 container for the corrosive wastes. A corrosion-resistivity chart is used to check the construction material
16 of the reaction container (and any TIC used in the operations) against the corrosion properties of the
17 waste and the reagent used. The moisture in the enclosure environment is kept to a minimum when
18 treating wastes, such as fuming nitric or sulfuric acids, because acid vapors may contact moisture, deposit
19 on glassware and other surfaces, and require clean-up.

20
21 **7. P&P Procedures.**

22
23 Equipment inspection, maintenance, and calibration are performed on this system based on the
24 manufacturer's recommendations. The following additional inspections are conducted as a part of the
25 MWF P&P procedures.

26
27 **Instruments Measuring Process Parameters:** The temperature and pH sensors and indicating devices
28 are checked for proper operation and calibration. Inspection frequency is every 90 days. Calibration
29 frequency of these instruments is once every 180 days or as recommended by the manufacturer,
30 whichever is shorter.

31
32 **System Confinement:** System confinement is checked by reading the negative pressure in the
33 differential pressure indicator alarms (PDI-0901 and PDI-0902). If the system's internal pressure is
34 greater than -0.05 inch W.C. then the operations are stopped and the containers capped. Inspection
35 frequency is daily at the beginning of the morning shift when in use.

36
37 **Differential Pressure Indicators (PDI-0901 and PDI-0902):** These instruments are inspected for
38 problems relating to the proper indication of the desired differential pressure in the system. Both the
39 sensing device and the indication dial are checked for operability and calibration. Inspection frequency is
40 at least once every 90 days when in use.

41
42 **Spill Control:** The TIC filling area under the enclosure is inspected for spills of liquid waste. Any
43 spilled material is cleaned by a vacuum device and placed inside a container for processing along with the
44 given waste processing campaign. Inspection frequency is daily at the end of the last shift when in use.
45 A level detector/alarm (LAH-0902), set at 80% container volume, is mounted on the receiving TIC to
46 inform the operator when the TIC is full.

47
48 **Equipment Leaks:** The enclosure, the airlock door, and ventilation ducts are visually inspected for
49 indications of any corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection
50 frequency is at least once every 90 days when in use.

1
2 **8. Process Throughput**
3

4 Throughput for this system depends on the type of pretreatment required for consolidation. The nominal
5 capacity for this tank system is eight 5 gallon bottles/shift.
6

7 **9. Secondary Containment**
8

9 A metal pan is provided and installed under the hooded enclosure. The pan is designed to hold the entire
10 volume of one TIC (plus one 5 gallon container) full of liquid waste. On this basis, the total volume of
11 liquids used for the design of the secondary containment system is 60 gallons.
12

13 A portable secondary containment pallet is placed under any liquid-containing TIC or any liquid waste
14 container that is brought to the system for liquid transfer operations.
15

16 The free volume in the secondary containment space takes into account the space occupied by the
17 container or any equipment that is placed inside the containment area during the normal operation of the
18 system.
19

20 **3.10 System TP-15, Aerosol Can Puncture Device**
21

22 **1. General Function**
23

24 The aerosol can puncturing device is part of treatment line 400 providing the capability to safely
25 depressurize non-punctured aerosol cans and treat the propellants and gases with a commercially-
26 available puncturing device and carbon filter.
27

28 **2. Reference Documents**
29

- 30 1. State of Washington’s Focus on Aerosol Can Management guidance document (Doc. No. 07-
31 04-005, dated April 2007, revised 11/2007).
32

33 **3. Equipment and Process Description**
34

35 **Equipment Description:** The aerosol can puncturing device and carbon filter cartridge is a
36 commercially-available unit that depressurizes aerosol cans rendering them empty and stable. The
37 puncturing device consists of a cylinder where the non-punctured can is placed, a spark-resistant tip that
38 enters the aerosol can, and a lever that controls the tip.
39
40

41 **4. Operations and Control**
42

43 In accordance with Perma-Fix’ WAP (Attachment CC of the RCRA/TSCA Part B permit), all incoming
44 waste shipments are undergo visual inspection. When these shipments of mixed waste undergo
45 processing, the containers are opened and the contents are sorted. Any intact aerosol cans found in the
46 waste will be removed and safely punctured using this commercially-available puncturing device. The
47 punctured aerosol can(s) will be allowed to drain for a minimum of 30 seconds each. The empty,
48 punctured can(s) will be placed back in to the waste stream to undergo further treatment. For each
49 shipment of mixed waste that contains an aerosol can, a different container will be used to puncture the
50 aerosol can(s) and collect the drained contents of the aerosol can(s) for that shipment of mixed waste.

1 The drained liquids will be removed from the container when the entire aerosol cans found in that mixed
2 waste shipment are punctured and drained. The container will be placed back in the waste shipment for
3 further processing. The puncturing device and carbon filter cartridge will be reused, however, a different
4 container will be used for each shipment of mixed waste. The expected waste stream is empty and non-
5 empty aerosol cans. The containerized gas treatment unit will be utilized to treat the sorted containerized
6 gas containers by safely puncturing the containers and releasing the containerized gas. The unit will be
7 capable of treating containerized gas containers with internal pressures equal to or less than 25 pounds per
8 square inch and have a maximum height of 18 inches.
9

10 **5. Fugitive Emissions Control**

11
12 Any compressed gases and/or propellants are treated with the carbon filter cartridge. Once these gases
13 are treated and discharges from the carbon filter cartridge, they will be considered fugitive emissions.
14 Fugitive emissions are controlled by venting the enclosure above the mixer and the space above the
15 container filling enclosure. The enclosures are kept under negative pressure (- 0.05 inch W.C.) by
16 connecting the vent ports to the STB process vent system (SB-09). Differential pressure indicating
17 instruments (PDI-0104 and PDI-0105) are used to verify that the enclosures are kept in negative operating
18 pressure. The STB process vent system uses a baghouse and carbon filtration to treat any particulate and
19 organics vapors that may be generated during the stabilization operation. The vent from the stabilization
20 process is treated for a second time by discharging the STB process vent system exhaust to the STB
21 confinement system, which has HEPA and carbon filters.
22

23 **6. Compliance with Process and Safety Performance Requirements**

24
25 The overall performance objective of the resulting waste form is to meet all of the requirements for land
26 disposal as prescribed by the RCRA and Dangerous Waste Regulations. Depending on the RCRA Waste
27 Code, the waste forms will meet: 1) a total concentration limit in the waste form; 2) the TCLP limits
28 specified for the waste code or, 3) a total concentration in the waste form, plus meet the TCLP limits in
29 the Universal Treatment Standards, (UTS or Section 268.48 Standards). At a minimum, the stabilized
30 waste form produced by the treatment system meets the following specific requirements to qualify for
31 disposal as mixed waste in a mixed waste landfill.
32

- 33 1. The waste form must be a solid (i.e., pass the Paint Filter Test EPA SW 846 Method 9095) to
34 qualify for land disposal.
- 35 2. The waste form must pass the Liquid Release Test (51 FR 46828) to determine the presence
36 of free liquids released under pressure.
- 37 3. The waste form must have a minimum compressive strength of cohesive soil (ASTM D 695).
- 38 4. The waste form must pass the LDR requirements based on BDAT.
39

40 Key safety performance requirements are minimizing discharged liquids from the aerosol can puncturing
41 device, preventing potential spills, and preventing cleaning up any spray residue. The system operates at
42 temperatures below 200° Fahrenheit and a fire potential is not a key safety concern.
43

44 To ensure a safe and reliable stabilization operation, the PDS developed along with the required
45 performance and detailed processing procedure is specified for the given waste stream. The process data
46 sheet is prepared before proceeding with the stabilization of a waste stream. The performance
47 specification and operating procedures take into account the specific characteristics of the given waste
48 stream and appropriate treatability test(s).
49

50 The following design and administrative features are provided for compliance of the system with the

1 process and safety performance requirements.

2
3 **7. P&P Procedures.**

4
5 Equipment inspection, maintenance, and carbon filter cartridge changeout is performed on this system
6 based on the manufacturer’s recommendations.

7
8 **8. Throughput**

9
10 Throughput for TP-15 is two (2) non-punctured aerosol cans per minute. Each can will drain for a
11 minimum of 30 seconds. In the event a partially full aerosol can is found (because the spray nozzle was
12 damaged and the can is no longer able to be used) the can will be drained until the operator determines the
13 can is empty. Regardless, all punctured aerosol cans will be drained for a minimum of 30 seconds. The
14 maximum expected throughput of this process will be 100 aerosol cans per 8-hour shift. However, the
15 typical expected throughput will be less than a dozen cans per week. Parameters used for throughput
16 calculations are as follows.

17
18 The typical aerosol can will contain a maximum of five (5) percent (%) of the original product.
19 Assuming a maximum throughput is ever needed, the 100 aerosol cans could ideally be dispatched in 50
20 minutes.

21
22 **9. Secondary Containment**

23
24 Secondary containment for TP-15 will not be required. The drained contents of these punctured aerosol
25 cans will be placed back with the original waste stream for further processing.

26
27 **3.11 Systems TT-01 and TT-02, High- and Low-Capacity Mixing Systems**

28
29 **1. General Function**

30
31 The function of the high- and low-capacity mixing systems (TT-01 and TT-02) is to blend solid waste
32 streams with a cement reagent to form a homogeneous stabilized final product. The stabilized final
33 product must meet LDR requirements as defined in the MWF WAP. Stabilization has been identified as
34 the Best Developed Available Technology (BDAT) for treating a wide range of RCRA listed and
35 characteristic waste streams. The resulting waste forms will meet the concentration-based (performance)
36 standards or the stabilization (STABL) treatment technology requirements for the RCRA LDR.

37
38 Capability for stabilizing solid waste streams by cement, lime/pozzuolanic, and other similar reagents is
39 provided by the high-capacity mixing system (TT-01) and the low-capacity mixing system (TT-02).
40 Cement-based stabilization processes are versatile and adaptable to many types of hazardous and mixed
41 waste streams. Cement-based waste forms are well suited for stabilization of contaminants in size
42 reduced inorganic solids and soils. Blended Portland cements and/or blended pozzolans are also used
43 extensively in Comprehensive Environmental Response Compensation and Liability Act (CERCLA)
44 remediations where the treated soils and solid materials are often disposed of in place.

45
46 The high-capacity mixing system (TT-01) and the low-capacity mixing system (TT-02) have similar
47 design and operation features. The difference is that the high-capacity system (TT-01) has a capacity of
48 approximately two times the low-capacity mixing system (TT-02). The instrument and equipment
49 designations for the high-capacity mixing system have a prefix of TT-01 and the low-capacity mixing
50 system have a prefix of TT-02. The remaining digits of the equipment and instrument numbering

designations are the same for both systems.

2. Reference Documents

- **Process Flow Diagram:** See drawings 31001-P-003 in Attachment 7 of MWF Part B Permit
- **Piping and Instrumentation Diagram:** See drawings 31001-P-022 and 23 in Attachment 7 of MWF Part B Permit.
- **Key Components List:** See Table TT-01 and TT-02 in the equipment and instrument list in Attachment 8 of MWF Part B Permit.
- **Key Components Technical Specification:** See the technical specification package enclosed in Attachment 11 of MWF Part B Permit.
- **Key Control Devices:** See Table TT-01 and TT-02 in the equipment and instrument list in Attachment 8 of MWF Part B Permit.
- **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment 11 of MWF Part B Permit.
- **Interfacing Subsystems:** stabilization process vent system (SB-09); containerized waste staging (STB rooms 2 and 4); bulk waste staging area (STB room 3); size reduction and screening system (TP-01); cutting and shearing system (TP-02); dryer system (TP-08); container rinse system (TT-06); and sorting system (TP-03).

3. Equipment and Process Description

Equipment Description:

Each of the two systems has a mixer (a twin screw ribbon mixer in the low-capacity system [MX-0104] and a paddle mixer in the high-capacity system [MX-0204]), a reagent feeder (F-0106), a reagent container lift (E-0107), a solid waste feeder (F-0103), a waste container lift (F-0102), and disposal containers (C-0105). The process is automated and proportioning is controlled by interlocked systems for each of the three ingredients transferred into the mixer.

Note: Equipment and instrument numbers for the high-capacity mixing system have a prefix of TT-01 and the low-capacity mixing system have a prefix of TT-02. All the other numbers are the same. See cover sheet.

Reagent Description: A reagent blend consisting of primarily inorganic reagent formulations is used for the cement process. The process is designed for a given waste stream by using a mixture of various cement compositions (such as calcium silicates with calcium aluminate, calcium aluminosulfate, or calcium sulfate hydrates); pozzolans (such as pozzolans silicates and/or aluminates) which react with hydrated lime to form insoluble phases; fillers (such as bentonite, fly ash, blast furnace slag, zeolites, clays, and silica fume); specialty or proprietary additives (such as dispersants, set accelerators/retarders, thickeners, etc.); and water. Water is either in the waste or added during the mixing process. Wash water may be used in selected batches. Cement stabilization recipes are designed for the given waste stream. Each recipe will specify a water to binder ratio and the waste to reagent ratio. Processing aids, such as viscosifiers and dispersants, may also be added to modify the properties of the fresh and cured waste forms.

Several generic blends of cement-based reagents are described immediately below.

1. **Blend A-** 100% Portland cement reagent (by weight)

- 2. **Blend B-** Mixtures of Portland cement and fly ash (1:1 to 1:5 depending on the type of fly ash and the contaminants present).
- 3. **Blend C-** Mixtures of Portland cement and ground granulated blast furnace slag (1:1 to 1:5 to 1:0.1, depending on the chemical and engineering properties required).
- 4. **Blend D-** Mixtures of Portland cement, fly ash, and slag (in a wide range of ratios).
- 5. **Blend E-** Mixtures of hydrated lime, fly ash, and kiln dust etc. (in a wide range of ratios).
- 6. **Blend F-** A 100 % mixture of Aquaset (a proprietary reagent by FluidTech, Inc.)
- 7. **Blend G-** A 100 % mixture of Peteroset (a proprietary reagent by FluidTech, Inc.)

Process Chemistry: The stabilization process chemistry for a given waste stream is designed to transform the contaminants to less soluble/mobile or less toxic forms. All waste forms will be solid, but not necessarily monolithic. Monolithic waste forms will be produced only if required by the disposal site operator. The selected chemistry takes into account waste - cement physiochemical reactions including precipitation, adsorption, solid solution, and ion exchange. In a cementation process, anhydrous cementitious starting reagents react with water (in the waste or are added to the waste form mixture) and form hydrated compounds which are referred to as the binder. Portland cement hydration products include: calcium silicate hydrate, calcium alumino silicate hydrates, hydrated calcium alumino sulfate, and calcium hydroxide. As the result of these reactions, the cementation process typically, reduces the surface area and transforms liquid wastes into solid waste forms. In many cementation processes, including those based on Portland cement, the alkalinity (pH) of the mixture is also increased. All of these features contribute to the performance characteristics of the treated waste.

Examples of different approaches used to control process chemistry are:

- 1. **Alkalinity Control:** Portland cement or hydrated lime (Ca(OH)₂) is used to adjust the alkalinity of the waste form and, thereby, precipitate certain metal hydroxide compounds with low solubility (leachability). An example of this type of metal precipitation is the Pb⁺² ion which will react with an OH ion (formed by the reaction of lime, hydrated lime, kiln dust, Class C fly ash, or cement with water) to form Pb(OH)₂, a solid with low solubility. Similar hydration reactions result in precipitation of Ba, Cd, Cr⁺³, Cu, Ni, Ag, and Zn hydroxides in cement waste forms.
- 2. **Oxidation/Reduction Control:** Oxidation potential is another chemical parameter which can be modified with cementitious agents. For example, hydration of blast furnace slag in the presence of calcium and/or alkali ions (Na and K) results in a chemically-reducing environment. Certain metal ions, such as Cr⁺⁶ and Tc⁺⁷, are chemically altered (reduced to a lower oxidation states) in this environment (i.e., Cr⁺³ and Tc⁺⁴.) Fortunately, these new species are insoluble in the alkaline environment created by simultaneous hydration reaction of the cementitious ingredients (Portland cement, hydrated lime, etc.) in the blend reagent.
- 3. **Ion Exchange/Adsorption Control.** Other ingredients can be added to the blended reagents to stabilize still other contaminants. For example, zeolites and clays have high

Waste-Reagent Recipes: The ingredients selected for mixing waste with a blend of stabilization reagents will depend on the contaminants requiring treatment and the waste form processing constraints/requirements. A wide range of blended reagent, waste and mixing water ratios is possible. In general, waste form mixes are proportioned on the basis of the water to cement ratio or the water to blended reagent ratio. These ratios vary from 0.5 to 1.5 and are chosen for each waste stream. In addition to meeting the performance requirements, the waste, reagents, and mixing water proportions will be adjusted to meet the following design criteria: 1) the mixture must be mixable in the given mixer to

1 produce a homogeneous waste form; 2) the waste form must set within 7 days after mixing; 3) settling
2 (phase separation) of the solid and liquid phases will be minimized to control bleed water; and 4) the
3 curing waste form must not exceed 200° Fahrenheit. The purpose of the latter criteria is to prevent steam
4 generation and consequently the potential for pressurizing the container.

5
6 **4. Operations and Control**

7
8 System operations and control involves: 1) preparing a PDS; 2) transporting incoming waste containers;
9 3) transporting reagent containers; 4) checking mixing water flows; 5), the mixing cycle; 6) discharging
10 the mixture; 7) treatment verification; 8) equipment cleaning; and 9) log book update.

11
12 **Preparing Process Data Sheets (PDS):** The specific treatment process for each waste stream is
13 specified in a PDS which is developed after careful consideration of the waste characteristics. If
14 necessary, a treatability test is conducted to evaluate the compatibility of the wastes for mixing with
15 reagents and absorbents or verifying the safety and effectiveness of a given chemical treatment or
16 stabilization process. The format and content of the PDS is described in the WAP.

17
18 **Transporting Incoming Waste:** The system receives size reduced solid waste from either the WSB (if
19 the waste already meets the size reduction specifications) or the size reduction and screening system (TP-
20 01) in a TIC. Waste in a TIC is weighed before it is transferred to the system. A fork lift or modified cart
21 is used to transport the TIC and to position it on the waste container lift (E-0102). Activating the waste
22 container lift raise/hold/lower switch (HS-0102) to the “raise” position raises the TIC into position over
23 the waste feeder (F-0103). The waste TIC is secured in place over the waste feeders (F-0103). The
24 feeder uses a loss-in-weight (gravimetric) technique to meter a preset quantity of waste into the mixer.

25
26 **Transporting Reagent:** The blended reagents are also delivered to the system in a TIC using a fork lift
27 or a modified cart. Reagents are blended according to the given recipe in the bulk reagent storage system
28 (SB-01). The blended reagent is filled into a TIC which is weighed before it is transferred to the system.
29 This TIC is also positioned on the reagent container lift (E-0107), raised and positioned over the reagent
30 feeder (F-0106) by activating the container lift up/hold/down switch (HS-0107) to the “up” position. The
31 reagent TIC is secured in place over the reagent feeders (F-0106). The feeder uses a loss-in-weight
32 (gravimetric) technique to meter a preset quantity of waste into the mixer.

33
34 **Mixing Water Flow:** A service water is supplied to the system by turning the mixing water flow on/off
35 switch (FS-0109) to the “on” position. Activating the mixing water valve on/off/auto control switch (HS-
36 0109) in the auto setting provides water (liquid) to the mixer when demanded by the automatic controls.

37
38 **Mixing Cycle:** Before the addition of any materials to the mixer, the bottom gate on the mixer must be in
39 the closed position. The typical order of mixing is: 1) first add the water/liquid; 2) then the solid waste;
40 and finally, 3) the reactive binders. The appropriate sequence for transferring special additives to the
41 waste form is specified in the PDS on a case-by-case basis. Proportioning of the solid waste and the
42 stabilization reagents is based on a batch process. The two components are weighed in the TIC before
43 they are transferred to the system. This pre-measurement approach minimizes a potential for overflow or
44 overflow in the mixer or container filling operations. The mixing process is sequenced by the mix water
45 controller, waste feed controller and reagent controller (ILK-1101 and ILK-1102) respectively. These
46 control systems are interlocked so that each step in the system operation can be monitored and controlled.
47 The automated batching operation requires that the waste and reagent on/off /auto control switches (HS-
48 0104 and HS-0106, respectively) be activated in the “auto” positions and the waste and reagent feeder
49 weight on/off controller (WS-0104) is in the “on” position. After or during the addition of the solid
50 waste, reagents, and mixing ingredients, the mixer is turned on by activating the mixer on/off control

- A. The waste form must be a solid (i.e., pass the Paint Filter Test EPA SW 846 Method 9095) to qualify for land disposal
- B. The waste form must pass the Liquid Release Test (51 FR 46828) to determine the presence of free liquids released under pressure.
- C. The waste form must have a minimum compressive strength of cohesive soil (ASTM D 695).
- D. The waste form must pass the LDR requirements based on BDAT.

Key safety performance requirements are minimizing dust during stabilization, preventing potential spills, and preventing the mixing of incompatible chemicals and reagent. The system operates at temperatures below 200° Fahrenheit and a fire potential is not a key safety concern.

To ensure a safe and reliable stabilization operation, a PDS is developed and the required performance and detailed processing procedure are specified for the given waste stream. The process data sheet is prepared before proceeding with the stabilization of a waste stream. The performance specification and operating procedures take into account the specific characteristics of the given waste stream and appropriate treatability test(s).

The following design and administrative features are provided for compliance of the system with the process and safety performance requirements.

Reagent Quality Control: The composition of the reagents and the required quality control will be specified by the PDS. Reagent quality is controlled by obtaining a certificate of conformance from the supplies attesting that the supplied product meets the specified composition and properties.

Pretreatment: The pretreatment of the waste for pH adjustment is defined by the appropriate treatability tests. If pH adjustment for an input solid waste stream is specified, the waste is mixed with an appropriate reagent in the solid waste mixers in either system. The final waste pH is maintained by controlling the weight of the reagents added to the waste. If pH adjustment is specified for a given liquid waste stream, it is performed either in the liquid consolidation system (TP-08) or liquid treatment system (TP-04). The pH control methods employed by these systems are used to ensure that the required pH adjustment has been achieved.

Waste Particle Size: The particle size of the waste blended with the stabilizing reagent is important and is limited by the size of the material used in the TCLP test. The test requires that the treated waste be less than 3/8 inch (about 9 mm) in size. A screen installed at the size reduction and screening system (TP-01) shredder discharge ensure that the size of the feed is kept within the specified range.

Temperature: The maximum curing temperatures for waste-cement stabilization is 200° Fahrenheit. The temperature is controlled by the design of the waste-reagent formulation.

Feed Rate and Sequence of Water and Additives: Although the process is based on batch operation, the feed sequence of waste, water, and reagents vary based on the waste characteristics. The sequencing and the rate of additions is controlled to avoid premature hardening of the mixture and to achieve the desired performance. The requirements are established by the PDS and are implemented by setting the sequence of the various additives.

Mixing Time: Waste/reagent mixing time and the residence time in the mixer controls homogeneity of the product. These requirements are established by the PDS and are implemented by setting the automatic timers that control the running time and blade speed of the mixer.

1
2 **Minimizing Emissions:** Emissions from each of the systems are minimized by providing enclosures for
3 all processing equipment including the waste filling stations. The enclosures are kept under negative
4 pressure (-0.05 inch w.g.) by connecting the vent ports to the STB process vent system (SB-09). This
5 process vent system uses a baghouse and carbon filtration to treat any particulate and organic vapors that
6 may be generated during the stabilization operation. The vent from the stabilization process is treated for
7 a second time by discharging the STB process vent system exhaust to the STB confinement system which
8 has HEPA and carbon filters.
9

10 **Minimizing Overfill and Spills:** The components added to the mixer chamber are pre-weighed in the
11 TICs before they are transferred to the mixer. This pre-measurement approach minimizes a potential for
12 overfilling or overflow of material in the mixer or the disposal container under the mixer. Also, the
13 system is installed above a secondary containment pan which is designed to capture the entire mixer
14 volume in the event of a spill.
15

16 **Mixing of Incompatible Material:** The mixing of incompatible material is prevented by waste
17 characterization and by checking the waste, stabilization reagent, and pretreatment reagents in the
18 compatibility charts in the WAP.
19

20 **Corrosion Protection.** The mixer bowl thickness is designed and documented for corrosion protection.
21 The design basis is a minimum of five years life span when processing acidic (a pH greater than 2) and
22 alkaline (a pH less than 11) salts at a process throughput of approximately 200 tons per year.
23

24 **7. P&P Procedures.**
25

26 Equipment inspection, maintenance, and calibration is performed on this system based on the
27 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
28 MWF P&P procedures.
29

30 **Feeder Calibrations:** The gravimetric and volumetric metering device used in the process (scales, weigh
31 cells, flow meters, etc.) is checked for proper calibration and operability. These will include the waste
32 reagent feeder weigh scale element (WE-0104) and the waste reagent feed weight indicating totalizer
33 (WIQ-0104). Inspection frequency is at least once every 90 days when in use.
34

35 **Checking Mixing Water Flow:** Service water is supplied to the systems by turning the mixing water
36 flow on/off switch (FS-0109) to the “on” position. Activating the mixing water valve on/off/auto control
37 switch (HS-0109) in the “auto” setting provides water (liquid) to the mixer. The mixing water (liquid)
38 flow element and flow totalizer (FE-0109 and FIQ-0109, respectively) are checked for calibration and
39 functioning. Inspection frequency is at least once every 90 days when in use.
40

41 **System Confinement:** System confinement is checked by reading the negative pressure in the
42 differential pressure indicators (PDI-0104 and PDI-0105). If the system’s internal pressure is greater than
43 -0.05 inch w.g., then the system is shut down. Inspection frequency is daily at the beginning of the
44 morning shift when in use.
45

46 **Differential Pressure Indicators (PDI-0104 and PDI-0105):** These instruments are inspected for
47 problems relative to the proper indication of the desired differential pressure in the system. Both the
48 sensing device and the indication dial are checked for operability and calibration. Inspection frequency is
49 at least once every 90 days when in use.
50

1 **Spill Control:** The waste feed, reagent feed, and container fill areas are inspected for spills of solid
2 waste. Any spilled material is cleaned by a vacuum device and placed inside a container for processing
3 along with the given waste processing campaign. Inspection frequency is daily at the end of the last shift
4 when in use.

5
6 **Equipment Leaks:** The mixer bowl, housing, and enclosures are visually inspected for indications of
7 any corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
8 once every 90 days when in use

9
10 **8. Throughput**

11
12 Throughput for TT-01 is 20,000 lbs (9,070 kg) of soil and debris with an average density of 80 lbs per
13 cubic foot in an 8-hour shift. A 4.5 cubic yard mixer is used to mix waste with stabilization reagents.
14 Parameters used for throughput calculations are as follows.

15
16 TT-02 is designed to process up to 16,800 lbs. of waste in an 8-hour period. It is expected that the
17 incoming solid waste will have a bulk density of 80 lbs per cubic foot. Parameters used for throughput
18 calculations are as follows.

19
20 **9. Secondary Containment**

21
22 Secondary containment for TT-01 is a metal pan which is placed under the mixer assembly. The pan is
23 designed to have a free volume that holds the spillage from the entire volume of the mixer in the event of
24 a spill.

25
26 Secondary containment for TT-02 is also a metal pan which is placed under the mixer assembly. The pan
27 is designed to have a free volume that holds the spillage from the entire volume of the mixer in the event
28 of a spill.

29
30 A portable secondary containment pallet is placed under any liquid-containing TIC or any liquid waste
31 container that is brought to the system for liquid transfer operations.

32
33 The free volume in the secondary containment space takes into account the space occupied by the
34 container or any equipment that is placed inside the containment area during the normal operation of the
35 system.

36
37 **REFERENCES**

- 38
39 2. Application of Solidification/Stabilization to Waste Materials, J. L. Means, et. al., Lewis Publishers,
40 London, 1995.
41
42 3. RCRA Regulations and Key Word Index, Elsevier, NY, NY, 1996.
43
44 4. DOE/LLW-217 Rev.0, Radioactive Waste Technical Support Program - Chapter 5, Matrix
45 Parameters, T. D. Kirkpatrick, January 1995.
46
47 5. Hazardous, Radioactive and Mixed Wastes, T. M. Gilliam and C. C. Wiles, ed., ASTM - STP1123,
48 ASTM Publishing, Philadelphia, PA, 1992.
49
50 6. American Society for Testing and Materials, Annual Book of ASTM Standards, 1996, ASTM

1 Publishing, Philadelphia, PA, 1996.

- 2
3 7. EPA Publication SW-846, third edition, "Test Methods for Evaluating Solid Waste,
4 Physical/Chemical Methods."
5

6
7 **3.12 System TT-03, In-Container Mixing System**

8
9 **1. General Function**

10
11 The function of the in-container mixing system (TT-03) is to blend liquid/slurry waste streams with a
12 cement reagent to form a homogeneous stabilized final product. The stabilized final product must meet
13 LDR requirements as defined in the MWF WAP. Stabilization has been identified as the BDAT for
14 treating a wide range of RCRA-listed and characteristic waste streams. The resulting waste form meets
15 the concentration-based (performance) standards or the stabilization (STABL) treatment technology
16 requirements for the RCRA LDR.
17

18 Capability for stabilizing solid waste streams by cement, lime/pozzolan and other similar reagents is
19 provided by the system. Cement-based stabilization processes are versatile and adaptable to many types
20 of hazardous and mixed waste streams. Cement-based waste forms are well suited for stabilization of
21 contaminants in liquids and slurries.
22

23 **2. Reference Documents**

- 24
25 – **Process Flow Diagram:** See drawings 31001-P-004 in Attachment 7 of MWF Part B Permit
26 **Piping and Instrumentation Diagram:** See drawings 31001-P-024 in Attachment 7 of MWF
27 Part B Permit Application.
28 – **Key Components List:** See Table TT-03 in the equipment and instrument list in Attachment 8 of
29 MWF Part B Permit Application.
30 – **Key Components Technical Specification:** See the technical specification package in
31 Attachment 11 of MWF Part B Permit Application.
32 – **Key Control Devices:** See Table TT-03 in the equipment and instrument list in Attachment 8 of
33 MWF Part B Permit Application.
34 – **Instrument Data Sheets:** See the technical specification package that is enclosed in
35 Attachment 11 of MWF Part B Permit Application.
36 – **Interfacing Subsystems:** stabilization process vent system (SB-09); liquid consolidation system
37 (TP-09); liquid treatment system (TP-04); liquid holding system (TP-06); containerized waste
38 storage (TS-01); dryer system (TP-08); container rinse system (TT-06); cutting & shearing
39 system (TP-02); physical extraction system (TT-05); GASVIT™ secondary waste system (GV-
40 11); GV-05, GASVIT™ first stage syngas filters (GV-05).
41

42 **3. Equipment and Process Description**

43
44 **Equipment Description:** The in-container mixing system (TT-03) consists of an in-container mixer
45 (MX-1301); a reagent additive feeder (F-1306); a container pump (PMP-1308); and a confinement
46 enclosure (Z-1305) wherein empty disposal containers (e.g., 55 gallon drums, 85 gallon overpack drums)
47 are positioned to receive waste and stabilization reagents for final waste disposal. Liquid waste is brought
48 to this system in a TIC and is pumped into the disposal container (C-1302), with a pre-defined blend of
49 stabilizing reagent. The in-container mixing system uses a mixer blade mounted on a vertical shaft

1 mounted on a telescoping ram. The shaft is also attached to a drum-loading flange. The flange has two
2 feed ports which are used to supply the waste and the stabilization reagents.

3
4 A second approach available for stabilizing waste in this system is to transfer waste in a mixing vessel
5 that becomes the final disposal container. Such containers are brought and placed in the mixing station
6 and stabilizing reagents are then added during the mixing cycle. Waste streams using this approach may
7 include secondary waste from the MWF operations.

8
9 **Process, Reagents and Recipes:** Please refer to the process, reagents and recipes description for the
10 high- and low-capacity mixing systems (TT-01 and TT-02) in the previous section (Section 3.10). The
11 processing and chemistry aspects of the in-container mixing system (TT-03) are similar to systems TT-01
12 and TT-02. (See section 3.10.)

13
14 **4. Operation Description**

15
16 The stabilization operation includes: 1) preparing process data sheets; 2) reagent preparation;
17 3) receiving and preparing the incoming waste containers; 4) the mixing cycle; 5) treatment verification;
18 6) mixer cleaning; and 7) updating the log book.

19
20 **Preparing Process Data Sheet:** The specific treatment process for each waste stream is specified in a
21 PDS which is developed after careful consideration of the waste characteristics. If necessary, a
22 treatability test is conducted to evaluate the compatibility of the wastes for mixing with reagents and
23 absorbents or verifying the safety and effectiveness of a given chemical treatment or stabilization process.
24 The format and content of the PDS is described in the WAP.

25
26 **Reagent Preparation:** Stabilization reagents are stored in the reagent storage system. This system can
27 supply a proportioned mix of different reagents in accordance with the reagent formulation specified for a
28 given batch of waste. The mixed reagents are transferred to system TT-03 in a TIC, essentially a tote bin,
29 using a fork lift or pallet jack. The TIC is placed on the bin elevator (E-1310) which elevates and
30 positions the TIC directly above the reagent feeder (F-1306). The bottom of the conveyor bin is
31 connected to the reagent feeder inlet by a flexible boot to form an airtight seal. The bottom gate of the
32 conveyor bin is opened to allow reagent to flow into the feeder. The reagent is then metered into the
33 disposal container at a rate specified in the specific waste treatment procedure.

34
35 **Receiving Incoming Liquid Waste:** Prior to conducting liquid treatment operations, process ventilation
36 to this system is established and confirmed. The process ventilation system (SB-09) provides airspace
37 confinement of waste-bearing equipment and maintains that equipment at a negative air pressure relative
38 to the immediate room environment. Local differential pressure alarms (PDI-1305 and PDI-1311)
39 provide the operator with a positive indication that the process ventilation system is operating.

40
41 If the waste to be stabilized is in a TIC or in a container that is not suitable for use as both the mixing
42 vessel and the final disposal container, then the liquid waste is transferred to the system as follows.

43
44 The TIC or input waste container is positioned adjacent to the mixer enclosure (Z-1305). A portable
45 container pump (PMP-1308) is mounted on the incoming TIC or the container. A flexible pipe is used to
46 connect the pump outlet to the transfer line. The process vent line is also connected to the TIC or the
47 input waste container. An empty disposal container is then placed inside the enclosure, secured into
48 position, and the loading flange is lowered to mate and seal with the empty disposal container. The
49 portable container pump (PMP-1308) is turned on to pump the waste from the TIC or the input container
50 to the empty disposal container. If the waste container (up to 85 gallon overpacks) is suitable for use as

1 both a mixing vessel and a disposal container, the whole container is placed in the enclosure and staged
2 for receiving stabilizing reagents.

3
4 **Mixing Cycle:** When the container in the enclosure has the desired amount of waste, the reagent feeder
5 is started and a predetermined amount of reagent is metered into the container. The mixer (MX-1301) is
6 turned on for a predetermined period of time, during which the operator may raise or lower the mixer
7 impeller to promote a uniform mixture. When the mixing cycle is over, the mixer is turned off and raised
8 out of the container.

9
10 **Treatment Verification:** The filled disposal container is sampled, as required by the WAP, to verify
11 compliance with the LDR. After sampling, the container is capped, labeled, inspected for contamination
12 (the outer surface of the disposal container is swipe-tested for contamination and is cleaned, if necessary),
13 and then transported to the containerized waste staging area (STB room 2). When treatment is verified, a
14 treatment certification document is issued. If the container does not meet the treatment standard, it is
15 taken to the cutting and shearing system (TP-02) where it is size-reduced and then taken to the size
16 reduction and screening system (TP-01) where the waste is re-ground, placed in a TIC and taken to the
17 low-capacity mixing system (TT-02) for stabilization for a second time.

18
19 **Mixer Cleaning:** Since an in-container concept is used, only the mixer blade will require rinsing. The
20 mixer blade is cleaned by placing an empty drum in the mixing station, lowering the loading flange,
21 clamping the container, turning on the mixer, and spraying water on the mixer blade. After cleaning is
22 complete, the mixer is turned off, the clamps are released, the loading flange is raised, and the drum
23 containing rinse water is removed from the mixing station. The drum containing rinsate is filled with
24 additional waste and stabilized later in the same manner. The rinsate in the drum is subsequently used as
25 mixing water for stabilization of other waste at a later time.

26
27 **Log Book Update:** A log book is maintained and filled out for each container stabilization process and
28 for each container processed.

29
30 **5. Air Emissions**

31
32 For both worker safety and contamination control, process ventilation to this system is established and
33 confirmed prior to conducting liquid consolidation operations. The process ventilation system (SB-09)
34 provides airspace confinement of waste-bearing equipment and maintains that equipment and/or area at a
35 negative air pressure relative to the immediate room environment. The control of fugitive emissions is
36 provided by: A) the confinement enclosure (Z-1305) and B) the transportable in-process container (TIC).
37 Local differential pressure alarms (PDI-1301 and PDI-1305) provide the operator with a positive
38 indication that the process ventilation system is operating.

39
40 **6. Compliance with Process and Safety Performance Requirements**

41
42 The overall performance objective of the resulting waste form is to meet all of the requirements for land
43 disposal as prescribed by the RCRA and Dangerous Waste Regulations. Depending on the RCRA Waste
44 Code, the waste forms will meet: 1) a total concentration limit in the waste form; 2) the TCLP limits
45 specified for the waste code; or, 3) a total concentration in the waste form plus meet the TCLP limits in
46 the Universal Treatment Standards, (referred to as Universal Treatment Standards, UTS or Section 268.48
47 Standards). At a minimum, the stabilized waste form produced by the treatment system will meet the
48 following specific requirements to qualify for disposal as mixed waste in a mixed waste landfill.

49 A. The waste form must be a solid (i.e., pass the Paint Filter Test EPA SW 846 Method 9095) to

- 1 qualify for land disposal.
- 2 B. The waste form must pass the Liquid Release Test (51 FR 46828) to determine the presence of
- 3 free liquids released under pressure.
- 4 C. The waste form must have a minimum compressive strength of cohesive soil (ASTM D 695).
- 5 D. The waste form must pass the LDR requirements based on BDAT.

6
7 Key safety performance requirements are minimizing dust during stabilization, preventing potential spills,
8 and preventing the mixing of incompatible chemicals and reagents. The system operates at temperatures
9 below 200° Fahrenheit and a fire potential is not a key safety concern.

10
11 To ensure a safe and reliable stabilization operation, a PDS is developed and the required performance
12 and detailed processing procedure are specified for the given waste stream. The PDS is prepared before
13 proceeding with the stabilization of a waste stream. The performance specification and operating
14 procedures take into account the specific characteristics of the given waste stream and appropriate
15 treatability test(s).

16
17 The following design and administrative features are provided for compliance of the system with the
18 process and safety performance requirements.

19
20 **Reagent Quality Control:** The composition of the reagents and the required quality control is specified
21 by the PDS. Reagent quality is controlled by obtaining a certificate of conformance from the supplier
22 attesting that the supplied product meets the specified composition and properties.

23
24 **Pretreatment:** The pretreatment of the waste for pH adjustment is defined by the appropriate treatability
25 tests. If pH adjustment for an input solid waste stream is specified, the waste is mixed with an
26 appropriate reagent in the in-container mixing system. The final waste pH is maintained by controlling
27 the weight of the reagents added to the waste. If pH adjustment is specified for a given liquid waste
28 stream, it will be performed in the in-container mixing system. If the pH of the liquid waste is outside of
29 the greater-than-2-but-less-than-11 range, then the liquids are treated in the liquid consolidation system
30 (TP-09), the liquid treatment system (TP-04), or the in-container mixing system (TT-03) during the
31 stabilization process. The pH control methods employed by these systems are used to ensure that the
32 required pH adjustment has been achieved.

33
34 **Temperature:** The maximum curing temperatures for waste-cement stabilization is 200° Fahrenheit.
35 The temperature is controlled by the design of the waste-reagent formulation.

36
37 **Feed Rate and Sequence of Water and Additives:** Although the process is based on a batch operation,
38 the feed sequence of waste, water, and reagents varies based on the waste characteristics. The sequencing
39 and the rate of additions is controlled to avoid premature hardening of the mixture and to achieve the
40 desired performance. The requirements are established by the PDS and are implemented by setting the
41 sequence of the various additives.

42
43 **Mixing Time:** Waste/reagent mixing time controls homogeneity of the product. This requirement is
44 established by the PDS and is implemented by setting the automatic timers that control the running time
45 of the mixer.

46
47 **Minimizing Emissions:** Emissions from the system are minimized by providing enclosures for all
48 processing equipment including the waste transfer operations. The enclosures are kept under negative
49 pressure (-0.05 inch w.g. maximum) by connecting the vent ports to the STB process vent system (SB-
50 09). This process vent system uses a baghouse and carbon filtration to treat any particulate and organic

1 vapors that may be generated during the stabilization operation. The vent from the stabilization process is
2 treated for a second time by discharging the STB process vent system exhaust to the STB confinement
3 system which has HEPA and carbon filters.

4
5 **Minimizing Overfill and Spills:** Level controllers are provided and mounted above the mixing
6 vessel/disposable container. A high-level alarm stops all of the feed lines to the container. Also, the
7 system is installed above a secondary containment pan which is designed to capture the entire container
8 volume in the event of a spill.

9
10 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste
11 characterization and checking the waste stabilization reagent and pretreatment reagents in the
12 compatibility charts in the WAP.

13
14 **Corrosion Protection:** A corrosion chart is used to check the material of construction of the disposal
15 container against the waste composition. Anti-corrosion liners are placed inside the container when
16 needed.

17
18 **7. P&P Procedures.**

19
20 Equipment inspection, maintenance, and calibration are performed on this system based on the
21 manufacturer's recommendations. The following additional inspections are conducted as a part of the
22 MWF P&P procedures.

23
24 **Feeder Calibrations:** The reagent feeder weigh scale element (WE-0106) and the reagent feed weigh
25 scale transmitter (F-1306) are checked for calibration and proper operation. Inspection frequency is at
26 least once every 90 days when in use.

27
28 **System Confinement:** System confinement is checked by reading the negative pressure in the
29 differential pressure indicators (PDI-1301 and PDI-1305). If the system's internal pressure is greater than
30 -0.05 inch WG, then the system is shut down. Inspection frequency is daily at the beginning of the
31 morning shift when in use.

32
33 **Differential Pressure Indicators (PDI-1301 and PDI-1305):** These instruments are inspected for
34 problems relating to the proper indication of the desired differential pressure in the system (0.5 inch w.g.).
35 Both the sensing device and the indication dial are checked for operability and calibration. Inspection
36 frequency is at least once every 90 days when in use.

37
38 **Spill Control:** The waste feed, reagent feed, and container mixing areas are inspected for spills of solid
39 or liquid waste. Any spilled material is cleaned by a vacuum device and placed inside a container for
40 processing along with the given waste processing campaign. Inspection frequency is daily at the end of
41 the last shift when in use.

42
43 **Equipment Leaks:** System housing and enclosures are visually inspected for indication of any
44 corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency is at least
45 once every 90 days when in use

46
47 **8. Process Throughput**

48
49 The estimated output of the in-container mixing system is one 55 gallon drum of stabilized waste/hour.
50 This gives a waste processing throughput for of 3,600 lbs in an 8-hour shift. The average density of the

1 input waste is assumed to be 62 lbs/cubic foot. The design is based on the assumption that each drum will
2 contain 450 lbs (7.25 cubic feet) of liquid and 338 lbs. (4.83 cubic feet) of cement-based binder. The
3 liquid-binder mixture is continuously mixed for 5 minutes. The final product has a total volume of
4 7 cubic feet (density of 110 lbs/cubic foot). The waste form is cured for three days.

5 6 7 **9. Secondary Containment**

8
9 Secondary containment for TT-03 is a metal pan which is an integral floor of the mixing system. The pan
10 covers the entire mixing station enclosure floor and is designed to have a free volume that holds the
11 spillage from the entire volume of the largest container that is processed in the mixing station (i.e., an 85
12 gallon drum).

13
14 A portable secondary containment pallet is placed under any liquid-containing TIC or any liquid waste
15 container that is brought to the system for liquid transfer operations.

16
17 The free volume in the secondary containment space takes into account the space occupied by the
18 container or any equipment that is placed inside the containment area during the normal operation of the
19 system.

20 21 **REFERENCES**

22
23 Same as Systems TT-01 and TT-02 in Section 3.10

24 25 **3.13 SYSTEM TT-04, Polymer Mixing System**

26 27 **1. General Function**

28
29 The polymer mixing system (TT-04) has two modes of operation, stabilization/micro-encapsulation and
30 macro-encapsulation. In the stabilization/micro-encapsulation mode, the function of the system is to
31 target wastes to meet performance-based standards for land disposal. These wastes include nitrated salts
32 that cannot be stabilized by pozzolanic or grout type stabilization processes. In the stabilization/micro-
33 encapsulation mode, the system blends granular polymer reagents with granulated wastes to form a
34 homogeneous final product. The final product must meet LDR requirements as defined in the MWF
35 waste analysis plan (WAP). Stabilization has been identified as the Best Developed Available
36 Technology (BDAT) for treating a wide range of RCRA listed and characteristic waste streams. Also, the
37 treatment standards for many waste codes are performance-based. Therefore, any technology including
38 polymer micro-encapsulation which results in a waste form that meets the concentration performance
39 limits is acceptable. The resulting waste forms will meet the concentration based (performance) standards
40 and the stabilization (STABL) treatment technology requirements for the Resource Conservation
41 Recovery Act (RCRA) Land Disposal Restrictions (LDR).

42
43 In the second mode of operation, macro-encapsulation, the function of the system is to seal bulk lead
44 metals (RCRA Waste Code D-009, Radioactive Lead Solids Sub-category) with a layer of polymer.
45 Macro-encapsulation (MACRO) is defined as the application of a surface coating material or use of a
46 jacket of inert material to D009 RLSS or debris to completely surround the lead/debris and hinder the
47 release of hazardous constituents. The resulting waste form will meet the treatment technology standard
48 for the D009 RLSS waste thereby meeting the requirements for disposal in a non-Subtitle C Landfill per
49 the Resource Conservation Recovery Act (RCRA) Land Disposal Restrictions (LDR).

2. Reference Documents

- **Process Flow Diagram:** See drawings 31001-P-005 in Attachment 7 of Part B permit application.
- **Piping and Instrumentation Diagram:** See drawings 31001-P-025 in Attachment 7 of Part B permit application.
- **Key Components List:** See Table TT-04 in the equipment and instrument list in Attachment 8 of Part B permit application.
- **Key Components Technical Specification:** See the technical specification package enclosed in Attachment 8 of Part B permit application.
- **Key Control Devices:** See Table TT-04 in the equipment and instrument list in Attachment 8 of Part B permit application.
- **Instrument Data Sheets:** See the technical specification package that is enclosed in Attachment 8 of Part B permit application.
- **Interfacing Subsystems:** stabilization process vent system (SB-09); containerized waste staging area (STB room 2 and 4); bulk waste staging area (STB room 3); size reduction screening system (TP-01) cutting and shearing system (TP-02); sorting system (TP-03); dryer system (TP-08); GASVIT™ feed preparation system (GV-01).

3. Equipment and Process Description

The polymer mixing system TT-04 consists of a waste feeder (F-0413); a polymer screw feeder (F-0401); a waste/polymer blender (MX-0404), a polymer processing extruder (F-0409); an extruder cooling pump (PMP-0410); an extruder heat exchanger (HX-0411), a polymer pellet hopper (H-0402); and a polymer filling enclosure (Z-0416). In the stabilization mode, the system is automated and in the macro-encapsulation mode it is manually operated on a semi-continuous batch basis. Process safety monitoring and temperature-pressure control of the extruder are automated.

3.1 Polymer Stabilization Process

The polymer mixing system (TT-04) uses a plastic extruder to mix granulated solid waste with pelletized polymer reagents. This technique is based on the process developed and tested at the DOE sites. This process simultaneously heats, mixes, and conveys a pre-blended waste-plastic mixture so that a homogeneous melt (molten waste form) is extruded into a disposal container. After cooling below the melting temperature of plastic (about 120° Celsius), a solid monolithic waste form is produced.

The extruder equipment used for plastic stabilization/micro-encapsulation of wastes contains several processing zones in which temperature and pressure are controlled independently. This approach is used to control the melting process and to eliminate porosity in the waste form. A vent port provided in the extruder inlet allows the unit to be operated under negative pressure. The extruder process can accept waste streams with up to one weight per cent moisture and/or organic.

Low density polyethylene (LDPE) is used as the stabilization/micro-encapsulation reagent. Polymer stabilization/micro-encapsulation is accomplished by physical isolation of the waste and no chemical reaction occurs between the reagent and the waste. This encapsulation process physically isolates the solid waste particles and thereby the hazardous contaminants in a physically/mechanically stable, impermeable, chemically resistant polymeric material which is inert in the disposal environment. Consequently, contact between the waste and the environment and subsequent migration of contaminants into the disposal environment will be reduced. The waste particles and contaminants are more or less uniformly distributed throughout the encapsulating media. This process is used for waste streams which

1 are not suitable for treatment by stabilization technology based on cement type reagents. Pretreatment of
2 difficult-to-stabilize contaminants is performed by mixing solids with the selected reagents prior to feed
3 to extruder.
4

5 Polyethylene waste forms have a waste loading of approximately 60 wt % are typical for mixed wastes.
6 The TCLP test requires that the particle size of the waste matrix material is less than 3/8 inch (9 mm).
7 However, for certain waste stream, the polymer process will require a particle size of 1/8 inch. The
8 required size will be achieved by selection of a screen size at the shredder, size reduction and screening
9 system (TP-02). The polymer surrounds the waste and forms an impermeable barrier between the
10 contaminants/waste matrices and the environment.
11

12 The resistance to aggressive chemical attack is one of the primary reasons LDPE was chosen as a mixed
13 waste encapsulating media. At ambient temperatures, polyethylene is resistant to any concentration of
14 hydrochloric, hydrofluoric, phosphoric, and formic acids and ammonia, potassium hydroxide, sodium
15 hydroxide, potassium permanganate, and hydrogen peroxide. It is also resistant to sulfuric and nitric
16 acids in concentrations up to 50 wt%.

17
18 In general, LDPE is relatively unaffected by polar solvents including alcohols, phenols, esters, and
19 ketones. The LDPE encapsulant material has been shown to be very resistant to microbial attack. In
20 addition, gas generation due to radiolysis of the polymer, is negligible over the range of doses tested at
21 BNL (1.0×10^7 to 1.0×10^{11} Bq/m). Polyethylene is also resistant to water and to aqueous solutions.
22 This is particularly relevant to its use as waste encapsulating media. The surfaces of polyethylene waste
23 forms are hydrophobic and consequently they repel aqueous leaching solutions.
24

25 **3.2 Polymer Macro-Encapsulation Process**

26
27 The macro-encapsulation process used by the polymer mixing system (TT-04) provides a surface coating
28 material for D009 RLSS and completely surround the lead and hinders the release of hazardous
29 constituents. In macro-encapsulation application, the polyethylene is melted in an extruder and applied to
30 the lead so as to form a coating or jacket which is physically and mechanically stable, impermeable,
31 chemically resistant and inert in the disposal environment. Consequently, contact between the waste and
32 the environment and subsequent migration of contaminants into the disposal environment is reduced.
33

34 **4. Operations and Control Description**

35 36 **4.1 Polymer Stabilization Mode**

37
38 Operations performed by this system for a stabilization/micro-encapsulation process will include: 1)
39 prepare a process data sheet for stabilizing the waste stream; 2) perform pre-treatment as specified in the
40 PDS; 3) receive waste in the system; 4) receive polymer from the reagent storage system (SB-01); 5) mix
41 polymer, and waste in a blender; 6) feed the blend to the plastic extruder to produce a stabilized waste
42 form; 7) discharge waste into a disposal container; and, 8) perform treatment verification; 9) rinse mixer;
43 and 10) update log book.
44

45 **Preparing Process Data Sheets:** The specific treatment process for each waste stream is specified in a
46 process data sheet (PDS) which is developed after careful consideration of the waste characteristics. If
47 necessary, a treatability test is conducted to evaluate the compatibility of the wastes for mixing with
48 reagents or verifying the safety and effectiveness of a given stabilization process. The format and content
49 of the PDS is described in previous sections (Section 3.10).
50

1 **Pretreatment:** Incoming waste is prepared and size reduced in other pretreatment systems in accordance
2 with the requirements established by the PDS. Wet and moist waste streams requiring polymer treatment
3 are pretreated in the dryer system (TP-08) where the waste is dried to less than 1% moisture. Waste
4 streams not in compliance with the stabilization sizing requirements, (i.e., less than 3/8-in) are size
5 reduced in the size-reduction and screening system (TP-01). Also, if waste has a contaminant that is
6 incompatible with polymer stabilization and causes failure of the TCLP tests of the product, then
7 additional pre-treatment is performed by adding fixation reagent/s when the waste is being blended in the
8 polymer mixing system.
9

10 **Waste Transfer.** After the initial pretreatment, waste is placed in a TIC, weighed, and transported to TT-
11 04 by a fork lift. The TIC is placed on top of the waste feed volumetric conveyor (F-0413) installed
12 above the mixer. The bottom of the TIC is connected to the waste feeder inlet by a flexible boot to form
13 an airtight seal. The bottom gate of the TIC opens to allow waste to flow into the feeder. The feeder
14 transfers waste to the waste/polymer blender.
15

16 **Polymer Preparation:** Polymer reagents in pellet form are shipped dry to the MWF in Gaylord boxes (a
17 large cardboard box with plastic liner). The pellets are redistributed from the bulk packaging box to 55
18 gallon drums. The weight of the drum is measured and a fork lift is used to transport the reagent drums
19 from the reagent storage system to the polymer feeder system. A flex screw conveyor with a volumetric
20 feeder is used to transfer granular polymer reagent from the pre measured 55 gallon barrels to the waste/
21 polymer blender.
22

23 **Blending:** The waste feeder is turned on to introduce a predetermined quantity of waste from the TIC
24 into the blender. When the desired ratio of polymer and waste is accumulated in the blender, the mixer is
25 turned on to allow mixing for a pre-determine cycle.
26

27 **Extrusion:** A continuous homogeneous batch of waste and polymer is prepared in the blender. Next, the
28 extruder is operated in heating mode. When the extruder reaches the desired temperature, the operator
29 sets the desired flow rate and simultaneously turns on the blender and the weight screw feeder to deliver
30 the mix of waste and polymer into the extruder feed hopper. The extruder processes the mixture and
31 discharges the mixture into a container. When the container is full, the mixer, the blender, and the feeder
32 are turned off. However, the extruder is allowed to run until all the residue in the screw section is
33 discharged.
34

35 **Extruder rinse:** The extruder is a self-cleaning device and no rinsing is needed. At the end of each
36 batch the extruder will be fed with polymer only to encapsulate any residual waste in the extruder barrel
37 and transfer it to a disposal container.
38

39 **Treatment Verification:** The filled disposal container is sampled as required by the WAP to verify
40 compliance with the LDR. After sampling, the container is capped, labeled, inspected for contamination
41 (the outer surface of the disposal container will be swipe tested for contamination and will be cleaned, if
42 necessary) and then transported to the containerized waste staging area (STB room 2). When treatment is
43 verified, a treatment certification document is issued. If the container does not meet the treatment
44 standard, it is taken to the cutting and shearing system (TP-02) where it is size-reduced and then taken to
45 the size reduction and screening system (TP-01) where the waste is re-ground, placed in a TIC and taken
46 to the polymer mixing system (TT-04) for stabilization for a second time.
47

48 **Log Book Update.** A log book will be maintained and filled out for each container stabilization process
49 and for each container processed.
50

1 **Filled container transfer:** A forklift is used to remove the filled container from under the extruder to
2 TS-01.

3
4 **4.2 Polymer Macro-Encapsulation Mode**

5
6 Operations involving a macro-encapsulation process will include: 1) polymer preparation; 2) receiving
7 and preparing bulk lead material; 3) feeding polymer to the extruder and allowing molten plastic to flow
8 into the container and seal the bulk lead surface; 4) when the lead is macro-encapsulated, stop the
9 extruder, allow the container to cool down, cap the container; 5) verifying treatment and sending the
10 container to the containerized waste staging area for final inspection and certification.

11
12 Waste classified as RLLS is macro-encapsulated in accordance with the following procedure.

13
14 **Polymer Preparation:** Polymer reagents, in pelletized form, are shipped to the MWF in Gaylord boxes
15 (a large cardboard box with plastic liner). The pellets are redistributed from the bulk packaging box to 55
16 gallon drums. The weight of the drum is measured and a forklift is used to transport the reagent barrels
17 from the reagent storage system to the polymer feeder. A flex screw conveyor with a volumetric feeder is
18 used to transfer granular polymer reagent from the pre measured 55 gallon barrels to the waste/polymer
19 blender.

20
21 **Receiving and Preparing Bulk Lead:** Incoming bulk lead is placed inside a basket and the basket is
22 placed inside an empty container such that there is a minimum 2-inch void space between the container
23 shell and the basket. The basket/container filling operation is either conducted in the cutting and shearing
24 system (TP-02), sorting system (TP-03) or in the inspection room (STB room 4). The operator transports
25 the container to TT-04 by a forklift.

26
27 **Polymer Filling:** The lead container is placed near the polymer mixing station and the basket containing
28 bulk lead is taken out. The empty container is put in the polymer fill station under the extruder discharge
29 port. The operator turns on the extruder in the heating mode. When the extruder reaches the desired
30 temperature, the operator starts the polymer feeder and molten polymer flows to the bottom of empty
31 container until approximately a 2 inch layer of polymer is accumulated to form a seal in the bottom of the
32 container. The operator stops the polymer feeder and takes the container out of the filling enclosure.
33 Next, the operator puts the basket containing RLSS back into the container before it is transferred to the
34 polymer filling station. The basket is securely positioned on a solid polyethylene base in the bottom of
35 the disposal container. The basket is also centered in the disposal container such that the minimum
36 thickness of polymer encapsulant required to meet the performance specifications can be poured around
37 and on top of the basket. The minimum thickness of the extruded polyethylene jacket in the TT-04
38 process is 2 inch.

39
40 Next, the operator places the container on top of the turn-table in the polymer filling station. The turn-
41 table is turned on and the polymer feeder and extruder are started to pour molten polymer into the void
42 space in the outer shell and top of the container. The extruder discharges polymer into the container until
43 it is full. At least 2 inches of polymer are placed on top of the radioactive lead solid sub-category
44 (RLSS). The polymer feeder, mixer and weight feeder are turned off while the extruder is allowed to run
45 until all of the product is discharged. The container is considered full when the freeboard is less than 10
46 percent of the total container volume.

47
48 **Treatment Verification:** The filled container (cooled waste form) is visually inspected as required by
49 the WAP to verify compliance with the LDR. After inspection, the container is capped, labeled, inspected
50 for contamination (the outer surface of the disposal container will be swipe tested for contamination and

1 will be cleaned, if necessary) and then transported to the containerized waste staging area (STB room 2).
2 When treatment is verified, a treatment certification document is issued. If the container does not meet
3 the treatment standard, it is taken to the cutting and shearing system (TP-02) where the container is
4 opened and then placed inside another container and the container is macro-encapsulated for the second
5 time.

6
7 **Log Book Update:** A log book will be maintained and filled out for each container macro-encapsulation
8 process and for each container processed.
9

10 **5. Air Emissions**

11
12 For both worker safety and contamination control, process ventilation to this system will be established
13 and confirmed, prior to mixing the waste and the polymer pellets, and feeding any waste into the extruder,
14 or filling enclosure treatment operations. The process ventilation system (SB-09) provides air-space
15 confinement of waste bearing equipment and maintains that equipment and/or area at a negative air
16 pressure relative to the immediate room environment. The control of fugitive emissions is provided for:
17 A) the waste/polymer blender (MX-0404); B) the extruder (F-0409); C) the waste feeder (F-0413); and D)
18 the polymer filling enclosure (Z-0416). Local differential pressure alarms (PDI-0404, PDI-0409, PDI-
19 0413, PDI-0416) provide positive operator indication that the process ventilation system is operating.
20

21 **6. Compliance with Process and Safety Performance Requirements**

22
23 Polyethylene is used by the system as a sealant for macro-encapsulation and micro-encapsulation. In the
24 stabilization/micro-encapsulation mode, waste and polyethylene are blended and fed to an extruder where
25 polyethylene melts and encapsulates the waste in a homogeneous waste form. In the macro-encapsulation
26 mode, polyethylene is melted in an extruder and applied to the lead/debris so as to form a jacket which is
27 physically and mechanically stable, impermeable, chemically resistant and inert in the disposal
28 environment. Consequently, contact between the waste/debris and the environment and subsequent
29 migration of contaminants into the disposal environment is reduced.
30

31 **6.1 Polymer Stabilization Mode**

32
33 The overall performance objective of the resulting waste form is to meet all of the requirements for land
34 disposal as prescribed by the RCRA and Dangerous Waste Regulations. Depending on the RCRA Waste
35 Code, the waste forms will meet: 1) a total concentration limit in the waste form; 2) the TCLP limits
36 specified for the waste code; 3) a total concentration in the waste form plus meet the TCLP limits in the
37 Universal Treatment Standards, (referred to as Universal Treatment Standards, UTS or Section 268.48
38 Standards); or 4) the specified treatment technology (i.e., macro RLSS and macro debris). At a minimum,
39 the waste form produced by the treatment system will meet the following specific requirements to qualify
40 for disposal as mixed waste in a mixed waste landfill.
41

- 42 1. The waste form must be a solid (i.e., pass the Paint Filter Test EPA SW 846 Method 9095 to
43 qualify for land disposal).
- 44 2. The waste form must pass the Liquid Release Test (51 FR 46828) to determine the presence
45 of free liquids released under pressure.
- 46 3. The waste form must have a minimum compressive strength of cohesive soil (ASTM D 695).
- 47 4. The waste form must pass the Land Disposal Restriction (LDR) requirements based on Best
48 Developed Available Technology (BDAT).
49

50 Key safety performance requirements are minimizing fugitive emissions, preventing fire potentials, and

1 preventing the mixing of incompatible material. Liquid spill is not a safety concern in this process
2 because liquids are not treated by the plastic stabilization process. However, the molten polymer-waste
3 mixture is a liquid which freezes to a solid upon cooling.

4 To ensure a safe and reliable stabilization operation, a process data sheet is developed and the required
5 performance and a detailed processing procedure is specified for the given waste stream. The process
6 data sheet is prepared before proceeding with the stabilization of a waste stream. The performance
7 specification and operating procedures take into account the specific characteristics of the given waste
8 stream and an appropriate treatability tests.

9
10 Parameters deemed important to meet processing and safety performance requirements and their control
11 during operations are discussed next.

12
13 **Polymer Molecular Weight:** Low density polyethylene (LDPE) typically has a density between 0.910
14 and 0.925 g/cm³ and is best suited for the extrusion waste form process. Reagent quality is controlled by
15 obtaining from the supplier a certificate of conformance attesting that the supplied product meets the
16 specified composition and density.

17
18 **Polymer Melt Index:** The melt index of the of about 55 g of polymer per 10 minutes of flow in the
19 standard test apparatus at 190 °C is typical of the LDPE used in extrusion processes. Reagent quality is
20 controlled by obtaining from the supplier a certificate of conformance attesting that the supplied product
21 meets the specified melt index.

22
23 **Pretreatment:** Chemical pretreatment may be necessary to stabilize contaminants which would
24 otherwise result in failure of the TCLP test. Pre-treatment needs are defined by treatability tests. The
25 reagent needed for pre-treatment is weighed by scale and fed to the batch in the blender. The mixing time
26 is set be a timer that controls the blender drive. Reagent quality is controlled by obtaining from the
27 supplier a certificate of conformance attesting that the supplied product meets the specified composition.

28
29 **Waste Particle Size:** The particle size of the waste blended with polymer is important and is limited by
30 the size of the material used in the TCLP test. The test requires that the treated waste be less than 3/8
31 inch (about 9 mm) in size. For certain waste streams, the particle size will be 1/8 inch. A screen installed
32 at the size reduction and screening system (TP-01) shredder discharge ensures that the size of the feed is
33 kept within the specified range.

34
35 **Moisture Content:** Moisture content of the waste must be less than 1 percent. This is needed to
36 minimizes holes in the monolith created by steam bobbles. This parameter is controlled by characterizing
37 the incoming waste.

38
39 **Temperature:** Process temperatures for waste - plastic stabilization range between 125° Celsius and
40 150° Celsius. Temperature control is automated by a multi-zone heating system. Each zone has its own
41 temperature sensing element which is interlocked to the heating system for that zone.

42
43 **Pressure:** Moderate pressures in the range of 1 to 20 MPa are used to enhance mixing and delivery of the
44 molten waste form to the mold. This pressure range is monitored by an instrument mounted on the unit.

45
46 **Process Rate:** The extruder is designed for a specified nominal feed/extrusion rates. The adjustment
47 range of the feed/extrusion rate is also determined by the manufacturer. The process rates for various
48 waste streams will be set according to the waste characteristics and by staying within the range
49 recommended by the manufacturer.

1 **Mixing Time:** Waste/reagent pre-blending time and the residence time in the extruder will control
2 homogeneity of the product. These requirements are established by the process data sheet and are
3 implemented by setting automatic timers that control the mixing time in the blender. The resident time in
4 the extruder is controlled by setting the feed rate of the blend into the extruder inlet.

5
6 **Minimizing Emissions:** The inlet and outlet ports are vented to the STB process vent system and are
7 maintained at negative pressure with respect to ambient. Emissions from the system is minimized by
8 providing enclosures for all processing equipment including the waste filling station. The enclosures are
9 kept under negative pressure by connecting the vent ports to the STB process vent system (SB-09). This
10 process vent system uses carbon filtration to treat any organic vapors that may be generated during the
11 stabilization operation. The vent from the stabilization process is treated for a second time by discharging
12 the STB process vent system exhaust to the STB confinement system, which has HEPA as well as carbon
13 filters.

14
15 **Preventing Fire:** Only waste with low concentrations (less than 500 ppm total) of hazardous
16 contaminants or chemicals that have a flash point below 190 °C are acceptable. The waste is
17 characterized prior to processing to ensure that only acceptable wastes are processed by polymer
18 stabilization process.

19
20 **Mixing of Incompatible Material:** Mixing of incompatible material is prevented by waste
21 characterization and checking the waste, low-density polyethylene (LDPE) reagent and pretreatment
22 reagents in the compatibility charts in WAP.

23
24 **6.2 Polymer Macro-Encapsulation Mode**

25
26 The overall performance objective of the resulting waste form is to meet all of the requirements for land
27 disposal as prescribed by the RCRA and Dangerous Waste Regulations. Macro-encapsulation is the
28 technology based standard for radioactivity contaminated elemental lead and an alternate treatment
29 standard for debris. Consequently inspection of the encapsulated waste form and demonstration that an
30 appropriate encapsulating material is used are the minimal requirements. At a minimum, the macro-
31 encapsulated lead waste form and the macro-encapsulated debris produced in the system will meet the
32 following specific requirements to qualify for disposal as mixed waste in a mixed waste landfill.

- 33
34 – The waste form must be a solid (i. e., pass the Paint Filter Test EPA SW 846 Method 9095 to
35 qualify for land disposal).
36 – The waste form must pass the Liquid Release Test (51 FR 46828) to determine the presence of
37 free liquids released under pressure.
38 – The waste form must have a minimum compressive strength of cohesive soil (ASTM D 695)
39 – The waste form must pass the Land Disposal Restriction (LDR) requirements based on Best
40 Developed Available Technology (BDAT).

41
42 Key safety performance requirements are minimizing fugitive emissions, preventing fire potentials, and
43 preventing the mixing of incompatible material. Liquid spill is not a safety concern in this process
44 because liquids are not treated by the plastic stabilization process.

45
46 To ensure a safe and reliable stabilization operation, a process data sheet is developed and the required
47 performance and a detailed processing procedure is specified for the given waste stream. The process
48 data sheet is prepared before proceeding with the stabilization of a waste stream. The performance
49 specification and operating procedures take into account the specific characteristics of the given waste

1 stream and an appropriate treatability test/s.

2
3 Parameters deemed important to meet processing and safety performance requirements and their control
4 during operations are discussed next.

5
6 **Polymer Molecular Weight:** Low density polyethylene (LDPE) typically has a density between 0.910
7 and 0.925 g/cm³ and is best suited for the extrusion waste form process. Reagent quality is controlled by
8 obtaining from the supplier a certificate of conformance attesting that the supplied product meets the
9 specified composition and density.

10
11 **Polymer Melt Index:** The melt index of the of about 55 g of polymer per 10 minutes of flow in the
12 standard test apparatus at 190° Celsius is typical of the LDPE used in extrusion processes. This low melt
13 index allows means that the molten polymer flows in the container easily to fill the void space in the
14 container. Reagent quality is controlled by obtaining from the supplier a certificate of conformance
15 attesting that the supplied product meets the specified melt index.

16
17 **Minimizing Cracks In the Seal:** A thick layer of coating (a minimum thickness of 2 inches) is applied
18 to the lead surface to provide a strong jacket around the waste. This jacket has sufficient strength and
19 resists any internal forces cracking in the macro-encapsulation jacket.

20
21 **Preventing Fire:** Only waste with low concentrations (less than 500 ppm total) of hazardous
22 contaminants or chemicals that have a flash point below 190° Celsius are acceptable. The waste is
23 characterized prior to processing to ensure that only acceptable wastes are processed by the polymer
24 macro-encapsulation process.

25
26 **7. P&P Procedures.**

27
28 Equipment inspection, maintenance, and calibration will be performed on this system based on
29 manufacturer’s recommendations. The following additional inspections will be conducted as a part of the
30 MWF P&P procedures.

31
32 **Feeder Calibrations:** The gravimetric and volumetric metering device used in the process (scales, weigh
33 cells, flow meters, etc.) will be checked for proper calibration and operability. Inspection frequency will
34 be at least once every 90 days when in use.

35
36 **System Confinement:** System confinement will be checked by reading the negative pressure in the
37 differential pressure indicators (PDI-0404, PDI-0409, PDI-0413, PDI-0416). If the system internal
38 pressure of the system is greater than -0.05 w.g., then the system will be shut down. Inspection frequency
39 will be daily at the beginning of the morning shift, when in use.

40
41 **Differential Pressure Indicators (PDI-0404, PDI-0409, PDI-0413, PDI-0416):** These instruments will
42 be inspected for problems relative to proper indication of the desired differential pressure in the system.
43 Both the sensing device and indication dial will be checked for operability and calibration. Inspection
44 frequency shall be at least once every 90 days when in use.

45
46 **Spill Control:** Any solid waste spilled in the waste feed, reagent feed, and container fill areas will be
47 cleaned manually or by a vacuum device and placed inside a container for processing along with the
48 given waste processing campaign. The area near the system will be inspected for solid waste spillage.
49 The inspection frequency will be at the end of the last shift, daily, when in use.

1 **Equipment Leaks:** Mixer housing, extruder housing, feeders and system enclosures, and flexible
2 connections will be visually inspected for indication of any rupture, corrosion, weld cracks, and/or loose
3 bolts at the flanged connections. Inspection frequency will be at least once every 90 days when in use
4

5 **8. Process Throughput**

6
7 A 500 lbs/hour extruder is provided. The waste container production rate is estimated to be one
8 55 gallon container per hour.
9

10 The polymer mixing system does not process liquid wastes. Hence, a liquid spillage scenario is unlikely.
11 The unit is installed on the STB floor which is contained by a concrete curb constructed around the floor
12 slab boundary.
13

14 **REFERENCES**

- 15
16 1. Section 268.40, 51 FR 40641.
17
18 2. Section 268.42, 51 FR 40641.
19
20 3. Section 268.45, 51 FR 40641.
21
22 4. CD2F-S0118, Hazardous debris Final Rule technical Support Document, US EPA,
23 Washington, DC, June 30, 1992.
24
25 5. DOE Mixed Waste Focus Area Technology Development Requirements Document,
26 Polymer Encapsulation, DRAFT, May,14, 1996.
27
28 6. P. D. Kalb, J. H. Heiser, III, and P. Colombo, Polyethylene Encapsulation of Nitrate Salt
29 Wastes: “Waste Form Stability, Process Scale-up, and Economics,” Technical Status
30 Topical Report: BNL 52293, UC-721 (Defense Waste Management -DOE/OSTI-4500-
31 R75), Brookhaven National Laboratory, Associated Universities, Inc., Upton, NY, July
32 1991.
33
34 7. DOE/LLW-217 Rev. 0, Radioactive Waste Technical Support Program - Chapter 5,
35 Matrix Parameters, T. D. Kirkpatrick, January 1995.
36
37 8. American Society for Testing and Materials, Annual Book of ASTM standards, 1996,
38 ASTM Publishing, Philadelphia _A, 1996.
39
40 9. EPA Publication SW-846, third edition, “Test Methods for Evaluating Solid Waste,
41 Physical/Chemical Methods.”

1 **3.14 System TT-05, Physical Extraction System**

2
3 **1. General Function**

4
5 The function of this system is to treat (decontaminate) bulk metals, bulk non-metals, loose metals, and
6 empty metal containers by an abrasive blasting process in TT-05. Physical extraction is a treatment
7 standard for waste classified under the EPA Debris Rule.
8

9 **2. Reference Documents**

- 10
11 – **Process Flow Diagram:** See drawings 31001-P-005 in Attachment 7 of Part B permit
12 Application.
13 – **Piping and Instrumentation Diagram:** See drawings 31001-P-026 005 in Attachment 7 of Part
14 B permit Application.
15 – **Key Components List:** See Table TT-05 in the equipment and instrument list 005 in Attachment
16 8 of Part B permit Application.
17 – **Key Components Technical Specification.** See the technical specification package enclosed
18 005 in Attachment 11 of Part B permit Application.
19 – **Key Control Devices.** See Table TT-05 in the equipment and instrument list 005 in Attachment
20 8 of Part B permit Application.
21 – **Instrument Data Sheets.** See the technical specification package 005 in Attachment 11 of Part
22 B permit Application.
23 – **Interfacing Subsystems.** stabilization process vent system (SB-09); containerized waste staging
24 system (TS-01); bulk waste receiving system (TS-02); cutting and shearing system (TP-02);
25 sorting system (TP-03); liquid holding tanks (TP-06); compaction system (TP-07); GASVIT™
26 feed preparation system (GV-01); GASVIT™ liquid feed system (GV-02).
27

28 **3. Equipment and Process Description**

29
30 The physical extraction tank system consists of a decontamination enclosure and a turntable/trolley
31 assembly for mounting the items to be cleaned. The cleaning process removes surface contamination
32 from waste classified as debris. The cleaning operation is contained in an atmosphere-controlled booth.
33 The booth is operated manually through a gloveport. The tank system primarily uses CO₂ pellet (dry-ice)
34 abrasive blasting since this minimizes secondary waste generation. Other abrasive media, such as
35 aluminum oxide pellets and glass beads, may also be used. Treated waste is containerized and sent to the
36 compaction system (TP-07) for in-drum compaction.
37

38 **4. Operations and Control Description**

39
40 Operations include: 1) waste item receipt; 2) abrasive blasting; 3) treatment verification; 4) treated waste
41 transfer; and 5) secondary waste handling.
42

43 **Waste Item Receipt:** The operator transports conveyor bins containing waste material primarily from
44 the cutting and shearing tank system (TP-02) and from the sorting system (TP-03). Before the transfer,
45 large pieces are size reduced in the cutting and shearing tank system (TP-02) to fit on the decontamination
46 booth turntable. The bins are transferred to TT-05 by fork lift.
47

48 **Abrasive Blasting:** Size reduced waste items are placed on the decontamination booth turntable. The
49 turntable is moved into the decontamination chamber. The operator turns on the abrasive blasting media

1 pumps and directs the blasting nozzle toward the selected surface. The operator can use different blasting
2 methods by changing the blasting material in the blasting sump. The blasting operation is continued until
3 the surface is clean.

4
5 **Treatment Verification:** After cleaning, the treated item is taken out of the booth and a visually
6 inspected to verify the cleanliness level. If the item passes the inspection, it is documented and placed
7 into an outgoing waste TIC. If inspection fails, the waste is put back into the booth and cleaned again.

8
9 **Treated Waste Transfer:** After inspection, the treated items are placed in a TIC and sent to the staging
10 area for documentation and staging.

11
12 **Secondary Waste Handling:** The residues generated from surface cleaning and the abrasive media
13 together with rinse spray water are collected in a sump in the decontamination enclosure. The rinse water
14 is recycled through a media filter where the solids and water are separated. The water is returned to the
15 spray system. The filtered solids are collected in a TIC. When full, the drum is sent to the in-container
16 mixing tank system (TT-03) for treatment, or to the liquid treatment system (TP-04).

17
18 **5. Air Emissions**

19
20 The process ventilation system (SB-09) is connected to the abrasive blast booth enclosure to provide
21 airspace confinement. Local differential pressure gauge (PDI-0509) provides the operator with a positive
22 indication that the process ventilation system is operating.

23
24 **6. Compliance with Process and Safety Performance Requirements**

25
26 The overall performance objective of the unit is to clean debris-classified waste by a physical extraction
27 technique according to the standards specified in WAC 173-303-140 (40 CFR 268.45). This regulation
28 requires a visual inspection for verification of “clean debris surfaces.” “Clean debris surface” means the
29 surface, when viewed without magnification, is free of all visible contaminated soil and hazardous waste,
30 except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor
31 discolorations. Soil and waste in cracks, crevices, and pits may be present provided that such staining,
32 waste, and soil in cracks, crevices, and pits are limited to no more than 5% of each square inch of surface
33 area (WAC 173-303-140 (40 CFR 268.45). Key safety performance requirements are preventing spills
34 and safe equipment operation.

35
36 The following design and administrative features are provided for compliance of the system with the
37 process and safety performance requirements.

38
39 **Leak Detection:** Level-indicating devices are located internally in the booth sump. A local alarm will
40 automatically sound if a high-level occurs.

41
42 **7. P&P Procedures**

43
44 Equipment inspection, maintenance, and calibration are performed on this system based on the
45 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
46 MWF P&P procedures.

47
48 **Spill Control:** The container physical extraction system area is inspected for loose material and water
49 spills. Any spilled material is cleaned by the vacuum cleaner machine. Inspection frequency is daily at
50 the end of the last shift when in use.

Level Controllers: Both sump level controllers are inspected and calibrated. Inspection cycle is once every 180 days.

Equipment Leaks: System enclosures, piping, and pumps are visually inspected for indications of any corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection frequency are at least once every 90 days when in use.

Confinement: The abrasive blast booth is both an airtight and watertight enclosure to prevent the release of vapors and liquid from release from the unit. The system is equipped with a differential pressure gauge. Prior to start, the operator assures that the cleaning booth is under a negative pressure.

Emergency Stop (E-Stop): A local E-Stop switch is readily accessible for the operator to activate if required. This action immediately stops all operating devices in the booth.

8. Process Throughput

Throughput for TT-05 depends on the type of surface area to be decontaminated, the type of contaminant, and the desired final product specifications. The process can be adjusted to accommodate all three variables. Nominal throughput for the physical extraction system is estimated at 60 cubic feet of debris in an 8-hour shift.

9. Secondary Containment

Secondary containment for TT-06 is the floor area which is an integral floor of the STB. A concrete curve is provided around the STB slab boundary. The area has sufficient free volume to collect water accumulated in the drum and the large container washing units.

A portable secondary containment pallet is placed under any liquid-containing TIC or any liquid waste container that is brought to the system for liquid transfer operations.

The free volume in the secondary containment space takes into account the space occupied by the container or any equipment that is placed inside the containment area during the normal operation of the system.

3.15 System TT-06, Container Rinse System

1. General Function

The function of the container rinse system (TT-06) is to wash and triple-rinse empty containers to comply with the State of Washington Regulation WAC 173-303-160 for container reuse.

2. Reference Documents

- **Process Flow Diagram:** See drawings 31001-P-005
- **Piping and Instrumentation Diagram:** See drawings 31001-P-027
- **Key Components List:** See Table TT-06 in the equipment and instrument list in Attachment 8.
- **Key Components Technical Specification:** See the technical specification package enclosed in Attachment 8.
- **Key Control Devices:** See Table TT-06 in the equipment and instrument list in Attachment 8.
- **Instrument Data Sheets:** See the technical specification package that is enclosed in

Attachment 8.

- **Interfacing Subsystems:** stabilization process vent system (SB-09); containerized waste staging system (TS-01); bulk waste receiving system (TS-02); size reduction and screening (TP-01); cutting and shearing system (TP-02); sorting system (TP-03); liquid treatment system (TP-04); liquid holding tanks (TP-06); compaction system (TP-07); dryer system (TP-08); in-container mixing system (TT-03); polymer mixing system (TT-04); physical extraction system (TT-05); GASVIT™ feed preparation system (GV-01); and GASVIT™ liquid feed system (GV-02).

3. Equipment and Process Description

The container rinse system (TT-06) consists of: 1) a large container rinse enclosure for the B-25 boxes and IBC containers; 2) a 55 gallon drum washer, and 3) a vacuum cleaning system suitable for cleaning both wet and dry surfaces. Each unit is self-contained complete with a spray system, pumps, sumps, and controls. The inside and the outside surface of the containers are cleaned as necessary to meet decontamination standards. Once the empty drums or B-25 boxes are cleaned they are sent to other function areas within the stabilization facility for reuse. Rinsate and filtered sludge are collected and sent to one of the following treatment systems: in-container mixing (TT-03), liquid treatment, (TP-04), or the GASVIT™ box sort system (GV-01).

4. Operation and Control Description

Operations in this system include: 1) the receipt of empty containers; 2) vacuuming the containers; 3) rinsing of the containers; and 4) the disposition of secondary waste.

Empty Container Receipt: Containers consisting of either empty drums and/or empty B-25 boxes are received in the container rinse system from other treatment systems throughout the stabilization building.

Container Vacuum Cleaning: The container’s inside walls and floors are vacuumed to remove loose debris and any loose water.

ISO Container Rinse: ISO containers are first vacuum cleaned to remove residues and loose particulates. If triple-rinsing is required due to the nature of waste stored in the container, the operation is performed using a hand-held spray nozzle which receives high-pressure spray water from the IBC container wash system. Using the nozzle, the ISO container is washed down and the water is allowed to accumulate in the secondary containment on the floor of the ISO container. After triple-rinse, the loose water is removed from the ISO container floor by the vacuum pump.

IBC and B-25 Box Container Rinse: TT-06 is designed to wash metal bins and B-25 boxes. Box and container washing is accomplished by using a cap that covers and seals the top of the B-25 container. A switch is activated that starts simultaneous spray and siphoning operations. A wash solution is sprayed under high-pressure on the inside of the container. The waste water is siphoned into a waste water holding sump. The sump is equipped with a level sensor to guard against accidental over filling. The waste water is transported to the liquid waste treatment system for treatment.

Drum Rinse: The drum washing system is designed to wash 55 gallon drums and 85 gallon drums. The washing unit is equipped with a high-pressure hot water spray system, vacuum- operated siphon, and a sump. This operation is contained inside an atmosphere-controlled enclosure. The operator places contaminated drums on the drum-feeding track and pushes them inside the enclosed wash booth. Once in position, the booth door is closed. A switch is activated that starts simultaneous spray and siphoning operations. Heated wash solution is sprayed under high-pressure on the outside and the inside of the

1 drums. Waste water is siphoned into a waste water holding sump. The sump is equipped with a level
2 sensor to guard against accidental over filling. The contents of the waste water sump tanks are
3 transported to the liquid waste treatment system for treatment.

4
5 **Secondary Waste Handling:** Secondary waste from this process is waste water which is collected in
6 holding sumps or drums and transferred to the liquid treatment system. Spent filters and residue from the
7 vacuum cleaning unit are either stabilized in the STB or sent to the GVB for treatment.

8
9 **Clean Container Handling:** Washed B-25 boxes are either returned directly to trucks or sent to the
10 waste storage facility for pickup. Cleaned drums and boxes are either returned to the generators for reuse
11 or used by the MWF. At the end of their useful service lives, all containers are size reduced by cutting
12 and compaction and treated to meet land disposal requirements.

13
14 **Non-Reusable Containers Disposition:** Any container that is found to be unusable is sent to a
15 radioactive waste processing facility licensed for decontamination and free release of radioactive material.

16
17 **5. Air Emissions**

18
19 For both worker safety and contamination control, process ventilation to this system is established and
20 confirmed prior to conducting washing/rinsing treatment operations. The process ventilation system (SB-
21 09) provides airspace confinement of waste-bearing equipment and maintains that equipment and/or area
22 at a negative air pressure relative to the immediate room environment. The control of fugitive emissions
23 is provided for the triple rinse drum washer (Z-0601), and tote bin washer (Z-0603). Local differential
24 pressure alarms (PDI-0601 and PDI-0603) provide the operator with a positive indication that the process
25 ventilation system is operating.

26
27 **6. Procedures to Prevent Hazards**

28
29 The following administrative and design features are provided for P&P.

- 30
31 1. Empty drums or containers received by the container rinse system (TT-06) are examined to
32 ensure that the recycled containers or drums are acceptable, or else the drums or containers are
33 tagged as non-recyclable units and are size reduced after cleaning.
34 2. The operator visually verifies that the process vent system is active and maintains a negative
35 pressure within the rinse unit by means of local indication.
36 3. Visually inspect and verify that drum and/or TIC is empty and that the level indicator is in place
37 prior to removal of the waste water from the washing units. Transporting of the TIC to the liquid
38 treatment system follows the facility protocol of liquid transportation.

39
40 The operator inspects and follows the drum compactor's operating instructions when operating the
41 compactor.

42
43 The triple-rinse drum washer, the tote bin washer, and the drum compactor units and associated controls
44 are vendor furnished. Control features on the triple-rinse drum washer, the tote bin washer, and the drum
45 compactor units are self-contained.

46
47 **7. Compliance with Process and Safety Performance Requirements**

48
49 The overall performance objective of the unit is to provide empty container cleaning and triple-rinse
50 operations according to WAC 173-303-160. This regulation requires a visual inspection for performance

1 verification. Key safety performance requirements are preventing spills and safe equipment operation.
2 The following design and administrative features are provided for compliance of the system with the
3 process and safety performance requirements.
4

5 **Leak Detection:** Level-indicating alarm devices are located in the triple rinse washer, the waste water
6 transport drum, and TICs to assure against accidental overfilling of those reservoirs. A local alarm will
7 automatically sound if a high-level occurs.
8

9 **8. P&P Procedures**

10 Equipment inspection, maintenance, and calibration are performed on this system based on the
11 manufacturer’s recommendations. The following additional inspections are conducted as a part of the
12 MWF P&P procedures.
13

14 **Spill Control:** The container rinse room is inspected for loose material and water spills. Any spilled
15 material is cleaned by the vacuum cleaner machine. Inspection frequency is daily at the end of the last
16 shift when in use.
17

18 **Level Controllers:** Rinsate collection box level controllers are inspected and calibrated. Inspection
19 cycle is once every 180 days.
20

21 **Equipment Leaks:** System housing and enclosures, piping, and pumps are visually inspected for
22 indications of any corrosion, weld cracks, and/or loose bolts at the flanged connections. Inspection
23 frequency is at least once every 90 days when in use
24

25
26 **9. Process Throughput**

27
28 The throughput for the large containers in TT-06 is three B-25 or IBC container/8-hour shift. The
29 throughput for the drum rinse unit is 16 waste drums every 8-hour shift.
30

31 **10. Secondary Containment**

32
33 Secondary containment for TT-06 is the floor area which is an integral floor of the STB. A concrete
34 curb is provided around the STB slab boundary. The area has sufficient free volume to collect water
35 accumulated in the drum and the large container washing units.
36

37 A portable secondary containment pallet is placed under any liquid-containing TIC or any liquid waste
38 container that is brought to the system for liquid transfer operations.
39 The free volume in the secondary containment space takes into account the space occupied by the
40 container or any equipment that is placed inside the containment area during the normal operation of the
41 system.
42

43 Metal catch pans beneath the container and drum rinse assemblies catch liquid that spills from the
44 assemblies. The free volume of the pans is greater than the maximum volume of the rinse water in the
45 assemblies.
46

47 **3.16 Reserved**

1 **3.17 System SB-02, STB Confinement System**

2
3 **1. General Function**

4
5 The building confinement system (SB-02) provides for general STB ventilation and zone pressure control.

6
7 The system is designed to provide seven to ten air changes per hour in the operating process areas. Fresh
8 air is admitted to the access aisles while the exhaust is extracted from the opposite end of the space above
9 the waste processing equipment. The volume of fresh air is varied to control the pressure in each of the
10 four individual control zones. This system is not classified under WAC 173-600.

11
12 **Performance Requirements:**

- 13
14 a) System flowrate (nominal) 100,000 standard cubic feet/minute (scfm)
15 b) Particle filtration 99.97%
16 c) Air change 7 changes per hour (minimum)

17
18 **2. Reference Documents**

- 19
20 – **Piping and Instrumentation Diagram:** See drawings 31001-P-029-01 and 02.
21 – **Key Components List:** See Table SB-02 in the equipment and instrument list.
22 – **Key Components Technical Specification:** See the technical specification package enclosed in
23 Attachment 8.
24 – **Key Control Devices:** See Table SB-02 in the equipment and instrument list in Attachment 8.
25 – **Instrument Data Sheets:** See the technical specification package that is enclosed in
26 Attachment 8.
27 – **Interfacing Subsystems:** STB process vent (SB-09).

28
29 **3. Equipment and Process Description**

30
31 The system consists of one supply air-handling units, two main exhaust trains, associated pressure control
32 sensors, controllers, and damper actuators.

33
34 Fresh air to the facility is provided by one 100,000 scfm air handling unit. The air handler has direct-fired
35 gas heater and chilled water-type cooling. The confinement system maintains the correct building
36 pressure differential by modulating the amount of air admitted to each pressure control zone in the STB.
37 The four pressure control zones are bulk waste receiving/size reduction, containerized waste, sorting,
38 mixing, and liquid consolidation.

39
40 The exhaust system consists of two 50,000 scfm exhaust fans and associated filter banks located in the
41 heating ventilation and air conditioning equipment room. Each of the exhaust units is capable of
42 providing up to 60% of the total building exhaust requirements. Each filter bank consists of a pre-filter,
43 HEPA filter, and carbon adsorption filter stages. Process vent exhaust (SB-09) discharges into the
44 building exhaust system ahead of the filter banks. Building exhaust is discharged through two exhaust
45 stacks located on the roof of the STB.

46
47 **4. Operation and Controls Description**

48
49 **Building Pressure Control:** The pressure in each of the individual stabilization process areas is

1 monitored by a pressure control transmitter (PDT-0206, PDT-0207, PDT-0208, and PDT-0209). The
2 associated master differential pressure controller (PDC-0216) receives zone differential pressure signals
3 which are compared against each other and a pre-selected setpoint. A control signal is then sent to the
4 appropriate supply air damper actuator. Insufficient negative pressure in the process area relative to
5 outside ambient pressure causes the pressure control system to respond by closing the corresponding
6 supply air damper on the air handler unit until the zone differential pressure returns to within the
7 programmed range. Similarly, excessive differential pressure causes the system to respond by opening
8 the supply air damper as required to maintain setpoint.
9

10 Duct static pressure at the inlet to the filter banks is maintained at approximately -2 inch w.g. by the
11 pressure controller (PC-0256). The pressure controller adjusts the exhaust fan variable frequency drive as
12 needed to keep the inlet static pressure at a constant value. Therefore, if any or all of the three process
13 vent subsystems (SB-09) are not in operation, a constant draw is maintained on the building exhaust
14 ductwork and allow for a minimum area exhaust flow rate.
15

16 **5. Air Emissions**

17
18 The system serves as the secondary confinement for STB. It receives exhaust from the STB process vent
19 system (SB-09).
20

21 **6. Procedures to Prevent Hazards**

22
23 To prevent positive pressure in the process areas, ILK-0211 prevents the air supply unit from operating
24 unless building exhaust is first established. The process vent system (SB-09) also shuts down in the event
25 of a loss in the building exhaust flow (ILK-2901). (See the process description for this system [SB-09] in
26 section 3.9.)
27

28 **Smoke/Fire Detection:** All building ventilation and exhaust equipment can be controlled and monitored
29 from the Firefighter’s Smoke Control Panel (FSCP). Manual override of all the automatic pressure
30 control functions allows pressure in the affected zone to be adjusted to a value more negative than
31 surrounding areas, thereby preventing the spread of smoke.
32

33 **7. Inspection Plan**

34
35 Equipment inspection, maintenance, and calibration are performed on this system based on the
36 manufacturer’s recommendations. Surveillance procedures for the STB liquid treatment system includes
37 monitoring of all critical elements as detailed in Table SB-02 in section 3.16.
38

39 **3.18 System SB-05, STB Exhaust Monitoring**

40
41 **1. General Function**

42
43 The STB exhaust monitors consist of a continuous air monitoring (CAM) and a record sample filter. Both
44 collect representative samples of the radioactive particles in the discharge stream. A local alarm sounds if
45 a high radiation level is detected. In addition, the building exhaust monitors provides a continuous
46 readout for the gas flow to the atmosphere.
47

48 **2. Reference Documents**

49
50 **Piping and Instrumentation** **Diagram:** See drawings 31001-P-030

1 signal is transmitted to the data logger (LOG-2528) and is displayed on the local LCD monitor.
2 The controller (CTL-2530) compares the data to an operator setpoint and calculates an output signal to
3 modulate the control valve (PCV-2531) to maintain the desired static pressure.
4

5 There are two vacuum pumps used in the sampling system, one is for redundancy. The pump start/stop
6 initiation is interlocked with the exhaust stack fan on/off status (ILK-a).

7 For clarity of discussion, pump #1 is assumed to be the primary pump. With the exhaust stack on,
8 interlock ILK-a is satisfied and with HS-2534 in "start", the control module (CTL-2532) begins its start
9 sequence. The exhaust stack "on" signal is also sent to the data logger (LOG-2528).
10

11 The control module (CTL-2532) positions the pump selection valve (FV-2536 and FV-2537) for pump #1
12 operation. After a time delay (to ensure that the valves are positioned), the control module (CTL-2532)
13 signals pump #1 (PMP-2534) to start and illuminates the "pump #1 on" light. A "pump #1 on" signal is
14 also sent to the data logger (LOG-2528). As vacuum pump #1 creates its vacuum, the vacuum switch
15 (PSL-2534) contact opens, satisfying ILK-c. Five seconds is allowed for this action. Pump #1 continues
16 to run until a pump failure occurs or the system is manually shut down. Failure of pump #1 to maintain a
17 sufficient vacuum on the vacuum switch pump selection (PSL-2534) causes the pressure switch to signal
18 the control module (CTL-2532) that a failure has occurred.
19

20 Upon receiving the failure signal, the control module (CTL-2532) turns off pump #1 and repositions the
21 selection valves (FCV-2536 and FCV-2537) for pump #2. The pump #1 signal to the data logger turns
22 off and a fault light (YA-2507) is illuminated. Once the valves (FCV-2536, FCV-2537) are repositioned
23 for pump #2, pump #2 is started. Pump #2 runs until vacuum failure or manual shut down. If there is a
24 vacuum failure (PSL-2534), and the pump #1 (PMP-2534) low pressure alarm is not cleared, then ILK-h
25 shuts down pump #2 (PMP-2535) and pump #1 (PMP-2534) is not started due to ILK-c.
26

27 Under normal conditions, the lead pump can be changed to standby status by operating the pump
28 selection switch (HS-2537). This switch is disabled when a pump failure fault occurs.
29

30 **Sample Flow Alarms:**

- 31
- 32 1) An isokinetic alarm occurs when either the record sample flow or the radiation monitor sample
33 flow exceed 10% over or under the required flow to remain isokinetic for more than 5 minutes.
34 This calculation is performed within the data logger. The data logger (LOG-2528) records the
35 alarm and energizes the fault alarm light (QA-2528). The condition is cleared when isokinetic
36 flow resumes.
37
 - 38 2) Eberline AMS-4 sounds an alarm during conditions of high radiation or monitor failure. A local
39 and remote alarm (AAH-2516) is energized for both functions, and the event is recorded on the
40 data logger (LOG-2528).
41

42 **4. Operation and Controls Description**

43

44 The operator turns on the power to the control panel. To initiate sampling, the operator selects the pump
45 to be used as the primary vacuum pump. The corresponding pump is then turned on. Sampling
46 commences if the exhaust fan is running (ILK-a, -b). If the exhaust fan is operating, the operator needs to
47 wait approximately 10 seconds to insure that the pump creates a vacuum. The operator then enters the
48 static pressure setpoint. Once a vacuum is initiated, the system is operating.
49

50 Operator interface is not required, unless an event occurs.

- 1) If the primary pump fails, an alarm sounds, and the secondary pump is automatically started. If the secondary pump also fails, another alarm sounds and sampling ends. At the sound of the first alarm, the operator checks the cause of failure: valve position, pinched line, and/or power loss. The operator makes the necessary adjustments to remedy the problem.
- 2) If isokinetic sampling is lost for more than 5 minutes, an alarm sounds. The operator goes to the data logger to determine the cause and then remedy the situation. If required, the operator changes the record sample filter or increases the static pressure setpoint of the sampling train.
- 3) If the high radiation alarm is activated, the operators follow the procedure guidelines for radiation leakage.

5. Compliance with Performance Requirements.

The following design features are included in the system to provide compliance with the performance requirements for the systems which is a continuous and reliable monitoring of the stack radiation emissions.

Exhaust Fan On (Tag ID: ILK-a): The Exhaust Fan On interlock is designed to ensure that the sampling of the stack is done when there is flow. Pump #1 (PMP-2534) is prevented from starting and the data logger (LOG-2528) is signaled not to log. This prevents the data logger from unnecessary logging, erroneous sampling, and protects the equipment from attempting to match a zero sample flow rate.

Exhaust Fan On (Tag ID: ILK-b): The Exhaust Fan On interlock is designed to ensure that the sampling of the stack is done when there is flow. Pump #1 (PMP-2534) is prevented from starting and the data logger (LOG-2528) is signaled not to log. This prevents the data logger from unnecessary logging, erroneous sampling, and protects the equipment from attempting to match a zero sample flow rate.

Primary, Standby (Tag ID: ILK-c): The Primary/Standby interlock is designed to prevent Pump #1 (PMP-2534) from starting, thereby preventing a potential over-vacuum on the filter media (FLT-2517 and FL-2518).

Primary, Standby (Tag ID: ILK-d): The Primary/Standby interlock is designed to prevent Pump 2 (PMP-2535) from starting, thereby preventing a potential over-vacuum on the filter media (FLT-2517, and FL-2518).

Pump #1 Vacuum Low Cutout (Tag ID: ILK-e): The Pump #1 (PMP-2534) Vacuum Low Cutout interlock is designed to alert the operator of a vacuum fault, prevent damage to the vacuum pump #1 (PMP-2534), and switch to the standby pump: pump 2 (PMP-2535).

Pump #1 Vacuum Low Start of Pump #2 (Tag ID: ILK-f): The Pump #1 (PMP-2534) Vacuum Low Start of Pump 2 (PMP-2535) interlock is a permissive to allow vacuum pump 2 (PMP-2535) to start if there is low pressure on pump #1 (PMP-2534).

Pump #1 Vacuum Low Start of Pump #2 (Tag ID: ILK-g): The Pump #1 (PMP-2534) Vacuum Low Start of Pump #2 (PMP-2535) interlock is a permissive to allow vacuum pump #2 (PMP-2535) to start if there is low pressure on pump #1 (PMP-2534).

1
2 **Pump #2 Vacuum Low Start of Pump #1 (Tag ID: ILK-h):** The Pump #2 (PMP-2535) Vacuum Low
3 Start of Pump #1 (PMP-2534) interlock is a permissive to allow vacuum pump #1 (PMP-2534) to start if
4 there is low pressure on pump #2 (PMP-2535).

5
6 **6. Inspection Plan**

7
8 Equipment inspection, maintenance, and calibration are performed on this system based on the
9 manufacturer’s recommendations. Surveillance procedures for the STB liquid treatment system include
10 monitoring of all critical elements as detailed in Table SB-05.

11
12 **3.19 System SB-09, STB Process Vent System**

13
14 **1. General Function**

15
16 The function of the STB process vent system (SB-09) is the abatement of fugitive emissions to the
17 environment. The system collects and treats fugitive emissions generated by the various waste handling,
18 pretreatment, and treatment operations.

19
20 **2. Reference Documents**

- 21
22 _ **Piping and Instrumentation Diagram:** See drawings 31001-P-028-02A, 03A, 03B, 04A, and
23 04B.
24 _ **Key Components List:** See Table SB-09 in the equipment and instrument list in Attachment 8.
25 _ **Key Components Technical Specification:** See the technical specification package enclosed in
26 Attachment 8.
27 _ **Key Control Devices:** See Table SB-09 in the equipment and instrument list in Attachment 8.
28 _ **Instrument Data Sheets:** See the technical specification package that is enclosed in
29 Attachment 8.
30 _ **Interfacing Subsystems:** All STB systems interface with the process vent system.

31
32 **3. Equipment and Process Description**

33
34 The system is divided into four subsystems. Each subsystem is designed for a particular set of operations.
35 A particulate removal step followed by treatment by organic vapor abatement equipment are provided for
36 each subsystem.

37
38 Each subsystem has several collection points which are connected to the treatment units by air exhaust
39 ducts. Induced draft fans provide the suction flow needed to capture dust and organic vapors at the point
40 of generation and transport them to either a dust collector or HEPA filter and then through a bank of
41 carbon filter beds. The carbon filter beds provide organic and mercury vapor abatement, when needed,
42 before discharging the air into the STB confinement system (SB-02).

43
44 Enclosures or capture hoods are provided for each individual waste processing operation that produces
45 particulates, fumes, or organic vapors. Exhaust from these operations is maintained at high transport
46 velocities (above 3500 feet per minute [fpm]) to prevent any settling of the particles in the ductwork.

47
48 **Process vent subsystem BLO-0925:** This subsystem has three branches: 1) a cutting and shearing
49 system (SB-01); 2) a bulk waste receiving/staging area (STB room 3); and, 3) a size reduction and

1 screening system. Each branch is isolated by a remote actuated damper. Only one branch is operated at
 2 any given time. An induced draft fan (BLO-0925) provides the necessary flow rate and negative
 3 differential pressure at the source. A dedicated dust collector unit is provided for both the cutting and
 4 sheering system and the size reduction and screening system. Due to the potential existence of mercury at
 5 the sources to this subsystem, the carbon bed will be mixed (or layered) with impregnated carbon media.
 6 The exhaust pick up sources and flow rates for this subsystem are listed below.
 7

Carbon Bed Filter Tag	Line Number	Source Tag	Source Description	Flow Rate (CFM)
Size Reduction and Screening System (TP-01)				
	TP-01	CV-0103	ENCLOSED METERING CONVEYOR	1,500
	TP-01	N/A	TIC	250
	TP-01	SHR-0105	SHEAR SHREDDER	2,000
SB-09-FLT-0923			TOTAL FLOWRATE	3,750

Cutting and Sheering System (TP-02)				
	TP-02	TT-0202, SHR-0205	CUTTING TOOLS	700
	TP-02	DC-0210	NON FERROUS SAW	600
	TP-02	DC-0209	FERROUS SAW	600
SB-09-FLT-0923			TOTAL FLOWRATE	1900

Bulk Waste Staging Room (STB Room 3)				
	STB Room 3	N/A	CEILING AIR INTAKE	1000
	STB Room 3	N/A	CEILING AIR INTAKE	1000
SB-09-FLT-0923			TOTAL FLOWRATE	2000

16
 17 **Process vent subsystem BLO-0926:** This subsystem collects fugitive emissions generated during
 18 sorting operations at the sorting system (TP-03) and stabilization operations at the low- and high-capacity
 19 mixing systems (TT-01 and TT-02). The exhaust from these sources is processed through a dust collector
 20 and treated by a carbon filter bank. The exhaust sources and flow rates for this subsystem are as follows:
 21

Carbon Bed Filter Tag	Line Number	Source Tag	Source Description	Flow Rate (CFM)
	TP-03	CV-0303	CONVEYOR HOOD	175
	TP-03	CV-0303	CONVEYOR HOOD	175
	TP-03	Z-0304	SORTING TABLE	350
	TT-01	C-0105	DISPOSAL CONTAINER	200
	TT-01	MX-0104	HIGH-CAPACITY MIXER	500
	TT-02	C-0205	DISPOSAL CONTAINER	200
	TT-02	MX-0204	LOW-CAPACITY MIXER	500

STB-09-FLT-0922	TOTAL FLOWRATE	2,100
------------------------	-----------------------	--------------

1
2 **Process vent subsystem BLO-0927:** This subsystem collects fugitive emissions generated during
3 inspection operations at the container inspection room (STB room 4). The subsystem also picks up air
4 exhaust from the inspection station hood in the containerized waste staging area in STB room 2. The
5 exhaust from these sources is treated by a carbon filter bank. The exhaust sources and flow rates for this
6 subsystem are as follows:
7

Carbon Bed Filter Tag	Line Number	Source Tag	Source Description	Flow Rate (CFM)
	N/A	STB-ROOM 2	CONTAINERIZED WORK STORAGE AREA	2,000
	N/A	STB-ROOM 4	CONTAINER INSPECTION	2,000
SB-09-FLT-0926		TOTAL FLOWRATE		4,000

8
9 **Process vent subsystem BLO-0937.** This process vent subsystem collects fugitive emissions from
10 various locations, including the dryer system (TP-08), the compaction and macro-encapsulation system
11 (TP-07), physical extraction system (TT-05), liquid consolidation system, (TP-09), polymer mixing
12 system (TT-04), in-container mixing system (TT-03), liquid treatment system (TP-04), liquid holding
13 system (TP-06), and the container rinse system (TT-06). De-misters are provided for the vent lines from
14 the liquid treatment, liquid holding, container rinse, and physical extraction systems. Exhaust from the
15 compactor enclosures is passed through a HEPA filter. After the initial particulate removal steps, all
16 vents are filtered by a bank of carbon beds to abate organic vapors and mercury. The pick-up points and
17 flow rates for this subsystem are as follows:

Carbon Bed Filter Tag	Line Number	Source Tag	Source Description	Flow Rate (CFM)
	TP-04	N/A	TIC	30
	TP-04	TK-0403	LIQUID TREATMENT TANK #1	70
	TP-04	TK-0406	LIQUID TREATMENT TANK #2	70
	TP-04	N/A	TIC	30
	TP-06	N/A	TIC	30
	TP-06	TK-0603	LIQUID HOLDING TANK #1	20
	TP-06	TK-0606	LIQUID HOLDING TANK #2	20
	TP-06	N/A	TIC	30
	TP-07	CPR-0705	IN-DRUM COMPACTOR	50
	TP-07	CPR-0707	SUPER-COMPACTOR	150
	TP-07	Z-0714	OVERPACK VENT HOOD	150
	TP-08	Z-0805	WASTE DRYER ENCLOSURE	1,000
	TP-09	Z-0901	GLOVE BOX	20
	TP-09	N/A	TIC	30
	TT-03	N/A	TIC	30
	TT-03	Z-1305	CONFINEMENT ENCLOSURE	20
	TT-04	F-0409	EXTRUDER	50
	TT-04	F-0413	WASTE FEEDER	50
	TT-04	MX-0404	WASTE POLYMER MIXER	50
	TT-04	Z-0416	POLYMER FILLING ENCLOSURE	50
	TT-05	ABB-0503	ABBRAISIVE BLAST BOOTH	300
	TT-06	Z-0601	TRIPLE RINSE DRUM WASHER	400
	TT-06	Z-0603	TIC WASHER	1,800
STB-09-FLT-0939			TOTAL FLOWRATE	4,450

Particulate Removal: Particulate removal is accomplished with baghouses as described above. HEPA filters are provided for particulate removal from the compactor vent lines.

Organic Vapor Removal: The filter beds are designed for the given flow rate recommended by the carbon bed manufacturers. The design basis used for sizing carbon beds is: 100 lbs. of carbon for every lb. of organic vapor to be removed, or as recommended by the manufacturer.

Mercury Removal: As indicated above, to remove any potential airborne mercury from the process vent effluent in subsystem BLO-0925, the carbon beds for this subsystem will be mixed (or layered) with impregnated carbon media. A summary of the assumptions used for sizing the carbon beds of this subsystem for mercury abatement is presented below.

1. The basis for sizing the carbon filter for Mercury (Hg) removal is developed based on the assumption that 1 percent of the incoming waste contains mercury (260 ppm).
2. The total weight of mercury calculated on this basis is approximately 0.5 kg/yr.
3. It is assumed that 10 percent of this mercury may become airborne during handling operations and be collected by the stabilization process vent and subsequently collected by the carbon filters.

4. Operation and Controls Description

Collection Points: The process vent subsystem (BLO-0925) and its associated carbon filter bank (FLT-0923) and blower (BLO-0925) exhaust from systems TP-01, TP-02, and STB room 3. Only one of these systems will be used at any given time, therefore, only the system in use will be exhausted through the carbon bed filter. The other two systems will be isolated with the flow control dampers (FCU-0901, FCU-0902, and FCU-0903). Local pressure indications are provided at air intake points to inform the workers that the vent system is operating and the component isolation dampers are not closed.

Blowers: The blower for each of the subsystems is sized specifically for the flow rate and pressures required by the subsystem. The process vent blowers (BLO-0925, BLO-0926, BLO-0927, and BLO-0939) are started manually at the associated motor control center in the HVAC equipment room. Interlock 2901 prevents operation of the process vent blowers if the building exhaust system is not in operation. Blower BLO-0925 operates in conjunction with flow control dampers FCU-0901, FCU-0902, and FCU-0903 to ensure that only the system in use is exhausted.

Dust Filtration: Differential pressure across the dust collectors is monitored by vendor supplied instrumentation. Blowdown of the cartridges occurs automatically at preset values of filter differential pressure. Collected particles and dust are sent to in-container mixing system (TT-03) for stabilization or to the GASVIT™ system for treatment.

Carbon Filter Exhaust Monitoring: The organic vapor removal effectiveness of the carbon filters is monitored continuously by an organic vapor meter (OVM) installed at the outlet of the first bed. The mercury vapor removal effectiveness is also monitored continuously. The OVM uses a 10.2 ev lamp in a photo-ionization detector such as an OVM 580 PID, manufactured by Thermo Environmental, or equal. The mercury monitor uses an electrode sensor such as a Jerome Mercury Analyzer manufactured by Arizona Instrument, or equal.

Bed breakthrough occurs when the rolling 24 hour average concentration of organic vapors is 20 ppm above the background level and mercury vapors are more than 0.04 mg/cubic meter above background readings. This background level is established by measuring a four hour average of the OVM reading at the outlet of a freshly charged carbon bed. Background mercury is also measured in the same manner.

During the background measurement period, the process vent system will be operating but all activities that generate organic and mercury vapors are shut down. Between carbon changeouts, the organic vapor and mercury monitoring instruments are reset by drawing building air through the monitors.

Carbon Filter Replacement: When bed breakthrough occurs, the carbon is replaced as follows: 1) the spent carbon filter is unloaded from the bed and placed in a TIC; 2) a fresh carbon filter is loaded into the bed, and 3) the order of flow through the beds is reversed. After reversing the order of flow through the vessels, the vent gases flow first through the carbon that had previously been in the downstream bed and then through the new carbon.

5. Compliance with Performance Requirements.

The performance requirements for this system are:

- a) Dust collection: 99 percent for particles greater than 1.5 microns
- b) Particle filtration: 99.97 percent

- c) Organic vapor abatement: Background concentrations
- d) Mercury abatement: Background concentrations

The following design features are included to provide compliance to the performance requirements for the system which is a continuous and reliable abatement of fugitive emissions.

Filter changeouts: Differential pressure indicators, OVM, and mercury monitors are provided to monitor the performance of the filters. Carbon filters are replaced periodically when they are spent. Dust collection filters have automatic cleaning systems and their replacement is seldom required. However, HEPA filters and pre-filters will be replaced when they reach the differential pressure that is recommended by the manufacturer.

Equipment Operation Monitoring: Safe and normal operation of the equipment as well as shut down features are provided by the manufacturer for the process vent blowers fan and the dust collectors.

Reverse Flow Prevention: The subsystem has an automatic safety interlock (ILK-2901). ILK-2901 shuts down the process vent blowers when there is a loss of STB confinement system (SB-02) exhaust. The signal to activate this interlock is provided by a pressure differential transmitter in the main confinement exhaust duct. This interlock is used to prevent back pressure and reverse flow in to the building confinement exhaust system when the main fans are not running or if a main exhaust damper is inadvertently shut.

Operation Verification: Negative air pressure indicators (manometers) are provided inside the hoods and enclosures for visual verification of a safe breathing environment.

6. Inspection Plan

Equipment inspection, maintenance, and calibrations are performed on this subsystem based on the manufacturer’s recommendations. The mercury sensor and OVM sensors are subject to periodic inspections in accordance with the inspection plan included in Attachment 19 of this RCRA/TSCA permit application.

7. Secondary Containment

Secondary containment for SB-09 is metal pans that are placed under the carbon filters and dust collectors. The pans are designed to have a free volume equal to the entire internal volume of the carbon filters and dust collectors.

3.20 System SB-10, Inventory Control System

1. General Function

The inventory control system allows data entry that describes and tracks the contents of all waste items/containers received at, and processed in, the MWF. The items are identified by a unique bar-code and a pedigree established for the items accepted. Waste information for any item is available at any time during the receiving, pretreatment, and stabilization processes using hard copy and/or electronic media.

Performance Requirements:

The inventory control system (ICS):

- a) provides waste inventory control, data logging, and data retrieval in an ASCII text format for a minimum of 2 rolling years;
- b) establishes waste pedigree;
- c) tracks all waste (including secondary waste) from receipt through disposition; and
- d) generates bar-code labels commensurate with specific waste streams.

2. Reference Documents

- **Process Flow Diagram:** See drawings 31001-P-001-03 through 07
- **Key Components Technical Specification:** See the technical specification package enclosed in Attachment 8.
- **Interfacing Systems:** All the MWF waste systems.
- **Standards:** IEEE RS-232C; Resource Conservation and Recovery Act (RCRA) 40 Code of Federal Regulations (CFR); Resource Conservation and Recovery Act (RCRA) 49 Code of Federal Regulations (CFR); EPA 600/2-84-057 Design and Development of Hazardous Waste Reactivity Testing Protocol; ANSI/AIM BC1-1995 Uniform Symbology Specification Code 39; and ANSI/AIM BC4-1995 Uniform Symbology Specification Code 128.

3. Equipment and Process Description

General Description: The ICS is installed into the MWF and provides item identification, item tracking, item content documentation, bar-code label generation, item labeling, and current item information retrieval. The data entry computer (workstation A), bar-code label printer and a hand-held bar-code reader (HH) with data entry capabilities is located at the mixed waste receiving stations (TS-01 and TS-02). The hand-held scanner has a docking station connected to workstation A using an RS232 connection. The operator at this receiving station is required to answer a standard set of questions that catalog the identity and contents of the item. If the item meets the proper criteria, the operator places a unique bar-code label on the item and downloads the information using the HH to workstation A. The received item now has a pedigree that follows it throughout the process to its final destination. At any time, the current information or status of the item is available as hardcopy and/or electronic media. At appropriate time intervals, or on demand, workstation A uploads the data using an Ethernet link to workstation B for inventory data storage, security control, and archives of data.

Depending on the item or the contents of a container, it is placed into the process or sent directly to the waste storage facility (WSF). If rejected, it is not be entered into the system and is returned to the point of origin. Based on the process that each item qualifies for, there is a HH available for operators at various stations throughout the process. At the stations, various steps of the process are conducted on the item and the additional data is entered into workstation A using the HH to maintain the item’s current status. The basic procedure is conducted at each station until the item is ultimately dispositioned.

Application Software: The computer’s operating system software is a standard “off-the-shelf” software package. The Inventory Control application software for workstation B is a standard “off-the-shelf” software package that is customized to meet the MWF process needs. The Inventory Control application software is compatible with the computer operating software (i.e., *Microsoft WINDOWS 95* or *Microsoft WINDOWS NT*). The Inventory Control application software contains information management capabilities, records storage and archival capabilities, and is upwardly compatible.

4. Operation and Controls Description

Waste Receiving: Waste arrives at the MWF in five major container categories (see Section D-1 of the Permit Application): small containers, drums, IBCs, B-25 boxes, and ISO containers. An operator applies a unique bar-code to each and every container. The operator then uses the HH to scan the bar-code and enter the following information.

- a) Date/Time container arrived at the MWF;
- b) Date/Time container was inspected for acceptance;
- c) Generator;
- d) Project number;
- e) Container type/capacity;
- f) Profile of contained waste (each weight, percentage of volume, phase type [solid, fines, etc.]);
- g) Radioactive isotope profile/concentration;
- h) Waste codes;
- i) RCRA/TSCA codes;
- j) Was a sample taken? Yes/No (If a sample was taken, assign a new number to sample in order to trace back to this container. This is a parent/child relationship.);
- k) What is the sample's identification number?;
- l) Any waste rejected? Yes/No;
- m) Proposed next step for treatment;
- n) Sent to storage or to Treatment;
- n) Date sent to storage/treatment;
- o) Name of operator keying in information; and
- p) Any discrepancies between profile sheet and reality.

Storage: Some waste is stored until it is time to process. The program alerts the operators if a container is within X days of allowed storage time. The program also alerts operators that a container has exceeded its allowed storage time. When an operator scans the bar-code with the HH, the program shows, at a minimum the following information:

- a) What treatment system is the container destined for: and
- b) When the container was sent to storage.

When the container is removed from storage, the Operator, using an HH enters the following information.

- a) The date the container leaves storage.
- b) Treatment phase container is sent to.
- c) Name of operator keying in information.

Processing System: When the waste arrives, the operator views the database to verify that the waste goes to this treatment system. Upon verification, the operator, using an HH, enters the following information.

- a) The date/time processing waste began.
- b) The date/time processing waste ended.
- c) Did waste create multiple/new containers (children)? Yes/No. If Yes, then the child's identification numbers are to be linked.
- d) Did any accidents occur during treatment?

1 e) Comments.
2

3 **Children Waste Containers:** For each child container created, the operator will enter the following
4 information using an HH. The program defaults to parental information to decrease data entry time.
5

- 6 a) Enter parent’s identification number. (There may be more than one.) (The database needs to
7 have an automatic link of parent-child relationships if a roll-up or sort is queried.)
- 8 b) The date/time container was created.
- 9 c) The system the container was generated by.
- 10 d) Generator.
- 11 e) Project number.
- 12 f) Container type, capacity.
- 13 g) Profile of contained waste (each weight, percentage of volume, phase type [solid, liquids,
14 etc.]).
- 15 h) Radioactive isotope profile/concentration. (Performed through sampling or review manifest
16 sheet).
- 17 i) Waste codes.
- 18 j) RCRA/TSCA Codes.
- 19 k) Was a sample taken? Yes/No (If Yes, assign a new number to sample in order to trace it back
20 to this container.)
- 21 l) What is the sample’s identification number.
- 22 m) Proposed next step for treatment.
- 23 n) Time/date sent to next treatment/phase.
- 24 o) Name of operator keying in information.
25

26 **Empty Containers:** When a container is emptied, the following information is entered into that
27 identification number’s database by an operator using an HH.
28

- 29 a) The date emptied; and
- 30 b) The system emptied into (see container rinse system, [TT-06], for further information
31 regarding cleaning and certification).
32

33 **Stabilized Waste Containers:** For each stabilized container, the operator uses an HH to enter the
34 following information. The program defaults to parental information to decrease data entry time.
35

- 36 a) Parent’s identification number (There may be more than one.) (The database needs to have
37 an automatic link of parent-child relationships if a roll-up or sort is queried.)
- 38 b) The date/time the container was created.
- 39 c) The system the container was generated by.
- 40 d) Generator.
- 41 e) Project number.
- 42 f) The container type and capacity.
- 43 g) The profile of the contained waste (each weight, percentage of volume, phase type [solid,
44 liquids, etc.]).
- 45 h) The radioactive isotope profile/concentration. (This is done through samples or a manifest
46 sheet.)
- 47 i) Waste codes.
- 48 j) RCRA/TSCA codes.
- 49 k) Was a sample taken? Yes/No. (If Yes, assign a new number to sample in order to trace back
50 to this container.)

1 **Main Alarm Panel (MAP):** The MAP is a panel containing the alarms from the various monitored
2 parameters of the processes in the stabilization building. The individual signals alert the operators to
3 potential problems by way of a visual and audio signal.
4

5 **Inventory Control System (STB-10):** The inventory control system includes bar-code scanners, a
6 computer server and terminals, printers, and a software package. The system maintains an electronic
7 record of the incoming and outgoing waste. The system interfaces with the GASVIT™ feed processing
8 subsystem (GV-10) and the STB systems and provides reports and data needed for submittal to the
9 generators and the regulatory agencies.
10

11 As mentioned above, all of the STB systems are operated from local control panels. For each system,
12 parameters important to safety and reliability are monitored at both the local and central control panel
13 locations. When necessary, these parameters are annunciated in the main control panel. A brief
14 description of the control panels and the various parameters monitored, indicated and the annunciated
15 alarms are given below:
16

17 **STB Main Process Monitors and Alarms:** STB-MPC has no active controls. The control panel is used
18 for the co-monitoring of key process parameters and alarms which are listed below:
19

20	LAH-0603-02	Liquid Holding Tank #1 Level Alarm high
21	TAHH-0603	Liquid Holding Tank #1 Temperature Alarm high-high
22	LAH-0606-02	Liquid Holding Tank #2 Level Alarm high
23	TAHH-0606	Liquid Holding Tank #2 Temperature Alarm high-high
24	CA-0616-02	Pipe Leak Alarm Light/Horn
25	CA-0620-02	Drip Pan Leak Alarm Light/Horn
26	LAHH-0603-01	Liquid Holding Tank #1 Level Alarm high-high
27	LAHH-0603-02	Liquid Holding Tank #1 Level Alarm high-high
28	LAHH-0606-01	Liquid Holding Tank #2 Level Alarm high-high
29	LAHH-0606-02	Liquid Holding Tank #2 Level Alarm high-high
30	LAH-0403-02	Liquid Treatment Tank #1 Level Alarm high
31	TAH-0403-02	Liquid Treatment Tank #1 Temperature Alarm high
32	TAHH-0403	Liquid Treatment Tank #1 Temperature Alarm high-high
33	LAH-0406-02	Liquid Treatment Tank #2 Level Alarm high
34	TAH-0406-02	Liquid Treatment Tank #2 Temperature Alarm high
35	TAHH-0406	Liquid Treatment Tank #2 Temperature Alarm high-high
36	PDI-0410	Liquid Bag Filter #3 Differential Pressure Gauge
37	PDI-0414	Liquid Bag Filter #2 Differential Pressure Gauge
38	CA-0415-02	Drip Pan Leak Alarm Light/Horn
39	CA-0416-02	Pipe Leak Alarm Light/Horn
40	PDI-0417	Treated Liquid Container Vent Differential Pressure Gauge
41	LAHH-0403-02	Liquid Treatment Tank #1 Level Alarm high-high
42	LAHH-0406-02	Liquid Treatment Tank #2 Level Alarm high-high
43	AAH-0901	Carbon Filter #1 Photo-Ionization Alarm high
44	AAHH-0901	Carbon Filter #1 Photo-Ionization Alarm high-high
45	AAHH-0901	Carbon Filter #1 Photo-Ionization Alarm high-high (Central Panel)
46	PDAH-0901	Carbon Filter #1 Differential Pressure Alarm high
47	PDAH-0901	Carbon Filter #1 Differential Pressure Alarm high (Central Panel)
48	PDI-0903	Carbon Filter #1 Differential Pressure Gauge
49	PDI-0919	Baghouse Differential Pressure Gauge
50	PDAH-0921	HEPA Filter Differential Pressure Alarm high

1	PDI-0920	Baghouse Differential Pressure Gauge
2	PDAH-0922	HEPA Filter Differential Pressure Alarm high
3	PDI-0251	Exhaust #1 HEPA Filter Differential Pressure Gauge
4	PDI-0252	Exhaust #2 HEPA Filter Differential Pressure Gauge

5
6 **Size Reduction and Screening System (TP-01):** This system and the related components are started and
7 shut down by a vendor supplied local control panel. The parameters that are monitored from local
8 indicators and the related alarms are described below:
9

10	PDI-0102	Skip Hoist Enclosure Vent Differential Pressure Gauge
11	SC-0103	Conveyor Feed Rate Controller
12	SIT-0103	Conveyor Feed Rate Indicating Transmitter
13	IAH-0105	Shredder Motor Current Alarm high
14	IAHH-0105	Shredder Motor Current Alarm high-high
15	PDI-0105	Shredder Enclosure Vent Differential Pressure Gauge
16	SC-0105	Shredder Speed Rate Controller
17	SIT-0105	Shredder Speed Rate Indicating Transmitter
18	PDI-0106	Feeder Vent Hood Differential Pressure Gauge
19	SC-0106	Feeder Speed Rate Controller
20	SIT-0106	Feeder Speed Rate Indicating Transmitter
21	TAH-0107	Shredder Temperature high Alarm
22	TI-0107	Shredder Temperature Indicator

23
24 **Cutting and Shearing System (TP-02):** This system and the related components are started and
25 shut down by a vendor supplied local control panel. The parameters that are monitored from local
26 indicators and the related alarms are described below:
27

28	PDI-0209	Ferrous Dust Collector Differential Pressure Gauge
29	PDI-0210	Torch Cutting Table Vent Differential Pressure Gauge
30	PDI-0210	Non-Ferrous Dust Collector Differential Pressure Gauge
31	PDI-0211	Shear Table Vent Differential Pressure Gauge
32	PDI-0212	Disassembly Table Vent Differential Pressure Gauge
33	PDI-0213	Ferrous Metal Cutting Saw Vent Differential Pressure Gauge
34	PDI-0214	Non-Ferrous Metal Cutting Saw Vent Differential Pressure Gauge

35
36 **Sorting System (TP-03):** This system and the related components are started and shut down from a
37 vendor supplied local control panel. The parameters that are monitored from local indicators and the
38 related alarms are described below:
39

40	SC-0303	Conveyor Speed Controller
41	SC-0304	Sort Table Speed Controller
42	PDI-0305	Sort Table Vent Differential Pressure Gauge
43	PDI-0306	Dump Area Hood Differential Pressure Gauge
44	PDI-0308	Conveyor Vent Differential Pressure Gauge

45
46 **Liquid Treatment System (TP-04):** This system and the related components are started and shut down
47 from a vendor supplied local control panel. The parameters that are monitored from local indicators and
48 the related alarms are described below:
49

50	YK-0402	Liquid Treatment Tank Mixer #1 Timer Control
----	---------	--

1	LAH-0403	Liquid Treatment Tank #1 Level Alarm high
2	LAL-0403	Liquid Treatment Tank #1 Level Alarm low
3	LI- 0403	Liquid Treatment Tank #1 Level Indicator
4	PDI-0403	Liquid Treatment Tank #1 Vent Differential Pressure Gauge
5	TAH-0403	Liquid Treatment Tank #1 Temperature Alarm high
6	TAHH-0403	Liquid Treatment Tank #1 Temperature Alarm high-high
7	TI-0403	Liquid Treatment Tank #1 Temperature Display
8	PDI-0404	Liquid Bag Filter #1 Differential Pressure Gauge
9	LAH-0406	Liquid Treatment Tank #2 Level Alarm high
10	LAL-0406	Liquid Treatment Tank #2 Level Alarm low
11	LI-0406	Liquid Treatment Tank #2 Level Indicator
12	PDI-0406	Liquid Treatment Tank #2 Vent Differential Pressure Gauge
13	TAH-0406	Liquid Treatment Tank #2 Temperature Alarm high
14	TAHH-0406	Liquid Treatment Tank #2 Temperature Alarm high-high
15	TI-0406	Liquid Treatment Tank #2 Temperature Display
16	YK-0406	Liquid Treatment Tank Mixer #2 Timer Control
17	PDI-0408	Container Vent Differential Pressure Gauge
18	PDI-0410	Liquid Bag Filter #3 Differential Pressure Gauge
19	FI-0412	Chemical Feed Flow Indicator
20	FIT-0412	Chemical Feed Flow Indicating Transmitter
21	PDI-0414	Liquid Bag Filter #2 Differential Pressure Gauge
22	CA-0415	Drip Pan Leak Alarm Light/Horn
23	CA-0416	Pipe Leak Alarm Light/Horn
24	PDI-0417	Treated Liquid Container Vent Differential Pressure Gauge
25	LAHH-0403-01	Liquid Treatment Tank #1 Level Alarm high-high
26	LAHH-0403-02	Liquid Treatment Tank #1 Level Alarm high-high
27	LAHH-0406-01	Liquid Treatment Tank #2 Level Alarm high-high
28	LAHH-0406-02	Liquid Treatment Tank #2 Level Alarm high-high
29	CE-0416-01	Container Pump Piping Leak Detection
30	CE-0416-02	Product Discharge (TIC) Piping Leak Detection

31
32 **Liquid Holding (TP-06):** This system and the related components are started and shut down from a
33 vendor supplied local control panel. The parameters that are monitored from local indicators and the
34 related alarms are described below:
35

36	YK-0602	Liquid Holding Tank #1 Mixer Timer
37	LAH-0603	Liquid Holding Tank #1 Level Alarm high
38	LAL-0603	Liquid Holding Tank #1 Level Alarm low
39	LI-0603	Liquid Holding Tank #1 Level Indicator
40	TAHH-0603	Liquid Holding Tank #1 Temperature Alarm high-high
41	TI-0603	Liquid Holding Tank #1 Temperature Indicator
42	LAH-0606	Liquid Holding Tank #2 Level Alarm high
43	LAL-0606	Liquid Holding Tank #2 Level Alarm low
44	LI-0606	Liquid Holding Tank #2 Level Indicator
45	TAHH-0606	Liquid Holding Tank #2 Temperature Alarm high-high
46	TI-0606	Liquid Holding Tank #2 Temperature Indicator
47	YK-0606	Liquid Holding Tank #2 Mixer Timer
48	PDI-0608	Liquid Holding Tank #1 Vent Differential Pressure Gauge
49	PDI-0609	Product Discharge (TIC) Vent Differential Pressure Gauge
50	PDI-0614	Liquid Holding Tank #2 Vent Differential Pressure Gauge

1	CA-0616	Pipe Leak Alarm Light/Horn
2	PDI-0618	Product Inlet Container Vent Differential Pressure Gauge
3	CA-0620	Drip Pan Leak Alarm Light/Horn
4	CE-0620	Drip Pan Leak Detection
5	LAHH-0603-01	Liquid Holding Tank #1 Level Alarm high-high
6	LAHH-0603-02	Liquid Holding Tank #1 Level Alarm high-high
7	LAHH-0606-01	Liquid Holding Tank #2 Level Alarm high-high
8	LAHH-0606-02	Liquid Holding Tank #2 Level Alarm high-high

9
10 **Compaction and Macro-encapsulation System (TP-07):** This system and the related components are
11 started and shut down from a vendor supplied local control panel. The parameters that are monitored
12 from local indicators and the related alarms are described below:

13		
14	PDI-0705	Compactor Vent Differential Pressure Gauge
15	ZIC-0705	Compactor Door Closed Indicator
16	ZSC-0705	Compactor Door Closed Switch
17	PDI-0707	Super-compactor Vent Differential Pressure Gauge
18	ZIC-0707	Super-compactor Gate Closed Indicator
19	ZSC-0707	Super-compactor Gate Closed Switch
20	PDI-0714	Overpack Vent Hood Differential Pressure Gauge
21	ZIO-0707-01	Super-compactor Gate Opened Indicator
22	ZSO-0707-01	Super-compactor Gate Opened Switch
23	ZIO-0707-02	Super-compactor Feed Ram Retracted Indicator
24	ZSO-0707-02	Super-compactor Feed Ram Retracted Switch

25
26 **Dryer System (TP-08):** This system and the related components are started and shut down from a
27 vendor supplied local control panel. The parameters that are monitored from local indicators and the
28 related alarms are described below:

29		
30	TAH-0803	Dryer Air Temperature Alarm high
31	TIC-0803	Dryer Air Temperature Indicating Controller
32	LAH-0806	Condensate Collection Level Alarm high
33	LAHH-0806	Condensate Collection Level Alarm high-high
34	LI-0806	Condensate Collection Level Indication
35	PDAL-0808	Dryer Differential Pressure Alarm low
36	PDIS-0808	Dryer Differential Pressure Indicating Switch
37	AAH-0815	Dryer Air Flammability Level Alarm high
38	AI- 0815	Dryer Air Flammability Level Indicator

39
40 **Liquid Consolidation System (TP-09):** This system has no active components. Process vent
41 differential pressure indicators are locally mounted near the enclosure. All other bench scale equipment
42 are plugged in to the electrical receptacles inside the enclosure. The parameters that are monitored from
43 local indicators and the related alarms are described below:

44		
45	AAH-0901	Beta-Gamma Radiation Level Alarm high
46	AI- 0901	Beta-Gamma Radiation Level Indicator
47	AT-0901	Beta-Gamma Radiation Level Transmitter
48	PDI-0901	Consolidation Box Differential Pressure Gauge
49	LAH-0902	Container Level Alarm high (full)
50	PDI-0902	Container Vent Differential Pressure Gauge

Extraction System (TP-10): This system and the related components are started and shut down from a vendor supplied local control panel.

Aerosol Can Puncturing Device (TP-15): This system is manually operated. The only parameter to be monitored is the colorimetric device located on the carbon filter cartridge. The carbon filter will match a specific color when the carbon has reached its treatment capacity. The cartridge will need to be changed when this happens or when the manufacturer’s recommendations are followed, whichever is longer.

High-Capacity Mixing System (TT-01): This system and the related components are started and shut down from a vendor supplied local control panel. The parameters that are monitored from local indicators and the related alarms are described below:

PDI-0104	Mixer Vent Differential Pressure Gauge
WE-0104	Mixer Weight Element
WI-0104	Mixer Weight Indicator
WIQ-0104	Mixer Weight Indicating Totalizer
WS-0104	Mixer Weight Controller
WT-0104	Mixer Weight Transmitter
YK-0104	Mixer Timer Control
PDI-0105	Container Vent Differential Pressure Gauge
FIQ-0109	Mixing Water Flow Totalizer
FV-0109	Mixing Water Solenoid Valve

Low-Capacity Mixing System (TT-02): This system and the related components are started and shut down from a vendor supplied local control panel. The parameters that are monitored from local indicators and the related alarms are described below:

PDI-0204	Mixer Vent Differential Pressure Gauge
WE-0204	Mixer Weight Element
WI-0204	Mixer Weight Indicator
WIQ-0204	Mixer Weight Indicating Totalizer
WS-0204	Mixer Weight Controller
WT-0204	Mixer Weight Transmitter
YK-0204	Mixer Timer Control
PDI-0205	Container Vent Differential Pressure Gauge
FE-0209	Mixing Water Flow Element
FIQ-0209	Mixing Water Flow Totalizer
FT-0209	Mixing Water Flow Transmitter

In-Container Mixing System (TT-03): This system and the related components are started and shut down from a vendor supplied local control panel. The parameters that are monitored from local indicators and the related alarms are described below:

YK-1301	In-Container Mixer Timer Control
PDI-1305	Confinement Enclosure Vent Differential Pressure Gauge
PDI-1311	Container Vent Differential Pressure Gauge

Polymer Mixing System (TT-04): This system and the related components are started and shut down from a vendor supplied local control panel. The parameters that are monitored from local indicators and

1 the related alarms are described below:
2

3	PDI-0404	Waste Blender Vent Differential Pressure Gauge
4	YK-0404	Waste Blender Timer Control
5	ZIC-0405	Blender Discharge Valve Closed Limit Indicator
6	ZIO-0405	Blender Discharge Valve Opened Limit Indicator
7	SIC-0407	Screw Feeder Speed Controller
8	WE-0407	Blender Weight Element
9	WI-0407	Blender Weight Indicator
10	WT-0407	Blender Weight Transmitter
11	PDI-0409	Extruder Vent Differential Pressure Gauge
12	SIC-0409	Extruder Speed Controller
13	PI-0411	Extruder Heat Exchanger Supply Pressure Gauge
14	PDI-0413	Waste Feeder Vent Differential Pressure Gauge
15	SIC-0413	Waste Feeder Speed Controller
16	HS-0416	Polymer Filing Enclosure Rotate On/Off Switch
17	PI-0911	Extruder Heat Exchanger PCW Supply Pressure Gauge
18	TAH-0409-01	Extruder Zone #1 Temperature Alarm high
19	TAL-0409-01	Extruder Zone #1 Temperature Alarm low
20	TIC-0409-01	Extruder Zone #1 Temperature Indicating Controller
21	TAH-0409-02	Extruder Zone #2 Temperature Alarm high
22	TAL-0409-02	Extruder Zone #2 Temperature Alarm low
23	TIC-0409-02	Extruder Zone #2 Temperature Indicating Controller
24	TAH-0409-03	Extruder Zone #3 Temperature Alarm high
25	TAL-0409-03	Extruder Zone #3 Temperature Alarm low
26	TIC-0409-03	Extruder Zone #3 Temperature Indicating Controller
27	TAH-0409-04	Extruder Zone #4 Temperature Alarm high
28	TAL-0409-04	Extruder Zone #4 Temperature Alarm low
29	TIC-0409-04	Extruder Zone #4 Temperature Indicating Controller
30	TAH-0409-05	Extruder Zone #5 Temperature Alarm high
31	TAL-0409-05	Extruder Zone #5 Temperature Alarm low
32	TIC-0409-05	Extruder Zone #5 Temperature Indicating Controller
33	TI-0411-01	Extruder Heat Exchanger Supply Temperature Gauge
34	TI-0411-02	Extruder Heat Exchanger Return Temperature Gauge
35	PDI-0416-01	Polymer Filing Enclosure Vent Differential Pressure Gauge
36	TI-0911-01	Extruder Heat Exchanger PCW Supply Temperature Gauge
37	TI-0911-02	Extruder Heat Exchanger PCW Return Temperature Gauge

38
39 **Physical Extraction System (TT-05):** This system and the related components are started and shut
40 down from a vendor supplied local control panel. The parameters that are monitored from local
41 indicators and the related alarms are described below:
42

43	CA-0506	Liquid Drip Pan Leak Alarm Light/Horn
44	PDI-0509	Abrasive Blast Booth Vent Differential Pressure Gauge
45	LAH-0510	Abrasive Slurry Level Alarm high
46	LAHH-0510	Abrasive Slurry Level Alarm high-high
47	LAL-0510	Abrasive Slurry Level Alarm low
48	LI-0510	Abrasive Slurry Level Indicator

49
50 **Container Rinse System (TT-06):** This system and the related components are started and shut down

1 from a vendor supplied local control panel. The parameters that are monitored from local indicators and
2 the related alarms are described below:

3
4 FV-0601 Drum Washer Drain Diverter Solenoid Valve
5 PDI-0601 Drum Washer Vent Differential Pressure Gauge
6

7 **STB Confinement Subsystem (SB-02):** The STB building ventilation subsystem controls are located in
8 a local control panel. The supply air to the plant is controlled by three PID controllers. The controllers
9 modulate the inlet vanes of the AHUs to control room pressure.

10
11 The building exhaust fan control either on or off, by hand switches, in a local panel. The local panel also
12 has hand switches for the positioning of the exhaust dampers. The parameters that are monitored from
13 local indicators and the related alarms are described below:

14
15 PDC-0216 Supply Air Pressure Differential Controller
16 PDI-0251 Exhaust #1 HEPA Filter Differential Pressure Gauge
17 PDI-0252 Exhaust #2 HEPA Filter Differential Pressure Gauge
18 SIC-0254 Exhaust Unit #1 Speed Indicating Controller
19 SIC-0255 Exhaust Unit #2 Speed Indicating Controller
20 PDC-0256 Exhaust Pressure Differential Controller
21 PDT-0256 Exhaust Pressure Differential Transmitter

22 **STB Electrical Power Distribution (SB-03):** Power distribution throughout the STB plant is received
23 from the incoming 12.47kV switchgear by way of a 1500k VA pad-mounted transformer located on site.
24 The transformer supplies 480 volt power to the STB main switchgear. The main switchgear supplies
25 power to three motor control centers (MCC) and two power distribution panelboards, which will supply
26 power to miscellaneous loads throughout the STB facility. The MCC units provides power to
27 approximately 85 different loads, (i.e., liquid pumps, shredders, circulation pumps air handling units,
28 crushers, drum washing units, overhead doors, compactors). Emergency power is supplied from the GVB
29 generator. The generator has its own control panel plus an automatic-transfer switch (ATS). The ATS
30 will switch the critical plant systems to the generator power in the event of a power outage. The STB
31 building has one emergency MCC unit, which feeds the exhaust, fans, re-circulation blowers, and
32 emergency lighting panel. The emergency lighting panel feeds selected overhead lights, fire protection
33 panel, and instrumentation. The GVB's uninterruptible power supply (UPS) distribution panel was sized
34 to feed the STB loads. The UPS panel supplies power for smaller critical load which cannot be off-line
35 for the 10 second generator start time (i.e., STB-MAP computers, the automatic continuous air
36 monitoring system, the intercommunication system and the public address system. All the STB electrical
37 equipment is located in room 10.
38

39 **STB Exhaust Monitoring (SB-05):** The monitoring system is a complete vendor provided package with
40 a local control panel. The panel displays the flows, stack temperatures, and any alarms present. The local
41 panel houses the data logger, vacuum pumps, flow controller, flow valves, and Eberline monitor. The
42 Eberline sensor and Record Sample filter will be mounted on the stack next to the sampling point. The
43 STB-MPC is alerted to a fault or radiation detection. The parameters that are monitored from local
44 indicators and the related alarms are described below:

45
46 CAM-0516 Radiation Detection Sensor/Monitor
47 Z-0520 Stack Masstron
48 Z-0522 Record Sample Masstron
49 Z-0524 Radiation Monitor Masstron
50 LOG-0528 Data Logger

Containment (SB-06): This system has leak detectors in various locations. The following leak detection alarms will be monitored at the STB-MPC.

Area Monitors (SB-08): Radiation air sampler are vendor supplied items. These units are provided and located throughout the buildings.

STB Process Vent (SB-09): The system dust collection units have a vendor supplied panel which is mounted on the unit. The ID fans are started from the motor control center and there is an E-Stop switch next to each fan. The parameters that will be monitored from local indicators and the related alarms are described below:

AAH-0901	Carbon Filter #1 Photo-Ionization Alarm high
AAHH-0901	Carbon Filter #1 Photo-Ionization Alarm high-high
AAHH-0901	Carbon Filter #1 Photo-Ionization Alarm high-high (Central Panel)
PDAH-0901	Carbon Filter #1 Differential Pressure Alarm high
PDAH-0901	Carbon Filter #1 Differential Pressure Alarm high (Central Panel)
PDIS-0901	Carbon Filter #1 Differential Pressure Indicating Switch
PDI-0903	Carbon Filter #1 Differential Pressure Gauge
PDI-0919	Baghouse Differential Pressure Gauge
PDI-0920	Baghouse Differential Pressure Gauge

STB Fire Protection & Alarm (SB-11): A centralized fire alarm panel is located in the GVB control room 7. The remote fire alarm panel/firemen’s panel for the facility is located in STB room 1. Local fire detection units are to be provided and installed throughout the buildings. A “conceptual” summary of the detectors and alarm features is presented below:

The fire detection system in the STB and the GVB facilities will consist of intelligent photoelectric detectors, intelligent thermal heat detectors, addressable manual pull stations, firehorns and strobes, main fire alarm panel, a remote fire panel/firemen’s panel, and a fire alarm graphics computer terminal unit. The detailed design will be designed in accordance with NFPA 72, NFPA 70, NFPA 101, and the authority having jurisdiction within the City of Richland, Washington. The photoelectric detectors and the thermal heat detectors will be mounting in the ceiling space and on the underneath side of required platforms that surround specific process areas or piece of equipment with the facilities. Upon detection of smoke from a photoelectric detector or from a heat detection above 135° Fahrenheit or an increase greater than or equal to 15° Fahrenheit per hour, or a manual pull station activation, the main fire panel will go into alarm in the GVB control room 7. This will signal the audible (horns) and visual (strobe lights) throughout the facility, warning the operators of a fire in the area. In addition, the main fire control panel will automatically dial the central dispatching station that will call the local fire station for dispatch to the site. There will be a minimum of one 20 lb. ABC-type fire extinguisher in each to the STB and GVB rooms and noted on the overall facility layout drawing. The fire extinguishers will be surface mounted at the handicapped accessible height of 54 inches maximum; the maximum travel distance to a fire extinguisher will be within 75 feet. In the event that a fire is visually noted, all the fire extinguishers locations will be identified with a minimum of a red vinyl applied letters positioned vertically on the wall or column above the cabinet. The sign will be in a V-shaped white sign with lettering on two faces. Lettering to read “FIRE EXTINGUISHER”.

Alarm and Communication Systems

The STB and the GV facility buildings will be equipped with telephones for both on site and off site

1 communications. Personnel will be able to use this system to summon assistance on an emergency. The
2 STB and GV buildings will also be equipped with loudspeakers and local telephone access to the public
3 address system, which will provide an immediate means of contacting all personnel in the process areas in
4 the event of an emergency. Fire alarms, initiated by the automatic heat detectors, smoke detectors, or the
5 manual pull stations, were described above. Also, instrumentation alarms will signal on the local control
6 panel(s) or computer system in the process control rooms on site. A common trouble alarm will signal at
7 the control room as previously described. Local area monitors will be in the facility to monitor for carbon
8 monoxide, hydrogen, and radiation. These will be accomplished by the automatic continuous air
9 monitoring systems in both on the STB and GVB area pollution abatement system stack; if element
10 agents are detected, an alarm will signal at the control room.
11

Table 2.1 Estimated annual quantities by waste streams for treatment line 100.

Stream No.	Stream Description	Estimated Annual Quantities (metric tons / year)
------------	--------------------	--

LINE 100 INPUT STREAMS

100	Waste streams requiring stabilization.	1,740
101	Waste streams containing moisture that must be removed prior to size reduction or stabilization. These wastes are sent to a dryer system for pretreatment.	174
102	Waste streams requiring pretreatment by size reduction prior to stabilization.	1,044
103	Waste streams that can be sent directly to the stabilization systems.	522
104-110	RESERVED	

LINE 100 IN-PROCESS STREAMS

111	Dried waste that does not meet the sizing requirement of the stabilization system.	35
112	Dried waste that meets the size requirements and other acceptance requirements for the stabilization systems. Furthermore, the waste properties are such that it can be treated by a cement reagent formulation.	87
113	Dried and size reduced waste that meets the size requirements and other acceptance requirements for the stabilization systems. Furthermore, the waste properties are such that it can be treated by a cement reagent formulation.	971
114	Condensate produced from drying the incoming waste. The stream will include waste water that will have minimal dissolved solids content. Any volatile organic material contained in the incoming waste stream and that may have vaporized during the drying process will be condensed in the condenser and contained in this waste stream.	17
115	Empty waste containers generated after the waste is dumped into the size reduction system.	135
116	Dried and size reduced waste that meets the acceptance requirements for the stabilization systems. Furthermore, the waste properties are such that it must be treated by a polymer reagent formulation.	108
117	Dried waste that meets the size requirements and other acceptance requirements for the stabilization systems. Furthermore, the waste properties are such that they are treatable by a polymer reagent formulation.	35

118	Empty waste containers generated after the waste is dumped into the mixing system.	58
119-150	RESERVED	

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LINE 100 OUTPUT STREAMS

151	Waste stabilized with cement reagent which complies with LDR requirements either by the treatment technology standard (STABL) or the appropriate concentration treatment standards.	1,580
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Table 2.2 Estimated annual quantities by waste streams for treatment line 200.

Stream No.	Stream Description	Estimated Annual Quantities (metric tons / year)
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LINE 200 INPUT STREAMS

200	Liquids and/or sludge with less than 5% suspended solids requiring chemical treatment prior to stabilization.	870
201	Liquid waste shipped to the facility in small containers (less than 5 gallons) that must be consolidated, chemically treated and/or stabilized. If the facility receives several small containers that are chemically compatible they will be consolidated into a single drum. If the liquid waste is in such a small quantity that consolidation is not required (see stream 201E) it will be chemically treated and stabilized in a container inside the consolidation enclosure. Stream designations for waste requiring chemical treatment before stabilization are 201 A, B, C, and D.	44
202	Bulk liquid waste (>55 gal.) requiring chemical treatment neutralization (NEUTR, CHOXD, CHRED, DEACT) before stabilization (STABL).	440
203	Liquid waste requiring concentration before stabilization.	141
204	Liquid waste containers (<55 gal.) requiring in-container neutralization and/or stabilization.	182
205	Waste requiring UV, ion exchange, or carbon filtration	63
206	Waste requiring washing, rinsing and grouting	1886
207-210	RESERVED	

LINE 200 IN-PROCESS STREAMS

211	Empty containers requiring cleaning or triple rinse.	5
212	Consolidated and chemically treated liquids requiring stabilization.	57
213	Consolidated and chemically treated liquids requiring concentration.	19
214	Empty containers requiring cleaning or triple rinse.	49
215	Chemically treated bulk liquids requiring stabilization.	414
216	Chemically treated bulk liquids requiring concentration.	22
218	Concentrated waste requiring stabilization.	91
219	Distillate liquids generated for concentrating the incoming liquid waste.	91
220	Treated liquids requiring stabilization.	169
221	Spent IX in requiring stabilization.	1
222	Spent carbon requiring stabilization.	1
223	Spent carbon requiring GASVIT™ treatment.	1
224	Spent IX resins requiring GASVIT™ treatment.	1

225	Spent filter element/sludge requiring GASVIT™ treatment.	2
226	Spent filter element/sludge requiring stabilization.	2
227	Empty container requiring cleaning or triple rinse.	36
228	Empty container requiring cleaning or triple rinse.	7
229-250	RESERVED	

LINE 200 OUTPUT STREAMS

251	Waste stabilized with cement reagent which complies with LDR requirements either via the treatment technology standard (STABL) or the appropriate concentration treatment standards.	997
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Table 2.3 Estimated annual quantities by waste streams for treatment line 300.

Stream No.	Stream Description	Estimated Annual; Quantities (metric tons / year)
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LINE 300 INPUT STREAMS

300	Bulk lead requiring macro-encapsulation (MACRO) and metal debris requiring physical extraction.	1,540
301	Metals requiring size reduction prior to physical extraction or macro-encapsulation.	400
302	Lead requiring size reduction prior to macro-encapsulation	200
303	Metal classified as "debris" requiring physical extraction.	540
304	Bulk lead requiring macro-encapsulation.	400
305-310	RESERVED	

LINE 300 IN-PROCESS STREAMS

311	Empty containers requiring cleaning or triple rinse	67
312	Size reduced lead requiring immobilization	120
313	Size reduced metals requiring physical extraction.	420
314	Empty container requiring cleaning or triple rinse.	60
315	Metal & lead shavings requiring stabilization.	30
316	Spent blasting media slurry and cartridge filters requiring stabilization	6
317	Spent blasting media slurry and cartridge filters requiring GASVIT™ processing.	1
318	Empty container rinse/cleaning residues requiring stabilization.	6
319	Empty container rinse/cleaning residues requiring GASVIT™ processing.	4
320	Size-reduced metal not suitable for physical extraction.	30
321	Empty container requiring cleaning or triple rinse.	44
322-350	RESERVED	

LINE 300 OUTPUT STREAMS

351	Debris waste treated to meet LDR standards using physical extraction method.	1,052
352	Waste stabilized with polymer reagent which complies with LDR requirements either via the treatment technology standard (STABL) or the appropriate concentration treatment standards.	411
353	Bulk lead macro-encapsulated to meet required treatment technology (MACRO).	411
354	Intact and reusable containers cleaned or triple-rinsed to meet clean container criteria.	528

355	Damaged and non-reusable containers cleaned or triple-rinsed to meet clean container criteria.	528
356	Amalgamated (ALMGM) Hg waste	300

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Table 2.4 Estimated annual quantities by waste streams for treatment line 400.

Stream No.	Stream Description	Estimated Annual Quantities (metric tons / year)
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LINE 400 INPUT STREAMS

400	Heterogeneous solids requiring sorting and debris requiring sorting and/or immobilization (including aerosol cans)	4,350
401	Debris not requiring sorting	2,175
402	Heterogeneous waste requiring sorting	1,088
403	Debris requiring sorting	1,088
404-410	RESERVED	

LINE 400 IN-PROCESS STREAMS

411	Empty container requiring cleaning or triple rinse.	242
412	Sorted debris requiring compaction and immobilization.	1,523
413	Empty containers requiring cleaning or triple rinse.	242
414	Sorted bulk lead requiring macro-encapsulation.	109
415	Sorted metals requiring physical extraction.	109
416	Canistered sorted material requiring GASVIT™ treatment	283
417	Bagged sorted material requiring GASVIT™ treatment	152
418	Collected liquids from compaction operations.	37
419-450	RESERVED	

LINE 400 OUTPUT STREAMS

451	Debris treated to meet LDR standards using immobilization.	3,700
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Table 2.5 Estimated annual quantities by waste streams for treatment line 500.

Stream No.	Stream Description	Estimated Annual Quantities (metric tons / year)
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LINE 500 INPUT STREAMS

500	Waste requiring GASVIT™ treatment.	1,000
501	Solids requiring box sorting and GASVIT™ processing	50
502	PCB-contaminated solids requiring box sorting and GASVIT™ processing.	50
503	Solids requiring table sorting and GASVIT™ processing	500
504	PCB-contaminated solids requiring table sorting and GASVIT™ processing	50
505	Liquids/sludge requiring GASVIT processing	250
506	PCB-contaminated liquids/sludge requiring GASVIT™ processing.	100
507-510	RESERVED	

LINE 500 IN-PROCESS STREAMS

511	Stabilization building HEPA filters requiring GASVIT™ processing.	3
512	Stabilization building HEPA filters requiring immobilization.	9
513	GASVIT™ building HEPA filters requiring immobilization.	1
514	Stabilization building HEPA filters requiring GASVIT™ processing.	1
515	Stabilization building charcoal filters requiring GASVIT™ processing.	3
516	GASVIT™ building charcoal filters requiring GASVIT™ processing.	1
517	Box sorted metals requiring physical extraction.	10
518	Box sorted and canister packaged solids requiring GASVIT™ treatment.	76
519	Box sorted and bagged solids requiring GASVIT™ treatment.	3
520	Table sorted bulk lead requiring macro-encapsulation.	40
521	Table sorted metals requiring physical extraction.	40
522	Table sorted and canister packaged solids requiring GASVIT™ treatment.	50
523	Table sorted and bagged solids requiring GASVIT™ treatment.	409
524	Liquids/sludge requiring GASVIT™ treatment.	325
525	Bagged solids requiring GASVIT™ treatment.	564
526	Canistered solids requiring GASVIT™ treatment.	412
527	Concentrated scrubber liquids requiring stabilization	26

528	1st stage syngas filter residues requiring stabilization	13
529	Empty container requiring cleaning or triple rinse.	11

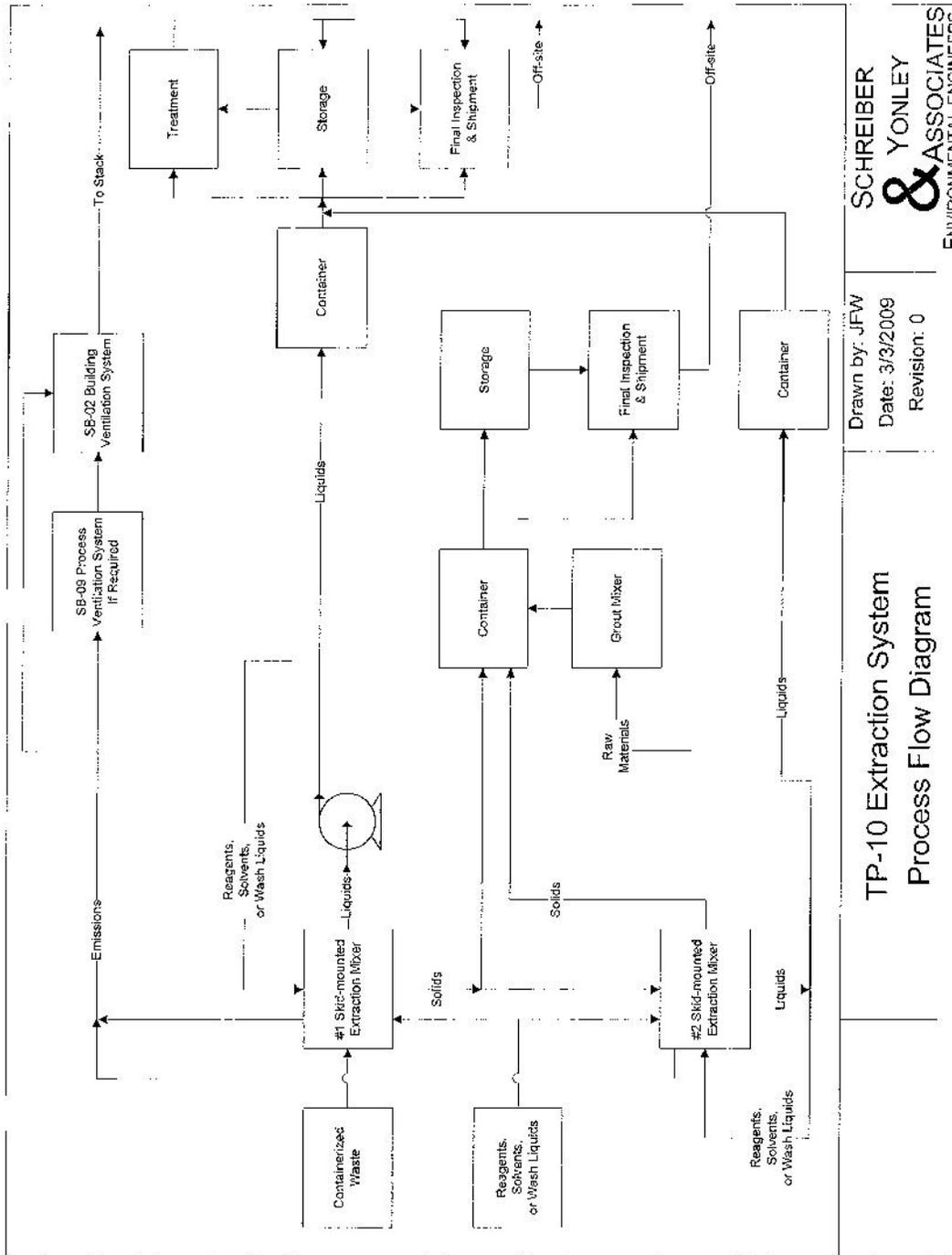
530	Empty container requiring cleaning or triple rinse.	61
531	Empty container requiring cleaning or triple rinse.	39
532	Box sorted bulk lead requiring macro-encapsulation.	10
533	PCB-contaminated empty container requiring decontamination.	3
534	PCB-contaminated empty container requiring cleaning and triple rinse.	11
535	PCB-contaminated empty container requiring decontamination.	11
536	Rinse water from empty PCB container cleaning and triple rinse requiring GASVIT™ treatment (rinsate will be pumped to the GASVIT™ liquid feed tank)	25
537-550	RESERVED	

LINE 500 OUTPUT STREAMS

551	GASVIT™ process chamber bottom vitrified waste residue.	260
552	GASVIT™ process chamber side vitrified waste residue.	65
553	Decontaminated PCB containers (e.g., empty drums).	10

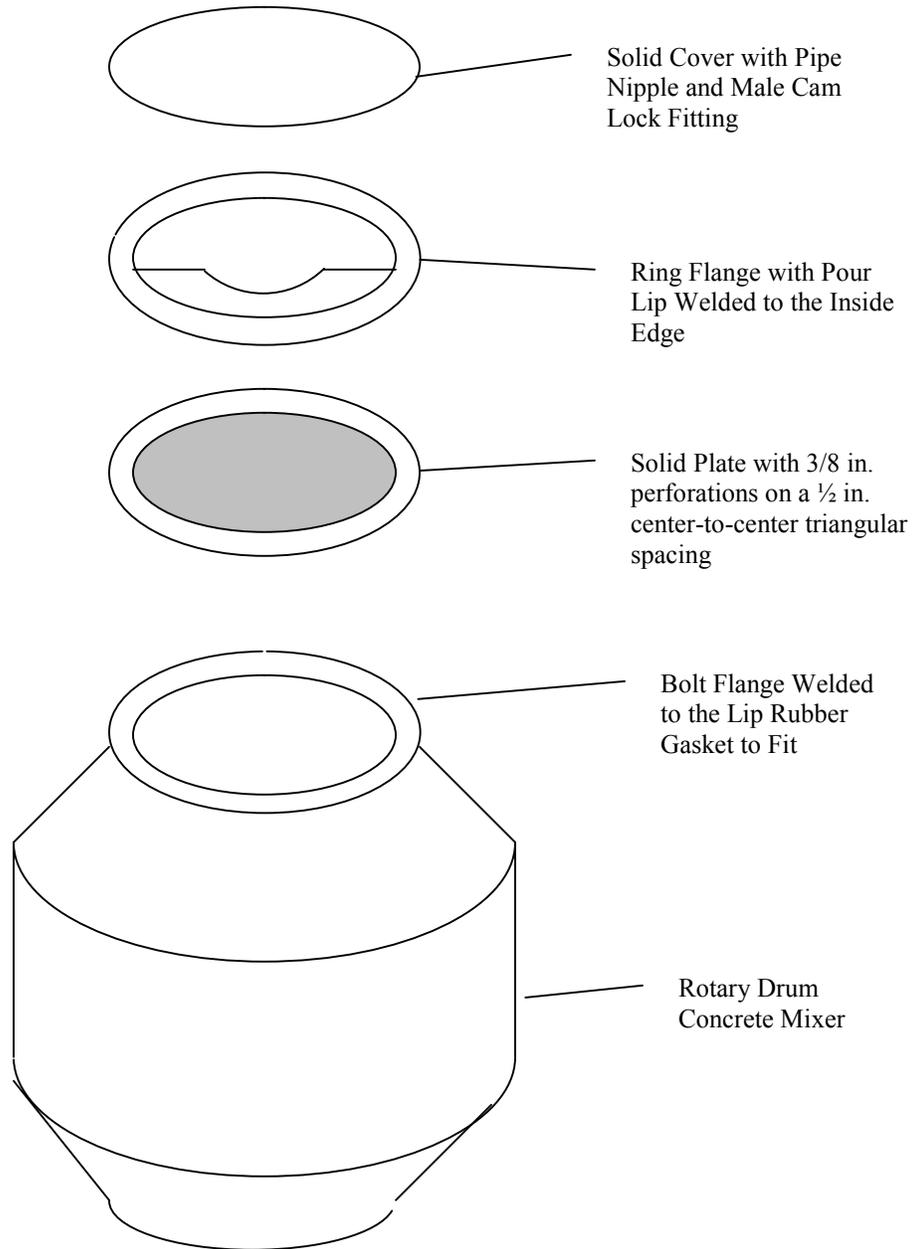
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- 1 5.0 DESCRIPTION DIAGRAMS FOR TP-10, EXTRACTION SYSTEM
- 2
- 3 5.1 Process Flow Diagram for TP-10, Extraction System
- 4

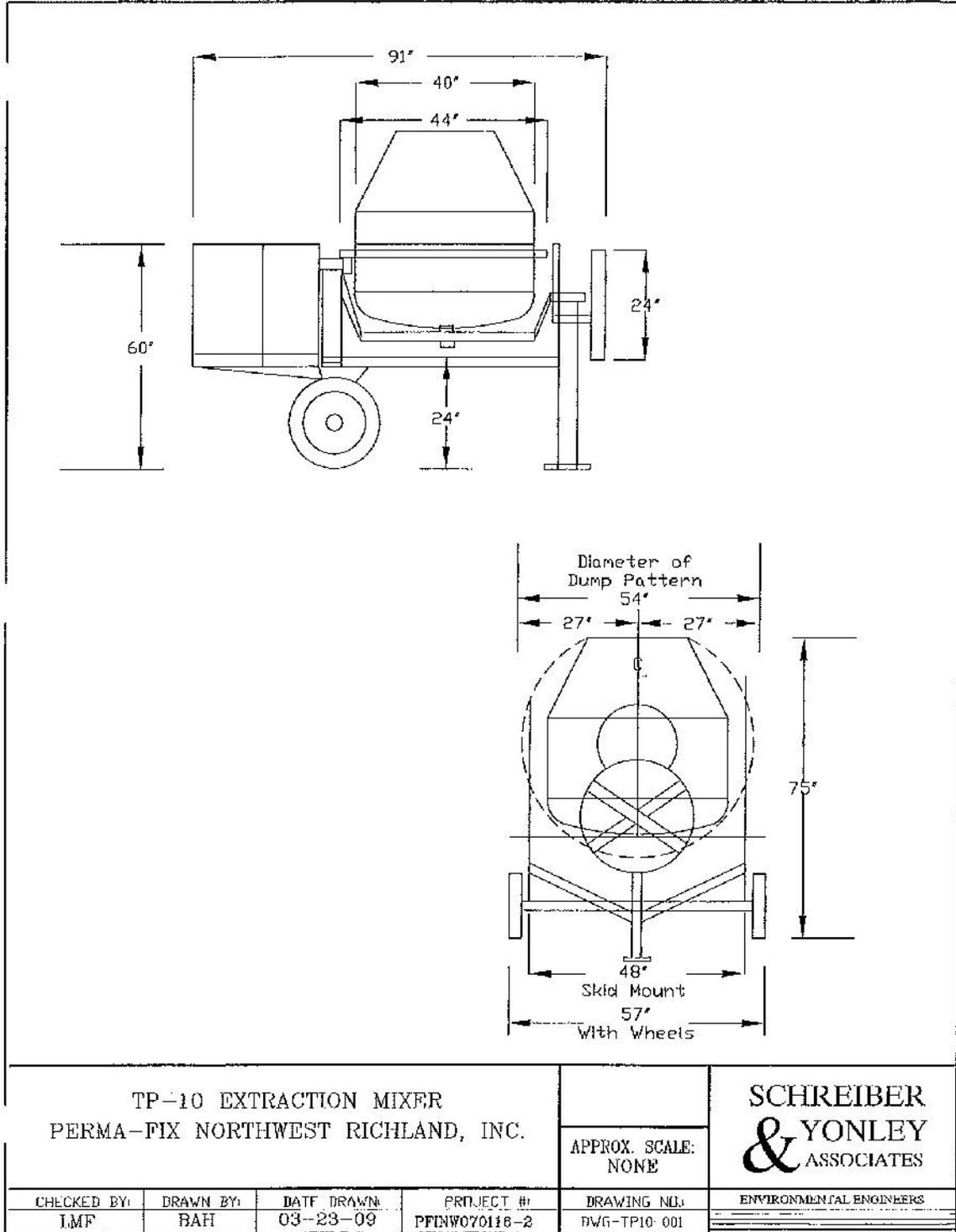


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2 5.2 Sketch of the Screening Arrangement For the Rotary Drum Concrete Mixer



1 5.3 Specifications for the Rotary Drum Mixers (DWG-TP10-001)



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