ATTACHMENT NN

PROCESS INFORMATION

MIXED WASTE FACILITY
RCRA/TSCA PERMIT APPLICATION

Perma-Fix NW, Inc.
RICHLAND, WASHINGTON
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TABLES

SECTION D-11 STB MISCELLANEOUS UNITS

ACRONYM LIST

PEcoS	Pacific EcoSolutions, LLC
CAA	Clean Air Act
CARBN	Carbon filtration
CHOXD	Chemical Oxidation
DOE	Department of Energy
DOT	Department of Transportation
EIS	Environmental Impact Statement
HEPA	High-efficiency particulate air
ID	Induced draft
LDPE	Low density polyethylene
LDR	Land Disposal Restrictions
OVM	Organic vapor meter
NEC	National Electrical Codes
NFPA	National Fire Protection Association
NRC	Nuclear Regulatory Commission
MEO	Maximally exposed individual
MWF	Mixed Waste Facility
P&ID	Process and Instrumentation Diagrams
PCB	Polychlorinated biphenyls
PDS	Process data sheets
PUREX	Plutonium-Uranium Extraction Plant
RCRA	Resource Conservation and Recovery Act
RLSS	Radioactive Lead Solids Subcategory
SEPA	State Environmental Policy Act
STB	Stabilization Building
TIC	Transportable Inprocess Container
UV	Ultra-violet
WAC	Washington Administrative Code
WAP	Waste Analysis Plan

D-11. STB MISCELLANEOUS UNITS

[WAC 303-806(I), 40 CFR 264.600 through 264.603, 270.23];

There are 18 miscellaneous units addressed in this section of the permit application. These units are installed in the STB. The units listed according to their appropriate treatment lines are shown in Table D-11-1.

These units do not fit the definition of container, tank, surface impoundment, waste pile, land treatment unit, landfill, incinerator, boiler, industrial furnace, or underground injection well. Therefore, these units are categorized as miscellaneous treatment units under the RCRA. These miscellaneous treatment units will be used to treat and stabilize wastes at the STB.

Section D-11a provides information on the miscellaneous units as required under WAC 173-805(i)(i) including:

1. Physical characteristics
2. Materials of construction, and dimensions of the units
3. Location
4. Design, construction, operations, maintenance, monitoring, inspections
5. Closure to comply with WAC 173-303-680(2) and (3).

Section D-11b addresses the environmental performance standards for these miscellaneous units including waste types processed, containment, land usage, precipitation, and air, groundwater, and surface water quality as required by WAC 173-303-806(i)(ii).

Information on the potential pathways of exposure to humans or environment from dangerous wastes or dangerous constituents and on the potential and nature of such exposures [as required by WAC 173-303-806(i)(iii)]are summarized in an Environmental Impact Statement (EIS) issued by the City of Richland in accordance with the State Environmental Policy Act (SEPA). The EIS is included as Attachment 18, Appendix C, of the permit application.

D-11A DESCRIPTION OF STB MISCELLANEOUS UNITS

[WAC 173-805(i)(i), 805(i); 40 CFR 270.23(a)(1), 270.23(a)(2)]

D-11a-I Physical Characteristics

[WAC 173-805(i)(i), 805(i)(A)]

A description of the STB miscellaneous units is presented below. Additional data on the design of the equipment are included in the specifications, data sheet and typical vender information sheets provided for major items in each system. These can be found by referring to equipment lists in Attachment 8 and equipment technical specification package in Attachment 11. Except for the super-compactor unit, all equipment will be new and will be purchased after Part B Permit is issued.

Treatment line 100 - Soils and Inorganic Debris

Miscellaneous units included in treatment line 100 are: 1) size reduction and screening system (TP-01), dryer system (TP-08), high capacity mixing system (TT-01) and low-capacity mixing system (TT-02). These units are described below. A process flow diagram for treatment line 100 systems is shown in drawing 31001-P-003, included in Attachment 7, Construction Drawings.

Size Reduction and Screening (TP-01). The size reduction and screening system consists of the following: 1) a waste container dumper (E-0102); 2) an enclosed metering conveyor / skip loader (CV-0103); 3) a single-stage high-torque quad-shear shredder with internally mounted screen (SHR-0105); and; 4) a waste transfer auger. The system (TP-01) provides the size reduction needed by the stabilization process which requires that the particle size of the waste matrix be less than 3/8" (9 mm). Size reduction is a physical process accomplished in a low speed shredder. A screen, mounted directly below the shredder teeth, allows passage of material that is granulated below 3/8" in size. Material larger than 3/8" are returned to the top of the shredder teeth and re-ground, Due to the physical design of the shredder, only particles below 3/8" pass the screen and, hence, nearly all of the solid materials are ground to the selected size.

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

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

Following size reduction and classification, waste particles conforming to the required size (≤ 3/8") pass the screen and are conveyed, via feeder F-0106, into a receiving TIC. Waste particles larger than the specified size, are recirculated in the shredder until reduced to ≤ 3/8" size. Waste collected in the TIC is transported to the appropriate pre-treatment and treatment systems.

Dryer (TP-08). The dryer system includes 1) an enclosure (oven) 2) a transfer cart 3) an air recirculation fan 4) electrical heating coils 5) an exhaust fan and 6) and exhaust condenser. The system is designed to process a maximum of either six 55-gallon drums or one B-25 box (4-ft by 4' by 6' max.) container of RCRA contaminated waste. The design evaporation rate is 25 lb/hr (for a continuous 48-hour period). The design condensate recovery efficiency is up to 90%.

The dryer is operated at temperatures between 180°F and 250°F to provide adequate heat to vaporize the moisture content of the waste in the container, and to minimize the vaporization of toxic organics.

Water evaporation is provided by electrically heated hot air that recirculates through the dryer enclosure (Z-0805). The electric heater (HT-0803) is intrinsically safe and designed to operate in a hazard class I, division II environment (as defined by NFPA and NEC). A portion of the re-circulated air, having entrained water vapor, is purged to a separate condenser (CD-0806). The condensate is then recovered and collected in a TIC. When full, the TIC is staged for treatment either by the liquid holding system (TP-06) or the in-container mixing system (TT-03). The dried waste is sent to the appropriate pretreatment or treatment system. The air exiting the condenser is discharged to the STB process vent system (SB-09) where it is filtered by a carbon filter bank that removes nearly all of the organic vapors.

High- and Low-Capacity Mixing (TT-01 and TT-02). Each of the two systems has a pug-mill type mixer (MIX-0104), 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 proportions are controlled by interlocked systems for each of the three ingredients transferred into the mixer.

A reagent blend consisting of primarily inorganic reagent formulations will be used for the waste-cement stabilization. The formulations used for a given waste stream will be a mixture of various cement compositions, including calcium silicates with calcium aluminate, calcium alumino sulfate, or calcium sulfate hydrates, pozzolans, including reactivate silicates and/or aluminates which react with hydrated lime to form insoluble phases, fillers, such as bentonite, fly ash, blast furnace slag, zeolites, clays, silica fume, specialty or proprietary additives, such as dispersants, set accelerators/retarders, thickeners, etc., and water. Water will be in either the waste or added during the mixing process. Wash water may be used in selected batches. Cement stabilization recipes will be designed for the given waste stream. Each recipe will specify a water to binder ratio and the waste to reagent blend 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 below.

1. **Blend A.** 100 percent 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 (wide range of ratios).
5. **Blend E**. Mixtures of hydrated lime, fly ash, kiln dust etc. (wide range of ratios).
6. **Blend F**. A 100 percent mixture of Aquaset, a proprietary reagent by FluidTech, Inc.
7. **Blend G.** A 100 percent mixture of Peteroset, a proprietary reagent by FluidTech, Inc.

The ingredients selected for mixing waste with a blend of stabilization reagents depends on the contaminants requiring treatment and the waste form processing constraints/requirements. A wide range of blended reagent, waste and mixing water ratios will be used. In general, waste form mixes are proportioned on the basis of water cement ratio or water to blended reagent ratio. These ratios typically vary from 0.5 to 1.5 depending on the waste and reagents.

The specific stabilization formulations used for a given waste stream is governed by a process data sheet (PDS) which is developed for each waste stream and reviewed and approved for implementation by the MWF management before a treatment is started.

Treatment line 200 - Inorganic Liquids

Miscellaneous units included in treatment line 200 are: 1) liquid consolidation system (TP-09); 2) carbon filter unit (TP-06 -FLT-0612); 3) UV oxidation unit (TP-06 -Z-0610); 4) ion-exchange unit (TP-06-FLT-0613); and 4) in-container mixing system (TT-03). These units are described below. A process flow diagram for treatment line 200 systems is shown in drawing 31001-P-004, included in Attachment 7, Construction Drawings.

Liquid Consolidation (TP-09): The liquid consolidation system (TP-09) consists of a hooded enclosure (Z-0901), with adjoining airlock, to consolidate and treat small quantity (less than 5 gallons) wastes such as lab packs and other bottled liquids sent to the MWF. The hooded enclosure is used for a series of bench-scale treatment operations such as combining liquid wastes (that are compatible), neutralization and deactivation, stabilization, and liquid absorption of small quantity (less than five gallon) waste streams. The consolidated waste is collected in TICs that are positioned directly under the consolidation enclosure. The consolidated waste is then transferred to an appropriate system for the next processing step. The specific operations conducted in the enclosure are governed by a PDS developed for each waste stream, reviewed, and approved for implementation by the MWF management before a treatment is started.

Liquid holding (TP-06): The liquid holding system consists of: 1) two 1,200 gallon tanks and accessories including intake and discharge pumps, mixer piping, valve instrumentation and control; 2) carbon filters; 3) a UV oxidation unit; and 3) an ion-exchange unit. The tank and its accessories are classified as a tank system and are described in Section D-2.

Waste is brought to this system by a TIC or in its original container. The liquid holding system employs a granular activated carbon adsorber, an ion-exchange unit, and UV oxidation for removal and/or destruction of small amounts of organic material (e.g., hydrocarbons, alcohol, ketones, organic vapors, and aromatics) followed by removal of dissolved metals and ionic compounds in the incoming liquid waste. Treatment by the different processing methods is optional and is selected based on the input waste characteristics and the ultimate waste treatment objectives:

1. Removal of organic or inorganic contaminants to allow the waste to meet the LDR treatment standards of CARBN or CHOXD.

2. Removal of organic or inorganic contaminants so that the waste meets the leachability requirements after it is stabilized.

3. Removal of contaminants to a cleanliness level allowing reuse of the waste.

The carbon filter, UV oxidation, and ion-exchange units are classified as miscellaneous units.

Carbon Filter (TP-06-FLT-0612). The carbon filter unit is a part of the liquid holding system (TP-06). This system has two 1,200 gallon tanks, mixers and pumps as described in Section D-2. The system also has an UV oxidation unit and an ion-exchange system described later in this section. The carbon filter has two filter beds and the related piping, valve, instrumentation, and controls needed to perform the specified treatment. The activated carbon filter is provided to remove chlorine and some of the organic contaminants in the feed water. The removal is an adsorption process. Each carbon bed has one layer of filter media and several layers with the least dense carbon layer on top and the most dense quartz layer at the bottom. The spent carbon will be regenerated by washing or non-regenerative modes, whichever is most effective for the given waste stream.

Ultraviolet Oxidation (TP-06 -Z-0610). A UV oxidation unit is provided as part of the liquid holding system (TP-06). The unit serves as a polishing step to reduce total organic carbon. Low pressure mercury lamps are mounted at the unit's chamber. The UV light rays produced by each lamp efficiently pass through the lamp housing and into the UV treatment chamber. This UV energy is sufficient for effective reduction of the oxidizable carbon in the waste. The UV energy promotes free radicals in varying degrees of photo-chemical excitation. The hydroxyl (OH-) free radicals break various chemical bonds of organic which in turn produce chain reactions, oxidizing most organic into CO2 and H2O.

Ion Exchange (TP-06 -FLT-0613). The ion-exchange unit is also a part of the liquid holding system (TP-06). The ion-exchange system has a cation bed and an anion bed which are used for removal of dissolved metals in the incoming liquid waste streams. The cation resin at the initial operation will be in sodium form and the anion will be in chlorine form. In addition to the two ion-exchange vessels, the unit has all the interconnection piping, valves, instrumentation, and controls needed to perform the specified treatment. When the ion exchange media is spent, it will be either discarded for stabilization and disposal or regenerated, whichever is the most effective for the given waste stream. In the regeneration mode, the ion-exchange beds will be washed with an alkaline and acidic regeneration solution. This solution will remove ionic contaminants collected on the ion-exchange media, hence making the media freshly charged. The spent regeneration solution will be collected in a TIC and stabilized in the in-container mixing system (TT-03).

In-Container Mixing (TP-03). The in-container mixing assembly consists of an in-container mixer (MX-1301), a reagent additive feeder (F-1306), a container pump (PMP-1308), and a confinement enclosure (Z-1305) wherein empty disposal containers (e.g., 55-gallon drums, 85-gallon over-pack drums) are positioned to receive waste and stabilization reagents. Liquid waste is brought to this system via a TIC and is pumped into the disposal container with a pre-defined blend of stabilizing reagent. The in-container mixing system uses a mixer blade mounted on a vertical shaft mounted on a telescoping ram. The shaft is also attached to a drum-loading flange. The flange has two feed ports which are used to supply the waste and the stabilization reagents. A second approach available for stabilizing waste in this system is to transfer waste in a mixing vessel that becomes the final disposal container. Such containers are brought and placed in the mixing stations and stabilizing reagents are added during the mixing cycle. Waste streams using this approach may include secondary waste from the MWF operations. Waste and reagent recipes and mixes are developed and documented in a PDS for each waste stream. The stabilization process employed by the in-container mixing system is similar to the process used for the low- and high-capacity mixing systems (TT-01 and TT-02).

Treatment line 300 - Metals and Lead

Miscellaneous units included in treatment line 300 are: 1) cutting and shearing system (TP-02); 2) physical extraction system (TT-5) and polymer mixing system (TT-04) and container rinse system (TT-06). These units are described below. A process flow diagram for treatment line 300 systems is shown in drawing 31001-P-005, included in Attachment 7, Construction Drawings.

Cutting and Shearing System (TP-01). The cutting and shearing system will have work benches, tables, an electric saw, a shear cutter, a high pressure water cutter, and hand tools such as pneumatic, air or electric operated grinders, drills, hammers, chisels, and cutting torches. All tools are standard shop tools used in similar applications. These tools will be used in Room 4 of the STB. Processing occurs on either the disassembly table, metal cutting saw, or torch cutting table. The sheared, and sized reduce metal waste is placed in 55 gallon drum(s) or B-25 container(s) boxes and are transported to appropriate pre-treatment and treatment systems throughout the facility.

Cutting and Shearing System (designated at TP-02). The cutting and shearing system will have work benches, tables, an electric saw, a shear cutter, and hand tools, such as pneumatic, air- or electric-operated grinders, drills, hammers, chisels, and cutting torches. All operations will be conducted under a portable hood that will be provided for this system. The function of cutting and shearing system will be to reduce large waste objects to a size suitable for further processing in other pre-treatment and treatment systems. Objects that may require shearing include metal, wood, plastic and construction debris, such as discarded tanks, piping, and paneling. Containers of cemented wastes that do not pass the required LDR standards will also be brought to this room, their container metal skin will be cut and removed, and the cemented waste will be sent to the size reduction and screening system (TP-01) for re-shredding. Waste requiring size reduction will e brought to the cutting and shearing area in TICs or in their original containers. The size reduction operation will be performed inside enclosures or under vent hoods. The vent lines will be connected to the stabilization process vent system. The size-reduced waste will be placed in a TIC which will be transported to an appropriate pre-treatment and treatment system.

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

Physical Extraction (TT-05). The physical extraction system consists of a decontamination enclosure and a turntable/trolley assembly for mounting the items to be cleaned. The cleaning process removes surface contamination from waste classified as debris. The cleaning operation is contained in an atmosphere-controlled booth. The booth is operated manually through a gloveport. The system primarily uses CO_2 pellet (dry-ice) abrasive blasting since this minimizes secondary waste generation. Other abrasive media, such as aluminum oxide pellets and glass beads, may also be used. Treated waste is containerized and sent for final inspection and storage prior to offsite shipout.

Polymer Mixing System (TT-04). The polymer mixing system TT-04 consists of a waste feeder (F-0413); a polymer screw feeder (F-0401); a waste/polymer blender (F-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). The system is used in two modes of operation: stabilization/micro-encapsulation and macro-encapsulation. In the stabilization / micro-encapsulation 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 controls of the extruder are automated.

In the stabilization/micro-encapsulation mode, the plastic extruder is used to mix powdered solid waste with granulated (pelletized) polymer reagents. 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 (approximately 120 $^{\circ}$C), a solid monolithic waste form is produced. The extruder has several processing zones in which temperature is 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 plenum and outlet enclosure allows the feed and discharge ports of 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 reagent. Polymer stabilization/micro-encapsulation is accomplished by an encapsulation process 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 are reduced. The waste particles and contaminants are more or less uniformly distributed throughout the encapsulating media. This process is used for waste streams not suitable for treatment by stabilization technology based on cement type reagents.

Polyethylene waste forms have a waste loading of approximately 60 percent by weight. The TCLP test requires that the particle size of the waste matrix material is less than 3/8" (9 mm) and for some waste streams, the polymer process will require a maximum size of 1/8". The polymer surrounds the waste and forms an impermeable barrier between the contaminants/waste matrices and the environment.

In the macro-encapsulation mode, the extruder provides a surface coating material for D009-Radioactive Lead Solids Subcategory (RLSS) and completely surrounds the lead and hinders the release of hazardous constituents. The extruder polyethylene is applied to the lead to form a jacket that is physically and mechanically stable, impermeable, chemically resistant and inert in the disposal environment. Thus reducing contact between the waste and environment and minimizing the subsequent migration of contaminants.

Container Rinse System (TT-06). The container rinse system TT-06 includes both a tote/bin washer enclosure (Z-0603) for B-25 boxes and IBC containers and a drum washer (Z-0601). The drum washer includes a re-circulation pump (PMP-0602) and the bin washer includes several pumps, including high pressure (PMP-0604), rinse (PMP-0605), and scavenger (PMP-0606). Each unit is self-contained, complete with a spray system, pumps, sumps, and controls. After cleaning, the empty containers are either free released or disposed of at an approved facility. 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™ feed preparation area (GV-01).

Treatment line 400 - Heterogeneous Solids/Debris

Miscellaneous units included in treatment line 400 are: 1) sorting system (TP-03); and, 2) in-drum compactor (TP-07-CPR-0705), and 3) super-compactor (TP-07-CPR-0707). These units are described below. A process flow diagram for treatment line 400 systems is shown in drawing 31001-P-006, included in Attachment 7, Construction Drawings.

Sorting (TP-03). The sorting system (TP-03) consists of drum and box dumpers (TP-03-E-0301 & 0302), staging conveyer (TP-03-CV-0303), and a sorting table (TP-03-Z-0304). The segregated waste is placed in either 55 gallon drums or B-25 box containers. These containers are transferred to other pretreatment or treatment systems for further processing. The dumping units for the drums and box containers are located below a process venting hood. The transfer conveyor and the sorting table are equipped with a hooded cover. This table provides the primary containment for unpacked waste during sorting. The hooded cover provides additional confinement.

Aerosol Can Puncturing Device (TP-15). Treatment line 400 includes the treatment capability to safely depressurize non-punctured aerosol cans and treat the propellants and gases with a commercially-available puncturing device and carbon filter. As required by the WAP, all incoming waste shipments are required to undergo visual inspection. When these shipments of mixed waste undergo processing, the containers are opened and the contents are sorted. The aerosol cans will be removed and safely punctured using this commercially-available puncturing device. The punctured aerosol can(s) will be allowed to drain for a minimum of 30 seconds each. The empty, punctured can(s) will be placed back in to the waste stream to undergo further treatment. For each shipment of mixed waste that contains an aerosol can, a different container will be used to puncture the aerosol can(s) and collect the drained contents of the aerosol can(s) for that shipment of mixed waste. The drained liquids will be removed from the container when all of the aerosol cans found in that mixed waste shipment are punctured and drained. The container will be placed back in the waste shipment for further processing. The puncturing device and carbon filter cartridge will be reused, however, a different container will be used for each shipment of mixed waste. The expected waste stream is empty and non-empty aerosol cans. The containerized gas treatment unit will be utilized to treat the sorted containerized gas containers by safely puncturing the containers and releasing the containerized gas. The unit will be capable of treating containerized gas containers with internal pressures equal to or less than 25 pounds per square inch and have a maximum height of 18 inches.

Compaction and Macro-Encapsulation (TP-07). The compaction and macro encapsulation consist of major components: 1) in-drum compactor; and 2) super-compactor. Each one of these components are classified as a separate miscellaneous unit and are described below.

In-Drum Compactor (TP-07-CPR-0705). The in-drum compactor includes a hydraulic ram, a compaction enclosure, an enclosure door, a drum cart, an air handling unit, a hydraulic drive unit and a control panel. An empty drum is loaded onto the cart which moves the drum into the compaction enclosure. The drum is secured by closing a drum holder latch. Solid wastes are placed inside the empty drum and the hydraulic ram solenoid valve is energized from the panel. The ram presses the waste with a compression force of 50,000 pounds (min.). The filtration unit is mounted above the compaction enclosure. An induced draft (ID) fan is started during the compaction operation. The fan exhausts the enclosure air to the STB process vent system (SB-09).

Super-Compactor (TP-07-CPR-0707). The super-compactor includes a hydraulic ram, a compaction chamber, a drum feed conveyor, an air handling unit, a hydraulic drive unit and a control panel. Accessories include a jib crane and a polyethylene sealer. The super-compactor receives a pre-compacted drum into the conveyor drum. The conveyor moves the drum into the compaction chamber. The hydraulic ram solenoid valve is energized from the control panel. At the same time, an ID fan start to vents air from the chamber. The vent exhausts to the STB process vent system (SB-09). The ram presses the drum with a compaction force of approximately 300,000 pounds. The compressed drum, referred to as a "puck", is forced out of the chamber by a second ram. The second ram places the puck on the feed conveyor. Any incidental liquids generated as a result of the compaction is collected in a sump in the compaction chamber. This liquid is pumped to a TIC and sent to other system for processing. The jib crane is used to lift the puck and place it in a staging area next to the super-compactor. When sufficient pucks are accumulated in this area, the jib crane is again used to place the pucks inside a macro-encapsulation jacket. Three types of jackets are used for macro-encapsulation: polyethylene pipe, stainless steel cylinder, and stainless steel box (see Attachment 2, Container Management Plan). When the jacket is filled with pucks, the void space in the jacket is filled with sand. Next, the jacket is capped and welded continuously.

D-11a-II. Materials of construction, and dimensions of the units

[WAC 173-805(i)(i), 805(i)(i)(A)]

Construction materials and the outer dimension of the major components in each unit are listed in Table D-11-2. More detailed data is presented in design documentation contained in Attachments 7, 8 and 11.

D-11a-III. Location

[WAC 173-805(i)(i), 805(i)(i)(A)]

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STB miscellaneous units are located in the stabilization building. Drawing 31001-M-100, M003 shows the location of each unit in this building.

D-11a-IV. Detailed Plan and Engineering Reports
[WAC 173-805(i)(i), 805(i)(i)(B)]

Design and Construction
[WAC 173-805(i)(i), 805(i)(i)(B)]

Design and construction of the units described in this section are included in the following Documents:

1. **Attachment 5** Process Engineering Description for Stabilization Building
2. **Attachment 7** Construction Drawings
3. **Attachment 8** Equipment/Instrument List for Stabilization Building
4. **Attachment 11** Technical Specification for Stabilization Building Processes

Operations
[WAC 173-805(i)(i), 805(i)(i)(B)]

Operation and control of the miscellaneous units in this section are included in Attachment 5, Process Engineering Description for Stabilization Building.

Maintenance
[WAC 173-805(i)(i), 805(i)(i)(B)]

Maintenance and inspection of the units in this section are included in Attachment 5 Process Engineering Description for Stabilization Building.

Monitoring
[WAC 173-805(i)(i), 805(i)(i)(B)]

Detailed description of the operation, maintenance, monitoring and inspection of the units in this section are included in Sections 3 and 4 of Attachment 5, Process Engineering Description for Stabilization Building.

Maintenance and Inspections
[WAC 173-805(i)(i), 805(i)(i)(B)]

Attachment 19 and Attachment 14 of this permit application contain the inspection requirements and schedules for the miscellaneous units described in this section. Additional hardware specific maintenance programs will be implemented in accordance with the operations and maintenance manuals for each piece of equipment after it is purchased.

D-11a-V. Closure to comply with WAC 173-303-680(2) and (3)
[WAC 173-805(i)(i), 805(i)(i)(C)]

Closure of the miscellaneous units in this section are addressed in Section I and Attachment 17 of this permit application.

D-11a-VI Mitigative Design and Operating Standards
[WAC 173-303-805(i)(ii); 40 CFR 270.23(a)(2)]

The miscellaneous units described in this section have been designed and will be operated in a manner to reduce the risk of waste constituents to the environment. All units will be inside the STB, which will have concrete floors and curbs, steel stud walls, and a roof. This building will protect the units from precipitation, thereby precluding the potential for contaminated runoff.

Specific design features include a concrete slab with a chemical-resistant epoxy coating to prevent waste constituents from infiltrating the slab. The curbed concrete slab will provide secondary containment to collect any leakage of liquid waste outside the processing units in the event of failure of a miscellaneous unit or ancillary equipment. Any material collected in the curbed area will be pumped either to TICs, treatment tanks or holding tanks.

There will also be catch pans beneath any miscellaneous unit that processes predominantly liquid waste including:

- Dryer
- High capacity mixer
- Low capacity mixer

- Liquid consolidation system hood enclosure
- Carbon filter
- UV oxidation
- Ion exchange filter
- In-container mixer

Furthermore, liquid waste containers will be placed on top of a portable catch pan or pallet with secondary containment during in-process transfer operations.

The materials of construction for piping, pumps, filter housing, and ancillary equipment will all be compatible with the waste to be processed. As a further means of the protecting equipment against undue corrosion, an administrative control will be established (Attachment 1, WAP) to verify the compatibility of the equipment construction materials with the waste stream to be processed before any such waste stream is fed to the process unit.

Fugitive emissions (and process vents lines) are kept at a minimum by a double confinement air handling design as described below.

STB process vent (SB-09). In addition to the STB confinement system, a second filtration system, referred to as STB process vent system (SB-09), will be installed to collect and treat any fugitive emissions, including particulate that are generated during waste handling and treatment operations (see Process and Instrumentation Diagram (P&ID) drawings 31001-P -028 in Attachment 7, Construction Drawings). The system has four branches and each branch has a particulate filtration unit, two carbon filter beds and an ID fan. The process collects air exhaust from the hoods and processing enclosures, and removes particulates and organic vapors. The exhaust treated by the STB process vent system is treated a second time by discharging it to the building confinement system (SB-02).

The STB process vent system provides for continuous and reliable removal of both organic vapors and mercury by using two carbon filter beds which are installed in series. The organic vapor removal effectiveness is monitored by an organic vapor meter (OVM) installed in series. The organic vapor removal effectiveness is monitored continuously by an OVM installed at the outlet of the first bed. The mercury vapor removal effectiveness is also monitored continuously at the same location by a mercury sensor.

When bed breakthrough occurs, the carbon is replaced as follows: 1) the spent carbon is unloaded from the bed and placed in a TIC; 2) fresh carbon 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 gas first flows through the carbon that had previously been in the downstream bed and then through the new carbon.

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/m^3 above background readings. This background level is established by measuring a four hour average of the OVM and mercury readings at the outlet of a freshly charged carbon bed. During this period, the process vent system is operating but all activities that generate organic and mercury vapors fed to the filter system are shut-down. Between carbon changeouts, the organic vapor and mercury monitoring instruments are zeroed by drawing building air through the monitors.

STB confinement (SB-02). The areas of the building where process operations are conducted are maintained at a slightly negative pressure by the STB confinement system (SB-02). This system (see P&ID drawing 31001-P-029) has two 50,000 cubic feet per minute fans that collect the area vent from various intake louvers in the building. The collected vent passes through a bank of pre-filters, a bank of HEPA filters and a bank of activated charcoal filters. This ventilation system filters out 99.97% of both radioactive and non-radioactive particulates. Organic vapors are removed by carbon filters before discharging the building vent to the atmosphere.

Aside from the design features to prevent waste constituents from entering the environment, administrative measures will be implemented to reduce the risk of waste exposure to personnel and the environment. These measures will include:

- Confirmation inspection of the waste prior to processing (Attachment 1, WAP)

- Keeping containers capped at all times. When needed for inspection or material transfer, the container will be opened only when placed under hoods, inside an enclosure or in rooms ventilated by the STB process vent system.

- Hydrostatically testing pipe lines to ensure there are no leaks (upon installation of the system and after replacing piping).

- Emptying the catch pans under the miscellaneous units within 24 hours after leaks occur.
- Periodically monitoring key process parameters from the process units and trouble alarms at the STB main process control panel (STB room 13).
- Visually examining the processing areas for loose solids and debris spills near the equipment at least once daily. Removing loose solids and debris by vacuum cleaning.

During waste processing operations, operating personnel in the STB are required to wear a minimum Level E protective clothing. (More detailed descriptions of Level E protective clothing are provided in Attachment 14.)

Prior to shutdown of the systems, rinse solutions will be fed through the system to flush the lines, hoses, and equipment of any residual waste, thus minimizing the chance of waste spillage during shutdown.

Monitoring instrumentation, alarms, fire protection, communications, and control mechanisms will be present. These are discussed in detail in Sections 3 and 4 of Attachment 5.

D-11B Environmental Performance Standards For Miscellaneous Units

[WAC 173-805(i)(ii); 40 CFR 264.601, 270.23(c)]

The STB miscellaneous treatment units are located, designed, and operated in a manner to preclude the release of dangerous waste constituents that may have adverse effects on human health or the environment. The following sections describe the potential pathways of waste constituent release, the potential impact of such releases, and the features that minimize potential risks. Information on the design and operating description of these units is also given to demonstrate that there is no potential risk for a release of wastes to the environment during treatment.

Section D-11b-I addresses the wastes treated at the STB miscellaneous treatment units. Section D-11b-II addresses the secondary containment systems for the STB miscellaneous unit. Section D-11b-III describes air quality at and around the MWF site in Richland, Washington. Section D-11b-IV addresses the prevention of air emissions. Section D-11b-V describes how the topography and seismology affects the design of the site to minimize releases to the environment. Section D-11b VI addresses the hydrologic conditions for the MWF site in Richland site. Prevention of surface and groundwater contamination is addressed in Sections D-11b VII. The impact of site operations on plant and animals are discussed in Section D11b VIII. The land uses for the area surrounding the MWF are discussed in Section D-11b(IX). The potential for waste constituents to migrate from the miscellaneous treatment units and the potential human and environmental health risks are discussed in Sections D-11b(X) and D-11c, respectively.

D-11b I STB Miscellaneous Unit Wastes
[WAC 173-805(i)(ii); 40 CFR 264.601(a)(1), 264.601(b)(1), 264.601(c)(1)]

Description of waste processed by the four treatment lines in the STB are given in Attachment 1, Waste Analysis Plan.

D-11b-II Containment System
[WAC 173-805(i)(ii); 40 CFR 264.601(b)(2), 270.23(a)(2)]

General Description
STB secondary containment for the miscellaneous units is provided by a base which is comprised of the curbed and sloped floor. The additional catch pans will be located above this base. Therefore, for many equipment and containers, a triple containment system will be provided.

There will be no openings in the STB secondary containment curbs on any side of the building. Where there are personnel entries, there will be either a ramp or step from the STB floor to allow exit from the door or entry. Entries and roll-up doors for material handling equipment will have sloped ramps allowing carts and fork lift trucks to cross the curb at the given door or entryway.

The area around the building will be graded and paved to promote drainage away from the building (see Drawing 31001-C-004, Sheet C301 & C302) to protect the miscellaneous units in the STB from precipitation, and, therefore, will not generate runoff.

The floor of the STB will be constructed entirely of concrete. Structural adequacy of the foundation is addressed in Section D-1.

Chemical-resistant water-stops made of polyvinyl chloride or rubber will be used underneath all construction joints. Joints will be sealed with a heat-resistant silicone sealant, and the floor will be sealed with an epoxy coating to prevent infiltration of any waste that may be released (see Attachment 7, Construction Drawings).
The STB floor will be prepared with a chemical resistant coating described in Section D-1.

The STB floor will be divided into several rectangular sections and each section will be sloped to the center of the rectangle (Drawing 31001-S-003, Sheets S301 to S312) to a 2-ft x 2-ft square flat area. In the event of an accidental spill, or floor washing, the liquids will flow to this flat square area in the center of the rectangle. The operators, wearing appropriate protective clothing will use a vacuum pump to remove the liquids from this area. Any spilled solid waste will be removed either manually or by a vacuum pump by personnel wearing appropriate protective clothing.

The design and construction of the sealed concrete floor preclude the chance of hazardous wastes or chemical constituents from migrating to surface water, soil, or groundwater.

The design of the secondary containment system for the individual miscellaneous units is presented in Section D-1.

As described in Section D-1, the secondary containment system (the curbed area plus the sloped floor) will be able to contain more than the volume of the largest treatment unit or 10% of the combined liquids in containers that are in staging, storage or in-process mode and the liquids that are contained in the tanks and other treatment enclosures.

D-11b III Site Air Conditions
[WAC 173-805(i)(i), 805(i)(ii); 40 CFR 264.601(c)(4), 264.601(c)(5), 270.23(b)]

The following paragraphs describe the features that affect air conditions near the MWF. A discussion is also provided on existing air conditions and sources of potential contamination, including their cumulative impacts on the air quality. Note that operations at the STB miscellaneous units involve size reduction, chemical adjustment, drying, stabilization, and macro-encapsulation. Fugitive emissions including particulate and low volatile organic compounds generated from these operations are treated by particulate filtration and carbon filters.

Meteorology

The MWF is located adjacent to the DOE Hanford Site boundary, approximately 2.8 km (1.75 mi) south south-west of the 300 Area, and is a semi-arid region. The Cascade Mountains to the west greatly influence the area's climate by providing rainshadow. This range also serves as a source of cold air drainage, which has a considerable effect on the area's wind regime.

Prevailing winds at the Hanford 300 Area Meteorological Station are from the southwest and northwest (Cushing 1995). Monthly average wind speeds are lowest during December, averaging approximately 10 km/hr (6 mi/hr), and highest during June, averaging approximately 15 km/hr (9 mi/hr).

Average monthly temperatures vary from – degrees °C (30°F) in January to 24°C (76°F) in July with a yearly average of 12°C (53°F). On the average, 51 days during the year have maximum temperatures greater than or equal to 32°C (90°F), and 12 days have a maximum greater than or equal to 38°C (100°F). Also, an average of 25 days during the year have maximum temperatures less than 0°C (32°F), and 106 days per year have minimum temperatures less than 0°C (32°F).

The average annual precipitation is 16 cm (6.5 in.) with more than half of this occurring from November through February. December, the wettest month, receives an average of 2.5 cm (1 in.), while July, the driest month, averaging 0.5 cm (0.2 in.) of precipitation. The annual average snowfall is 38 cm (15 in.). Although fog is recorded throughout the year, nearly 90 percent of the occurrences are during the late fall and winter months. Other phenomena that restrict visibility to 10 km (6 mi) or less include dust, smoke (typically from wildfires, orchard smudging [e.g., using oil fired heaters to protect fruit crops during springtime freezes], and agricultural field burning). Reduced visibility from blowing dust occurs on average of five days per year, and reduced visibility resulting from smoke occurs an average of two days per year.

Severe high winds are often associated with thunderstorms. On average, the MWF vicinity experiences 10 thunderstorms per year, most frequently (80 percent) during May through August.

Good atmospheric dispersion conditions exist about 57 percent of the time during the summer (PNNL 1994). Favorable dispersion conditions occur when the wind speed is light and the mixing layer is shallow. These conditions are most common during the winter when moderately to extremely stable stratification exists about 66 percent of the time. he probability of an inversion period (e.g., poor dispersion conditions) extending more than 12 hours varies from a low of about 10 percent in May and June to a high of about 64 percent in September and October (Holzworth 1972).

Air Quality

Natural occurrences such as dust storms and brush first sometimes occur in arid eastern Washington State (PNNL 1993 and Cushing 1994) occasionally causing levels of particulate matter to exceed regulatory standards.

National Ambient Air Quality Standards have been established as mandated by the Clean Air Act. Ambient air refers to air outside which the general public is exposed to. The National Ambient Air Quality Standards define levels of air quality as protective of public health (primary standards) and welfare (secondary standards). The air quality standards exist for the following pollutants: sulfur oxides (measured as sulfur dioxide), nitrogen dioxide, carbon monoxide, PM-10 (particle matter that is less than 10 micrometers [0.0004 in.] in diameter), lead, and ozone. The air quality standards specify maximum allowable pollutant concentrations and frequencies of occurrence for averaging periods ranging from one hour to one year, depending on the pollutant. Washington State adheres to current Federal standards, however, more stringent standards for sulfur dioxide and ozone are required. The state of Washington maintains an air quality standard for total suspended particulates and gaseous fluorides.

Air quality monitoring data adjacent to the MWF on the Hanford Site are available for nitrogen oxides, polychlorinated biphenyls, and volatile organic compounds (PNNL 1995). The nearest monitoring station is approximately 3.0 km (1.8 mi) north-northeast from the MWF. Monitoring of nitrogen oxides was discontinued in 1990. The primary source of nitrogen oxides, the Hanford Site Plutonium-Uranium Extraction [PUREX] Plant, ceased operation. The highest annual average nitrogen oxides concentration was approximately an order of magnitude below the Federal and Washington state standard of 0.05 parts per million. Nine out of 17 PCB samples collected during 1993 were below the detection limit of 0.29 nanograms per cubic meter (nano = $1x10^{-9}$) and thus well below the level of regulatory concern. Eight samples were above the detection limit, with results from 0.25 to 3.9 nanograms per cubic meter (Cushing 1995).

Ten volatile organic compound samples were collected on the Hanford Site and analyzed in 1994 for halogenated alkanes and alkenes, benzene, and ethylbenzenes. Overall, the concentrations measured were within the range of values reported in previous studies and within guidelines and allowable regulatory limits (PNNL 1995).

During 1993, monitoring near the Hanford Site showed the 24-hour particulate matter standard of 50 micrograms per cubic meter (µg/m3) being exceeded twice at the Columbia Center monitoring location in Kennewick. The maximum 24-hour concentration of 150 µg/m3 was also exceeded twice, with the highest level reaching 1,166 µg/m3, the suspected cause being wind blown dust. The annual primary standard of 50 µg/m3 was not exceeded.

Radiological data were collected during 1995 through a network of 47 continuously operating samplers at Hanford Site radiological monitoring stations, at the site perimeter, and at nearby and distant communities. Cesium-137, plutonium-239, plutonium-240, strontium-90, and uranium were consistently detected in air samples collected in the Hanford 200 Areas located approximately 25 km (15 mi) northwest of the MWF site. Concentrations were higher on the Hanford Site than those measured at locations off the Hanford Site and were in the same range as measured in previous years. Levels measured at locations both on and off the Hanford site were much lower than the applicable standards (PNNL 1996).

Perma-Fix continuously monitors radiation levels at the facility perimeter using air samplers at four fixed-compass-direction locations. Radionuclide emissions during the year of 1996 were 1.4E-10 Ci/yr of manganese-54, 2.0E-10 Ci/yr of cobalt-60, 1.7E-10 Ci/yr of cesium-137, 3.0E-10 Ci/yr of bismuth-214, 2.4E-10 Ci/yr of lead-214, and 2.0E-09 Ci/yr of radium-226 (PEcoS 1997). These levels resulted in a radiological dose of 4.9E-08 mrem/yr for a maximally exposed individual (MEI) at the facility boundary, which is below the state standard of 25 mrem/yr (Jacobs 1997).

D-11b IV Prevention of Air Emissions

WAC 173-805(i)(i), 805(i)(ii), 40 CFR 264.601(c)(2), 270.23(a)(2); OAR 340-104-001, 340-105-014]

Emissions from the STB will be minimized by providing a two-stage fugitive emission and particulate treatment unit that will filter out nearly all the particulates and organic vapors generated during STB miscellaneous unit operations. The emissions will be filtered for particulates and organic vapors in the STB process vent system (SB-09) and filtered by HEPA and charcoal filters in the STB confinement system (SB-02). After carbon filtration, the gases and potential steam will be discharged via the building stack using the building ventilation exhausts. The confinement systems will remove particulates from the exhaust stream to a level less than 0.08 grains per dry standard cubic foot (or the level specified in the CAA permit, whichever is smallest). Similar systems are provided for the GVB, the adjacent building, which is described in Section D-12.

The combined air pollutant emissions estimates from STB and GVB were developed and primary air dispersion modeling was performed to analyze air quality impacts from treating LLMW at the MWF

(Tetra Tech 1996a). The emission estimates were based on pilot plant testing and assumed standard efficiencies for HEPA and carbon filters. HEPA filters were assumed to remove 99 percent of all particulate matter greater than 0.3 micron, and carbon filters were assumed to remove 50 percent of the organic vapors. The analyses were conducted to compare the calculated impacts of potential criteria pollutant releases against National Ambient Air Quality Standards and Washington State Air Quality Standards, the calculated impacts of emissions of toxic and hazardous air pollutants against applicable Washington state regulations, and the calculated impacts of emissions of radionuclides against applicable Federal and Washington state standards.

The results of the modeling (Tetra Tech 1996a) were adjusted to reflect an increased feed rate of GASVIT™ system to 230 kg/hr (500 pound [lb]/hr) and the preliminary dose calculations and compared with Washington state air quality standards or emission levels. Washington state standards are listed in the WAC and include the following:

- Acceptable source impact levels for toxic air pollutants (WAC 173-460)
- Ambient air quality standards for particulate matter (WAC 173-470)
- Ambient air quality standards for sulfur oxides (WAC 173-474)
- Ambient air quality standards for carbon monoxide, ozone, and nitrogen dioxide (WAC 173-475)
- Ambient air quality standards for radionuclides (WAC 173-480)
- Ambient air quality standards for fluorides (WAC 173-481).

The modeling results show no exceedance of Federal or State air quality standards for criteria pollutants, hazardous air pollutants, or radionuclides. The pollutants presented in Table D-11-3 would result in the highest levels of emission compared to Federal or State standards.

D11b V Topography and Seismology

Topography

The MWF will involve only small, localized changes in topography during construction. The current topography at the site is flat. All disturbed areas will be graded to conform to the surrounding topography and drainage systems. The facility will be constructed on stable soils. Soil at the MWF site has been disturbed so there will be only a small amount of additional soil disturbance during facility construction. Construction will involve temporary disturbances to soil outside the facility footprint, primarily in the trample zone around work areas, heavy equipment traffic areas, and material laydown areas. Temporary impacts will include soil compaction and increased potential for soil erosion. However, the total area of disturbance will be approximately 5 acres and within areas previously disturbed by site activities or agricultural production. Previous site activities include clearing and raveling the surface and constructing access roads within the fence line of the existing Perma-Fix facility.

Because the volume of sand and gravel needed for site construction will be small and both resources are readily available in the Richland area in quantities greatly exceeding the PEcoS requirements, there will be little impact on local availability and cost of the resources.

Seismology

The U.S. Nuclear Regulatory Commission (NRC) concluded that four earthquake sources should be considered for seismic design: the Rattlesnake-Wallula alignment, Gable Mountain, a floating earthquake in the tectonic province, and a swarm area (a floating earthquake) (NRC 1982).

For the Rattlesnake-Wallula alignment, which passes along the southwest boundary of the Hanford site, the NRC estimated a maximum magnitude quake of 6.5, and for Gable Mountain, an east-west structure that passes through the northern portion of the Hanford Site, a maximum magnitude quake of 5.0. These estimates were based on the inferred sense of slip, the fault length, and/or the fault area. The floating earthquake for the tectonic province was developed from the largest event located in the Columbia Plateau, the magnitude 5.75 Milton-Freewater earthquake. The maximum swarm earthquake for the Supply System Plant 2 seismic design was a magnitude 4.0 event, based on the maximum swarm earthquake in 1973 (NRC 1982). The most recent probabilistic seismic hazard analysis calculated an annual probability of recurrence of a 0.2 g earthquake at 5E-04 (Geomatrix 1994). Because the facility is designed to meet or exceed uniform building code design standards for Seismic Zone 3, tanks and containers designed to hold liquids will be secured to prevent overturning. Since spill control measures in the event of an overturn are incorporated into the facility design, no additional analysis of potential impacts associated with earthquakes is provided in this section.

D-11b VI Site Hydrologic Conditions

[40 CFR 264.601(a)(2), 264.601(a)(3) 264.601(a)(4), 264.601(b)(3), 264.601(b)(5), 270.23(b)]

Surface Water

There are no natural perennial surface water bodies within 152 m (500 feet [ft]) of the MWF. The principal river systems within the region surrounding the MWF Site include the Columbia and the Yakima rivers; however, the MWF Site is not within designated 100-year or 500-year floodplains of either river system (PEcoS 1995). A small intermittent surface stream is located about 0.8 km (0.5 mi) west of the MWF Site.

Groundwater

Groundwater in the southeastern portion of the Hanford site and in the vicinity of the MWF site is less affected by Hanford Site operations than by agricultural irrigation cycles and growing seasons in and around Richland (Newcomer et al. 1992). The aquifers near the MWF are recharged both naturally (e.g., via surface water bodies and precipitation) and artificially (e.g., via Irrigation, canal seepage, and industrial discharges). Artificial recharge is primarily by the north Richland recharge basins and by irrigated farming in the north Richland area. Groundwater depth at the MWF is slightly greater than 3 m (10 ft) (Ecology 1995). The MWF site is not over a sole source aquifer, as defined in the Safe Drinking Water Act, and is not located in a groundwater management area. No public or private domestic water supply wells are known to exist within 152 m (500 ft) of or down gradient of the MWF site.

D-11b VII Preventing Surface and Groundwater Contamination.

Site Drainage

Drawing 31001-C-002-C101 (in Attachment 7, Construction Drawings) provides topographic maps of the area. As the topographic maps show, the final grade of the MWF yard will be approximately 370 feet in elevation. The yard will be located on a flat area. This area will be approximately 6-ft higher than the ground in the western and southern part of the MWF. Because of the high permeability of the soil in the area, there will be no runoff potential from outside the yard. Drainage from the site will flow to the southern portion of the yard. All surface runoff from paved areas within the MWF yard will be diverted via a storm drainage system to a series of interconnected sumps. The sumps have a common drain line that will lead to a natural drainage area to the south of the yard. Because of limited precipitation and highly permeable soils, little or no surface water runoff leaves the MWF site.

Leakage and Spill Controls

All waste handling, storage, and treatment will be in areas of the facility within the STB. The STB base consists of a secondary spill containment system to prevent leaks and spills of waste until the accumulated materials are detected and removed, preventing releases to the environment that could potentially impact groundwater. Based on this system and the distance from the surface of the facility to the water table, the risk of dangerous waste contaminants entering the groundwater is extremely low.

To prevent groundwater contamination during truck off-loading and onsite transportation of liquid containers, administrative controls will be established to limit the material handling equipment travel to top of the concrete passageways only. As mentioned above, the passageways are sloped to a series of inter-connected collection sumps located in the center of the passageway. When a liquid container off-loading or onsite transportation operation is planned, the operators isolate the sumps by closing the drainage line shut-off valve and pumping out any storm water trapped in the sumps. The isolated sumps become a secondary containment system in the yard. In the event of a liquid spill accident, the spilled liquids will flow to the sumps and will be contained in the sump system. The operators will now be able to retrieve the spilled liquids and clean the sump. This design will prevent releases to the environment that could potentially impact groundwater during truck off-loading operations.

Runoff/Run-on Controls

The MWF will be located on a topographically high area and the local relief is such that the MWF will easily shed surface runoff to the west and south. The site has been designed to accommodate the 25-year, 24-hour precipitation. In addition, there is no flood threat to the MWF from local ponds.

Contamination of surface water in the vicinity of the MWF site is precluded by the location and design of the MWF buildings and yard. Since it is not near any lakes, rivers, streams, or wetlands, and natural drainage is away from the buildings within the MWF. For these reasons, contact between the waste treated at MWF and surface water is unlikely. Secondly, the waste will be processed in an enclosed treatment system inside the buildings, and the treated wastes will be collected in containers and stored before shipment to offsite facilities for disposal, all of which precludes contact between the waste and any run-on/runoff.

D11b VIII. Plants and Animals

No threatened or endangered plant or animal species are known to exist or are suspected to be present on the MWF Site. Table D-11-4 provides a list of threatened or endangered plant or animal species known to exist on or near the Hanford Site, which is in close proximity to the MWF site. The absence of native vegetation and the industrial nature of the area render it unlikely habitat for such species. The MWF site is located within an area of north Richland designated for heavy industrial uses. Some of the undeveloped land within the designated industrial area remains under agricultural cultivation. Vegetation on the MWF site includes shrubs and a variety of wild mustards and sagebrush plants sparsely scattered throughout the site. Site vegetation is dominated by nonnative weeds, including Russian thistle. Approximately 5 acres of previously disturbed land with minimal value as wildlife habitat would be disturbed during construction of the facility.

Common bird species in the vicinity of the MWF site include the western meadowlark, white crowned sparrow, gull, black-billed magpie, American crow, and European starling. Canada geese, red-tailed hawk, and American kestrel are common and are likely to occasionally feed in nearby grain fields (PEcoS 1995). The Tri-Cities area is within a major waterfowl flyway and wintering area. Waterfowl use is concentrated along the Columbia River, with limited waterfowl presence in the immediate vicinity of the MWF site so there will be no anticipated impact on waterfowl. Because there is no surface water in the immediate vicinity of the MWF site, there will be no impact to aquatic species.

D-11b IX Area Land Use

[40 CFR 264.601(a)(6), 264.601(b)(9), 270.23(b)]

The MWF site is located in an industrial area in the northern portion of the city of Richland. Most developed land in the surrounding area is used for agriculture, light industry, or residences. The area to the north of the site is the DOE Hanford site.

The nearest neighbors to the MWF is Perma-Fix NW-R Low-Level Waste Processing Facility which is adjacent to the MWF and the Siemens Power Corporation Facility which is approximately 0.64 km (0.4 mi.) to the northwest; a farm is located on the south and west sides of the site; the Richland Industrial Park to the northwest; the Richland Disposal Site and Horn Rapids Off-Road Vehicle Park is approximately 3.86 km (2.4 mi.) to the northwest; and the PNNL complex is located 1.6 km (1 mi.) to the northeast of the site. The nearest residential dwellings are located in north Richland and are approximately 2.7 km (1.7 mi) to the southeast and there is a child care center located 2 km (1.25 mi) to the east-south east.

D-11b X Preventing Migration of Waste Constituents

[40 CFR 264.601(a)(7), 270.23(c)]

The potential for release of waste constituents from STB miscellaneous units into subsurface physical structures, the environment, or the root zone of food chain crops or other vegetation is minimal. All waste treatment operations will be performed inside STB and will be confined by enclosures, tanks and treatment chambers. The waste will be inspected and sampled, if needed, to confirm that it will be compatible with these miscellaneous systems. This will mitigate the potential for a waste release to inside the building caused by deterioration of the primary containment system.

Should a spill or leak occur from the miscellaneous system equipment, the released waste will be contained inside the STB secondary containment system. The containment system will provide adequate containment volume, as described in previous sections. Operations personnel will regularly inspect the secondary containment during normal operations, so if a spill were to occur, they will be readily detected and mitigated in accordance with the Contingency Plan as described in Section G and Attachment 15.

Since spills that may occur in the STB will be contained within an enclosed structure, the released waste will be prevented from coming into contact with soil, thus precluding migration of wastes in to the subsurface or groundwater

The STB will be an enclosed building that will prevent run-on and precipitation from contacting the equipment and generating contaminated runoff.

D-11C EVALUATION OF RISK TO HUMAN HEALTH AND THE ENVIRONMENT
[WAC-173-303-805 (i)(iii); 40 CFR 264.601(a)(8), 264.601(a)(9), 264.601(b)(10), 264.601(b)(11),264.601(c)(6), 264.601(c)(7), 270.23(c)]

The following paragraphs present a general evaluation of risks to human health and the environment associated with release of waste constituents from the STB miscellaneous units. The focus of this assessment is potential risks to human health, domestic animals, wildlife, and crops and vegetation surrounding MWF as well as physical structures of the facility itself. A more detailed health risk assessment for the STB and GVB miscellaneous units is in Attachment 4 - Risk Assessment Work Plan. In general terms, a risk assessment examines the potential for adverse or unwanted effects. Adverse effects can only occur following exposure to inherently toxic or hazardous materials. Previous sections have examined the potential for release of waste constituents from the STB miscellaneous units and its associated confinement systems. This section evaluates this information and the potential for exposure of human and nonhuman receptors to hazardous materials.

As discussed in Section D-11b IX, the region surrounding the MWF consists of primarily industrial and agricultural lands and is sparsely populated. The facility is more than 500 feet from any residential or public gathering place. The city of Richland residential community is within 1.7 miles of the facility. A day care center is located within 1.25 mile of the facility. The facility is more than 200 feet away from any public road (Battelle Blvd.).

Section D-11b X evaluated the potential for release of waste constituents from the STB to environmental media surrounding the MWF. Based on analyses presented, no release of solid or liquid waste constituents to the environment is anticipated. As noted in that section:

- The miscellaneous units will be located within STB, a fully enclosed, contained and confined structure built to ensure containment of any unanticipated solid or liquid waste release. Any leaks that might occur will be contained within STB and catch pans. There will be no discharge or release of waste constituents to soil, surface water, or groundwater.

- Incoming and outgoing wastes will be containerized in DOT approved containers. During off-loading and loading by fork-lift, the containers will be transported above concrete pads sloped to collection sumps. Any spills during loading and unloading will be collected by these sumps. There will be no discharge or release of waste constituents to soil, surface water, or groundwater.

Given this information, no exposure of human or non-human receptors to liquid and solid waste from the normal operation of the STB miscellaneous units is anticipated. Therefore, there will be no risk of adverse effects to offsite receptors associated with generation or handling of the wastes. Physical damage to the structural components of the STB is very unlikely.

Wastes that pose an inherent physical threat to the STB or a safety hazard for the operators will not be processed through the MWF.

Wastes that are incompatible with the STB miscellaneous units, containers, or piping will not be accepted.

Fugitive and particulate emissions from normal operation of the STB miscellaneous units will be collected and treated by confinement systems. The confinement systems are designed to remove particulate matter and organic vapors from the vent streams. After the particulate matter and organic vapors are removed, the vent stream will be released via system stack to the atmosphere.

The resultant combined effluent gases from all of MWF generations will contain some residual particulate matter along with small quantities of volatile organic matter and metals.

In summary, the STB miscellaneous units have been designed to ensure compliance with the requirements of the RCRA regulations and the CAA permit. No adverse impacts to human health or the environment are projected to be associated with release of waste constituents to the atmosphere from the MWF.

Table D-11-1 Equipment Classified as Miscellaneous Unit

System Name	**Equipment Classified as Miscellaneous Unit Under** ***WAC 303-680, Miscellaneous Units***
Systems in Treatment Line 100	
Size reduction and screening (TP-01)	Shredding/screening system (PFD 31001-P-003)
Dryer (TP-08)	Dryer system (PFD 31001-P-003)
High capacity mixing (TT-01)	Mixer system (PFD 31001-P-003)
Low capacity mixing (TT-02)	Mixing system (PFD 31001-P-003)
Systems in Treatment Line 200	
Liquid consolidation (TP-09)	Liquid consolidation system (PFD 31001-P-004)
Liquid holding (TP-06)	Carbon filter (PFD 31001-P-004) UV oxidation (PFD 31001-P-004) Ion exchange filter (PFD 31001-P-004)
In-container mixing (TT-03)	In-container mixing system (PFD 31001-P-004)
Systems in Treatment Line 300	
Cutting and shearing (TP-02)	Cutting and shearing system (PFD 31001-P-005)
Physical extraction (TT-05)	Decontamination Unit (PFD 31001-P-004)
Polymer mixing (TT-03)	Polymer mixing system (PFD 31001-P-005)
Container cleaning (TT-06)	1. Drum rinse unit (PFD 31001-P-005) 2. Container rinse unit (PFD 31001-P-005)
Systems in Treatment Line 400	
Sorting (TP-03)	Sorting system (PFD 31001-P-006)
Aerosol Can Puncture Device (TP-15)	Aerosol Can Puncture Device
Compaction and macro-encapsulation (TP-07)	1. In-drum compactor (PFD 31001-P-006) 2. Super-compactor (PFD 31001-P-006)

Table D-11-2 STB Miscellaneous Unit Description

STB Misc Unit Description	Material of Construction	Dimension
Size reduction and screening system (PFD 31001-P-003)		
Drum Dumper	Carbon steel	4' W x 5' L x 5' H
Skip hoist	Carbon steel	7 ' W x 10' L x 20' H
Intake popper/feed conveyor	Carbon steel	6' W x 12' L x 25' H
Shredder	Carbon steel	6' W x 12' L x 25' H
Discharge conveyor	Carbon steel	3' W x 12' L x 3' H
Dryer system (TP-08) (PFD 31001-P-003)		
Dryer Enclosure and cart	Stainless Steel	7' W x 9' L x 12' H
Dryer air re-circulation duct	Stainless steel	
High capacity mixing system (TT-01) (PFD 31001-P-003)		
Mixer	Stainless steel	10' W x 10' L x 7' H
Waste feeder	Stainless steel	2' W x 1.5' L x 3' H
Reagent feeder	Stainless steel	2' W x 2.5' L x 2' H
Low capacity mixing system (TT-02) (PFD 31001-P-003)		
Mixer	Stainless steel	4' W x 11' L x 5' H
Waste feeder	Stainless steel	2' W x 2.5' L x 3' H
Reagent feeder	Stainless steel	2' W x 2.5; L x 3' H
Liquid consolidation system (TP-09)		
Hood enclosure (PFD 31001-P-004)	Stainless steel	2.5' W x 5.5' L x 4.5' H
Carbon filter (PFD 31001-P-004)		
Filter vessel	Carbon steel	2.5" W x 6' L x 7' H
Piping	PVC	1/4"

Container Rinse Assembly (PFD 31001-P-006)		
Enclosure	Carbon steel	5' W x 7' L x 8' H
Sorting System (TP-03) (PFD 31001-P-006)		
Container dumper	Carbon steel	7' W x 7' L x 8' H
Feed conveyor	Carbon steel	56' W x 20' L x 4' H
Sorting table	Carbon steel	8' Diameter x 7' H
Aerosol Can Puncture Device (TP-15)		See Attachment XX of Permit
Puncture apparatus	Carbon steel, spark-resistant parts	See Attachment XX of Permit
Carbon filter cartridge	Plastic housing	6" Diameter x 2' L
In-Drum Compaction (PFD 31001-P-006)		
Compactor assembly	Carbon steel	3.5' W x 4' L x 8' H
Super-Compaction (PFD 31001-P-006)		
Super-compactor assembly and all accessories	Carbon steel	7' W x 28' L x 20' H

Table D-11-2 (continued)

UV oxidation (PFD 31001-P-004)		
UV. oxidation vessel	Stainless steel	2.5' x 2.5' x 2.5'
UV oxidation piping & valves	Stainless steel	1"
Ion exchange filter (PFD 31001-P-004)		
Ion-exchange vessel	Carbon steel	4' w x 12' L x 8' H
Ion-exchange piping and valves	PVC	1"
In-container mixing system (TT-05) (PFD 31001-P-004)		
Reagent feeder	Stainless steel	2.5' W x 2.5' L x 3' H
Mixer blade and shaft	Stainless steel	1/2" diameter
Loading flange	Stainless steel	30" diameter
Cutting and shearing system (TP-02) (PFD 31001-P-005)		
Table saw	Carbon steel	4' W x 7' L x 5' H
Sheer	Carbon steel	3.5' W x 10' L x 2.5' H
High pressure cutter	Carbon steel	4' W x 7' L x 6' H
Physical extraction System (TT-05) Unit (PFD 31001-P-005)		
Booth and sump	Carbon steel	4' W x 20' L x 8' H
Polymer mixing system (PFD 31001-P-005)		
Waste feeder	Stainless steel	1.5' W x 2.5' L x 3' H
Polyment feeder	Stainless steel	2.5' W x 6' H x 11' H
Blender	Stainless steel	4' W x 11' L x 5' H
Extruder	Stainless steel	4.5' W x 9.5' L x 7' H
Enclosures	Carbon steel	6' W x 6' L x 7' H
Drum rinse assembly (PFD 31001-P-005)		
Drum Waster	Carbon steel	7' W x 10' L x 7' H

Table D- 11-3 STB Emissions Estimate Summary

Pollutant	Averaging Period	Concentration µg/m3	State µg/m3	Federal µg/m3
Particulate Matter (				
Particulate Matter (PM'10)	24 hr	1.5E-03	1.5E+02	1.5E+02
Carbon Monoxide	1 hr	1.1E+01	4.0E+04	4.0E+04
Nitrogen Oxides	annual	7.5E-01a	1.0E+02	1.0E+02
Sulfur Oxides	1 hr	1.3E-01	1.3E-01	NA
	3 hr	1 2E-01	N/A	1.3E+03
	24 hr	5.3E-02	2.6E+02	3.7E+02
Hydrogen Fluoride	24 hr	9.7E-04	8.7	NA
Formaldehyde	annual	4.2E-02a	7.7E-02	NA
Acetaldehyde	annual	2.12E-0 I a	4.5E-01	NA
Diphenylene Methane (Fluorene)	24 hr	9.7E-06	5.3E+00	NA
Phenol	24 hr	2.8E-04	6.3E+01	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	24 hr	3.9E-06	I.5E+00	NA
Combined Methylphenol (Cresol) isomers	24 hr	4.3E-05	7.3E+01	NA
Naphthalene	24 hr	1.3E-04	1.7E+02	NA
Dimethyl Phthalate	24 hr	8.1E-06	1.7E+01	NA
Diethyl Phthalate	24 hr	4.8E-05	1.7E+01	NA
Di-n-Butyl Phthalate	24 hr	1.2E-04	1.7E+01	NA
bis(2-Ethylhexyl) Phthalate	annual	5.6E-02a	2. 5E+00	NA
Total Dioxin + Furan Toxicity Equivalent	24 hr	5.2E-10	3.0E-08	NA
Aluminum (combined particulate and vapor)	24 hr	6.9E-05	6.7E+00	NA

Table D- 11-3 STB Emissions Estimate Summary (continued)

Barium (combined particulate and vapor)	4 hr	3.5E-06	1.7E+00	NA
Cadmium	annual	I.2E-06a	5.6E-04	NA
Copper	24 hr	2.9E-06	6.7E-01	NA
Iron	24 hr	4.1E-05	1.7E+01	NA
Lead	24 hr	1.3E-05	5.0E-01	NA
Magnesium	24 hr	4.7E-06	3.3E+01	NA
Zinc	24 hr	1.6E-05	1.7E+01	NA
Nickel	annual	1.0E-05a	2.1 E-03	NA
Total Radionuclide	mrem/yr	0.2	2.5E+0 1b	NA
Total Radionuclide (c)	mrem/h	0.01	N/A	1.0E+01c

Notes:

a = This is a 24-hour concentration value that is less than the annual State standards, therefore annual concentrations were not generated with ISC3 computer code (annual concentrations values are typically reduced from the 24-hour values by one to two orders of magnitude).

b = Maximum at any offsite receptor, WAC 173-480.

c = Maximum at nearest residence, 40 CFR 61.

Air concentrations taken from Tetra Tech (1996a) and adjusted to reflect increased feed rate from 68 kg/hr (150 lb/hr) to 230 kg/hr (500 lb/hr).

Total dioxin and furan toxicity equivalent pollutants come from PCBs.

NA = Not applicable.

Table D-11-4 Threatened and Endangered Species

Common Name	Scientific Name	Federal	State
Insects			
Oregon silverspot butterfly2	Speyerrazerone	T	T
Plants			
Columbia milk-vetch	Astragalus columbianus		T
Columbia yellowcress	Rorippa columbiae		E (1)
Dwarf evening primrose	Oenothera pygmaea		T
Hoover's desert parsley	Lomatium tuberosum		T
Northern wormwood	Artemisia campestris		E
borealis var. wormskioldii			
Birds			
Aleutian Canada goose 3	Branta canadensis leucopareia	T	E
American white pelican	Pelecanus erythrorhychos		E
Bald eagle	Haliaeetus leucocephalus	T	T
Ferruginous hawk	Buteo regalis		T
Peregrine falcon 3	Falco peregrinus	E	E
Sandhill crane 3	Grus canadensis		E
Mammals			
Pygmy rabbit2	Brachylagus idahoensis		E

Notes:

T = Threatened; E = Endangered

2 = Likely not currently inhabiting Hanford Site

3 = Incidental occurrence

Source: Cushing 1995