INTEGRATED DISPOSAL FACILITY
~~CHAPTER 11~~ADDENDUM H
CLOSURE PLAN
CHANGE CONTROL LOG

Change Control Logs ensure that changes to this unit are performed in a methodical, controlled, coordinated, and transparent manner. Each unit addendum will have its own change control log with a modification history table. The "**Modification Number**" represents Ecology's method for tracking the different versions of the permit. This log will serve as an up to date record of modifications and version history of the unit.

Modification History Table

Modification Date	Modification Number
09/30/2014	

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CLOSURE PLAN

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TERMS

CQA	Construction Quality Assurance
DWMU	Dangerous waste management units
Ecology	Washington State Department of Ecology
IDF	Integrated Disposal Facility
ILAW	Immobilized low-activity waste
IQRPE	Independent, Qualified, Registered Professional Engineer
LLW	Low-level waste
MLLW	Mixed low-level waste
MTCA	Model Toxics Control Act - Cleanup
RCRA	*Resource Conservation and Recovery Act of 1976*
SAP	Sampling and analysis plan
WTP	Waste Treatment and Immobilization Plant

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~~11.0~~ H.1 INTRODUCTION~~CLOSURE~~

This addendum~~chapter~~ discusses ~~preclosure,~~ closure~~, and post closure~~ activities for the four Integrated Disposal Facility (IDF) dangerous waste management units (DWMUs) that comprise Operating Unit Group 11 of WA7890008967, Hanford Facility Resource Conservation and Recovery Act (RCRA) Permit (hereinafter referred to as the Hanford Facility RCRA Permit). The four IDF DWMUs addressed in this closure plan will be closed in accordance with this closure plan after final waste receipt at IDF.

This closure plan addresses the requirements of ~~complies with~~ Washington Administrative Code (WAC) 173-303-610, *Closure and post-closure*, as they apply to the physical components of the IDF. Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b) and WAC 173-303-830, *Permit changes*, as applicable. Minor deviations from this closure plan which do not impact the overall closure strategy, but provide equivalent results are allowed and must be documented as addressed in the Hanford Facility RCRA Permit Condition II.K.6.

This closure plan and the approved closure plan sampling and analysis plan (SAP) are designed to fulfill the elements of the Data Quality Objectives Process, as defined in U.S. Environmental Protection Agency (EPA) Publication EPA/240/B-06/001, *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4)~~and represents the baseline for closure~~.

H.1.1 Physical Description

The IDF ~~has been constructed~~is located on 82 hectares (202 acres) ~~on 25 hectares of vacant land southwest of the Plutonium Uranium Extraction Facility (PUREX) Plant~~ of land within the southcentral portion of the 200 East Area of the Hanford Site (see the topographic map located in Addendum A, "Part A Form," Appendix C, Figure C-1).~~on file at the Department of Ecology library (3100 Port of Benton Boulevard, Richland, WA 99354)].~~ ~~The landfill is segregated into a Resource Conservation and Recovery Act (RCRA) permitted side and a non-RCRA permitted side. The scope of this permit is limited to the western side of the landfill where the RCRA waste will be placed.~~ Construction began at the IDF in September of 2004. The IDF is a near-surface disposal facility for Hanford Site mixed waste as defined by WAC 173-303-040, *Definitions*, and non-dangerous radioactive low-level waste (LLW). The IDF operating unit group consists of four DWMUs (Figure H-1), as listed in Addendum A for Operating Group 11:

- Storage Pad (Process code: S01, container storage).
- Treatment Pad (Process codes: S01, container storage, and T04, other: immobilization).
- Disposal Cell 1 (Process code: D80, landfill disposal).
- Disposal Cell 2 (Process code: D80, landfill disposal).

~~The waste containers and bulk waste that meet the IDF waste acceptance criteria will be inventoried, and disposed in this lined landfill.~~ Leachate ~~collected~~ from the ~~lined landfill~~disposal cell DWMUs drains to sumps located at the north-center of each cell. Collected leachate is pumped from the sumps to ~~will be transferred to~~ leachate collection tanks (219A201 and 219E201) located north of the disposal cells.~~tanks located in proximity to the landfill for subsequent treatment~~ The leachate is stored in these tanks for 90 days or less until being transferred to the 200 Area Effluent Treatment Facility for treatment.

~~A more detailed discussion of IDF waste types and the identification of the IDF processes and equipment are provided in Chapters 3.0 and 4.0, and attendant appendices. The IDF only will accept and dispose waste containers and bulk waste that meet the IDF waste acceptance criteria, RCRA and Land Disposal Restriction (LDR).~~Additional drawings and pictures of the IDF are provided in Addendum A. Further IDF design, construction, and operation information is provided in Addendum C, "Process Information." Soil, geologic, and hydrogeologic information is provided in Addendum C, "Process Information" and Addendum D, "Groundwater Monitoring Plan."

~~The closure process will be the same for partial closure or closure of the entire IDF. The remainder of this chapter describes the performance standards that will be met, and the closure/post closure activities that will be conducted.~~This closure plan discusses closure activities for the Storage Pad, Treatment Pad, and Disposal Cells 1 and 2.

H.1.1.1 Storage and Treatment Pads

The Storage Pad is an outwardly sloped reinforced concrete pad with thickened edges that allows for storm water to runoff. The concrete pad is 36.6 m (120 ft) by 42.7 m (140 ft).

The Treatment Pad is an outwardly sloped, reinforced concrete pad with thickened edges and a perimeter curb open at the northwest corner to allow stormwater to runoff. The Treatment Pad is 24.4 m (80 ft) long by 24.4 (80 ft) wide.

H.1.1.2 Disposal Cells

The IDF disposal area consists of two cells that are double-lined and are constructed to RCRA Subtitle C standards. The disposal area is ~~4~~219 m (717 ft) long by 410 m (1,345 ft) wide at ground surface, 12.8 m (42 ft) deep, and divided lengthwise into two cells (Disposal Cells 1 and 2). The maximum design capacity of the two combined disposal cells is approximately 504,966 m^3 (660,471 yd^3).

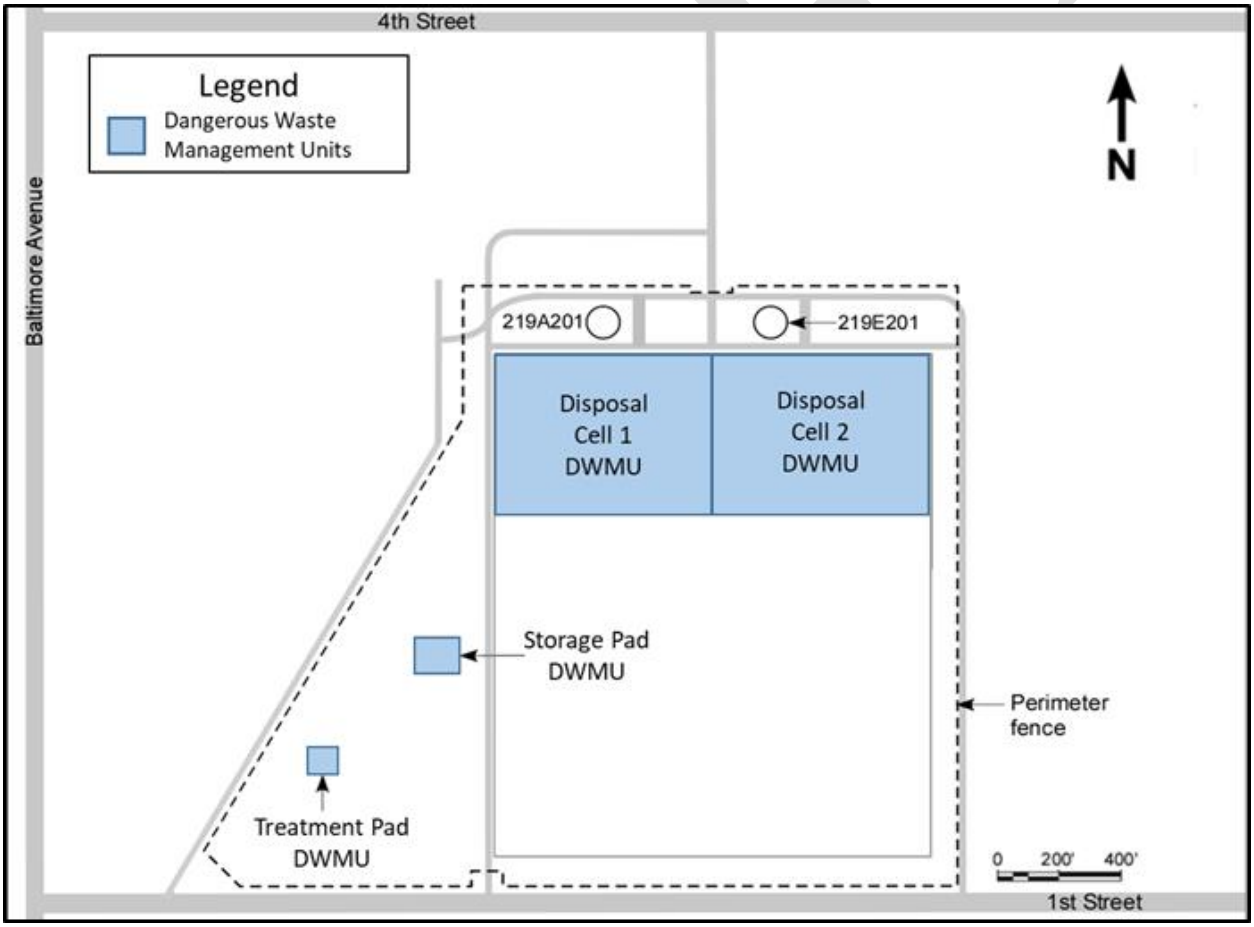

Figure H-1 Integrated Disposal Facility Dangerous Waste Management Units

H.1.2 Process Information

Waste to be disposed in the disposal cells will be transported from various Hanford Site locations to the IDF using a tractor-trailer system. Some Hanford Site waste will be sent off-site for treatment and returned to IDF for disposal. Waste received at the IDF may need to be thermally cooled on either the Storage Pad or Treatment Pad before final disposition. Waste is treated only on the Treatment Pad. The Storage Pad will be used to unload, stage, and temporarily store incoming containers of immobilized low-activity waste (ILAW) generated at the Hanford Site Waste Treatment and Immobilization Plant (WTP), allowing the ILAW containers to thermally cool before final deposition and burial in the IDF disposal cells. In addition, the Storage Pad may be used to temporarily store mixed low-level waste (MLLW) containers before placement in the IDF disposal cells.

IDF also manages nondangerous radioactive LLW from Hanford Site operations in accordance with the *Atomic Energy Act of 1954*. Management of radioactive waste is not within the scope of RCRA or WAC 173-303, *Dangerous Waste Regulations*. Any information provided in this document for radioactive waste is for informational purposes only.

Waste intended for disposal at IDF that does not meet land disposal restrictions (LDR) requirements will be treated via sealing, macroencapsulation, or microencapsulation on the Treatment Pad to meet land disposal restrictions. Waste management and disposal operations are detailed in Addendum B, "Waste Analysis Plan," and Addendum C, "Process Information."

H.1.3 Waste Inventory and Characteristics

MLLW will be disposed to both of the IDF cells. Waste disposed at the IDF will consist primarily of ILAW from the WTP. Additional waste streams to be disposed at the IDF include:

- Mixed waste generated by the IDF operations.
- Used WTP low-activity waste melter systems.
- Secondary solid waste from WTP.
- Solidified secondary solid waste from the Effluent Treatment Facility.
- Fast Flux Test Facility non-liquid waste and demolition waste resulting from decommissioning.
- Secondary waste (LLW and MLLW) from operations at the Tank Farms and the Solid Waste Operations Complex.
- Non-*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, non-tank LLW and MLLW from various on-site generators.

A comprehensive list of wastes managed in accordance with RCRA regulations, including classification and estimated annual quantities and design capacities, is provided in Addendum A.

For permitting purposes, it is assumed that all dangerous and mixed waste stored, treated, and disposed at the IDF will carry one or more of the waste codes listed in Addendum A. The IDF closure plan target analytes and associated waste codes are listed in Table H-1.

Table H-1 Integrated Disposal Facility Target Analytes

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Inorganics			
Acetyl Chloride[d] (U006)	75-36-5	Mercury (D009, U151)	7439-97-6
Arsenic (D004)	7440-38-2	Phosphorus Sulfide[d] (U189)	1314-80-3
Arsenic Trioxide[d] (P012)	1327-53-3	Potassium Cyanide[b] (P098)	151-50-8
Barium (D005)	7440-39-3	Sodium Cyanide[b] (P106)	143-33-9
Beryllium (P015)	7440-41-7	Selenium (D010)	7782-49-2
Cadmium (D006)	7440-43-9	Selenium Dioxide[d] (U204)	7446-08-4
Chromium (D007)	7440-47-3	Silver (D011)	7440-22-4
Copper Cyanide[b] (P029)	544-92-3	Thallium Nitrate[h] (U217)	10102-45-1
Cyanide (P030)	57-12-5	Thallium Oxide[d] (P113)	1314-32-5
Hexavalent Chromium (D007)	18540-29-9	Vanadic Acid, Ammonium Salt[d] (P119)	7803-55-6
Lead (D008)	7439-92-1	Vanadium Pentoxide[f] (P120)	1314-62-1
Lead (II) Acetate[d] (U144)	301-04-2	---	---
Organics			
1,1-Dichloroethylene (D029)	75-35-4	Formic Acid (U123)	64-18-6
1,1,1-Trichloroethane (F001, F002, U226)	71-55-6	Heptachlor (D031)	76-44-8
1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)[g] (F002)	76-13-1	Heptachlor Epoxide (D031)	1024-57-3
1,1,2-Trichloroethane (F002)	79-00-5	Hexachlorobenzene (D032)	118-74-1
1,2-Dichloroethane (D028)	107-06-2	Hexachlorobutadiene (D033)	87-68-3
1,4-Dichlorobenzene (D027)	106-46-7	Hexachloroethane (D034)	67-72-1
1,4-Dioxane (U108)	123-91-1	Hydrofluoric Acid[d] (U134)	7664-39-3
2,4,5-Trichlorophenol (D041)	95-95-4	Isobutanol (F005)	78-83-1
2,4,6-Trichlorophenol (D042)	88-06-2	Lindane (D013)	58-89-9
2,4-Dinitrotoluene (D030)	121-14-2	Methanol (F003, U154)	67-56-1
2,6-Dinitrotoluene (U106)	606-20-2	Methoxychlor (D014)	72-43-5
2-Ethoxyethanol[e] (F005, U359)	110-80-5	Methyl Ethyl Ketone (D035, F005, U159)	78-93-3
2-Nitropropane[c,d] (F005)	79-46-9	Methyl Ethyl Ketone Peroxide[d] (U160)	1338-23-4
3-Methylcholanthrene[d] (U157)	56-49-5	Methyl Isobutyl Ketone (F003, U161)	108-10-1
Acetaldehyde[d] (U001)	75-07-0	Methyl Methacrylate (U162)	80-62-6

Table H-1 Integrated Disposal Facility Target Analytes

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Acetone (F003, U002)	67-64-1	Methylene Chloride (F001, F002, U080)	75-09-2
Acetophenone (U004)	98-86-2	Naphthalene (U165)	91-20-3
Benzene (D018, F005, U019)	71-43-2	Nitrobenzene (D036, F004, U169)	98-95-3
Carbon Disulfide (F005, P022)	75-15-0	Pentachlorophenol (D037)	87-86-5
Carbon Tetrachloride (D019, F001, U211)	56-23-5	Phenol (U188)	108-95-2
Chlordane (D020)	57-74-9	Pyridine (D038, F005, U196)	110-86-1
Chlorinated Fluorocarbons[g] (F001, F002)	Not Applicable	Tetrachloroethylene (D039, F001, F002, U210)	127-18-4
Chloroacetaldehyde[d] (P023)	107-20-0	Tetrahydrofuran[d] (U213)	109-99-9
Chlorobenzene (D021, F002)	108-90-7	Toluene (F005, U220)	108-88-3
Chloroform (D022, U044)	67-66-3	Toxaphene (D015)	8001-35-2
Total Cresol (Cresylic Acid)[a] (D026, F004)	1319-77-3	Trichloroethylene (D040, F001, F002, U228)	79-01-6
Cyclohexanone (F003, U057)	108-94-1	Trichlorofluoromethane (CFC-11)[g] (F002, U121)	75-69-4
Dibutyl Phthalate (U069)	84-74-2	Vinyl Chloride (D043, U043)	75-01-4
Dichloroethyl Ether (U025)	111-44-4	Xylenes (F003, U239)	1330-20-7
Diethylarsine[d] (P038)	692-42-2	*m*-Cresol (D024, F004)[a]	108-39-4
Endrin (D012)	72-20-8	*o*-Cresol (D023, F004)	95-48-7
Ethyl Acetate (F003, U112)	141-78-6	*p*-Cresol (D025, F004)[a]	106-44-5
Ethyl Benzene (F003)	100-41-4	*n*-Butyl Alcohol (F003, U031)	71-36-3
Ethyl Ether (F003, U117)	60-29-7	*Ortho*-Dichlorobenzene (F002)	95-50-1

[a]The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol and *p*-cresol.

[b]Analyzed as total cyanide.

[c]The closure performance standard for 2-nitropropane was removed in the May 2014 CLARC table updates; therefore, this analyte will not be analyzed for, due to the unavailability of a closure performance standard.

[d]This analyte is removed from further consideration because it is not listed in the CLARC tables.

[e]Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

[f]Vanadium pentoxide will be analyzed as vanadium.

[g]A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

[h]Thallium nitrate will be analyzed as thallium.

CAS = Chemical abstracts service
CFC = Chlorinated fluorocarbon
CLARC = Cleanup Levels and Risk Calculation
IDF = Integrated Disposal Facility

H.2 Groundwater Monitoring

Groundwater monitoring will be performed in accordance with WAC 173-303-645, *Releases from regulated units*, and the provisions of Addendum D. Addendum D describes the groundwater monitoring activities, frequencies at which they will be performed, and groundwater monitoring data reporting standards.

~~11.1 Closure Plan~~

~~Waste containers and bulk waste that meet the IDF waste acceptance criteria will be disposed in the lined landfill that complies with WAC 173-303-665 standards (Chapter 4.0). The IDF will be closed according to current applicable WAC 173-303 regulations, United States Department of Energy (DOE) requirements, best management practices, and will be integrated with the overall cleanup activities performed under the Tri-Party Agreement (HFFACO).~~

~~The disposal landfill cover will be designed and located to comply with WAC 173-303-665(6) and WAC 173-303-610. The specification and/or variation for other cover designs will be provided at the time of closure once a hazard(s) has been defined.~~

~~11.2~~ H.3 Closure Performance Standards

~~Closure requirements found in WAC 173-303-665(6), incorporated by reference, and detailed here in Chapter 11.0 of the IDF portion of the permit, will make up the closure~~ The IDF DWMUs will be closed in a manner that meets the performance standards ~~for the IDF~~of WAC 173-303-610(2).

~~11.3 Preclosure Activities~~

~~Preclosure activities could include, at a minimum, placing interim or final covers over the filled portions of the landfill as the landfill is expanded to accept more waste. Placement of covers over the filled portions might be deferred until closure of all the IDF. Once a decision is made to construct the final cover over the landfill, a closure cover design will be used that satisfies the dangerous waste disposal requirements defined in WAC 173-303.~~

~~The selection of a final cover design has not been identified. Figure 11-1 shows an example of a typical Hanford Site landfill cover design. Design(s) will include features to satisfy the minimum requirements found in WAC 173-303-665(6).~~

~~11.4 Maximum Extent of Operation~~

~~The maximum process design capacity of the IDF conservatively is calculated to be 100 hectare-meters, which is 1,000,000 cubic meters (Chapter 1.0, Part A, Form, Section III). The IDF landfill will be segregated into a RCRA-permitted side of 50 hectare-meters and a non-RCRA permitted side of 50 hectare-meters.~~

H.3.1 Storage and Treatment Pad Closure Performance Standards

The storage and treatment pad DWMUs will be clean closed. Clean closure will be achieved by removal and disposal of the storage and treatment pads, and by removal of soil up to 1 m (3 ft) surrounding and below the pads. Verification sampling of the removal area will be performed to demonstrate there were no releases from the pads, or if releases occurred, that the contaminated soil has been sufficiently removed to meet closure performance standards. If the soil does not meet closure performance standards, steps will be taken in accordance with Section H.4.2.6.

Clean closure of the storage and treatment pads will eliminate the need for future post-closure inspections, monitoring, and maintenance resulting from potential contamination by the IDF dangerous waste constituents at these DWMUs.

In accordance with WAC 173-303-610(2)(b)(i), the closure performance standards for soil are the numeric cleanup levels calculated using WAC 173-340, *Model Toxics Control Act—Cleanup*, (MTCA) Method B. Table HA-3 of Appendix HA provides the closure performance standards for the Table H-1 target analytes. The closure performance standards consider all risk exposure pathways and reflect the most conservative values of the stated exposure pathways, or Hanford Site Background, or the laboratory practical quantitation limit for the specified analytical method, whichever is greater.

H.3.2 Disposal Cell Closure Performance Standards

The IDF disposal cells will be landfill-closed with a cover. Closure of the disposal cells will be consistent with the closure requirements specified in WAC 173-303-665(6), *Landfills*, and WAC 173-303-610. The cover design will satisfy the requirements of WAC 173-303-665(6). A description of the cover is provided in Section H.4.3.

H.4 CLOSURE ACTIVITIES

This section describes the activities that will be performed to implement closure of the IDF in accordance with WAC 173-303-610(3)(a)(iv) and WAC 173-303-665(6). These activities will be performed in accordance with the established closure schedule provided in Section H.6.

If an unexpected event occurs prior to closure that affects the closure plan, a permit modification request to amend the closure plan will be submitted to the Washington State Department of Ecology (Ecology) within 60 days of the unexpected event per WAC 173-303-610(3)(b)(iii). An unexpected event would be an event outside the scope of the closure plan or a condition that inhibits implementation of the plan as written. Deviations from the closure plan required by unforeseen circumstances encountered during closure activities, which do not impact the overall closure strategy, but provide equivalent results, shall be documented in the IDF Operating Record and made available to Ecology upon request, or during the course of an inspection. If an unexpected event occurs during the closure that affects the closure plan, a permit modification request to amend the closure plan will be submitted to Ecology within 30 days of the unexpected event per WAC 173-303-610(3)(b)(iii).

Hazardous waste associated with the closure of IDF will be accumulated, as necessary, in satellite accumulation areas or in central accumulation areas at appropriate locations near IDF, in accordance with WAC 173-303-170, *Requirements for generators of dangerous waste*, and WAC 173-303-200 *Conditions for exemption for a large quantity generator that accumulates dangerous waste*. Only newly generated hazardous wastes will be placed in these waste accumulation areas. Waste removed during closure activities will be designated to meet the requirements of WAC 173-303-070, *Designation of dangerous waste*, through WAC 173-303-100, *Dangerous waste criteria*. Waste may include equipment used during closure activities. Designation of waste generated during closure activities will be based on Addendum A, available process knowledge, and sampling results, as necessary to complete a disposal unit waste profile.

Hazardous wastes generated during closure will be treated (if necessary) to meet LDRs in 40 Code of Federal Regulations (CFR) 268, incorporated into WAC 173-303-140(2)(a), *Land disposal restrictions*, by reference. Ultimately, waste will be disposed of in an approved waste disposal facility, such as the IDF, the Environmental Restoration Disposal Facility, or another approved disposal facility, in accordance with WAC 173-303-610(5).

H.4.1 Security, Inspection, and Training Information

Security information, as it applies to the IDF DWMUs, is described in Addendum E, "Security." Inspection information is described in Addendum I, "Inspection Plan," and training information is in Addendum G, "Personnel Training." For groundwater monitoring well inspection and training of Soil and Groundwater Samplers, refer to Hanford Facility RCRA Permit Attachment 8, *Inspection and Training Plan for Groundwater Monitoring Wells*.

Closure activities will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will be trained to perform all necessary closure activities in compliance with the applicable safety and environmental requirements identified in Addendum G. Field operations will be performed in accordance with applicable health and safety requirements. Personnel will be equipped with appropriate personal protective equipment for the closure activity being performed.

Attachment 5, *Hanford Facility Personnel Training Program*, of the Hanford Facility RCRA Permit describes specific training requirements for Hanford Facility personnel. The training matrix detailed in Addendum G provides training requirements for Hanford Facility personnel whose job tasks are directly associated with the IDF. Training records are maintained for each employee in an electronic database.

Provisions of Addendum F, "Preparedness and Prevention" shall be implemented throughout the IDF active life period.

H.4.2 Storage and Treatment Pads

The IDF storage and treatment pads will be clean closed in accordance with the closure performance standards in this plan. The activities to clean close the storage and treatment pads include removal of waste, the pads, and surrounding soil, as well as visual inspections and soil verification sampling.

Waste generated due to closure activities may include:

- Concrete pad debris.
- Contaminated media (soil).
- Miscellaneous disposables (personal protective equipment, disposable sampling equipment, etc.).

H.4.2.1 Removal of Wastes and Waste Residues

Waste stored or treated on the pads will have been disposed in the Disposal Cells at the time of storage and treatment pad closure. No further removal of waste or waste residues from the pads is planned as part of these closure activities.

H.4.2.2 Removal of Unit, Parts, Equipment, Piping, and other Ancillary Equipment

No parts, equipment, piping, or ancillary equipment are anticipated to be associated with the IDF storage and treatment pads.

H.4.2.3 Unit Inspection

Following removal of wastes and waste residues from the storage and treatment pads, the concrete pads will be visually inspected for contamination (e.g., stains or residuals) and cracks or other openings. The inspection results will be evaluated for indications of potential past spills or releases at the DWMUs. The information will be used to determine the need for focused sampling of the underlying soil during closure.

Previous spills at the storage and treatment pads, and subsequent cleanup, will be identified and documented in the IDF portion of the facility operating record and reviewed at the time of closure. A permit modification prepared in accordance with WAC 173-303-610(3)(b) is required when a release occurs that requires modification of the closure plan.

~~**11.5 Decontaminating Equipment and Structures**~~

~~All ancillary equipment and its secondary containment, and instrumentation (e.g., level-indicating devices, leak detection devices, pumps, piping) meet the definition of "debris" as defined in WAC 173-303-040. Items in direct contact with mixed waste are assumed to meet the definition of "hazardous debris" as defined in WAC 173-303-040.~~

~~Currently, three options are available for treating hazardous debris. The first option is to treat the debris using one of the three debris treatment technologies extraction, destruction, or immobilization as described in 40 CFR 268.45. If the hazardous debris is treated using approved extraction or destruction technologies, the debris is no longer required to be managed as a dangerous waste as long as the debris does not exhibit a characteristic of a dangerous waste. If hazardous debris contaminated with a listed waste is treated using an immobilization technology, it remains a listed waste, even after the LDR treatment standards are met unless Ecology makes a case-by-case determination that the debris "no longer contains" a mixed waste. In effect, by making this "contained-in" determination on a case-by-case basis, Ecology will be setting clean closure standards in accordance with the closure performance standards of WAC 173-303-610(2)(a)(ii).~~

~~The second option is to treat the hazardous debris to meet the constituent-specific LDR treatment standard for the waste or waste-specific constituents contaminating the debris; however, such debris, even after treatment, may be considered a dangerous waste under the dangerous waste regulations and may require management at a facility permitted to manage dangerous waste.~~

~~The third option involves obtaining a "contained-in determination" for the hazardous debris, thereby rendering the waste "non-hazardous" for those waste-specific listed constituents that fall below Model Toxic Control Act (MTCA) method B risk-based health limits. Moreover, it must be proven that the debris does not designate as a characteristic waste under WAC 173-303.~~

~~11.5.1~~ H.4.2.4 Storage and Treatment Pad Removal and ~~Contaminated~~ Soil Sampling

~~Contaminated soil could be generated as a result of spill cleanup. Since the majority of IDF operations will be performed within secondary containment (see Chapters 4.0 and 6.0) the potential for spilling dangerous waste into the surrounding soil is low. Contaminated soil generated as a result of a dangerous waste spill will be managed pursuant to WAC 173-303-200.~~

~~Once the soil is designated, appropriate treatment and disposal or storage options will be determined and implemented.~~

~~A contained-in determination could also be sought for contaminated soil generated as a result of a spill. For contaminated media the contained-in policy requires that a statistically based sampling plan be used for obtaining the data to support a contained-in demonstration. The contained-in policy does not require that the waste be analytically nondetectable for it to be considered nondangerous. However, the analytical results must prove that the listed constituents in the soil are below health-based limits as provided in WAC 173-303-610(2)(b)(i) and that the soil does not exhibit any dangerous waste characteristics (i.e., soil does not designate for D codes). If approved by Ecology, this could allow waste that falls below specific health-based levels to be disposed of without requiring treatment~~

The storage and treatment pad DWMUs will be removed and disposed to support clean closure. Upon removal of the concrete pads, the underlying soil will be exposed for inspection and sampling. Up to 1 m (3 ft) surrounding and below the pads will be excavated to support clean closure.

Verification sampling of the removal area will be performed to demonstrate there were no releases from the pads, or if releases occurred, that the contaminated soil has been sufficiently removed to meet closure performance standards (Section H.4.2.6).

H.4.2.5 Identifying and Managing Contaminated Environmental Media

Soil surrounding and beneath the concrete pads will be inspected for staining or other indications of contamination. Focused soil samples may be required when visual inspection of the pads (prior to their removal) or the underlying soil indicates a potential release of waste to the soil. Soil with contamination at levels that exceed values in Table HA-3 in Appendix HA will be removed from the excavation location and disposed in an approved disposal facility.

Soil removal will be monitored closely, and removed soil will be placed in a satellite accumulation area or a central accumulation area. Precautions will be taken to prevent the spread of contamination. If contamination is indicated by field screening, a suitable cover or fixative would be applied to the soil. Soil accumulations will be placed in U.S. Department of Transportation-compliant containers and sent to an approved disposal facility or staged at central accumulation areas in accordance with WAC 173-303-200 standards.

Contaminated soil will be managed as newly-generated waste in accordance with WAC 173-303-610(5) and must be handled in accordance with applicable generator requirements of WAC 173-303-170 through WAC 173-303-230, *Special conditions*. The contaminated soil will be containerized, labeled, sampled if necessary, and waste designated. Contaminated soil requiring treatment will be transported to a facility where it will be treated to meet WAC 173-303-140(2)(a) prior to disposal.

H.4.2.6 Closure Confirmation

The concrete pads will be removed, in addition to soil contaminated to levels that exceed the values in Table HA-3 in Appendix HA. Verification sampling will be performed of the soil surrounding and beneath the storage and treatment pads to support clean closure of the DWMUs. Verification sampling will be performed in accordance with the closure SAP (Appendix HA).

If contaminated soil is identified as a result of closure verification sampling activities, the contaminated soil will be removed and disposed at an approved disposal facility in accordance with Section H.4.2.5. Following removal of the contaminated soil, additional sampling will be conducted to demonstrate meeting the closure performance standards.

Soil sampling will be conducted to confirm that unrestricted use cleanup standards (MTCA [WAC 173-340] Method B) have been achieved. Once analytical results confirm closure performance standards have been met, the area will be backfilled to grade with clean soil consistent with the future land-use determination (Section H.3.1).

H.4.3 Landfill Cell Closure

Upon completion of waste placement in both cells, Disposal Cells 1 and 2 will be landfill closed with a single cover. The landfill cover will be designed to comply with WAC 173-303-665(6) and WAC 173-303-610. The following activities are required to achieve landfill closure:

- Continuation of the established monitoring requirements for groundwater and leachate collection.
- Periodic inspections and maintenance of the facility.
- Preparations for final cover installation.
- Installation of the final cover.
- Certification of closure.

In accordance with WAC 173-303-665(6)(a), a final landfill cover will be designed and constructed to meet following objectives:

- Provide long-term minimization of migration of liquids through closed landfill.
- Require minimal maintenance.
- Promote drainage and minimize cover erosion or abrasion of the cover.
- Maintain cover integrity despite settling and subsidence.
- Provide permeability less than or equal to that of any bottom liner system or natural subsoil present.

In 1996, a focused feasibility study (DOE/RL-93-33) of engineered barriers (covers) was prepared for the 200 Area of the Hanford Facility. The focused feasibility study provided four generic conceptual cover designs that evaluated federal and state regulatory requirements and drew upon experience with cover designs for Hanford Facility applications.

The Modified RCRA Subtitle C Barrier is designed to provide long-term containment, hydrologic protection, and provision to control biointrusion and human intrusion for a performance period of 500 years. This design incorporates RCRA "minimum technology guidance" as established in EPA/530-SW-89-047, *Technical Guidance Document, Final Covers on Hazardous Waste Landfills and Surface Impoundments*, with modifications for extended performance. This barrier is designed to minimize moisture infiltration through the cover, facilitate drainage, minimize surface erosion by wind and water, provide resistance to natural degradation processes, and requires minimal maintenance during its design life. The slope of the final cover encourages runoff and minimizes/eliminates any tendency for ponding of rainwater on the barrier surface. The overall conceptual design of the Modified RCRA Subtitle C Barrier eliminates the need for surface water run-on and runoff control, and collection and discharge devices, thereby satisfying the requirements of WAC 173-303-665(6)(b)(v).

The IDF Modified RCRA Subtitle C Barrier will be composed of eight layers of durable material with a combined minimum thickness of 1.7 m (5.5 ft). Upon completion of installation of the final cover, the land will be returned to the appearance and use of surrounding land areas to the furthest degree possible. The top layer (Layer 1) of the final cover will be populated with perennial grass similar to the natural environment surrounding the Disposal Cells. The Modified RCRA Subtitle C Barrier layers are summarized in Figure H-2 and further described in the following subsections.

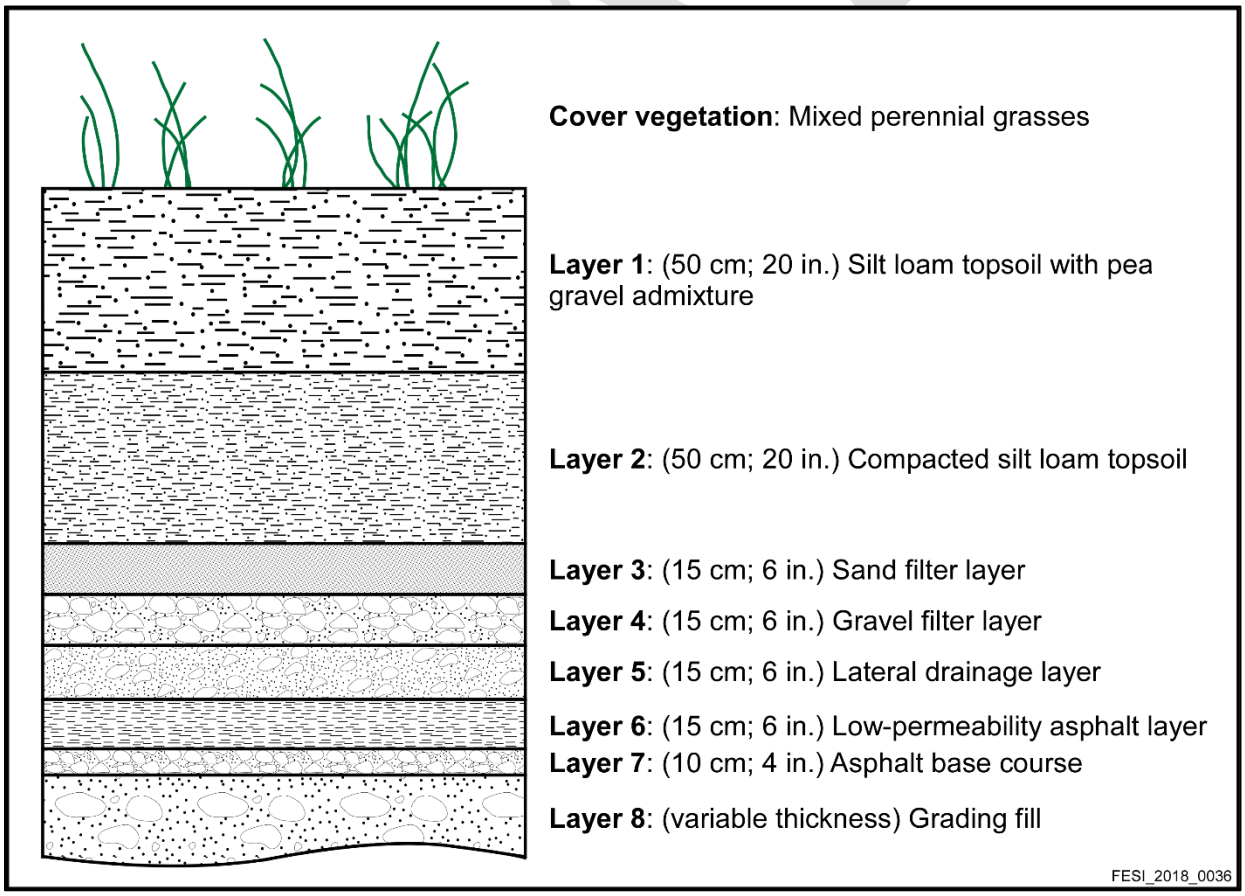

Figure H-1 Modified Resource Conservation and Recovery Act Subtitle C Barrier

11.6 Closure of Landfill Units

Closure of the IDF will be consistent with the closure requirements specified in WAC 173-303-665(6) and WAC 173-303-610. The cover design(s) will satisfy the requirements of WAC 173-303-665(6).

11.6.1 Cover Design

The cover could consist of several layers constructed on top of a native soil base. A generalized cross-section of an example cover is shown on Figure 11-1. It is assumed that before construction of the final cover, the waste form would be stabilized appropriately.

11.6.1.1 Grade Layer

The surface of the landfill would be graded and/or shaped, if necessary, to match the slope of the desired low-permeability layer. Additional soil would be placed over the landfill to achieve the required cover grade. This grade layer could taper from zero thickness near the edge of the cover boundary to perhaps several meters at the center of the cover; the thickness would depend on the lateral dimensions of the particular cover and the grade of the cover.

11.6.1.2 Low-Permeability Layer

The selection of an appropriate material for this layer would be based on the hazard that is to be isolated. The low-permeability layer will be the primary barrier in preventing soil and/or water from migrating into the waste zone and meet WAC 173-303-655(6)(v) "Have a permeability less than or equal to the permeability of any bottom liner system or natural sub-soils present".

11.6.1.3 Drainage Layer

The drainage layer would conduct any water that percolates through the overlying layers laterally to the drainage ditch. Thus, the drainage layer would prevent hydraulic pressure from building up directly on the low-permeability liner, and thereby eliminate one set of forces that would drive moisture through the primary moisture control barrier.

11.6.1.4 Plant, Animal, and Human Intrusion Layer (optional)

The performance objectives for the permanent isolation surface barrier are summarized as follows:

- Function in a semiarid to sub-humid environment.
- Limit the recharge of water through the waste to near zero amounts [0.05 centimeter per year (1.6×10^{-9} centimeters per second)].
- Be maintenance free.
- Minimize the likelihood of plant, animal, and human intrusion.
- Limit the exhalation of noxious gases.
- Minimize erosion-related problems.
- Meet or exceed WAC 173-303-665(6) cover performance requirements.
- Isolate waste for 1,000 years.

To satisfy the intrusion performance objective, an optional layer would be included in the design of barriers that require the additional human and/or biointrusion protection to reduce either the environmental or human health risk.

~~11.6.1.5 Graded Filter Layer~~

~~A graded filter consisting of crushed rock overlaid by sand would be placed on the plant, animal, and human intrusion layer if incorporated into the design, or directly over the drainage layer. The graded filter would serve to separate the surface soil layer from the drainage layer. A geotextile would be placed on the top of the graded filter to decrease the potential for fine material to enter the filter and drainage zone. The geotextile would be permeable, allowing drainage, and would not support a standing head of water.~~

~~11.6.1.6 Surface Soil Layer~~

~~The two most important factors in engineering the surface soil thickness would be the assignment of the water retention characteristics for soil and climate information. Surface soil would be placed over the geotextile to intercept, store, recycle water, and prevent damage to the underlying structure from natural and synthetic processes.~~

~~11.6.1.7~~ H.4.3.1 Cover Vegetation~~ve Cover~~

~~The vegetative cover would perform three functions. First, the plants would return water stored in the surface soil back to the atmosphere, significantly decreasing net infiltration and reducing the amount of moisture available to penetrate the cover. Second, the vegetation would stabilize the surface soil component of the cover against wind and water erosion. Finally, the vegetative cover would restore the appearance of the land to a more natural condition and appearance.~~

~~A mixture of seeds would be used to establish vegetation. The seed types would be selected based on resistance to drought, rooting density, and ability to extract water.~~Cover vegetation will consist of a mixture of perennial grass species. Specifications for the seed mix, and methods of seed application, fertilization, and mulching will be developed during definitive design. Planting of cover vegetation will meet or exceed recommendations in EPA technical guidance for final covers.

H.4.3.2 Layer 1: Topsoil with Pea Gravel Admixture

Layer 1 will consist of approximately 50 cm (20 in) of sandy silt to silt loam soil containing 15 percent (by weight) pea gravel. Layer 1 will be placed in a relatively loose condition and will retain soil moisture to support the cover vegetation. The pea gravel in Layer 1 will improve the soil's resistance to wind erosion. The slope of Layer 1 will be 5 percent, which will allow for drainage of runoff from the covered area yet limit exposure of the surface to wind erosion.

H.4.3.3 Layer 2: Compacted Topsoil

Layer 2 will consist of approximately 50 cm (20 in) of the same silt loam soil as Layer 1 but without the pea gravel. Layer 2 will be placed in a relatively densified state. Compaction of Layer 2 will help to resist moisture migration through Layer 2.

H.4.3.4 Layer 3: Sand Filter and Layer 4: Gravel Filter

Layers 3 and 4 will prevent topsoil from migrating downward and accumulating in the lateral drainage layer (Layer 5). Both layers will be approximately 15 cm (6.0 in) thick.

H.4.3.5 Layer 5: Lateral Drainage Layer

Layer 5 will facilitate removal of moisture that may filter through Layers 1 and 2. Layer 5 will consist of approximately 50 cm (6.0 in) of clean, screened aggregate material, and will be sloped at 5 percent to move water to the edge of the cover for collection and diversion away from the Leachate Collection System.

H.4.3.6 Layer 6: Asphalt Layer

Layer 6 will be a low-permeability layer constructed of a durable asphaltic concrete mixture consisting of double-tar asphalt with added sand as a binder. This layer will act as a biointrusion barrier for plant roots and burrowing animals. It will also function as a deterrent for human intrusion. Layer 6 will be constructed with a 5 percent slope.

H.4.3.7 Layer 7: Asphalt Base Course

Layer 7 will provide a stable base for placement of the overlying asphalt layer. Layer 7 will consist of screened, crushed-surfacing material.

H.4.3.8 Layer 8: Grading Fill

Layer 8 will be placed, as necessary, to establish a smooth surface for construction of the overlying barrier layers. Grading fill, which will consist of well-graded granular soil mixture, will create a uniform surface sloped at 5 percent.

~~11.6.2 Wind Erosion~~

~~The principal hazard associated with wind erosion is the thinning of the cover surface soil layer. This in turn potentially could lead to breaching of the moisture barriers, gradually allowing larger quantities of water to reach the waste. The engineering approaches to mitigating wind erosion of the cover would be (1) designing the surface soil layer with an appropriate total thickness to compensate for future soil loss that might result from wind erosion, (2) establishing a vegetative cover on the surface to reduce wind erosion, and (3) including an appropriate coarse material (admix) in the upper layer of the surface soil to form an armor layer.~~

~~11.6.3 Water Erosion~~

~~The potential hazard associated with water erosion is the same as that for wind erosion, namely the loss of soil from the top or surface layer.~~

~~Several of the following engineering approaches could be adopted to minimize the potential for water erosion:~~

- ~~Limiting the surface slopes.~~
- ~~Providing run-on control with the sideslope drainage ditches.~~
- ~~Compacting the surface soil in a way that promotes significant infiltration rather than excessive run-off.~~
- ~~Properly designing the sideslopes to prevent gullying.~~
- ~~Establishing a vegetative cover to slow surface run-off.~~
- ~~Incorporating coarse material (pea gravel admix) in the upper portion of the surface soil layer to help form an erosion-resistant armor.~~
- ~~Limiting flow path lengths through the use of vegetation and admix.~~

~~The cover design would be evaluated for potential erosion damage from overall soil erodibility, sheet flow, and gullying.~~

~~11.6.4 Deep-Rooted Plants~~

~~The following design features could minimize the potential for problems with deep-rooted plants.~~

- ~~The surface soil (top two layers) would retain most of the precipitation, because the underlying drainage layer would have significantly higher permeability and much less water retention capacity. Therefore, it is expected that vegetation preferentially would occupy the surface soil layer and not have an affinity for growing into the drier underlying layers.~~

- ~~The thickness of the surface soils would be sized to promote the development of semiarid deep-rooted perennial grasses and to discourage the development of deep-rooting intrusive species.~~

H.4.4 Equipment Decontamination

Equipment decontamination activities will be conducted in association with waste removal activities in accordance with WAC 173-303-610(5). Equipment used in closure activities will be decontaminated to minimize the potential spread of loose contamination. Decontamination of equipment will include, but is not limited to, a water rinse or high-pressure, low-volume steam cleaning coupled with a detergent wash. Rinsate from the decontamination activities will be collected and managed as dangerous waste. Decontaminated equipment to be disposed will be containerized only to the extent necessary to facilitate waste handling and to meet waste acceptance criteria.

H.4.5 Sampling and Analysis Plan

A closure SAP (Appendix HA) has been prepared to support clean closure of the storage and treatment pad DWMUs. The SAP lists the target analytes (consistent with Table H-1), documents the number and location of samples, type and quality of data, sampling and analytical methods, and the appropriate field and laboratory quality control. The SAP also contains the quality assurance project plan and the field sampling plan. The sample results will be used to verify that concentrations of dangerous waste constituents in soil are below the closure performance standards in Table HA-3 in Appendix HA.

H.5 CONTINGENT CLOSURE PLAN - RESERVED

~~11.7~~ H.6 SCHEDULE FOR CLOSURE

~~As stated previously, closure of the IDF will be a complex process. At the time of closure, this closure plan will be updated to reflect the current closure plan schedule per WAC 173-303-830, Appendix I. In addition, when a closure date is established, a revised closure plan and closure schedule will be submitted to Ecology that contains detailed information regarding specific activities and implementation timeframes.~~Closure activities for the IDF DWMUs, as well as the expected duration for each activity, are identified in Table H-2, Table H-3, and Figure H-3. Due to the extensive requirements that must be incorporated into the design and construction of the IDF landfill final cover, closure activities for the IDF are expected to take longer than the allotted 180 days [WAC 173-303-610(4)(b)]. During the extended closure period, steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, will continue to be taken.

Table H-2 Integrated Disposal Facility Pre-Closure Activities Schedule

Pre-Closure Activity Description		Timeframe Relative to Initiating Closure
Primary Activity	Description of Activity	
Conduct Monitoring, Inspections, and Maintenance	Perform required monitoring, inspections, and maintenance for groundwater and the Leachate Collection System.	Continuous Through Pre-Closure
Prepare Documentation	Prepare compliance documentation for clean closure of storage and treatment pads.	Continuous For 48 Weeks Before Beginning Closure
Submit the Final Cover Design, Specifications, and CQA Plan to Ecology	Submit the final cover design, specifications, and CQA Plan to Ecology for review and approval six months prior to construction of the IDF landfill final cover (but no later than six months prior to acceptance of the last shipment of waste at the IDF). Construction of the final cover may not proceed until Ecology approves the final cover design via a permit modification.	At Least Six Months Before Beginning Closure

Table H-2 Integrated Disposal Facility Pre-Closure Activities Schedule

Pre-Closure Activity Description		Timeframe Relative to Initiating Closure
Primary Activity	**Description of Activity**	
Submit Notification to Ecology of Intent to Close the IDF	Submit to Ecology the notification of intent to close the IDF at least 60 days prior to the date on which closure is expected to begin in accordance with WAC 173-303-610(3)(c)(i).	At Least 60 Days Before Beginning Closure

CQA = Construction quality assurance
Ecology = Washington Department of Ecology
IDF = Integrated Disposal Facility

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Table H-3 Integrated Disposal Facility Closure Activities Schedule

Closure Activity Description		Expected Duration
Primary Activity	**Description of Activity**	
Begin Closure of the IDF	Begin closure of the IDF no later than 30 days after receipt of last known volume of waste in accordance with WAC 173-303-610(3)(c)(ii).	0 Weeks (Milestone)
Conduct Monitoring, Inspections, and Maintenance	Perform required monitoring, inspections, and maintenance for groundwater and the Leachate Collection System.	190 Weeks (Continuous)
Remove Storage and Treatment Pads	Excavate concrete pads and up to 1 m (3 ft) of soil around and beneath the pad footprints. Perform visual inspection and verification sampling and analysis.	25 Weeks (Week 0 to Week 25)
Conduct Closure Verification	Obtain verification of clean closure for storage and treatment pads.	25 Weeks (Week 25 to Week 50)
Owner/Operators and IQRPE Prepare & Submit Clean Closure Certification	Submit to Ecology a certification that the pad DWMUs have been closed in accordance with the approved closure plan within 60 days of completion of closure in accordance with WAC 173-303-610(6).	8 Weeks (Week 50 to Week 58)
Conduct Cover Installation Preparation	General mobilization of water sources, construction trailers, heavy equipment.	25 Weeks (Week 0 to Week 25)
	Fill voids.	
	Prepare subgrade (filling of low areas, compacting, and re-grading).	
Install Final Cover	Stabilize barrier base.	155 Weeks (Week 25 to Week 180)
	Construct barrier layers.	
	Install vegetation.	
Owner/Operators and IQRPE Prepare & Submit Closure Certification	Submit to Ecology a certification that the DMWU has been closed in accordance with the approved closure plan within 60 days of completion of closure in accordance with WAC 173-303-610(6).	8 Weeks (Week 180 to Week 188)

DWMU = Dangerous waste management unit
IDF = Integrated Disposal Facility
IQRPE = Independent Qualified Registered Professional Engineer

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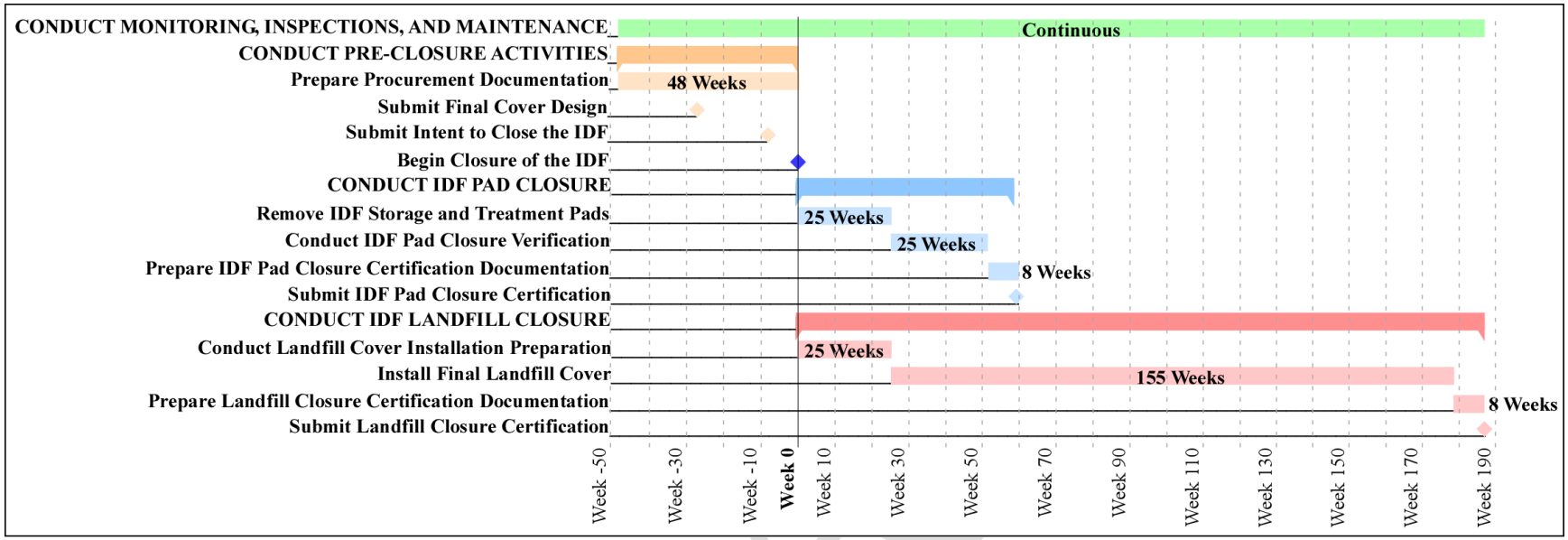

Figure H-2 Integrated Disposal Facility Dangerous Waste Management Unit Closure Schedule Timeline

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~~**11.8 Extension for Closure**~~

~~An extension for closure request is anticipated to complete the closure/post closure process of the IDF.~~

~~**11.9 Postclosure Plan**~~

~~Because of the long active life of the IDF, a comprehensive post closure plan will be developed when closure becomes imminent or when 200 Areas cleanup activities prescribed by the Tri-Party Agreement require integration.~~

H.7 CLOSURE COSTS

Closure cost estimates for Hanford Facility DWMUs are not required per Hanford Facility RCRA Permit Condition II.H.

H.8 CERTIFICATION OF CLOSURE

The U.S. Department of Energy will submit to Ecology a certification of closure and subsequent permit modification documentation, in accordance with WAC 173-303-610(6). The certification will be submitted by registered mail or an equivalent delivery service.

An IQRPE will be retained to provide and sign certification of the closures, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of IDF. At a minimum, the following activities will be performed:

- Review of the IDF final cover definitive designs.
- Review of leachate and groundwater sampling procedures and results during the closure periods.
- Observe and review final cover installation activities.
- Verify that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in the closure certification, which will then be provided to Ecology.

H.9 REFERENCES

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303-100, *Dangerous waste criteria*.

303-140, *Land disposal restrictions*.

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303-200, *Conditions for exemption for a large quantity generator that accumulates dangerous waste*.

303-230, *Special conditions*.

303-610, *Closure and post-closure*.

303-645, *Releases from regulated units*.

303-665, *Landfills*.

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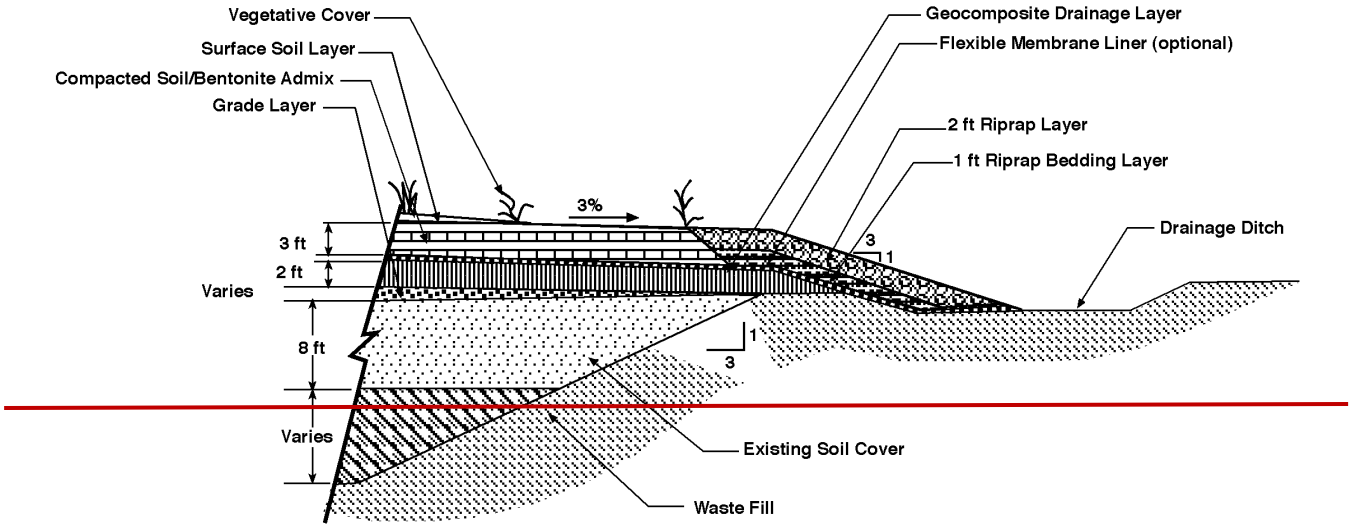

Notes:

1. Drawing not to scale.
2. Cover shown for unlined trench.
   Similar configuration for lined trench.

To convert feet (ft) to meters, multiply by 0.3048.

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2 ~~Figure 11.1. Typical Hanford Site Landfill Cover Design~~

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