SECTION 2.4: ENVIRONMENTAL ASSESSMENT REPORT

AUTHOR: JAY CORNISH, SR. ENVIRONMENTAL BIOLOGIST

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ACRONYMS, ABBREVIATIONS, AND UNITS

AAP	Army Ammunition Plant
ACM	asbestos containing material (> 1% by weight asbestiform minerals)
ADA	ammunition disposal area
AOC	area of concern
bgs	below ground surface
BCP	Base Cleanup Plan (U.S. Army, 1995)
BRAC	base realignment and closure
BTEX	benzene, toluene, ethylbenzene, and xylene
CERFA	Community Environmental Response Facilitation Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CL	confidence limit(s)
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
ECP	Environmental Condition of Property (report)
EMP	Environmental Monitoring Plan
ESD	explanation of significant differences
FOSL	finding of suitability to lease
FOST	finding of suitability to transfer
FOSET	finding of suitability to early transfer
ft	feet
GAC	granular activated carbon
gpm	gallons per minute
GWMA	Groundwater Management Area
HQ/HI	hazard quotient/hazard index
LEIC	lifetime excess incidence of cancer
LRA	Local Re-Use Authority
LTM	long-term monitoring
MCL	maximum contaminant level (in drinking water)
MEC	munitions and explosives of concern
µg/L	micrograms per liter (= parts per billion)
µg/m^3	micrograms per dry standard cubic meter
mg/L	milligrams per liter (= parts per million)
NEPA	National Environmental Policy Act
NPL	National Priorities List (under CERCLA)
OAR	Oregon Administrative Rules
OB/OD	open burning/open detonation
ODEQ	Oregon Department of Environmental Quality
ONG	Oregon National Guard
OU	operable unit
PAH	polyaromatic hydrocarbon
pCi/l	pico-Curie/liter
P.L.	public law
ppb(m)	parts per billion (million)
PRG	preliminary remediation goals
RA	risk assessment (human health or ecological)
RAC	remedial action complete

ACRONYMS, ABBREVIATIONS, AND UNITS (CONT'D)

RCRA	Resource Conservation and Recovery Act (as amended)
RDX	Royal Demolition Explosive (hexahydro–1,3,5–trinitro–1,3,5–triazine)
RI/FS	remedial investigation/feasibility study
ROD	record of decision
S/S	solidification/stabilization
TCLP	toxicity characteristic leach procedure
TNT	2,4,6 – trinitrotoluene
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, or disposal facility
UMCD	Umatilla Chemical Depot
UMCDF	Umatilla Chemical Agent Disposal Facility
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USDoD	United States Department of Defense
USEPA	United States Environmental Protection Agency
UXO	unexploded ordnance

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EXECUTIVE SUMMARY

The U.S. Army has two major options regarding environmental cleanup of the Umatilla Chemical Depot (UMCD) under the Base Closure and Realignment Act of 1988 (BRAC; P.L. 100-526) and Defense Closure and Realignment Act of 1990 (P.L. 101-510). These options are:

1. Cleanup of all operable units under authority of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. 9601-9675, as amended) to those conditions set by the OU-specific Record of Decision (ROD). In such case, the site-specific covenant then documents that all known remedial actions were taken prior to property transfer from the Army to the Local Redevelopment Authority (LRA). The deed should specify that the Army will be responsible for remediating any contamination after date of transfer (but arising from military service actions). This includes an access agreement with the LRA to perform such cleanup [CERCLA Section 120(h)(4)(D)]; or,

2. Property transfer occurs prior to completion of ROD requirements, but only after clear and mutually agreed upon stipulations exist as to the respective (Army vs. LRA) responsibilities regarding, "who, what, when, and where" for completing the necessary site-specific remedial actions. Such agreements will probably include engineering controls (eg. physical barriers) and/or institutional controls (eg. deed restrictions). The purpose of these land use controls is protection of human health and the environment before, during, and sometimes after site-specific cleanup.

Furthermore, the roles and responsibilities of Army and LRA regarding non-CERCLA cleanup actions must be clearly defined and agreed upon prior to transfer of a particular property. Such regulatory-based actions at UMCD include:

1. Decontamination and decommissioning (D&D) of the Umatilla Chemical Agent Disposal Facility (UMCDF) under authority of the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. §6901 et seq., as amended).

2. Removal of lead-based paint, asbestos containing materials, polychlorinated biphenyls, and radon gas mitigation in structures, all under authority of the Toxic Substances Control Act (TSCA; 15 U.S.C. §2601 et. seq.).

3. Removal of other substances or materials that could pose serious hazard to onsite workers (eg. accumulated bio-hazardous wastes in presently unused buildings) under Section 5(a)1, General Duty Clause, of the Occupational Safety and Health Act (OSH; P.L. 91-596, as amended).

The LRA will work closely with the Army to ensure that property-specific cleanup is indeed appropriate to its future reuse, as defined to the extent possible by the UMCD Redevelopment Plan. This plan must accommodate the following Army-lead remedial actions that will probably continue for the next 20 years:

1. Monitoring of selenium attenuation in alluvial groundwater at the Active Landfill site (OU 5);

2. Monitoring of RDX/TNT removal (via enhanced bio-physical treatment processes) in alluvial groundwater at the Explosives Washout Lagoon Site (OU 3);

3. Monitoring effectiveness of removing unexploded ordnance (UXO) at the Ammunition Disposal Area (ADA; OU 4).

On the other hand, ROD-based cleanup levels may be revisited to ensure that site-specific remediation is indeed protective of future human and ecological receptors. One such case is the potentially phytotoxic levels of copper and zinc allowed in ADA rooting zone soils by the 1994 ROD (See Table 2-2); such concentrations may interfere with (re)establishment of *Artemisia-Purshia* shrub-steppe in this portion of the UMCD.

The LRA will build upon the Army's significant cleanup programs made over the past 30 years if the following actions occur:

1. Ongoing and planned remediation of the industrial areas (eg. west warehouses and operations buildings) is protective of present and future worker health and safety;

2. Removal or retrofit of existing buildings and infrastructure (eg. utilities, roads) incorporates timely and appropriate environmental decontamination efforts (eg. removal of avian feces or other residual contamination) prior to initiating site-specific demolition or reconstruction activities;

3. Identification and mitigation of project-specific environmental impacts early in the planning process via performing site-specific biological and socio-cultural surveys and subsequent application of best management (environmental engineering) practices, respectively.

The creation and maintenance of an active partnership between the Army and LRA will expedite the property transfer process, and promote the long-term economic and environmental goals for reuse of the UMCD. Such relationship should result in:

1. Achieving highest and best use of the Depot's industrial areas (including the UMCDF);

2. Enhancing military training activities by the Oregon National Guard;

3. Preserving (and possibly restoring) the Depot's extensive shrub-steppe plant and animal communities;

4. Protecting Native American sacred sites and significant historical sites present at the Depot.

In summary, this environmental assessment did not identify any environmental constraints that will preclude the presently envisioned redevelopment of the UMCD. Mutually agreeable demarcation of economic and environmental-related reuse zones, and careful planning of future activities within each of those zones, will clearly support acceptance and subsequent implementation of the Redevelopment Plan. Destruction of mustard (HD) and secondary process waste (eg. contaminated, personal protective equipment) may not be complete until December 2012 (see section 2.2.4.1). The potential effects on scheduling of economic development could be mitigated via phased development of the UMCD. For example, "clean" and "early transfer" of properties located in the warehouse and administrative areas could be released for development prior to clean closure of the UMCDF.

Given present, and envisioned future, progress made between the LRA and Army the path forward for UMCD reuse should be adequately presented and evaluated in an Environmental Assessment-type National Environmental Policy Act [NEPA; 42 U.S.C. §4321 et. seq.] compliance document.

1. INTRODUCTION

1.1 OVERVIEW OF ENVIRONMENTAL CLEANUP UNDER BRAC

The Base Closure and Realignment Act of 1988 [Public Law (P.L.) 100-526] and Defense Base Closure and Realignment Act of 1990 (P.L. 101-510) require that the U.S Department of Defense (USDoD) comply with numerous statutes that address protection of the environment prior to, and following, disposal of real property at an effected installation (USDoD, 2006; Chapter 8). As discussed below, compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. 9601-9675, as amended) – also known as Superfund – is a key component of the BRAC process.

Prior to transfer of any federal property on which any hazardous substance [CERCLA §101(14)] was stored for one or more years, or known to have been released or disposed of, the U.S. Government must:

- provide a covenant warranting that all remedial action has been taken necessary for protection of human health and the environment; or
- provide for Early Transfer Authority that allows federal transfer of the property to another entity, as long as certain stipulations and assurances are made that such cleanup action(s) will occur [CERCLA §120(h)(3), as amended].

Furthermore, CERCLA mandates that the particular entity of the USDoD (e.g., U.S. Army) is liable for cleanup of any contamination arising from previous (historic) activities, even if/when discovered after the date of property transfer (CERCLA §120(h)(3)(ii)(II)]. A general discussion of property transfer and timing of cleanup actions under BRAC is presented below.

1.1.1 Determination of Property-Specific Environmental Status

The Community Environmental Response Facilitation Act (CERFA; P.L. 102-426) modified CERCLA to require that USDoD evaluate whether real property (at a particular installation) is contaminated with hazardous substances or petroleum products before any property transfer decisions are made [CERCLA §120(h)(4)]. Identification of clean vs. contaminated property or land parcels was documented in BRAC Rounds 1-4 in an Environmental Baseline Summary; in BRAC Round 5, Environmental Condition of Property (ECP) reports are now prepared. Both of these documents provide basewide summaries of:

- historic and current storage, release, treatment or disposal of hazardous substances or petroleum products;
- contaminated and/or uncontaminated parcels, including those suitable for transfer or lease; and
- information pertinent to potential reuse of individual buildings (e.g., dimensions, materials of construction, structural condition) on the installation

Documentation by USDoD that a particular property is environmentally acceptable for the proposed (future) reuse is accomplished via issuing a finding of suitability to lease (FOSL), transfer (FOST), or early transfer (FOSET) of the given parcel. The FOSL must be approved by the relevant state and/or USEPA region before execution of the property transfer [CERCLA §120(h)(5)]; it must also assure the lessee that all necessary remediation will be completed by USDoD at the property [CERCLA §120(h)(3)(b)]. The FOST must include a deed notice regarding presence of any hazardous substance found on the property and description of any cleanup activities taken, if any [CERCLA

§120(h)(3)(B)]; land use controls (LUCs) implemented at the site are also provided. If relevant, the deed includes a covenant that commits USDoD to:

- completing presently identified remediation activities; plus
- accessing the site in the future, should additional remedial action under CERCLA or corrective action under the Resource Conservation and Recovery Act (RCRA; 42U.S.C. §6901 et seq.), as amended, be required

If the property is believed to be clean at time of transfer, the deed should specify that USDoD will be responsible for and will remediate any contamination found after date of transfer (but arising only from military service actions), and includes an access agreement [CERCLA §120(h)(4)(D)]. The state and USEPA often review the FOST documents; if regulator agreement is not forthcoming, the unresolved comments must be attached to the final version of the FOST.

1.1.2 Early Transfer and Privatization (FOSET)

CERCLA §120(h)(3)(B) was amended by Congress in 1996 (P.L. 104-106) to allow government transfer by deed contaminated federal property before cleanup was complete or while the remedy was still in place and operating. Under this “early transfer authority” or “covenant deferral” process, the USDoD:

- determines that type(s) and location(s) of contamination present at the particular property; then
- includes the environmental assessment results in the deed notice

If the USDoD installation is on the National Priorities List (NPL), the USEPA (2006) may determine that the given property is suitable for early transfer upon receiving concurrence from the governor of the state.

A privatized early transfer of a BRAC installation can accelerate redevelopment and broadens the spectrum of financial (e.g., brownfield) tools for doing so (ITRC, 2006; Appendix B). The early transfer process can be achieved by:

- deeding the property to the particular Local Re-Use Authority (LRA), with USDoD retaining cleanup responsibility; or
- LRA assumption of both deed and cleanup responsibility

In the latter case, the USDoD provides funding for the LRA to complete remedial investigation and cleanup; this approach is referred to as a “privatized early transfer” commonly executed via an Environmental Services Cooperative Agreement that establishes the obligations between the USDoD and property recipient. Under the ESCA, the Government can either pay the recipient the dollar amount expected for cleanup, or deduct such amount from the sale price. Environmental insurance may be purchased to cover costs that exceed those originally anticipated for site remediation. Once the insurance proceeds are spent, the particular military service (e.g., U.S. Army) is responsible for completing, and paying for, cleanup of the remaining contamination.

Barring unexpected findings in either Environmental Condition of Property or building Inspection reports (forthcoming), and using the Lone Star AAP as a model (U.S. Army, 2010a), the FOSET approach should be applicable to phased reuse of the UMCD.

1.1.3 Land Use Controls in Property Transfers

In order to protect human health and the environment, land use controls can be imposed during or after site-specific cleanup. LUCs include engineering controls (ECs) and institutional controls (ICs). ECs contain and/or reduce contamination (e.g., biobarriers) and/or limit access to contaminated property (e.g., fences and signs). ICs are administrative/legal devices imposed to either protect an existing EC or to ensure that restrictions on land use remain in place. Such information is included in the particular property transfer deed. A deed restriction is used to:

- lower the potential for human or ecological exposure to existing (or residual) contamination; and
- protect the integrity of the interim or long-term remedy

Essentially, ICs provide information regarding contamination present on the property and place limits on how the property can be reused (USEPA, 2007a).

1.2 BRAC ACTIVITIES AT UMATILLA CHEMICAL DEPOT

1.2.1 Site Background

During the first 10 years (1941-1951) of operations, the primary function of the Umatilla Chemical Depot (UMCD) was receipt-storage-redistribution of various caliber ammunition and other conventional munitions. Over the next 10 years, Depot activities were expanded to include:

- open burning/open detonation (OB/OD) of obsolete munitions at such places as the Ammunition Disposal Area (ADA);
- testing , maintenance, and recycling of munition components at such places as the Explosives Washout Plant; and
- storage and maintenance of missile and missile fuel components

During the period 1962-1969, the UMCD also began storage and maintenance (but not manufacturing) of nerve agents (GB, VX) and blister agent (sulfur-mustard, HD). Pursuant to international treaty, all chemical weapon production facilities plus agents and dispersal systems must be destroyed by April 2012. Planning and permitting of the Umatilla Chemical Agent Disposal Facility (UMCDF) began in the 1980s and continued throughout most of the 1990s. Facility construction began in 1997 and was completed in 2001; following shakedown and trial burn operations, destruction of VX began in September 2004.

General locations for the above activities are shown in Figure 1-1.

1.2.2 BRAC History and Status

In 1988, the Commission on Base Closures recommended realignment of Depot activities. The disposal of some existing facilities and land generated by the 1988 BRAC realignment stopped after the September 11, 2001 attacks in response to increased security requirements for chemical weapons storage and disposal. From September 1991 through September 1994, the conventional ordnance mission was shifted from UMCD to the Hawthorne Army Ammunition Plant in Nevada. Conventional ordnance that could not be transferred safely was destroyed at UMCD (e.g., at the ADA, Figure 1-1). In 1990, the State of Oregon began assessment of ways to mitigate the economic impacts associated with closure of the Depot. Such efforts culminated in publication of a

Comprehensive Redevelopment Plan and Supplemental Technical Report in 1993 (Benkendorf Associates Group et al., 1993a, b).

On-site destruction of all remaining chemical agent (i.e., HD) and secondary wastes will probably occur by December 2012. Decontamination and decommissioning of the UMCDF, including demolition of the Munitions Demilitarization and Pollution Abatement System Buildings, may not be completed until June 2015. Although UMCD closure will then follow, U.S. Army presence will continue through completion of all remedial (e.g., groundwater cleanup) actions in January 2023 and long-term monitoring until September 2027 (U.S. Army, 2009a). Redevelopment of the UMCD is expected to commence in the summer of 2015, after the chemical agent demilitarization campaign is closed out.

The drawing referenced has been removed for security sensitive purposes. It is included in Appendix A: Section 2.4 Environmental_AdxA_FOUO
The drawing depicts the UMCD with various areas such as:

- Inert Storage/Warehouse Area
- Ammunition Workshop Area
- Magazine Area
- Administration Area
- Housing Area
- Munitions Storage
- Disposal Facility
- Chemical Agent Disposal
- Munition Demolition Area

Figure 1-1 Umatilla Chemical Depot facility and layout map
Source: Ecology and Environment, 2004 (Figure 1-3).

2. ENVIRONMENTAL CONTAMINATION AND CLEANUP STATUS

2.1 CERCLA

Pursuant to the U.S. Army's Installation Restoration Program (IRP), an Initial Installation Assessment was performed at the Umatilla Depot in December 1978. This effort, focused on historical records review, identified sites having groundwater and/or soils contaminated by various inorganic and organic pollutants. The follow-on Contamination Survey and Assessment (April 1982) confirmed, among other things, groundwater contamination associated with the Explosives Washout Plant Lagoons. The USEPA applied these data to produce a site-specific Preliminary Assessment (PA) and Hazard Ranking System (HRS; 40 CFR 300, Appendix A) package in December 1982. Given the multi-pathway score of 31.3 (vs. 28.5 threshold), the lagoons were nominated for inclusion on the NPL in October 1984; final listing on the NPL occurred in July 1987. Interagency negotiations regarding remediation oversight began in January 1988 and culminated in signing of the Federal Facility Act Agreement (between USEPA Region 10, the U.S. Army, and ODEQ) in October 1989.

In April 1990, the U.S. Army Toxic and Hazardous Materials Agency conducted an enhanced PA to further assess environmental quality at the Depot. The study identified 82 individual and multiple location sites for inclusion in the Remedial Investigation/Feasibility Study (RI/FS). Seventy-two of these sites were recommended for further investigation, including 27 existing and 6 former buildings. Selection of these sites was based on evaluations of known and/or suspected releases of hazardous substances, potential contaminants of concern, and potential migration pathways. The initial RI plus human health and ecological baseline risk assessments were released in August 1992. A supplemental RI report/baseline risk assessment was published in September 1993. This document provided information on 13 additional sites, Site 12 (inactive landfills), and 79 polychlorinated biphenyl (PCB) sites that were not included in the August 1992 RI report.

For all sites and receptors (humans, wildlife) evaluated under current (i.e., "industrial") land use conditions, lifetime excess incidence of cancer risks (LEIC) were less than the lower bound of the National Contingency Plan's (NCP; 40 CFR Part 300) risk range of 1×10^{-6} to 1×10^{-4}. In addition, multi-pathway contaminant-specific hazard indices (HIs) for non-carcinogenic substances were less than 1. However, in preparing preliminary site-specific remediation goals, the conservative assumption was made that residential exposure could occur in the future. Thus, cleanup levels were set at LEICs of $\leq 1 \times 10^{-4}$ and HIs of ≤ 1. Table 4-1 in the CERFA report (Young et al., 1994) presents the site-specific results for the above (RI/risk assessment) evaluations. Those sites exhibiting LEIC risks exceeding 1×10^{-4} and/or HIs exceeding 1 were included in site-specific feasibility studies of remedial action alternatives. Remediation disposition summaries for sites either requiring or not requiring remedial action are found in Table 3-1 of the BRAC Cleanup Plan (BCP) (U.S. Army, 1995). The current status of those sites being remediated under CERCLA authority is shown in Table 2-1. Operable unite-specific details that may affect the property transfer process are discussed below.

2.1.1 Explosives Washout Plant Groundwater (OU3)

Explosive washout operations were conducted at Building 489 (CERFA Site 5) from the mid-1950s until 1965. A pressurized hot water system was used to recover such explosives as TNT and RDX. Metal components (e.g., shell casings) were recycled. Process waste water was discharged via an open metal trough to the two infiltration lagoons located northwest of the plant (Figure 1-1). Average dimensions for these lagoons were 6 ft (deep) x 80 ft (long) x 33 ft (wide), and were constructed in native sandy-gravelly soil. Over this 10-year period, an estimated 85 million gallons of pink water were discharge to the lagoons. Wastewater then seeped from the lagoons and contaminated the underlying soils and shallow groundwater (45-50 ft bgs). The release of RDX, the most mobile of the pinkwater contaminants, resulted in a plume of about 350 acres; such groundwater contamination lies well within the UMCD's boundary.

Table 2-1 Superfund cleanup status at the UMCD

OU No./Name	AOC/Name	ROD Date(s)	Cleanup Levels	RAC Date	Comments
1 / Deactivation Furnace	Facility and near-surface soils	December 1992	< 500 ppm total lead and < 5 mg/L TCLP lead	September 2001	S / S and haulage to active landfill (OU5); upper 95% CL for Pb remaining in soil is 230 ppm. No groundwater issues.
2 / Explosives Washout Lagoons	Soils ≤ 5 ft bgs	September 1992; ESD in September 1997	< 30 ppm for TNT and RDX for industrial reuse; 20 and 6 ppm, respectively, for residential reuse	September 2001	Composting achieved levels of about 3.8 ppm for both contaminants. Treated soils returned to site and revegetated.
3 / Explosives Washout Lagoons	Alluvial aquifer (groundwater)	July 1994	< 2.8 ppb for TNT and < 2.1 ppb for RDX, for residential reuse	Ongoing	Pump and treat (GAC) began in January 1997 and compliance is probably 20 years from now, even if advanced bio-physical test processes are used.

OU No./Name	AOC/Name	ROD Date(s)	Cleanup Levels	RAC Date	Comments
4 / Ammunition Disposal Area (ADA)	15 / TNT soils 17 / OD soils 19 / OB trenches 31 / pesticide pits 32 / OB trays MEC / site wide	July 1994; ESD in June 2002 for Site 19 E/F	CoC-specific levels are found in the 2004 5-year review (USEPA, 2004). Cleanup levels for the "2000 stained soils" depend on future land use decision. MEC clearance to 4 ft bgs, based on agricultural reuse scenario.	Most soil sites by 2005; clearance of buried UXO by November 2017 and completion of LTM by November 2027 (U.S. Army, 2009a)	S / S of excavated soils, followed by on-site or off-site disposal. No groundwater issues. Site acquisition by ONG could reduce excavation depth to about 1 ft, and thus expedite RAC dates. Phase 1 geophysical investigations and surface clearance of UXO are complete.
5 / Active Landfill	CERFA Site No. 11	August 1993	Se: 50 ppb risk-based concentration set by ODEQ (2005)	Capped and closed in November 1997, with ODEQ issuing a closure permit in August 2000; groundwater monitoring continues.	The EMP/ROD cleanup plan are still being negotiated (USEPA, 2010). Post-closure monitoring could continue for decades (ODEQ, 2005)
6 / Miscellaneous Sites	22 / DRMO soils 36 / Bldg. 493 paint sludge	July 1994	Total / TCLP levels of 500 / 5 for lead, 127 / 1 for cadmium, and 40 / 1 for chromium (all concentrations in ppm).	September 2001	S / S and haulage to Active Landfill (OU5). No groundwater issues.
	39 / QAFR	May 2005	MEC clearance to a depth of 2 ft at the Test Pad and Rifle Range Areas; MEC clearance to 6 ft bgs at the Test Pit Area.	August 2009	Remaining 464 acres are not considered to potentially contain MEC, and the selected remedy is No Further Action.

OU No./Name	AOC/Name	ROD Date(s)	Cleanup Levels	RAC Date	Comments
7 / Explosives Washout Plant	Facility, including washout water sump and trough to lagoons (OU2)	July 1994	CoC-specific interior surface cleanup levels are found in Table 2 of the ROD (e.g., 128 mg TNT/m^2 from 0-6 ft).		Treated metal components were recycled off site; ash from reactive sludges (burned at the ADA) plus concrete went to Active Landfill (OU5).
8 / Inactive Landfills	CERFA Site No. 12, with 6 subsites	August 1993	None (no action required)	About 1996	ODEQ did not require capping and formal (permitted) closure of the OU. Post-ROD groundwater monitoring was curtailed by ODEQ due to absence of significant environmental contamination.

In keeping with the future residential exposure (reuse) scenario, remedial action criteria were set at an LEIC of 1×10^{-6} for carcinogens and hazard quotient (HQ) of 1 for noncarcinogenic compounds (Table 2-1). The selected remedial action for the groundwater OU includes (USEPA, 1994a):

- removal of contaminated groundwater by 3 extraction wells;
- surface treatment using granular activated carbon (GAC);
- reinfiltration of treated groundwater back into the aquifer, in such manner that prevents further expansion of the plume; plus
- off-site thermal treatment and disposal of the explosives-laden GAC

ICs were also imposed on groundwater use until the remedial criteria levels are met.

Plume boundaries vary seasonally in response to off-site groundwater use (e.g., crop irrigation); since startup in 1996, the RDX plume has decreased in areal extent. However, contaminant removal rates and concentrations have leveled off without complying with the ROD-based remediation levels. Alternate extraction (e.g., pulse-pumping/recovery) and remediation system configuration strategies have been investigated (e.g., Minsker et al., 2004). The analytical results (e.g., for RDX) associated with ongoing pulse pumping will be evaluated regarding ability to meet the residential cleanup standards by 2023. If such compliance appears to be technically impracticable, consideration will be given to less stringent standards for other (e.g., industrial or agricultural) groundwater use or application of in situ (biological or chemical) treatment of contaminant source materials. However, it should be noted that the Depot's shallow aquifer is:

- situated within the Ordnance Critical Groundwater Area, and no new permits for appropriating this water will be issued by the State of Oregon (Umatilla County Critical Groundwater Task Force, 2008)
- designated as a Groundwater Management Area due to nitrate levels commonly exceeding 7 mg/L, and occasionally above the 10 mg/L drinking water standard (ODEQ, 2009a)

Thus, considerations of nonresidential reuse alternatives – or near-term use of this resource at all – are probably moot.

2.1.2 Ammunition Disposal Area (OU4)

From about 1945 until the 1990s, portions of the 1,785-acre ADA were used for open burning/open detonation, burial or dumping of off-specification ordnance and other solid wastes generated at UMCD. Pursuant to the original ROD (July 1994b) and follow-on remedial design (August 1995), the following remedial actions were completed by August 1997:

- excavation and sieving of chemically contaminated soils from 5 sites (e.g., TNT soils; Table 2-1), soils solidification/stabilization using mobile treatment equipment, and landfilling the treated materials on site (OU5);
- geophysical survey for identification of buried (< 10 ft bgs) unexploded ordnance, discarded military munitions and potentially explosive soils – collectively termed Munitions and Explosives of Concern (MEC); and
- removal and recycling of about 350,000 lbs of MEC-related metal scrap associated with the above soil cleanup work plus visual search of land surface throughout the ADA

Sampling and analysis were performed on each batch of treated soils to assure they met the contaminant specific (TCLP) goals presented in Table 2-2, prior to disposal at the then-active landfill.

Table 2-2 Soil cleanup levels for the ADA (OU4)[a].

	USEPA (1994b)		USEPA (2002a)		Comparison Values[b]		Ecorisk Screening Values	
Contaminants of Concern	**Total**	**TCLP**	**Total**	**TCLP**	**USEPA (2009a)**	**ODEQ (2009b)**	**Phytotoxicity**	**Wildlife Toxicity[c]**
Antimony	820	1.0	N	N	410 (n)	NDP	5	NDP
Arsenic	15	5.0	N	N	1.6 (c) / 260 (n)	1.7 (c)	225	85
Barium	860	100	3,300	100	190,000 (n)	> 100,000 (n)	625	400
Beryllium	8.1	0.1	N	N	2,000 (n)	2,000 (c)	10	NPD
Cadmium	28	1.0	213	1.0	800 (n)	500 (c)	12	5
Chromium (total)	40	100	N	N	1,430 (c)	190 (c)	380	250
Cobalt	25	N	N	N	300 (n)	NPD	240	50
Copper	N	140	N	N	41,000 (n)	41,000 (n)	495	95
Lead	500	5.0	N	N	800 (n)	800 (n)	530	90
Nickel	N	10	N	N	20,000 (n)	20,000 (n)	210	100
Silver	N	5	N	N	5,100 (n)	5,100 (n)	50	NPD
Thallium	160	N	N	N	66 (n, c)	NDP	1	NDP
Zinc	N	1,100	N	N	310,000 (n)	NDP	500	145

RDX	52	0.2	19	0.2	24 (c)	NDP	≥ 1,500	1,250
1,3,5-TNB	2.3	0.18	25	0.18	27,000 (n)	NPD	150	NPD
2,4,6-TNT	23	0.2	49	0.2	79 (c)	NPD	105	100
2,4-DNT	1.9	0.13	2.7	0.13	1,200 (n)	NDP	70	NDP
HMX	N	40	N	N	49,000 (n)	NDP	≥ 1,500	≥ 1,500

[a] Total (acid-leachable) concentrations are in mg/kg, while TCLP-extractable levels are in mg/L; N = none, NDP = no data provided (but may exist somewhere in the open literature).
[b] USEPA and ODEQ values are for LEIC = 1 x 10^{-6} and HQ = 1, for occupational/industrial exposure scenario.
[c] Biotic toxicity values are estimates for sandy, para-neutral soils containing aged contaminants; key references include USDoE (1999) and Rocheleau et al. (2006) for phytotoxicity plus Ford (1996) and Robidoux et al. (2004) for mammal and invertebrate toxicity, respectively.

Arsenic levels in ADA groundwater (27-40 μg/L) exceed the drinking water standard (MCL; 10 μg/L). However, these concentrations do not correlate with arsenic levels observed in ADA soils. Thus, the groundwater arsenic levels were taken to be representative of site geochemical background and no remedial action was required by the ROD (USEPA, 1994b).

Based on revisions made to the inhalation and dermal exposure pathways (due largely to less fugitive dust generation than assumed before), cleanup goals for soils in the vicinity of burn trenches 19E and 19F were increased for several of the contaminants of concern (e.g., barium; Table 2-2). Consideration of RDX exposures via dermal and inhalation pathways resulted in a more stringent cleanup goal for this contaminant. Excavation and transport of soils to an off-site treatment and disposal facility, plus off-site recycling of about 829 lbs of MEC scrap (certified explosives-free), was completed in October 2002.

The data in Table 2-2 indicates that ADA-specific remediation goals can be more stringent (lower) than the respective levels set by generic cleanup guidance. Notable observations include:

- on-site antimony and thallium levels exceed their respective generic cleanup concentrations (i.e., 820 vs. 410 and 160 vs. 66 ppm) for mitigating non-carcinogenic exposure effects;
- on-site arsenic cleanup represents an LEIC of about 1 x 10^{-5} (i.e., 15 vs. 16 ppm), that is within the accepted 1 x 10^{-6} to 1 x 10^{-4} carcinogenic risk range;
- RDX cleanup level in 1994 exceeded the 1 x 10^{-6} LEIC, and was below this rate in 2002 once adjustments were made to accommodate both dermal and inhalation exposure pathways; while
- cadmium, copper, and zinc cleanup levels (at ADA) may not be protective of sensitive ecological receptors (e.g., 213 vs. 12 ppm for cadmium)

Thus, chemical-based cleanup at the ADA (and probably elsewhere within the UMCD) appears to be protective of industrial workers in the future. However, periodic sampling and analysis of rooting zone soils and plant materials (leaves, stems) should occur in those areas undergoing shrub-steppe restoration. Such data would be used to identity and mitigate pollutant-based impediments to reclamation success, including avoidance of adverse food web effects.

Alternative approaches to removal of subsurface MEC were initially addressed in an engineering evaluation/cost analysis (EE/CA) completed in July 1998. This EE/CA will serve as the basis for completing the focused feasibility study/remedial design during the period October 2013 through November 2014. At present, MEC clearance will be based on agriculture reuse of the ADA, and be implemented via excavation and sieving of the upper 4 ft of soils (U.S. Army 2009a). This remediation depth will:

- accommodate potential upward migration of UXO (at depths > 4 ft) due to frost heave; and
- corresponds with the USDoD/Explosives Safety Board criterion for public access, including for surface recreational, vehicle parking, surface supply storage, and agricultural purposes

The USDoD's Ammunition and Explosive Safety Standards also suggest a 1 ft bgs clearance for limited public access activities such as livestock grazing and wildlife preserve (USEPA, 2005a; p. 6-19).

2.1.3 Active Landfill Site (OU5)

Operable Unit No 5 is the formerly active landfill site located in the northeastern corner of the UMCD, between Igloo Blocks D and E and situated about 0.5-mile east of Coyote Coulee. Approximate dimensions are 5-acres by 50-ft deep; depth to groundwater varies between 140 to 150-ft bgs. From 1950 to 1968, OU5 was operated as a gravel pit. Between 1968 and early 1990s, the pit was permitted by ODEQ (in 1979 and 1982) for landfill disposal of nonhazardous municipal wastes (e.g., garbage, demolition debris). During the mid- to late-1990s, activities shifted to receipt of solidified/stabilized soils produced by on-site remediation activities (e.g., at the Deactivation Furnace and ADA OUs); no wasteforms were accepted after late 1994. A RCRA Subtitle D compliant (impermeable/vegetated) cap was installed in 1997, and the landfill officially closed in 1997. ODEQ modified the permit in August 2000 to reflect a post-closure condition.

Following recommendations contained in the USEPA's sitewide RCRA Facility Assessment report (July 1987), a series of groundwater investigations were performed at OU5 under the CERCLA program. These studies indicate presence of:

- unidentified semi-volatile organic compounds that may be attributable to historic landfill operations; and
- elevated levels of arsenic, selenium, and vanadium oxyanions plus nitrate/nitrite ions

The nitrate/nitrite levels observed may represent some contributions (i.e., leachate production) from the landfill. However, downgradient concentrations of the oxyanions (above) are, "consistent with the upgradient concentrations indicating that the landfill is not the source of these compounds (USEPA, 1993a; Section 2.5). The potential carcinogenic (LEIC) and noncarcinogenic (HQ) health risks due to ingestion of OU5 groundwater under a future residential land use scenario were 5×10^{-5} and 2.0, respectively. The USEPA and ODEQ judged these risk levels to be acceptable, and subsequently chose the "no further action" alternative. However, the USEPA reserved its authority to perform additional response actions should new information necessitate such a decision (USEPA, 1993a; Section 2.8).

Quarterly groundwater monitoring has continued at OU5 since October 1996 in accordance with the Environmental Monitoring Plan (EMP) approved in July 1997. Given that selenium levels occasionally exceed the federal drinking water standard (50 μg/L; 40 CFR 141.23), the U.S. Army/UMCD and ODEQ are negotiating revisions to the EMP, as well as potential selenium-related remedial actions (USEPA, 2010).

2.2 RCRA

Activities or sites subject to federal/state solid and hazardous waste management laws and regulations are discussed below.

2.2.1 Solid Waste Management

Given the absence of an opened landfill, UMCD's solid waste (including most recyclable items) is disposed of by Sanitary Disposal, Inc. (Hermiston, OR). Depending somewhat on their composition and quantity, the solid wastes are hauled to the appropriate, state permitted landfill (e.g., Finley Buttes south of Boardman, OR).

2.2.2 Storage Tanks

2.2.2.1 Aboveground Storage Tanks (ASTs)

The respective location, size, and contents of the historic ASTs are shown in Table 3-8 of the BCP (U.S. Army, 1995); supplementary information is appendicized to the CERFA report (Young et al., 1994). The currently active inventory includes 36 1,000-gallon and 5 500-gallon propane storage tanks plus 16 "other" ASTs. The individual, non-propane, tanks are described in Part A of Table 2-3 (U.S. Army, 2009b). These ASTs are managed in compliance with the Depot's Spill Prevention Control and Countermeasures Plan, pursuant to federal (40 CFR Parts 100, 112, and 116) and Oregon (   ) oil spill prevention regulations.

For those ASTs still in service at time of property transfer, the U.S. Army will probably require some release from liability. Conversely, the LRA must have sufficient knowledge of each tank's spill/cleanup-related history for proper assessment of future site-specific remediation costs and subsequent effect on property value. Thus, the following contingency plan is suggested:

- any surface soil exhibiting signs of past spills (e.g., discolored soils) should be sampled by UMCD personnel prior to property transfer; while
- chemical parameters selected for laboratory analysis will focus on volatile aromatic hydrocarbons (e.g., BTEX) at gasoline-type ASTs and polynuclear aromatic hydrocarbons (PAHs; e.g., chrysene) at diesel and heating oil sites

Table 2-3 Current status of non-propane storage tanks at the UMCD.

Part A. Aboveground Storage Tanks			
Location/Tank No.	Capacity (gallons)	Substance Stored	Status
Part B. Underground Storage Tanks			
Location/Tank No.	Capacity (gallons)	Substance Stored	Status

Source: U.S. Army, 20106			

2.2.2.2 Underground Storage Tanks (USTS)

The respective location, size, and contents of the historic USTs are shown in Table 3-7 of the BCP (U.S. Army, 1995); supplementary information is appendicized to the CERFA report (Young et al., 1994). The 3 USTs currently active include __________________ storage at Building 5 within the Administration Area plus _____________ and ______________ storage associated with UMCDF operations U.S. Army, 2010b). Further details regarding these USTs are presented in Table 2-3, Part B.

Prior to property transfer, UMCD personnel should collect subsurface (< 15 ft bgs) soil samples at the currently active UST sites, regardless of the LRA's intent for future reuse of these tanks. Consideration should also be given to soils sampling adjacent to and below the soil backfill volume associated with several of the historic tank removal sites. Preference should be given to sampling those sites most likely to exhibit residual soil contamination, as opposed to random selection of the sampling sites. Laboratory (analytical) parameters would be tank-specific, and need for cleanup addressed as discussed above for ASTs. Any necessary UST site remediation and closure would then follow the ODEQ's UST program.

2.2.3 Hazardous Waste Management

Aside from UMCDF activities, the Depot is a small quantity generator of hazardous waste (e.g., lead batteries, paint, mask filters). Pursuant to the installation's Hazardous Waste Management Plan (September 1992), there are:

- three 90-day waste accumulation points (at Buildings 5,7, and 656); and
- one Part B permitted storage facility at Building 203

Accumulation points at the Depot consist of 55-gallon drums used to store various combinations of compatible hazardous wastes. Storage at these points does not exceed 90 days from the time the waste (in a given drum) begins to accumulate. Once full, the drums are transported to Building 203. From there, hazardous waste is transported offsite twice a year by a licensed hauler to a licensed treatment, storage, or disposed facility (TSDF).

The RCRA Facility Assessment Report, completed in July 1987, identified 30 solid waste management units (e.g., landfill areas, waste oil tanks) at the Depot. Further evaluation and cleanup of a number of these sites (e.g., ADA soils and explosives plant washout lagoon groundwater) have occurred under CERCLA authority.

2.2.4 Umatilla Chemical Agent Disposal Facility (UMCDF)

2.2.4.1 Operations Phase

The UMCDF's mission involves reverse assembly/high temperature incineration of the on-site inventory of chemical warfare munitions (Section 1.2.2). Storage and treatment of waste chemical agents, storage and handling of secondary (process) wastes, plus decontamination and decommissioning (D&D) of the facility are controlled by RCRA Part B Permit ORQ 000 009 431. The permit was issued in February 1997 and has been amended numerous times since then; the day-to-day operations are overseen by the ODEQ's Chemical Demilitarization Program in Hermiston.

Destruction of the variously configured GB (sarin) and VX nerve agents began in September 2004 and was completed in November 2008. Incineration of ton containers (TCs) of sulfur-mustard (HD) agent began in June 2009; a court decision issued in October 2009 allowed full-scale processing of TCs to begin later that month. However, HD incineration was stopped almost immediately due to air emission problems associated with the organosalts ("tank heels") present in the TCs. A single TC trial burn occurred in late January 2010 and a multi-TC trial burn began in late April. The multi-burn effort will last about two months, with likely resumption of full-scale TC processing this summer. However, the reduction in allowable tank heel quantity from about 600lbs (currently) to 435 lbs per TC will slow the overall HD processing rate. Complete destruction of the HD inventory plus drummed secondary wastes (as allowed by the facility's RCRA permit) is envisioned to occur by December 2012. A generalized process flow diagram for treating the TCs of HD is shown in Figure 2-1.

The sequence of operations (associated with Figure 2-1) is summarized below (U.S. Army, 2008a):

- A few TCs are removed from their storage igloos (i.e., earth-covered concrete storage structures) and brought inside the UMCDF. At a bulk drain station (BDS) inside the UMCDF, the liquid mustard agent is drained from individual TCs, accumulated in agent collection system (ACS) tanks, and then fed into one of the two liquid incinerators (LICs) at the UMCDF for destruction.
- The drained TCs are placed into a metal parts furnace (MPF) for thermal decontamination and to destroy any residual agent remaining after the draining process.
- Each of the two LICs and the MPF has its own pollution abatement system (PAS). Each PAS uses wet scrubber technology to clean the incinerator gases before discharge. The spent liquids (also called scrubber brines) from these PASs are accumulated in tanks.
- Each PAS is followed by a PAS filtration system (PFS) which uses sulfur-impregnated carbon (SIC) to remove organic and mercury compounds from the exhaust gases. The atmospheric emissions from each PFS must comply with regulatory limits.
- The scrubber brines are sent off-site for further management at a TSDF that is permitted to handle such liquid wastes.

The brines generated during destruction of the nerve agents were volume-reduced via use of steam-heated evaporators and drum dryers; the salt cakes produced were then sent to an off-site TSDF. This approach is not used presently due to concerns regarding adequacy of mercury emissions control during volume reduction. Thus, the brines from HD processing are shipped as liquids to the off-site TSDF. The spent SIC filter media is shipped to an offsite TSDF for mercury recovery and subsequent disposal of the granular carbon. Scrap metal (i.e., the TCs) from the MPF is sent to a RCRA solid waste landfill. Used (contaminated) personal protective equipment is also destroyed in the MPF.

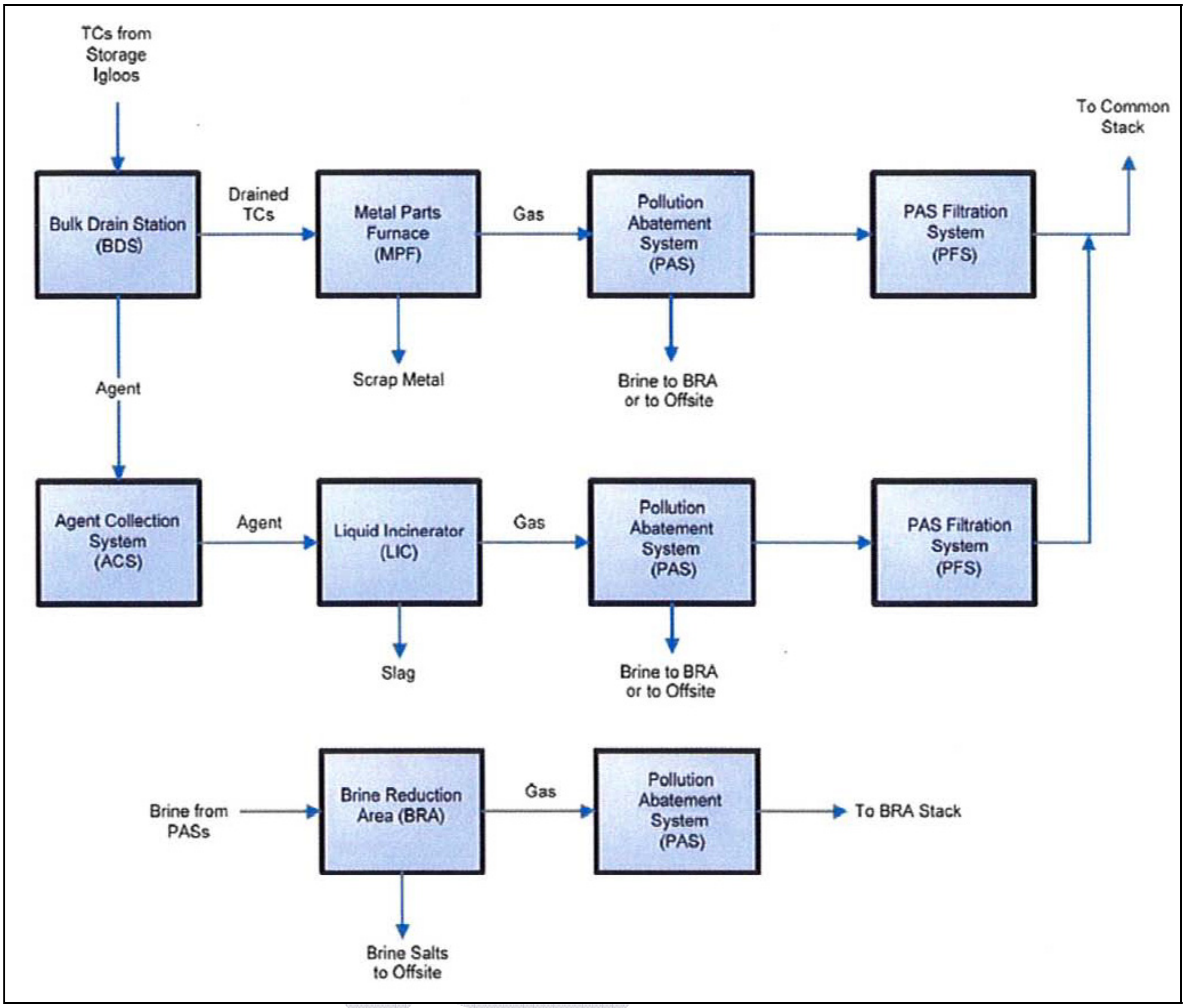

Figure 2-1 Overview of the HD incineration process at the UMCDF.
Source: U.S. Army (2008a)

The ODEQ/CDP has evaluated potential hazards of UMCDF operations on human and ecological receptors via preparation of pre- and post-trial burn risk assessments (RAs). The "Pre-Trial Burn" RA was conducted in 1996, and was based on emissions data collected at other chemical weapons incinerator sites (e.g., from the Johnston Atoll Chemical Agent Disposal System). The results (in February 1997) identified the potential for major adverse effects only within 330 ft and largely "downwind" (northeast), of the UMCDF stack. Such findings were judged to be acceptable, and were used to approve the hazardous waste permit and air permit applications in February 1997 (Pedersen, 2008). The "Post-Trial Burn" risk assessment work plan was prepared in 2003 (Ecology and Environment, 2004). Data from surrogate trial burns (2003) and from nerve agent trial burns (October 2004 – December 2007) were used to prepare screening level human and ecological risk assessments. Exposure to probable emissions of carcinogenic and noncarcinogenic substances was estimated to result in low levels of adverse effects to (Pedersen, 2008):

- some hypothetical human receptors present both on- and off-site;
- shrub-steppe ecological receptors only on-site; and
- freshwater ecological receptors only where such ecosystems are closest to the UMCDF

Given the conservative assumptions made (e.g., exposure to maximum contaminant-in-air concentrations and deposition rates) in preparing these RAs, the ODEQ concluded that no unacceptable risk/hazard levels exist for any receptor present within the assessments' areal extent. However, it was recognized that post-closure on-site risk and ecological hazards in general must be identified and appropriately remediated (Pedersen, 2008).

The UMCDF Comprehensive Monitoring Program (CMP) was implemented to provide information on regional environmental baseline conditions (April 1999 – July 2002), preoperational/trial burn (July 2002 – August 2007) environmental data, plus ongoing operational and post-closure data for the facility (Harter, 2004). Key features of the CMP include (Washington Demilitarization Co., 2008):

- establishment of 3 sample collection zones [i.e., within the UMCD fenceline plus 50- and 100-km (31- and 62-mile) radii from the UMCDF];
- quarterly (January, April, July, October) sampling of surface soils (0-8 inches bgs), surface water, vegetation, small mammals and terrestrial invertebrates, plus ambient air sampling (for 12-hr increments) within the UMCD fenceline; followed by
- chemical analysis of air samples for chemical agents only, plus select inorganic and organic contaminants of concern in the other environmental media

The analytes include (ibid; Tables 3-1, 3-2):

- GB, VX, and HD in air and soil media;
- 8 metallic (e.g., mercury) and nonmetallic (e.g., arsenic) elements in non-air media; plus
- 2 semi-volatile organics, 27 congeners of polychlorinated dibenzodioxins/furans, and 13 congeners of polychlorinated biphenyls in non-air environmental media.

Due to the presence of other sources for organic emissions in the vicinity of the UMCDF, "changes in metals levels are thought to give the best indication of impacts to the environment possibly attributable to the UMCDF" (Pedersen, 2008; p.3). As of June 2008, "no unequivocally positive trends in monitoring data [including those for metals levels] are evident that would indicate actual risk or hazard" (ibid).

2.2.4.2 Cleanup and Closure

As chemical agent destruction moves towards completion by December 2010, the UMCDF's physical plant (including all process and support equipment) will undergo phased decontamination and decommissioning. Pursuant to P.L. 106-65, the Munitions Destruction Building will be demolished after D&D. However, if the LRA identifies an alternative use for any of the other structures, the Permittee (i.e., U.S. Army) may request a Class 2 modification of the RCRA permit [in accordance with 40 CFR 270.42(b) and 40 CFR 270.32(b)(2)]to accommodate such use (see Module II.J.9 of ORQ 000 009 431; July 2009).

The UMCDF's closure plan is presented in Volume XII, Section I of the RCRA Part B Permit Application. The plan describes:

- the policy for environmental compliance for closure set forth by the RCRA permit (i.e., establishment of risk/health-based clean-closure target levels)
- the strategy/sequence for D&D of the facility

Essentially, the UMCDF will undergo a set sequence of unit-by-unit closure operations in accordance with preset cleanup levels. Property to be retained in government custody will undergo 3X surface decontamination, based on not-to-exceed chemical agent concentrations in air (e.g., < 0.003 mg HD/m^3). Those materials heated to 1,000 °F for at least 15 minutes are rated 5X; they are suitable for unrestricted reuse after U.S. Army certification of compliance with these treatment conditions. The plan also describes how and where baseline and post-closure soil samples will be acquired at the UMCDF.

Traditional tribal subsistence practices may result in greater route-specific exposures to near surface (0-1 ft bgs) soil contaminants than often assumed by conventional risk assessment methods. For example, the gathering and processing of root crops could result in soil ingestion rates of 400 mg/d, as opposed to the "default suburban" value of 100 mg/d or even the "rural residential gardener" rate of 300 mg/d (Harper et al., 2007; Table 5). Subsequently, the CTUIR (2009) proposed expansion of the post-closure soil sampling (0-10 inch bgs) program to include:

- areas downwind of the UMCDF, but within the UMCD fenceline
- background soil sampling at the Boardman Grasslands Preserve (BGP)

Sampling points located within the UMCD and at the BGP are shown in Figures 5-1 and 5-3, respectively, in the Supplemental Sampling and Analysis Plan (SAP), (CTUIR, 2009). The suite of contaminants of potential concern (CoPC) recommended for laboratory analysis include those associated with post-trial burn emissions from the UMCDF (e.g., polychlorinated dibenzodioxins/furans) or attributable only to UMCD actions (e.g., explosives and degradation products), (CTUIR, 2009; Tables 4-1 through 4-3). The tribe also intends to complete a UMCD-wide SAP by September 2010.

Given the ODEQ's recent assessment of UMCDF emissions-related risks (Pedersen, 2008; subsection 2.2.4.1), post-closure CoPC levels in soils are expected to be less than their respective USEPA/ODEQ screening concentrations for industrial reuse (Table 2-2). The USEPA is also reevaluating the 1 ppb and 5-20 ppb dioxin toxicity equivalent guidelines for cleanup of residential and commercial/industrial soils, respectively; interim recommended PRGs are scheduled for publication in June 2010 (USEPA, 2009b). In addition, exceedances of the respective ecorisk screening criteria (Table 2-2) are also judges unlikely. Thus, post-closure human health and ecological risk assessments will be the necessary basis for setting CoPC/land use-specific soil cleanup levels. Determination of ecologically protective cleanup levels could be improved via such bioassays as:

- comparing water extractable CoPC (e.g., cadmium) data from UMCD vs. BGP soils against selected screening data (e.g., seedling germination success; Efraymson et al., 1997)
- performing field-based microcosm investigations using defined vascular plant and macro-invertebrate (e.g., earthworm) species grown in UMCD vs. BGP soils (Fernandez et al., 2005)

These approaches would be particularly useful for cleanup of those areas proposed for shrub-steppe ecosystem restoration.

2.3 OTHER CONTAMINANTS OF POTENTIAL CONCERN

2.3.1 Asbestos

Asbestos surveys were performed at the UMCD in 1988 and 1990. Of the 289 buildings investigated, asbestos containing materials (ACM) were found in 121 of them. The surveys did not include the storage igloos in Blocks A through K. Based on a decision algorithm used during the 1990 survey, removal of friable and/or damaged ACM was recommended in 58 of the 121 buildings. Most of the ACMs were located in unoccupied areas such as attic spaces, crawl spaces or roofs. Asbestos abatement for those buildings was completed in the fall of 1994 (U.S. Army, 1995; Young et al., 1994).

The UMCD's Public Works Facilities Division is responsible for monitoring non-friable ACMs. If these materials become friable, division personnel are responsible for restricting access to the area and arranging for an asbestos abatement contractor to perform site cleanup. The handling and off-site disposal of bagged, solid waste also involves the UMCD's Safety and Environmental Departments. One more asbestos survey and abatement campaign will occur prior to UMCD property transfer (Gillis, 2009). Those structures probably requiring asbestos abatement before this event are identified in the Environmental Condition of Property Report (U.S. Army, 2010b).

If not previously done, or planned as future work, surface (0-4 inch bgs) soils at sites exhibiting a high potential for asbestos release (e.g., adjacent to Transite-covered warehouse buildings) should be sampled. One approach to collecting these samples has been prepared by the State of Colorado (2007); sample analysis would probably be done by oil dispersion-polarized light microscopy (USEPA, 1993b). Preliminary remediation goals of 0.25 to 1.0 percent by volume for asbestos-in-soils are expected to comply with the general workplace standard of 0.01 fiber/cc, as averaged over an 8-hr period [USEPA, 2003a; 29 CFR 1910.1001(c)]. However, formal determination of need for and level of cleanup should be based on site-specific quantitative risk assessment.

2.3.2 Lead-Based Paint

A lead-based paint survey was completed by the UMCD's Safety Office in 1995-1996. Rather than sampling and analysis of suspect materials, it was assumed that lead-based paint is present in all Depot buildings constructed prior to 1978. The Block A through K storage igloos, safe houses (700 series structures) and transfer depots (800 series structures) were excluded from this analysis; it was assumed that none of these structures were painted. Thus, 184 buildings at UMCD are designated as containing lead-based paint.

Pursuant to the Toxic Substances Control Act (TSCA), surface coatings must not presently exceed 5,000 ppm or 1.0 mg/cm^2 lead levels in residential/day-care settings or in public or commercial buildings [40 CFR 745.103(2); 40 CFR 745.223]. The residential standards for lead-in-dust are 40 μg/ft^2 of surface area for floors and 250 μm/ft^2 for interior window sills, based on wipe sample analyses [40 CFR 745.65(b)]. The USEPA is currently reviewing a TSCA Section 21 and Administrative Procedures Act petition for reducing the threshold lead level from 5,000 to 600 ppm, with corresponding reduction in the 1.0 mg/cm^2 surface standard (USEPA, 2009c).

If quantitative lead data are not provided in the forthcoming ECP for those buildings exhibiting the above reuse potentials, and of interest to the LRA, then:

- x-ray fluorescence analysis of paint, dust, and "dripline" soils should be performed using standard methods (USEPA, 2007b); and

- materials exceeding acceptable standards should be appropriately mitigated (e.g., using MT2's Enhanced LBP® treatment agent) by a certified lead abatement contractor

It is further suggested that those buildings designated for reuse as homeless shelters be cleaned to the more conservative, proposed, standards.

2.3.3 Polychlorinated Biphenyls

All 239 transformers at UMCD were sampled and analyzed for PCB congeners in June 1989; a total of 66 transformers were removed, stored temporarily in Building 70, and then disposed of off-post in accordance with regulatory requirements (OAR 340-110-0060; 40 CFR 761.60). Four-point composite soil samples were collected at the 61 locations where leaks were reported; wipe samples were taken at sites wherein transformers may have leaked dielectric fluids containing $>$ 10 ppm total PCBs. The maximum concentration observed in soil was 3.8 ppm, while all of the wipe sample PCB concentrations were $<$ 10 μg/100 cm^2 (Young et al., 1994).

Such levels are of minimal regulatory concern as:

- soil cleanup levels range between $\leq$ 1 ppm for high occupancy areas and $\leq$ 25 ppm for low occupancy areas, without surface capping [40 CFR 761.61(a)(4)]; while
- cleanup of porous (e.g., concrete) surfaces is $\leq$ 10 μg/100 cm^2 for both high and low occupancy areas [40 CFR 761.79(4)]

The threshold for "high" vs. "low" occupancy is $\geq$ 6.7 and $<$ 6.7 hrs/week exposure to PCB-contaminated materials, without dermal or respiratory protection [40 CFR 761.3]. Furthermore, the soil containing 3.8 ppm PCB 1260 (at transformer no. 229) was subject to removal action pursuant to ODEQ's environmental protection regulations [OAR 340-122-0040(2)(b)]. It should also be noted that the ODEQ's (2009b) risk-based concentration for PCBs at industrial sites is 0.98 ppm for protection against ingestion, dermal, and inhalation routes of exposure. If PCB data in the forthcoming ECP indicates that building materials (e.g., caulking) or soils exceed the above cleanup levels, they should be remediated prior to property transfer. Some older light ballast contains PCBs and is disposed of through the UMCD's hazardous waste management program. Empty rocket shipping and firing tubes contain PCBs, and are currently being stored and handled at J-Block as regulated TSCA wastes (Gillis, 2009). The USEPA's (2005b) Site Revitalization Guidance Manual provides useful approaches for PCB cleanup.

2.3.4 Radon Gas

The screening for radon-222 and progeny (e.g., polonium-218, lead-214) in indoor air was conducted in two phases at UMCD; 165 building were investigated in 1991 and 97 separate buildings in 1993 (including 5 that were also sampled in 1991). Only 10 percent of the igloos in Blocks A through H and Block J were sampled, as they were not inhabited structures. Key results include:

- only Buildings 1 and 5 had 1-year monitoring duration radon gas concentrations exceeding the USEPA's (2003b) risk-based action level of 4.0 pCi/L during the 1991 survey; and
- the mailroom of Building 1 had a 9.8 pCi/L reading, while 7 igloos in igloo blocks D, E, and H had radon concentrations $>$ 4.0 pCi/L during the 1993 survey (Young et al., 1994).

The elevated level in Building 5 is associated with a sample collected in a below-grade, unoccupied boiler room that is no longer in use. A radon venting system for the basement of Building 1 was to be installed in fiscal year 1995. Radon mitigation in the igloos will be addressed once reuse of the structures has been identified (U.S. Army, 1995).

Pending information contained in the forthcoming ECP (U.S. Army, 2010b), radon issues may be adequately addressed at the UMCD. However, site-specific validation of such conditions should be done by the LRA prior to property transfer. Essentially, 90-day (or longer) radon screen results would be used to determine whether radon/progeny levels in indoor air are within the 2-4 pCi/L "alert" or > 4 pCi/L "action" level at the particular building or structure (e.g., igloo). Overviews of monitoring and potential mitigating measures for radon release are found in a recent publication by the USEPA (2009d).

2.3.5 Pesticides, Herbicides, and Fungicides

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA; 7 U.S.C. §136 et seq., as amended) provides the basis for regulation, sale, distribution and use of pesticides in the U.S. The UMCD's Pest Management Plan (Canestorp, 2007; Appendix H) was prepared in accordance with the implementing regulations of FIFRA, including:

- labeling (40 CFR 156) and packaging (40 CFR 157) requirements for pesticides
- storage and disposal of pesticide-related wastes (40 CFR 165)
- worker protection standards for pesticide use (40 CFR 170)
- certification of pesticide applicators (40 CFR 171)

The plan is implemented by the UMCD's Public Works Branch. However, actual treatments are performed at the UMCDF by a federally licensed pest management company (Dobyns/Hart) under contract to the UMCDF. Secondary containment of stored chemicals occurs in Building 8; rinsate waters are collected and disposed of by an off-site contractor. Pesticide use on the UMCD is strictly monitored, especially for organophosphate compounds (e.g., malathion), because of the potential for causing false positives with the CMP's Perimeter Monitoring Network (Gillis, 2009).

CERFA sites wherein FIFRA-controlled compounds were stored (e.g., Site 27 = Building 8) or disposed of (e.g., Site 31 = pesticide pits at the ADA) have been assessed for environmental impacts, and risk-based cleanup (e.g., at Site 31) has occurred as judged necessary. The completeness of remediation of these "FIFRA" sites, under CERCLA authority, will be assessed via review of the forthcoming ECP report (U.S. Army, 2010b).

2.3.6 Radiological Sources

Approximately 50 M-43A1 chemical agent automatic alarms are stored at Building 656, under U.S. Army-wide NRC Materials License No. 12-00722-13. These are used in the detection of aerosols and gases potentially released from chemical munitions stored in Block-K igloos. Each alarm contains no more than 300 μCi of the alpha-emitting isotope Americium-241 in a sealed cell; the sources are never opened on-site, and the alarms are sent offsite when they need service (U.S. Army 1995; Young et al., 1994).

According to the above reports, there has never been a release of radioactive materials at the Depot. If such statement is not validated in the forthcoming ECP, fixed and removable radiological surveys should be performed at all locations where storage or use of the alarms occurred historically. If any site exceeds the U.S. Army's screening level of 600 disintegrations per minute/100 cm^2 for Am-241 (U.S. Army, 2009b); Table 5-2), it will be remediated ("cleared") prior to property transfer to the LRA.

2.3.7 Medical Wastes

The UMCD has occupational health clinics located in the Administration Area and at the UMCDF. Most infectious waste consists of sharps; all medical waste is containerized and then transferred to Madigan Hospital at Fort Lewis for disposal (Gillis, 2009). No medical waste has been buried at the landfill at UMCD (U.S. Army, 1995).

2.4 RECOMMENDATION FOR FURTHER CLEANUP OF THE UMCD

Following close and critical review of the U.S. Army's (2010b) Environmental Condition of Property (ECP) report, it is determined that …

3. REDEVELOPMENT IMPLICATIONS

Known or perceived environmental contamination of a particular land parcel or property significantly affects its redevelopment potential. Property transfer from the Army to the LRA is also influenced by the feasibility and economic viability of the proposed reuse; such reuse in turn determines the degree and responsibility/liability associated with site-specific cleanup. Furthermore, the Army's acceptance of the proposed redevelopment is also affected by the likely adverse and beneficial environmental consequences of implementing such reuse. All of these issues are discussed further below.

3.1 FUTURE LAND USE ISSUES

The intended (future) use of a given land parcel or structure at UMCD will significantly affect scope and cost of cleanup. The U.S. Army is concerned with identification of "reasonably foreseeable uses" that represent "highest and best use" of the given real property. The former criterion generally reflects those site-specific activities that occurred at the time of Depot closure (USDoD, 2006; pp. 103-104). The latter criterion considers greatest monetary return, promotion of maximum value, or serving a public or institutional purpose pursuant to 41 CFR 102-71.20 (ibid; p. 52). Furthermore, the projected reuse, "should not be remote, speculative, or conjectural" (USDoD, 2006; p. 52). Similarly, in preparing risk-based cleanup plans, the ODEQ does not accept "merely possible" future reuse, "without other supporting information such as regional trends" (ODEQ, 1998; p. E1-2). Thus, site-specific reuse proposals must consider market attraction, physical and environmental conditions, public needs, and potential zoning constraints.

However, the LRA's Redevelopment Plan for a particular site at UMCD may not align with its current use, yet still be acceptable to the Army. For example, conventional agricultural development and/or exercise of Tribal rights (i.e. implementation of subsistence lifestyles) at UMCD would require reevaluation of the adequacy of residential-based clean up levels. In this case, the need for additional remediation and/or imposition of institutional controls would be evaluated by the ODEQ and USEPA Region 10. Depending upon the magnitude/extent of further cleanup needed, the regulatory decision would be documented in a note to the file, or Explanation of Significant Difference or a ROD amendment (USEPA, 2006). At that point, the Army would either perform the response work, or negotiate with the LRA to complete site remediation (Section 1.1).

3.2 SITE- AND MEDIA-SPECIFIC CLEANUP LEVELS

The OU-specific baseline human health risk assessments generally assumed future residential reuse scenarios (e.g., USEPA, 1993a). Thus, in most cases, contaminant-specific cleanup levels were set at the upper bound of acceptability (i.e., LEIC = 1 X 10^{-4} and HQ = 1.0) for unrestricted exposure to carcinogenic and noncarcinogenic substances in site-specific soils and groundwater. Current, and likely, future land use at UMCD includes open space (e.g., the ADA), commercial/light industrial (e.g., warehouse areas), and “clean’ residential within the Administration Area.

The Columbia River Basalts provide potable water for on-site use; thus, consumption of shallow, potentially contaminated, groundwater is highly unlikely. Furthermore, cumulative exposure to soil contamination by industrial workers is less than that associated with residential exposure (at a given site). Therefore, the remediation goals implemented to date at UMCD should be protective for likely human, but not necessarily ecological, receptors. For example, contaminant-specific soil cleanup levels at the ADA OU (Table 2-2) are usually less than the respective, generic ODEQ/EPA concentrations set for protection of industrial workers (i.e., LEIC = 1 x 10^{-6}; HQ = 1). However, concern exists regarding some of the “acceptable” acid extractable and/or leachable metals levels (e.g., for zinc and copper) on plant growth and soil macroinvertebrates (e.g., earthworms), (Section 2.1.2). Therefore, the adequacy of currently complete risk-based cleanup should be reevaluated once a particular land parcel or structure is identified for a particular reuse by the LRA.

The U.S. Army will probably require release from liability for future leaks from any above- or below-ground storage tanks still present at time of property transfer. Storage capacity needed by future site occupants, but removed prior to the transfer, would need to be replaced at potentially high cost. Furthermore, many of the useful structures at UMCD contain asbestos and/or lead-based paint (Young et al., 1994; Table 5-1). In some instances it may not be financially practicable to remove the ACMs and/or lead-containing materials from the particular building of interest. Thus, institutional controls and environmental covenants would be required to mitigate potential exposure to these contaminants (Section 1.1).

3.3 NEPA CONSIDERATIONS

3.3.1 Overview

The transfer of real property at the UMCD to the LRA is a “major federal action” under the National Environmental Policy Act (NEPA), as the U.S. Army must review and approve the site-specific Redevelopment Plan (RD) before it can be implemented [Section C8.2 of USDoD, 2006; 40 CFR 1508.18(4)]. All NEPA-related decision-making is concerned with identification of environmentally significant direct or indirect impacts on a particular resource (e.g., endangered or threatened species), actions resulting in uncertain or controversial effects on the human environment, plus those actions that may violate legal requirements for protection of the environment (40 CFR 1508.27). If such effects do not exceed pre-defined threshold(s) of concern, or the environmental consequences are easily mitigated (40 CFR 1508.20), an Environmental Assessment (EA) level of analysis is usually sufficient.

However, if the particular impact is so severe that it can not be mitigated, or contributes to “cumulative effects” (40 CFR 1508.7) over time, an Environmental Impact Statement (EIS) is most appropriate. Generic actions taken by the U.S. Army that normally require an EIS include those leading to “significant changes in land use” [32 CFR 651.42(d)] or major changes in mission that affect environmentally sensitive resources [32 CFR 651.42(g)]. Both events are relevant to the closure and transfer of the UMCD to the LRA. Regarding reuse of the depot, early resolution of the following issues could eliminate the need for EIS preparation:

- Site-wide surface water and/or groundwater usage by the LRA relative to legally accessible water of suitable quality, especially if projected climate change indeed affects seasonal availability of water over the next 20-40 years (Umatilla County Critical Groundwater Task Force, 2008; Littell et al., 2009);
- Potential increases in disturbances-fragmentation of habitat(s) required to protect and maintain plant and animal species of regulatory concern plus ethnobotanical species of interest to CTUIR, in conjunction with site-wide needs for fire and noxious weed control and considerations for cost-effective restoration of priority habitat(s) for obligate shrub-steppe biota (Canestorp, 2007); plus
- Socioeconomic sustainability of the Redevelopment Plan, including overall effectiveness in coordinating site-wide land use by the two county governments and other stakeholder groups (e.g., CTUIR, Port Authorities) to achieve highest and best reuse of the UMCD (Benkendorf Associates et al., 1993a, b).

In other words, careful planning of UMCD reuse should accommodate preparation of an EA-level NEPA compliance document. Relevant “models” include EAs prepared for redevelopment of the Kansas Army Ammunition Plant (U.S. Army, 2008b) and Red River Army Depot (U.S. Army, 2009c) sites.

The NEPA compliance process, as applied to UMCD property transfer to the LRA, is summarized in Figure 3-1. An overview of the scoping phase, plus impact mitigation/monitoring approaches, are discussed below.

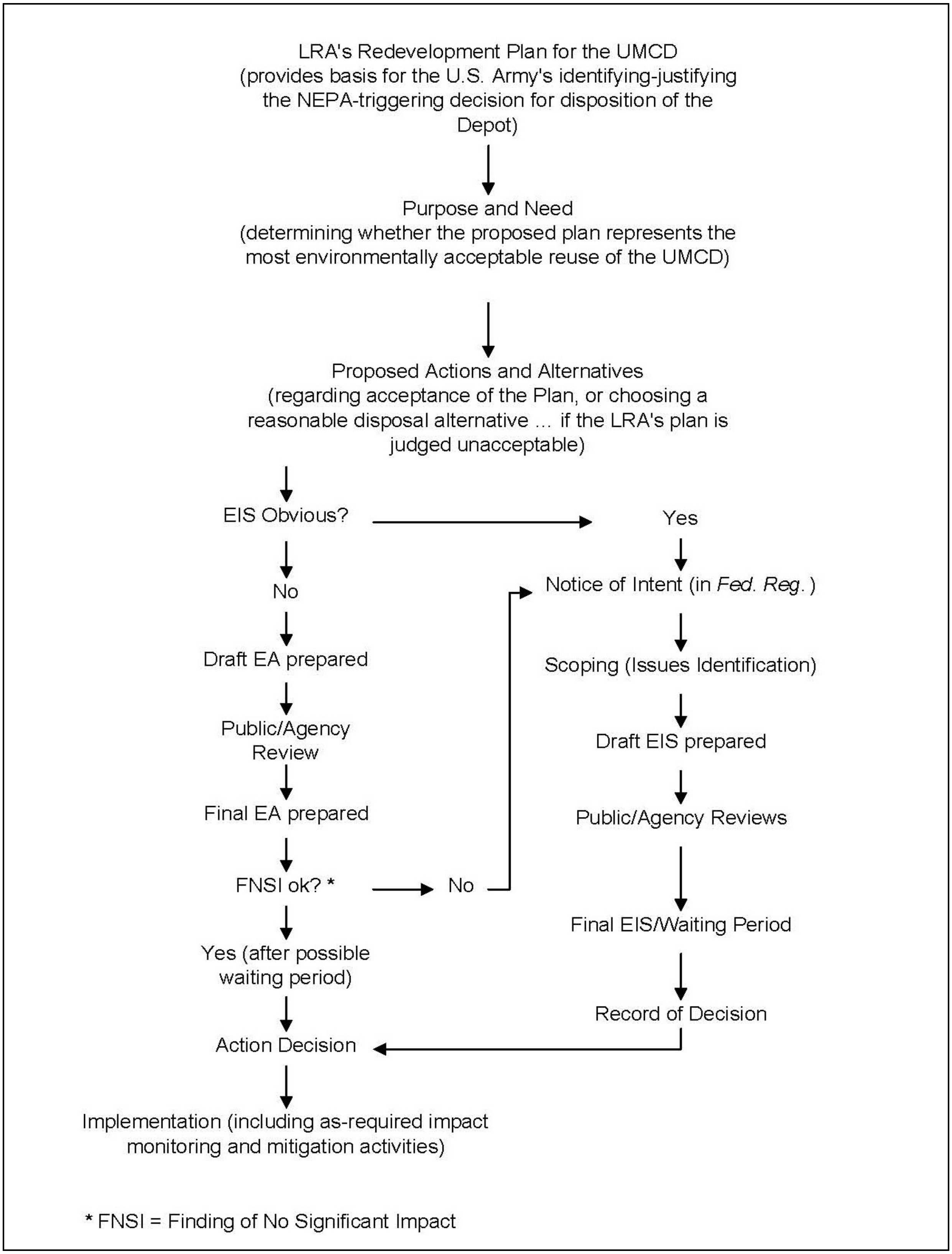

Figure 3-1 Summary of the NEPA process for reuse of the UMCD by the LRA.

3.3.2 Identification and Management of Impacts

The principle goals of the NEPA process include:

- Focusing on environmental issues that are truly significant to evaluation of the proposed action and reasonable alternatives (40 CFR 1500.1);
- Documenting such analyses in a manner that produces excellent decisions (40 CFR 1500.2); plus
- Integrating the process into early planning so as to resolve potential conflicts and avoid delays in completing the necessary documentation (40 CFR 1501.2; 32 CFR 651.5).

As applied to UMCD property transfer/reuse activities, the NEPA scoping phase includes (32 CFR 651.48):

- Focusing impact analyses on action-specific high probability/moderate-to-high consequence (adverse and beneficial) events on a particular valued environmental component (VEC; e.g., air quality, Native American cultural resources) throughout the UMCD and over a reasonable duration of time (e.g., next 20-40 years); thus
- Allowing development of acceptable mitigating measures for each of the (in) direct or cumulative impacts of concern.

The general approach to impact identification, mitigation, and monitoring is shown in Figure 3-2. Once a particular impact on a given VEC is identified, the appropriate level of evaluation (ranging from a "quick look" to "detailed analysis") is then implemented (Canter et al., 2007). If then judged necessary, the particular impact's magnitude (intensity/areal extent) may be reduced or eliminated via (32 CFR 651.15; Appendix C to Part 651):

- not taking a certain action or parts of an action
- limiting the degree or magnitude of an action
- repairing, rehabilitating, or restoring an affected area's VEC
- designing the action so as to reduce or eliminate adverse effects over time (e.g., via appropriate maintenance operations over the life of the action)
- replacing or providing substitute resources that will be affected by the action, at another location

Integration of the above considerations into identification and selection of proposals for reuse of the UMCD should improve the likelihood of Redevelopment Plan acceptance by the U.S. Army.

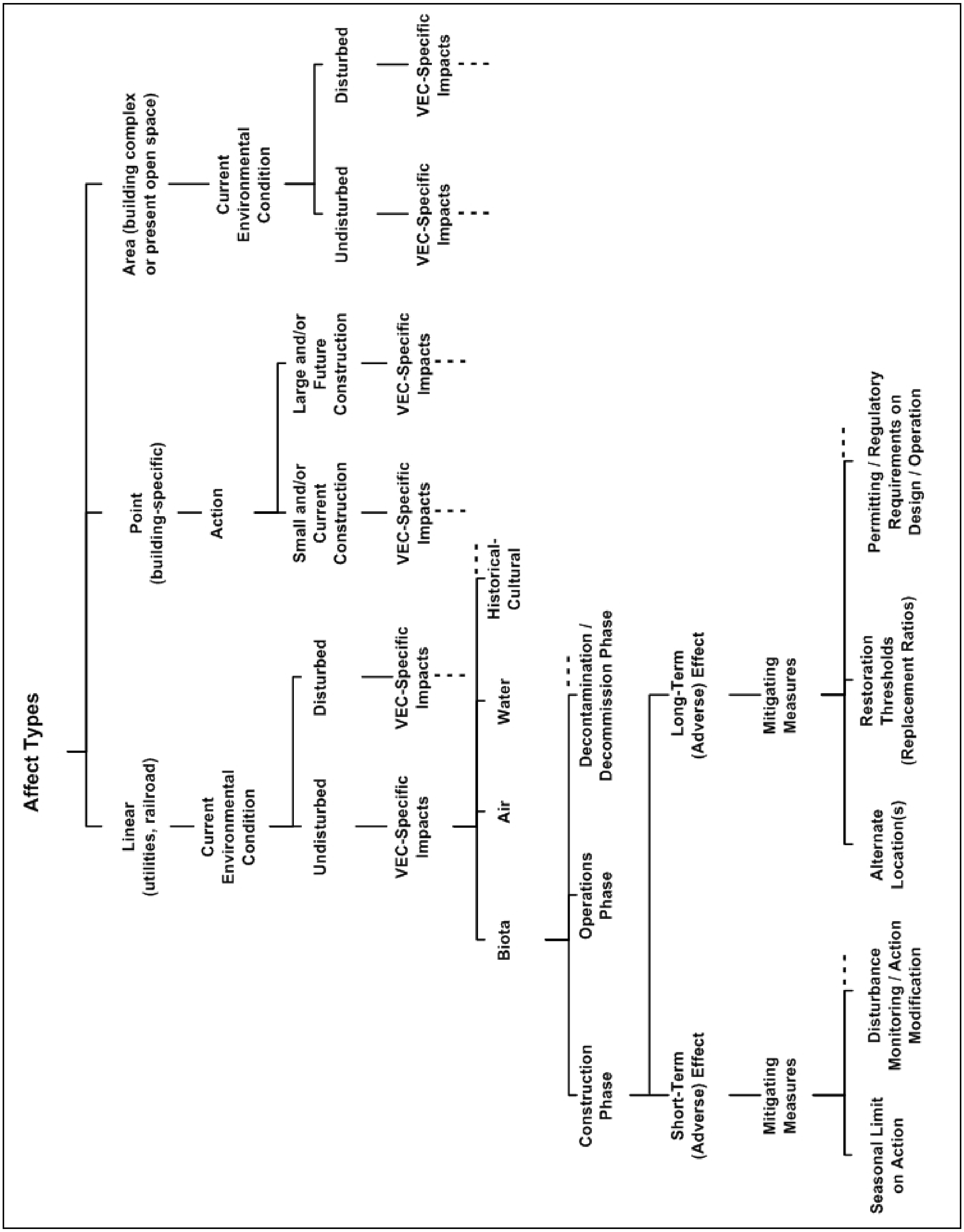

Figure 3-2 Summary of impact identification and mitigation processes.

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