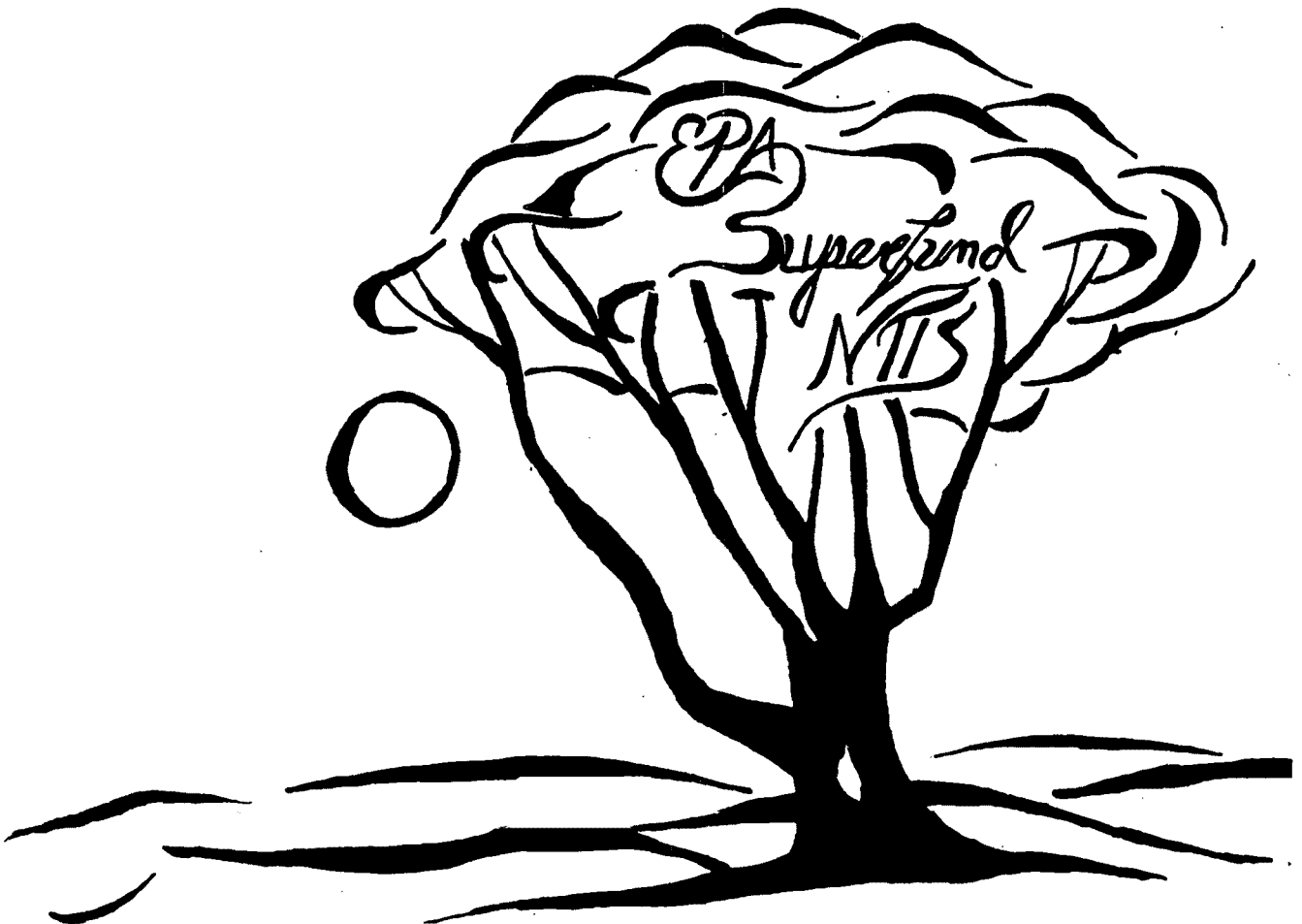


EPA Superfund Record of Decision:

**Umatilla Army Depot (Lagoons),
Operable Unit 7, Hermiston, OR
7/19/1994**



**DEFENSE ENVIRONMENTAL
RESTORATION PROGRAM**

FINAL RECORD OF DECISION

**UMATILLA DEPOT ACTIVITY
EXPLOSIVES WASHOUT PLANT
OPERABLE UNIT**

June 9, 1994

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Acronyms and Abbreviations

AAP	Army Ammunition Plant
ADA	Ammunition Demolition Activity
AMCCOM	Armament, Munitions, and Chemical Command
APC	Air pollution control
ARARs	Applicable or Relevant and Appropriate Requirements
BACT	Best available control technology
BRAC	Base Realignment and Closure
°C	Degrees Celsius
CAG	Carcinogen Assessment Group, EPA
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
2,4-DNT	2,4-Dinitrotoluene
2,6-DNT	2,6-Dinitrotoluene
DNB	1,3 -Dinitrobenzene
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
DOPP Kettle	Intermediate processing vessel between the explosive settling tank and pelletizer
DRE	Destruction and removal efficiency
EPA	U.S. Environmental Protection Agency
EPIC	Environmental Photographic Interpretation Center
FFA	Federal Facility Agreement
FS	Feasibility study
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index

Acronyms and Abbreviations (continued)

HMX	High Melting Explosive (1,3,5,7-tetranitro-1,3,5,7-tetrazacyclo-octane)
HRS	Hazard Ranking System
I	Intake
ID	Induced draft
IRIS	Integrated Risk Information System
LD ₅₀	Lethal dose to 50 percent of the study population
LDR	Land disposal restrictions
M	Million
MCL	Maximum contaminant level
µg/g	Micrograms per gram (parts per million)
µg/L	Micrograms per liter (parts per billion)
µg/sq cm	Micrograms per square centimeter
mg/kg	Milligrams per kilogram (parts per million)
MSL	Mean sea level
NAAQS	National Ambient Air Quality Standards
NB	Nitrobenzene
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
O&M	Operations and Maintenance
OAR	Oregon Administrative Rules
ODEQ	Oregon Department of Environmental Quality
ORNL	Oak Ridge National Laboratory

Acronyms and Abbreviations (continued)

ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PHRED	Public Health Risk Evaluation Data Base
ppm	Parts per million
ppb	Parts per billion
PRGs	Preliminary remediation goals
QA/QC	Quality Assurance/Quality Control
RA	Risk assessment
RAB	Restoration Advisory Board (Formerly the Technical Review Committee, TRC)
RAC	Remedial action criteria
RAG	Remedial action goal
RAGS	Risk Assessment Guidance for Superfund
RAOs	Remedial action objectives
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive (1,3,5-trinitro-1,3,5-triazacyclohexane)
RfD	Reference dose
RI	Remedial investigation
RI/FS	Remedial investigation/feasibility study
ROD	Record of Decision
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendments and Reauthorization Act
scfm	Standard cubic feet per minute
SF	Slope Factor (for risk assessment)

Acronyms and Abbreviations (continued)

TBC	To be considered
TCLP	Toxicity characteristic leaching procedure
TSD	Treatment, storage, and disposal
Tetryl	N, 2,4,6-Tetranitro-N-methylaniline
TNB	1,3,5-Trinitrobenzene
TNT	2,4,6-Trinitrotoluene
TRC	Technical Review Committee (now called the Restoration Advisory Board, RAB)
UMDA	Umatilla Depot Activity
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USAEC	U.S. Army Environmental Center (formerly USATHAMA)
USC	U.S. Code (Law)

1.0 Declaration of the Record of Decision

Site Name and Location

U.S. Army Depot Activity, Umatilla
Explosives Washout Plant Operable Unit
Hermiston, Oregon 97838-9544

Statement of Basis and Purpose

This decision document presents the selected remedial action for the Explosives Washout Plant Operable Unit at the U.S. Army Depot Activity, Umatilla (UMDA), at Hermiston, Oregon, which has been chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision is based on the administrative record for this site. Documents contained in the administrative record are identified in Section 2.2.

The remedy was selected by the U.S. Army and the U.S. Environmental Protection Agency (EPA). The State of Oregon concurs with the selected remedy.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

Description of the Selected Remedy

The purpose of this Washout Plant operable unit remedy is to eliminate the health and environmental risks associated with the washout water sump and reduce the potential safety/health risks associated with the Washout Plant building. The contaminated soils around the Washout Plant will be remediated under the Explosives Washout Lagoon Soils operable unit and are not addressed in this ROD.

The major components of the selected remedy include the following:

- Cleanout and disposal of explosive waste sludge and contaminated washout water from the washout water sump
- Decontamination by flaming and landfill disposal of the concrete washout water sump
- Pretreatment of the Washout Plant process equipment (removal of asbestos insulation, cleanup of pigeon droppings, and solvent flush)
- Treatment by solvent wiping of galvanized steel siding and hot gas decontamination of the aluminum siding, concrete, and process equipment
- Removal and disposal of the process equipment
- Demolition of the pelletizer building

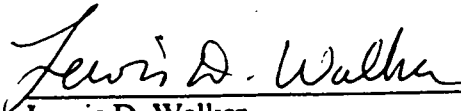
Statutory Determinations

The selected remedy is protective of human health and the environment and complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will not result in hazardous substances remaining on site above health-based levels, the five-year review will not apply to this action and the site will not require any long-term management or review due to total removal/destruction of contaminants of concern and hazard.

**Lead and Support Agency Acceptance of the Record of Decision
U.S. Army Depot Activity Umatilla
Explosives Washout Plant Operable Unit**

Signature sheet for the foregoing Record of Decision for the Explosives Washout Plant Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the U.S. Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality.




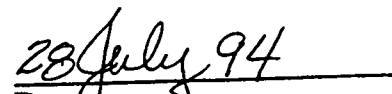
Lewis D. Walker
Deputy Assistant Secretary of the Army
(Environment, Safety, and Occupational Health)

9/30/94
Date

**Lead and Support Agency Acceptance of the Record of Decision
U.S. Army Depot Activity Umatilla
Explosives Washout Plant Operable Unit (Cont'd)**

Signature sheet for the foregoing Record of Decision for the Explosives Washout Plant Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the U.S. Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality.


Lieutenant Colonel Moses Whitehurst, Jr.
Commander
U.S. Army Depot Activity, Umatilla


Date

**Lead and Support Agency Acceptance of the Record of Decision
U.S. Army Depot Activity Umatilla
Explosives Washout Plant Operable Unit (Cont'd)**

Signature sheet for the foregoing Record of Decision for the Explosives Washout Plant Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the U.S. Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality.



Chuck Clarke
Regional Administrator, Region 10
U.S. Environmental Protection Agency

7/19/94
Date

**Lead and Support Agency Acceptance of the Record of Decision
U.S. Army Depot Activity Umatilla
Explosives Washout Plant Operable Unit (Cont'd)**

Signature sheet for the foregoing Record of Decision for the Explosives Washout Plant Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the U.S. Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality.

Fred Hansen
Fred Hansen
Director
Oregon Department of Environmental Quality

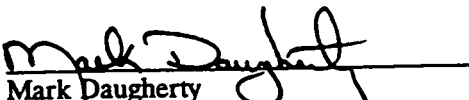
JUL 26 1994

Date

Note: The State of Oregon's Letter of Concurrence is appended to this Record of Decision.

**Lead and Support Agency Acceptance of the Record of Decision
U.S. Army Depot Activity Umatilla
Explosives Washout Plant Operable Unit (Cont'd)**

Signature sheet for the foregoing Record of Decision for the Explosives Washout Plant Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the U.S. Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality.


Mark Daugherty
BRAC Environmental Coordinator
U.S. Army Depot Activity, Umatilla

28 Jul 94
Date

2.0 Decision Summary

This Decision Summary provides an overview of the problems posed by the conditions at the UMDA Explosives Washout Plant (Washout Plant) building and sump, the remedial alternatives, and the analysis of those options. Following that, it explains the rationale for the remedy selection and describes how the selected remedy satisfies statutory requirements.

2.1 Site Name, Location, and Description

The U.S. Army Depot Activity at Umatilla is located in northeastern Oregon in Morrow and Umatilla Counties, approximately five miles west of Hermiston, Oregon, as shown in Figure 2-1. The installation covers 19,729 acres of land, of which 17,054 are owned by the Army and the remaining 2,675 acres are limited to agricultural use by restrictive easement. The UMDA Explosives Washout Plant and sump (Site 5) are located in the center of the UMDA installation, as shown in Figure 2-2.

The Washout Plant building, measuring about 100 feet by 32 feet, is located off Rim Road at the top of Coyote Coulee and to the east of the Explosives Washout Lagoons (Site 4). The washout water sump (measuring about 10 feet by 18 feet by 7 feet in depth) is located on the slope about half-way between the Washout Plant at the top of the Coulee and the Explosives Washout Lagoons (Washout Lagoons) at the bottom of the coulee. The poured concrete washout water sump has a total capacity of approximately 5,000 gallons. A sheet metal trough connects the Washout Plant building with the sump and the sump with the Washout Lagoons.

The Washout Plant building is constructed of poured concrete floors and structural steel and sheet metal siding and roofs. A concrete blast wall separates the building into two smaller buildings, the washout building and recovered explosive pelletizing building. Both buildings of the Washout Plant contain tanks, piping, and other process equipment.

The washout building is in generally good structural condition while the pelletizer building is in somewhat poorer structural condition. Both buildings could be secured (locked) to prevent unauthorized access to the contaminated building interiors or process equipment. The washout water sump is currently open at the top which allows it to collect rainwater which becomes contaminated and then overflows carrying contaminants to the Washout Lagoons.

UMDA was established as an Army ordnance depot in 1941 for the purpose of storing and handling munitions. Access is currently restricted to installation personnel, authorized contractors, and visitors. UMDA was included in the Department of Defense (DoD) Base Realignment and Closure (BRAC) program, which requires that the UMDA conventional ordnance storage mission be transferred to another installation. Under this program, it is probable that the Army will eventually vacate the site; ownership could then be relinquished to another governmental agency or private interests. Light industry is considered to be the most likely future land use scenario based on the surrounding area, but wildlife use is also being considered.

Northeastern Oregon, the setting for UMDA, is characterized by a semi-arid, cold desert climate, an average annual precipitation of 8 to 9 inches, and a potential annual evapo-

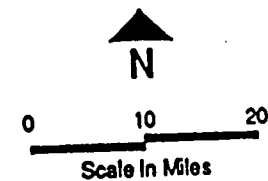
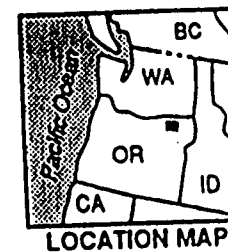
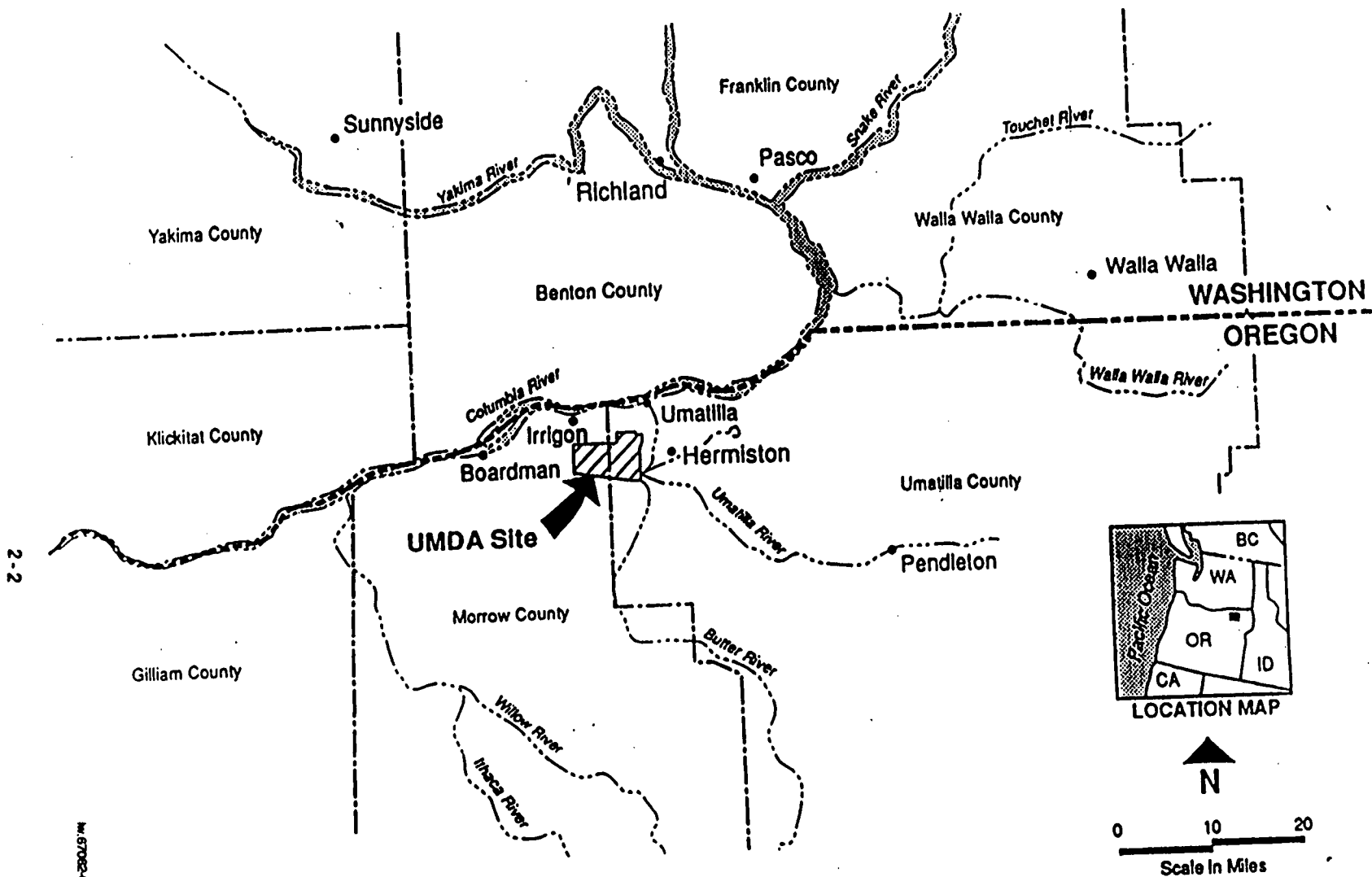
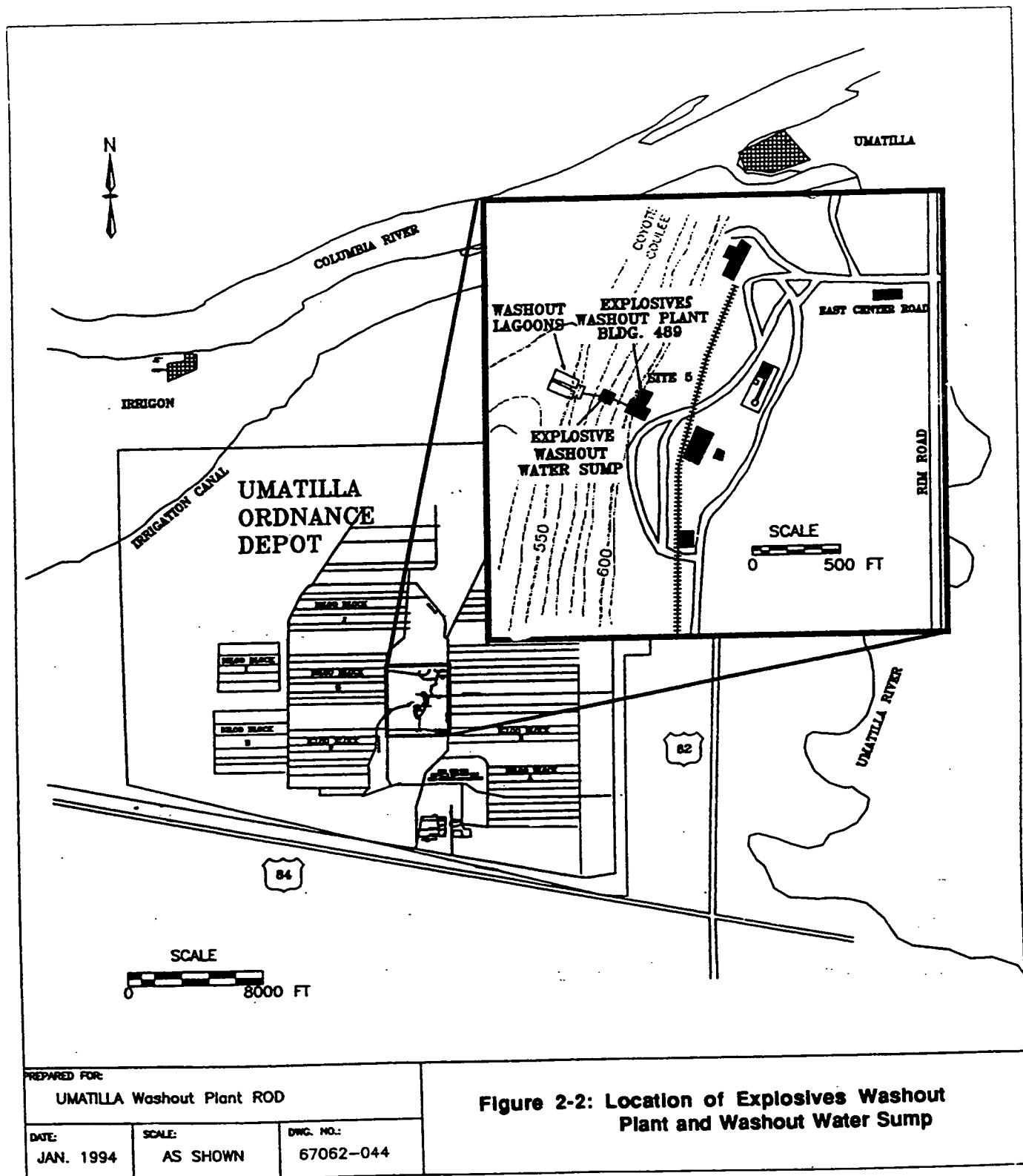


Figure 2-1:
Facility Location Map
Umatilla Depot Activity



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transpiration rate of 32 inches. The installation is located on a regional plateau of low relief that consists of relatively permeable glaciofluvial sand and gravel overlying Columbia River Basalt.

Ground water occurs primarily in two settings: in an unconfined aquifer within the overlying deposits and weathered basalts, and in a vertical sequence of semi-confined and confined aquifers within the basalt. The depth to the unconfined aquifer beneath the Washout Plant is approximately 100 ft. below grade. Ground water generally flows to the north and northwest, but flow directions vary throughout the year since regional flow gradients in the uppermost aquifer are influenced by irrigation, pumping, and leakage from irrigation canals.

The Columbia River, approximately 3 miles to the north of the UMDA boundary, flows from east to west; the Umatilla River, approximately 1 to 2 miles to the east, flows from south to north. No natural streams occur within UMDA; the facility is characterized by areas of closed drainage.

The region surrounding UMDA is primarily used for irrigated agriculture. The population centers closest to UMDA are Hermiston (population 10,075), approximately 5 miles east; Umatilla (population 3,032), approximately 3 miles northeast; and Irrigon (population 820), 2 miles northwest. The total populations of Umatilla and Morrow Counties are approximately 59,000 and 7,650, respectively.

Approximately 1,470 wells have been identified within a 4-mile radius of UMDA, the majority of which are used for domestic and irrigation water. Three municipal water systems (Hermiston, Umatilla, and Irrigon) draw from ground water within a 4-mile radius of UMDA. The Columbia River is a major source of potable and irrigation water, and is also used for recreation, fishing, and the generation of hydroelectric power. The principal use of the Umatilla River is irrigation.

2.2 Site History and Enforcement Activities

From the 1950s until 1965, UMDA operated an on-site Explosives Washout Plant similar to that at other Army installations. The plant processed munitions to remove and recover explosives using a pressurized hot water system. The principal explosives consisted of the following:

- 2,4,6-trinitrotoluene (TNT)
- 1,3,5-trinitro-1,3,5-triazacyclohexane (commonly referred to as Royal Demolition Explosive or RDX).
- 1,3,5,7-tetranitro-1,3,5,7-tetrazacyclo-octane (commonly referred to as High Melting Explosive or HMX)
- N,2,4,6-tetranitro-N-methylaniline (Tetryl)

In addition, the munitions contained small quantities of 2,4-dinitrotoluene (2,4-DNT), 2,6-dinitrotoluene (2,6-DNT), 1,3,5-trinitrobenzene (TNB), 1,3-dinitrobenzene (DNB), and nitrobenzene (NB), occurring as either impurities or degradation products of TNT.

Operation of the plant included periodic flushing and draining of the explosives washout system. The washwater produced was discharged via an open metal trough through the washout water sump to the two infiltration lagoons located to the northwest of the plant. The lagoons were constructed in the 1950s and used until 1965, when plant operations and all discharges to the lagoons ended.

An initial installation assessment was performed in 1978 and 1979 to evaluate environmental quality at UMDA with regard to the past use, storage, treatment, and disposal of toxic and hazardous materials. Based on image analysis provided by EPA's Environmental Photographic Interpretation Center (EPIC) as part of the assessment, the Explosives Washout Lagoons (Site 4) were characterized as a potentially hazardous site. In 1981, Battelle conducted an Environmental Contamination Survey and Assessment at UMDA and identified what appeared to be a 45-acre plume of RDX in the shallow aquifer underneath the lagoons. Battelle concluded that discharges to the lagoons had caused contamination of the alluvial aquifer. Subsequent investigations confirmed the presence of explosives in the soil and ground water.

In 1984, the Explosives Washout Lagoons were evaluated using EPA's Hazard Ranking System (HRS) and received a score in excess of 28.5. As a result, the lagoons were proposed for inclusion on the National Priorities List (NPL) in 49 Fed. Reg. 40320 (October 15, 1984). They were formally listed on the NPL in 49 Fed. Reg. 27620 (July 22, 1987) based on the HRS score and the results of the installation Resource Conservation and Recovery Act (RCRA) facility assessment. The Washout Plant was included as Site 5 in the RCRA facility assessment.

On October 31, 1989, a Federal Facility Agreement (FFA) was executed by UMDA, the Army, EPA Region X, and the Oregon Department of Environmental Quality (ODEQ) (USEPA et al, 1989). The FFA identifies the Army as the lead agency for initiating response actions at UMDA. One of the purposes of the FFA was to establish a framework for developing and implementing appropriate response actions at UMDA in accordance with CERCLA, the NCP, and Superfund guidance and policy. Investigation and remediation of the lagoons and the Washout Plant were tasks identified within this framework. A remedial investigation and feasibility study (RI/FS) of the entire UMDA installation, including the lagoons and the Washout Plant sites, was initiated in 1990 to determine the nature and extent of contamination and to identify alternatives available to clean up the facility.

The RI and Human Health Baseline Risk Assessment for UMDA were completed in August 1992. An additional risk assessment was performed for the interior of the Washout Plant in 1993. For purposes of the FS, the Washout Lagoons Soils and Washout Plant were each designated as separate operable units. The Washout Lagoons Soils Operable Unit reached a Record of Decision in 1992, which specified excavation and composting of all soils with TNT or RDX greater than 30 parts per million. The feasibility study for the Washout Plant was completed in December 1993, and the proposed plan was completed in February 1994.

2.3 Highlights of Community Participation

In 1988, UMDA assembled a Technical Review Committee (TRC) composed of elected and appointed officials and interested citizens from the surrounding communities. Quarterly meetings provide an opportunity for UMDA to brief the TRC on installation environmental restoration projects and to solicit input from the TRC. One TRC meeting was held in January 1993 during preparation of the feasibility study for the Explosives Washout Plant Operable Unit. In that meeting, the TRC was informed as to the scope and methodology of the Washout Plant remedial alternatives. Approximately 20 TRC meetings have been held during the RI/FS of the Washout Plant and Washout Lagoons. In December 1993, the TRC was changed to a Restoration Advisory Board (RAB) with similar functions. Two RAB meetings have been held since.

The feasibility study and proposed plan for the Explosives Washout Plant Operable Unit were made available to the public on February 15, 1994, at the following information repositories: UMDA Building 32, Hermiston, Oregon; the Hermiston Public Library, Hermiston, Oregon; and the EPA offices in Portland, Oregon. The notice of availability of the proposed plan was published in the *Hermiston Herald*, the *Tri-City Herald*, and the *East Oregonian* on February 15, 1994. The public comment period ended on March 17, 1994.

A public meeting was held at the Armand Larive Junior High School, Hermiston, Oregon, on March 2, 1994, to inform the public of the preferred alternative and to seek public comments. At this meeting, representatives from UMDA, the U.S. Army Environmental Center (USAEC), EPA, ODEQ, and Arthur D. Little, Inc. (an environmental consultant to USAEC) were available to answer questions about the site and remedial alternatives under consideration. A response to comments received at the meeting and during the 30-day comment period is included in the Responsiveness Summary appended to this ROD.

2.4 Scope and Role of Operable Unit

Operable units are discrete actions that constitute incremental steps toward the final overall remedy. Operable units can be actions that completely address a geographic portion of a site or specific problems, or can be one of many actions that will be taken at the site.

The Washout Plant Operable Unit consists of two major explosive contaminated items, the Washout Plant building and the washout water sump (and trough).

Some of the soil around the Washout Plant and under the washout water trough has also been found to be contaminated with explosives as the result of outdoor storage of old plant equipment, explosives tracked out of the building on employees' shoes and leakage or overflow from the washout water trough. This contaminated soil will not be treated as part of this operable unit but will be remediated as part of the Explosive Washout Lagoons Soil Operable Unit. The estimated quantity of this soil is approximately 500 cubic yards, which will not significantly increase the amount of soil already included within the Washout Lagoons Soil Operable Unit (4,800 cubic yards).

Although ground water in the vicinity of the Washout Plant has explosives contamination, it is thought to be due to disposal of wastewater in the Washout Lagoons. Thus, ground water remediation is not addressed in this ROD, since this remedy is intended to address exposure to the Washout Plant building and washout water sump. Ground water in the vicinity of the Washout Plant and lagoons is a separate operable unit with a separate FS, proposed plan, and ROD.

2.5 Site Characteristics

The original source of contamination at the Explosives Washout Plant Operable Unit was the spillage of explosives inside and around the plant and disposal of explosives-contaminated wash water through the trough and sump to the lagoons. No other contamination sources are suspected based on records of past activities. The type of contamination is explosives compounds (primarily TNT and RDX), and their manufacturing by-products and environmental breakdown products.

Presently, the primary source of any further soil or ground water contamination from this site is the washout water sump. Rainwater, which can enter the open top sump directly or by way of the open washout water trough, becomes contaminated with explosives from the sludge in the sump and then overflows to the Washout Lagoons. The sludge in the sump also contains sufficient explosive (up to 70 percent by weight, TNT) to be detonated (Arthur D. Little, 1987b), thus posing a safety hazard. Table 2-1 presents the analyses results for samples of sludge from the sump, and Table 2-2 presents analyses results of water samples from the sump.

Some of the soil around the Washout Plant and washout water sump has become contaminated with explosives, but this soil will be treated by a composting process along with the soil from the washout lagoons under the Explosives Washout Lagoons Soils Operable Unit to meet the remedial action criteria of 30 ppm or less of TNT and RDX (U.S. Army IR Program, 1992).

Ten wipe samples were taken from the inside surfaces of the Washout Plant building during the remedial investigation (Dames and Moore, 1992b). Four explosives (TNT, HMX, RDX, and TNB) were found to be present at concentrations ranging from less than 0.02 $\mu\text{g}/\text{sq cm}$ to 17.6 $\mu\text{g}/\text{sq cm}$. Locations of the wipe samples are described below and shown in Figure 2-3. The analytical results are summarized in Table 2-3.

- P5-1: Sample collected on the floor below the easternmost washout tank near the drainage valve. Possible spillage of contaminated water or water seepage from the drainage holes may have occurred here when the valves were changed or cleaned, or when the valve bladders were clogged.
- P5-2: Sample collected from the side of the washout tank below possible overflow area. Slight staining was observed on the metal tank wall in this area.
- P5-3: Sample collected on the floor below the westernmost washout tank near the drainage valve in a slight depression in the floor. This sample was collected for the same reason described for P5-1.

Table 2-1: Chemical Analysis Results of Sludge in Washout Water Overflow Sump

	Sample D4-1 (µg/g)*	Sample D4-2 (µg/g)*	Comparison Criteria (µg/g)*
Explosives			
1,3,5-TNB	210	370	NSA
1,3-DNB	LT 50	LT 50	NSA
2,4,6-TNT	400000	710000	NSA
2,4-DNT	LT 42	780	NSA
HMX	150	LT 67	NSA
Nitrobenzene	LT 240	LT 240	NSA
RDX	1800	870	NSA
Total Explosives	402,000	712,000	
Other Inorganics			
Nitrate/Nitrite	18	3.33	9.9
LT = Less Than NSA = No Standard Available in Media Analyzed * 1µg/g = 1 ppm by wt			

Source: Remedial Investigation Report, Umatilla Depot Activity (Dames & Moore, 1992b)

2-8

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Source: Remedial Investigation Report, Umatilla Depot Activity (Dames & Moore, 1992b)

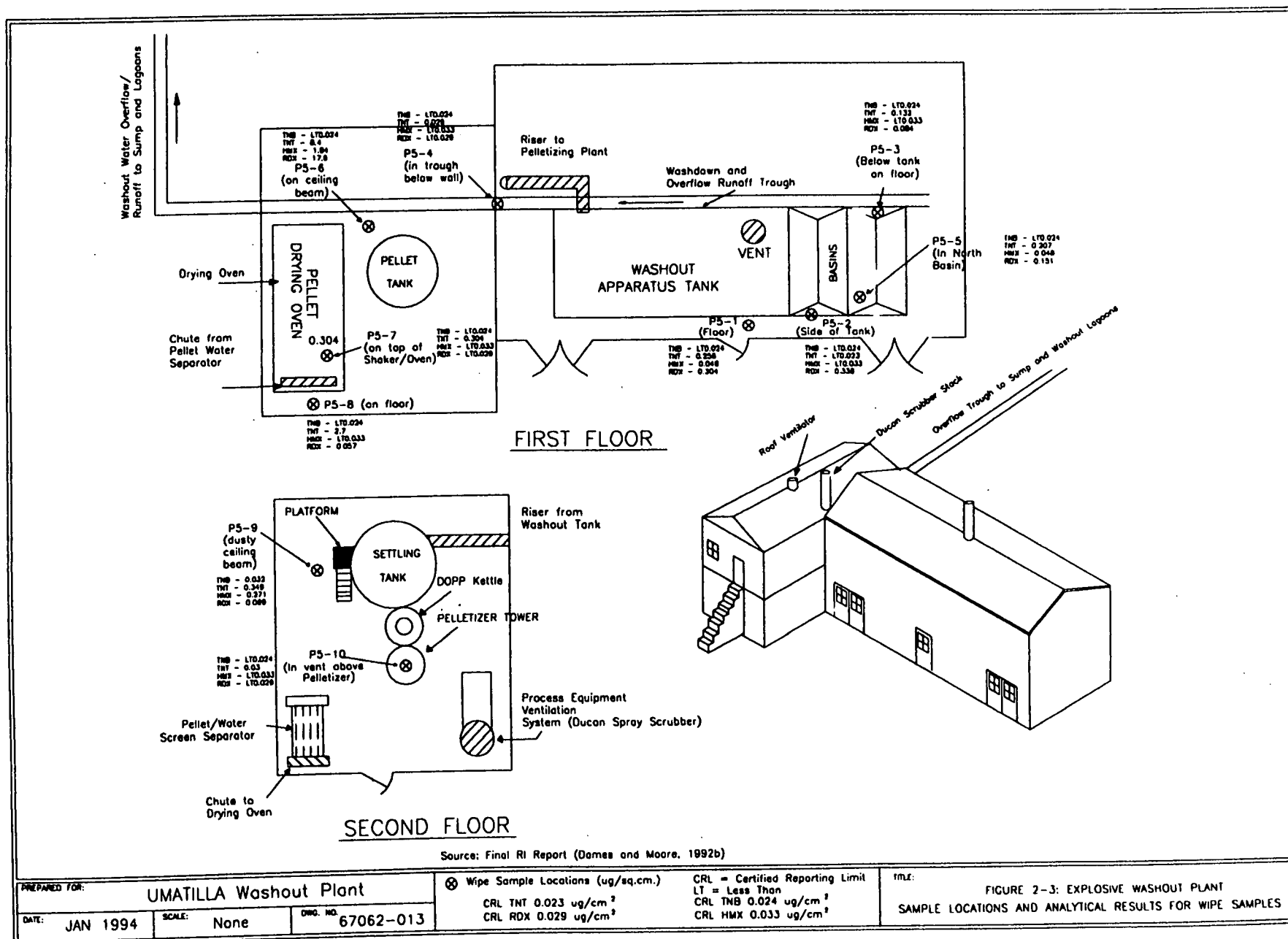


Table 2-3: Analytical Results of Wipe Samples From Explosives Washout Plant (Bldg. 489)

Sample No. Location	P5-1 Floor near Washout Tank	P5-2 Side of Washout Tank	P5-3 Floor Under Washout Tank	P5-4 Washout Water Overflow Trough	P5-5 Inside Washout Tank	P5-6 Top of Pelletizer Bldg. Beam	P5-7 Top of Shaker Oven	P5-8 Floor near Shaker Oven	P5-9 Top of Pelletizer Bldg. Beam	P5-10 Pelletizer Bldg. Vent
<u>µg/sq. cm. Explosive</u>										
1, 3, 5 - TNB	LT 0.024	LT 0.024	LT 0.024	LT 0.024	LT 0.024	LT 0.024	LT 0.024	LT 0.024	0.032	LT 0.024
2,4,6 - TNT	0.256	LT 0.023	0.132	0.029	0.207	9.400	0.304	2.700	0.349	0.030
HMX	0.049	LT 0.033	LT 0.033	LT 0.033	0.048	1.840	LT 0.033	LT 0.033	0.271	LT 0.033
RDX	0.304	0.338	0.084	LT 0.029	0.151	17.600	LT 0.029	0.057	0.064	LT 0.029

LT = Less than

Source: Final RI Report (Dames & Moore, 1992b)

- P5-4: Sample collected in the drainage trough below the south wall separating the washout building from the pelletizer building. All drainage from the washout room should have flowed through this trough.
- P5-5: Sample collected from the corner of the hopper in the easternmost washout tank. A former UMDA employee stated that residues that collected here were difficult to remove by steam cleaning.
- P5-6: Sample collected on a ceiling beam on the lower level of the pelletizing building. Pellet drying took place in this area, and a former UMDA employee reported that the room had been dusty during washout operations. The sample location on the beam was discolored and dusty.
- P5-7: Sample collected on top of the housing for the shaker dryer on the lower level of the pelletizing building. This sample was collected near the drop chute leading from the pellet water separator located on the second floor.
- P5-8: Sample collected on the floor on the lower level of the pelletizing building. This sample was collected near the drop chute that led from the pellet water separator (second floor) to the shaker (ground floor). The drop chute consists of sheet metal connected to the shaker dryer by a flexible seal. A former UMDA employee observed what he believed to be pelletized Composition B explosives on the floor in this area.
- P5-9: Sample collected on a ceiling beam on the upper level of the pelletizing building. Pelletizing and water separation occurred on this level, and the room was reported to have been very dusty during operations.
- P5-10: Sample collected in a dust vent above the pelletizer.

All 10 of the wipe samples were determined to contain one or more of the following explosives (Table 2-3):

- 2,4,6-TNT
- 1,3,5-TNB
- HMX
- RDX

Sample P5-9, collected on a ceiling beam on the upper level of the pelletizing building, was the only sample to contain all four explosives. Pelletizing and water separation occurred on this level, and the room was reported to have been very dusty during operations. Wipe sample P5-6, also collected on top of a ceiling beam in the lower level of the pelletizing building, contained the highest concentrations of three of the explosives. The high concentration was likely due to the beam being very dusty and never (or rarely) being cleaned. Pellet drying took place in this area, and the room was also reported to have been dusty during pelletizing operations.

During the RI, sampling was conducted for explosives on the exposed surfaces in the Washout Plant, and contamination by several explosives was verified. An additional area where larger concentrations of the explosives may possibly be found is inside the process equipment and piping. The process equipment was steam cleaned following the close of

the washout operations, but some explosives, possible at reactive levels, may remain in the joints, corners, etc., of this equipment. To date no investigation has been performed to determine the extent of contamination remaining within the process equipment. The assumption will have to be made, therefore, that the equipment is contaminated internally. Since there is no potential human health exposure pathway for this internal explosive contamination, it is considered a potential explosion health or safety issue rather than a toxicity or environmental contamination exposure issue.

Physical and chemical properties of the explosives are provided in Table 2-4. In general, the explosives can be characterized as having relatively low aqueous solubility and low volatility. Health effects criteria for the explosives, including carcinogenic data from EPA databases, are presented in Section 2.6.

Potential routes for migration of the explosives include the following:

Air

If the washout water sump is left uncovered in place and/or the washout water trough is left in place, rainwater will continue to enter the sump and convey dissolved explosives to the Washout Lagoons. Airborne transport of contaminated soil might then possibly occur. Passive transport of the explosives from the sump (or lagoons) is very unlikely because of the low volatility of the explosives.

There is little or no potential for air transport of the explosives on the inside building surfaces or residual explosives contained within the process equipment inside the Washout Plant.

Surface Water

There is no potential for surface water transport of the explosives to the environment from within the Washout Plant building or process equipment as long as the building is maintained. In the case of the washout water sump, even if rainwater did continue to flow through the washout water sump to the Washout Lagoons and convey further contamination to the lagoons, the lagoons are not located within a floodplain and there would be no likelihood of surface water runoff from the lagoons. The low precipitation rate and high soil permeability also make it highly unlikely that there could be any runoff from the lagoons to contaminate surface waters.

Subsurface

Infiltration of precipitation and the overflow of water from the sump to the lagoons does provide a potential subsurface pathway for migration. However, the rate of transport is expected to be low due to the low precipitation and high evaporation rates in the region.

2.6 Summary of Site Risks

This section summarizes the human health risks and environmental impacts associated with exposure to site contaminants and provides potential remedial action criteria.

Table 2-4: Physical and Chemical Properties of the Explosives

	TNT	2,4-DNT	2,6-DNT	TNB	DNB	RDX	HMX	Tetryl
CAS Registry No.	118-96-7	121-14-2	606-20-2	99-35-4	99-65-0	144-82-4	2691-41-0	479-45-8
Empirical Formula	$C_7H_5N_3O_6$	$C_7H_6N_2O_4$	$C_7H_6N_2O_4$	$C_6H_3N_3O_6$	$C_6H_4N_2O_4$	$C_3H_6N_6O_6$	$C_4H_8N_8O_8$	$C_7H_5N_5O_8$
Molecular Weight	227.15	182.15	182.15	213.12	168.12	222.15	296.20	287.17
Density (g/cm ³)	1.65	1.521	1.538	1.63	1.575	1.83	1.90(β form)	1.73
Melting Point (°C)	80.75	72	66	122	90	205	286	129.5
Vapor Pressure (mm Hg, 25°C)	5.51×10^{-6}	2.17×10^{-4}	5.67×10^{-4}	3.03×10^{-6}	1.31×10^{-4}	4.03×10^{-9}	3.33×10^{-14}	5.69×10^{-9}
Aqueous Solubility (mg/L, 25°C)	150	280	206	385	533	60	5	80
Henry's Constant (atm.m ³ /mole, 25°C)	1.10×10^{-8}	1.86×10^{-7}	4.86×10^{-7}	2.21×10^{-9}	5.44×10^{-8}	1.96×10^{-11}	2.60×10^{-15}	2.69×10^{-11}
Log K _{ow}	2.00	1.98	1.89	1.18	1.49	0.87	0.26	1.65
K (ml/g)	1.00	0.68	0.21	2.23	0.45	0.21	0.44	0.71
R	4.46	3.34	1.72	8.72	2.55	1.73	2.51	3.46
Bio-concentration factor (BCF) (fish)	8.95	10.6	9.82	2.65	4.70	1.50	0.49	6.31

Source: CH₂M Hill, 1992, Table 2-3

2.6.1 Human Health Risks

A baseline risk assessment was conducted by the Army to estimate the risk posed to human health by the Washout Plant building should it remain in its current state with no remediation. The risk assessment consisted of an exposure assessment, toxicity assessment, and human health risk characterization. The exposure assessment detailed the exposure pathways (such as dust inhalation) that exist at the site for various receptors. The toxicity assessment documented the adverse effects that can be caused in a receptor as a result of exposure to a site contaminant.

The health risk evaluation used both the exposure concentrations and the toxicity data to determine a Hazard Index (HI) for potential noncarcinogenic effects and a cancer risk level for potential carcinogenic contaminants. In general, an HI of less than or equal to 1 indicates that even the most sensitive population is not likely to experience adverse health effects. If it is above one, there might be a concern for adverse health effects. The degree of concern typically correlates with the magnitude of the index if it is above one. The cancer risk level is the additional chance that an exposed individual will develop cancer over the course of a lifetime. It is expressed as a probability such as 1×10^{-6} (1 in a million).

Risk assessments involve calculations based on a number of factors, some of which are uncertain. First, the health effects criteria of specific chemicals are often based on limited laboratory studies on animal species that are then extrapolated to humans. Further, the exposure scenario requires estimation of the duration and frequency of exposure, the identity of the exposed individual, and the contaminant concentration at the point of exposure. If the value of the factor required for the risk assessment is uncertain, a conservative estimate is used so that a health-based exposure level or concentration can be calculated. For example, in order to calculate a reference dose for humans, toxicity assessments divide doses observed to cause health effects in animals by an uncertainty factor to account for species differences and human population variability. The uncertainty factors for the explosives of concern are given in Table 2-5. In the case of uncertainties associated with exposure scenarios, the most conservative plausible scenario is selected. For example, in the New Jersey Department of Environmental Protection (NJDEP) method (1992) for calculating human uptake of contaminants from surfaces by a combination of three exposure pathways (dermal contact, dust inhalation and dust ingestion), the same lifetime dosage (50% of the total weight of contaminant) of uptake is assumed whether it is residential or industrial exposure. Since the number of hours assumed for industrial exposure is much less than the number of hours for residential exposure, the estimated uptake per hour for industrial exposure is greater, thereby posing greater carcinogenic, and non-carcinogenic risks. Therefore, industrial exposure was assumed as the most conservative scenario for the risk assessment for this site.

Contaminants of concern in the UMDA Explosives Washout Plant Operable Unit were identified as those explosives detected in the sump or on the building surfaces during the site investigations. They were:

- TNB
- TNT
- 2,4-DNT
- HMX
- RDX

Table 2-5: Health Effects Criteria for Contaminants of Concern in the Explosives Washout Plant and Sump

Contaminant of Concern	Slope Factor (mg/kg-day)	Source	Weight of Evidence Class.	Cancer Type	Reference Dose (mg/kg-day)	Source	Critical Effect	Uncertainty Factor	Confidence Level
1,3,5-Trinitrobenzene					5.00E-05	IRIS	Increased splenic weight	10,000	Low
2,4,6-Trinitrotoluene	0.030	IRIS	C	Urinary bladder papillomas	5.00E-04	IRIS	Liver effects	1,000	Medium
HMX					5.00E-02	IRIS	Hepatic lesions	1,000	Low
RDX	0.110	HEAST	C	Hepatocellular carcinomas and adenomas	3.00E-03	IRIS	Inflammation of prostate	100	High
2,4-Dinitrotoluene	0.680	IRIS	B2	Hepatocellular carcinomas, mammary, and renal	2.00 E-03	USEPA, 1992	Hepatocellular alterations	100	---

Sources: IRIS (Integrated Risk Information System) (USEPA, 1991c)
HEAST (Health Effects Assessment Summary Tables) (USEPA, 1991a)
Drinking Water Health Advisory for 2,4- and 2,6-Dinitrotoluene (USEPA, 1992)

The populations at risk of exposure to these explosives were identified by considering both current and future use scenarios. Currently, public access to the UMDA facility is restricted, and there is little incentive or opportunity for trespassers to approach the Washout Plant area, so public exposure is unlikely. There are no operations being conducted in the Washout Plant area other than remediation, so unplanned exposure of installation personnel is also unlikely. Therefore, the potential for current exposure was judged to be low and risks associated with current exposure scenarios were not evaluated.

The probability of future exposure to human receptors from the Washout Plant and sump was considered high, however, since it is likely that DoD will eventually vacate UMDA. A light industrial land use scenario is considered the most probable scenario for future use of UMDA based on site topography and the availability of utilities and resources. The exposed population would consist of adult industrial workers. Future residential use is also possible, although it is not probable, but was not evaluated in the risk assessment because the industrial scenario is more conservative.

Three exposure pathways for contaminated surfaces were identified for the industrial use scenario of the Washout Plant building:

- Incidental ingestion of contaminated dust
- Inhalation of contaminated airborne dust
- Dermal absorption of explosives from direct contact with surfaces

The probability of significant exposures by other pathways was considered low. Risks associated with the contaminated soil were assessed in greater detail during the study (feasibility study) of the Explosives Washout Lagoons Soils Operable Unit.

The concentrations of explosives on the accessible building surfaces as determined during the remedial investigation (Dames & Moore, 1992b) were used for purposes of calculating risk for potential human exposure. The risk(s) for potential human exposure to explosives in the sludge (and water) in the washout water sump were not calculated because the concentrations of explosives were so high in the sludge (Table 2-1) that the sludge not only poses a human toxicity hazard (more than four orders of magnitude greater than the remedial action level of 30 ppm required for the Washout Lagoon Soils), but also presents an explosion hazard. Therefore, the sump and sump contents will require remediation to remove this safety and potential human health hazard.

Also, there is a potential for reactive quantities of explosives remaining within the process equipment in the Washout Plant. Although this does not pose a human toxicity health risk, per se, because it is contained within the interior of the equipment, it does pose a potential safety hazard. Because of this safety hazard, the selected remedy will include cleanout and removal of the process equipment from the Washout Plant.

In the absence of standard EPA methods for estimating human contaminant uptake from building interior surfaces, a method developed by the New Jersey Department of Environmental Protection was used. This method considers the exposure pathways previously listed, and utilizes assumptions used by EPA to develop remediation goals for PCB contaminated surfaces. The method assumes that an occupant would absorb 50% of the total contamination existing in the building during the occupant's total exposure,

whether as residential or light industrial use. The amount of contamination was calculated from the area of the interior surfaces and the following three measures of the reasonable maximum exposure concentration:

- upper 95% confidence limit on the mean of all measured surface concentrations,
- upper 95% confidence limit on the mean of measured surface concentrations except the maximum,
- the maximum measured concentration

These three measures were used since the maximum detected concentration was much higher than the other results and could inappropriately skew the average. It also occurred in a high, inaccessible location in the building. An average daily uptake factor was calculated by dividing this total uptake by the averaging time and the average weight of a receptor. The averaging time was assumed to be 25 years for noncarcinogens and 70 years for carcinogens, in accordance with the EPA default values for light industrial use. Light industrial use is the most likely future use for the building. Since the only difference in this procedure for residential use is dividing by a 30 year averaging time for noncarcinogens instead of 25 years, in this case the light industrial scenario provides a higher, more conservative average daily intake.

The basic toxicity information and health effects criteria for the explosives, including carcinogenic data from EPA databases were previously presented in Table 2-5. All of the explosives are potentially toxic. In addition, both TNT and RDX are classified as potential human carcinogens (Group C), and 2,4-DNT is classified as a probable human carcinogen (Group B).

Because of the lack of toxicity data for TNB, EPA derived a reference dose (RfD) by analogy to DNB. This analogy is considered appropriate and acceptable because of their structural similarity and the fact that TNB is less toxic on an acute basis than DNB. To account for the derivation by analogy, the RfD for TNB incorporates an additional uncertainty factor of 10. The Army has initiated TNB-specific toxicity studies designed to reduce this uncertainty and provide a more definitive estimate of the RfD.

Using the Table 2-5 data and the calculated intake factors for a combination of the three significant exposure pathways cited above, excess cancer risks and noncancer hazard indices were calculated by the NJDEP method (1992) using the three different methods of averaging surface explosive concentrations noted above (Tables 2-6, 2-7, and 2-8). The risks calculated in Tables 2-6, 2-7, and 2-8 are based on accessible surfaces - those surfaces up to a height of 6 feet above the floor. Surface areas over 6 feet above the floor are considered to be (normally) inaccessible and to present approximately one-half the risk of accessible surfaces for the same concentrations of contaminants.

Based on a carcinogenic risk of 1×10^{-5} and an HI of 1, preliminary remediation goals (PRGs) were calculated as presented in Table 2-9. It should be noted that only one wipe sample taken during the RI, P5-6, exceeded the PRGs and this was a sample from a very inaccessible location (top of a beam in the pelletizer building) which exceeded the allowable RDX concentration. For this reason, the 95% UCL arithmetic mean *without the*

Table 2-6: Potential Carcinogenic and Noncarcinogenic Risks Due to Exposure to the Interior Building Surfaces of the Explosives Washout Plant (Building 489) using Maximum Detected Concentrations in Wipe Samples

Analyte	Maximum Surface Explosive Concentration ($\mu\text{g}/\text{cm}^2$)	Carcinogenic Intake ($\text{mg}/\text{kg}/\text{day}$)	Slope Factor 1 ($\text{mg}/\text{kg}/\text{day}$)	Carcinogenic Risk
135TNB	0.03	*	*	*
246 TNT	8.40	2.18E-04	3.0E-02	7E-06
HMX	1.84	*	*	*
RDX	17.60	4.56E-04	1.1E-01	5E-05
Total				<u>6E-05</u>

Analyte	Maximum Surface Explosive Concentration ($\mu\text{g}/\text{cm}^2$)	Noncarcinogenic Intake ($\text{mg}/\text{kg}/\text{day}$)	Reference Dose ($\text{mg}/\text{kg}/\text{day}$)	Noncarcinogenic (Hazard Index) Risk
135TNB	0.03	3.48E-06	5.0E-05	7E+02
246TNT	8.40	9.07E-04	5.0E-04	2E+00
HMX	1.84	1.99E-04	5.0E-02	4E-03
RDX	17.60	1.90E-03	5.0E-03	6E-01
Total				<u>3E+00</u>

* Not calculated because contaminant is not considered a carcinogen or slope factor is not available

Source: Dames & Moore (1994)

Table 2-7: Potential Carcinogenic and Noncarcinogenic Risks Due to Exposure to the Interior Building Surfaces of the Explosives Washout Plant (Building 489) using 95 Percent UCL of Arithmetic Mean of Concentrations in Wipe Samples

Analyte	Average Surface Explosive Concentration (µg/cm²)	Carcinogenic Intake (mg/kg/day)	Slope Factor 1/(mg/kg/day)	Carcinogenic Risk
135TNB	0.026	*	*	*
246TNT	2.770	7.17E-05	3.0E-02	2E-06
HMX	0.569	*	*	*
RDX	5.070	1.31E-04	1.1E-01	1E-05
Total				<u>2E-05</u>

Analyte	Average Surface Explosive Concentration (µg/cm²)	Non Carcinogenic Intake (mg/kg/day)	Reference Dose (mg/kg/day)	Non-Carcinogenic (Hazard Index) Risk
135TNB	0.026	2.84E-06	5.0E-05	6E-02
246TNT	2.770	2.99E-04	5.0E-04	6E-01
HMX	0.569	6.15E-05	5.0E-02	1E-03
RDX	5.070	5.48E-04	3.0E-03	2E-01
Total				<u>8E-01</u>

* Not calculated because contaminant is not considered a carcinogen or slope factor is not available.

Table 2- 8: Potential Carcinogenic and Noncarcinogenic Risks Due to Exposure to the Interior Building Surfaces of the Explosives Washout Plant (Building 489) using 95 Percent UCL of Arithmetic Mean of Concentrations other than the Maximum in Wipe Samples

Analyte	Average Surface Explosive Concentration ($\mu\text{g}/\text{cm}^2$)	Carcinogenic Intake ($\text{mg}/\text{kg}/\text{day}$)	Slope Factor 1/($\text{mg}/\text{kg}/\text{day}$)	Carcinogenic Risk
135TNB	0.024	*	*	*
246TNT	0.977	2.53E-05	3.0E-02	8E-07
HMX	0.111	*	*	*
RDX	0.195	5.05E-06	1.1E-01	6E-07
Total				<u>1E-06</u>

Analyte	Average Surface Explosive Concentration ($\mu\text{g}/\text{cm}^2$)	Non-Carcinogenic Intake ($\text{mg}/\text{kg}/\text{day}$)	Reference Dose ($\text{mg}/\text{kg}/\text{day}$)	Non-Carcinogenic (Hazard Index) Risk
135TNB	0.024	2.59E-06	5.0E-05	5E-02
246TNT	0.977	1.06E-04	5.0E-04	2E-01
HMX	0.111	1.20E-05	5.0E-02	2E-04
RDX	0.195	2.11E-05	3.0E-03	7E-03
Total				<u>3E-01</u>

* Not calculated because contaminant is not considered a carcinogen or slope factor is not available.

Source: Dames & Moore (1994)

**Table 2-9: Preliminary Remediation Goals for the Explosives Washout Plant
(Building 489) Interior Building Surfaces**

Analyte	Accessible Surfaces (below 6 feet)			Noncarcinogenic PRG (Hazard Index of 1) (mg/m ²) (µg/cm ²)	
	Carcinogenic PRG (1E-05 Risk Level) (mg/m ²) (µg/cm ²)		Average Surface Contamination** (µg/cm ²)		
135TNB	*	*	0.024	4.63	0.46
246TNT	128	12.8	0.977	46.3	4.63
HMX	*	*	0.111	4632	463
RDX	35	3.5	0.195	278	27.8

Analyte	Inaccessible Surfaces (above 6 feet)			Noncarcinogenic PRG (Hazard Index of 1) (mg/m ²) (µg/cm ²)	
	Carcinogenic PRG (1E-05 Risk Level) (mg/m ²) (µg/cm ²)		Average Surface Contamination** (µg/cm ²)		
135TNB	*	*	N/A	9.26	0.92
246TNT	256	25.6	N/A	92.6	9.26
HMX	*	*	N/A	9264	926
RDX	70	7	N/A	556	55.6

* Not calculated because contaminant is not considered a carcinogen or slope factor is not available.

** 95% UCL of Arithmetic Mean Excluding Maximum Wipe Sample of Washout Plant Surfaces

N/A = Not Available

Source: Dames & Moore (1994)

maximum concentrations is shown in Table 2-9 for comparison with the PRGs since it better represents the present level of contamination in the washout building of the Washout Plant.

The NCP states that the acceptable risk range for carcinogens is 1×10^{-4} to 1×10^{-6} [40 CFR 300.430(e)(2)(i)(A)(2)] For systemic toxicants (i.e., constituents having a noncancer health effect), the NCP states the following:

For systemic toxicants, acceptable exposure levels shall represent concentration levels to which human populations, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety. (40 CFR 300.430(e)(2)(i)(A)(1))

As discussed earlier, acceptable exposure levels are usually evaluated in terms of the HI; an HI of less than or equal to one generally represents an acceptable exposure. However, the NCP further states that remedial action objectives must consider "factors related to uncertainty." [40 CFR 300.430(e)(2)(i)(A)(4)] Therefore, the calculated HIs must be considered within the context of the uncertainty factor, a conservatism that is built into the EPA-derived RfD. For example, if the uncertainty factor is several orders of magnitude greater than the calculated HI, an HI somewhat greater than 1 may be acceptable.

The potential safety risks of the washout water sump and process equipment interiors are unacceptable based on Army explosive safety regulations. The potential health toxicity risks associated with the washout water sump also clearly exceed the acceptable carcinogenic and noncarcinogenic levels because the measured concentrations of explosives in the sludge in the sump (i.e., 40% and 70% TNT by wt.) greatly exceed the 30 ppm TNT cleanup level selected for soil in the Washout Lagoons Soils ROD (U.S. Army IR Program, 1992). In addition, because of the long-term exposure of the concrete sump to such high concentrations of explosives in the sludge, it is expected (but not confirmed) that the interior surfaces of the sump will also not meet the PRGs.

Therefore, in the event of likely future land use changes brought about by UMDA's inclusion in the BRAC program, actual or threatened releases of hazardous substances from the site (particularly the sump and possibly the process equipment interior), if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

2.6.2 Environmental Evaluation

The main potential for further release of the explosives to the environment would be if the washout water sump were not remediated. In this case, further release of explosives from this operable unit (Explosives Washout Plant) to the Explosives Washout Lagoons Operable Unit would occur.

An ecological assessment that included the Washout Lagoons near the Washout Plant was performed as part of the installation-wide RI/FS. Qualitative ecological observations and literature information were included in the feasibility study for the Explosives Washout Lagoons Soils Operable Unit. Although the UMDA installation is part of the critical winter range and habitat for several threatened and endangered avian species, none of these are now directly affected by the Washout Plant, nor are they likely to be in the future.

Although there are a number of wetlands near UMDA, none of these occur within the UMDA boundaries. Information available also indicates that UMDA is not located within 100 or 500 year floodplains.

There are two known historic buildings at UMDA, the headquarters building and the firehouse building. There are also two potential archeological resources at UMDA that have been tentatively identified as a portion of the Oregon Trail and a prehistoric site. However, none of the activities at the Explosives Washout Plant would affect these locations.

Finally there are no wilderness areas, wilderness areas, wildlife refuges or scenic rivers located within the boundaries of UMDA.

2.6.3 Remedial Action Criteria

Neither state nor federal regulations contain chemical-specific soil cleanup standards for the contaminants of concern. However, both authorities provide a framework for developing risk-based remedial action criteria. The State of Oregon requires cleanup to background or, if that is not feasible, the lowest levels that are protective of human health and the environment where feasible. The Oregon Environmental Cleanup Law process is as follows:

- In the event of a release of a hazardous substance, the environment shall be restored to background level (i.e., the concentration naturally occurring prior to any release from the facility [OAR 340-122-040(2)(a)] where feasible.
- When attaining background is not feasible, the acceptable cleanup level for the environment shall be the lowest concentration level that satisfies both the "protection" and feasibility" requirements in OAR 340-122-090(1). The party responsible for the contaminated site is responsible for demonstrating the non-feasibility of attaining background.

The NCP provides guidelines in terms of acceptable carcinogenic and non-carcinogenic risk. Therefore, the health criteria cited in Table 2-5, such as slope factors and reference doses, become "to-be-considered" (TBC) criteria for protectiveness.

The potential risk-based preliminary remediation goals were previously presented in Table 2-9. These risk-based PRGs should be readily achievable for the Washout Plant building surfaces by any of the remediation alternatives listed below that involve the pretreatment steps.

Under RCRA (40 CFR 261), wastewater treatment sludge from the manufacturing and processing of explosives is considered a listed waste due to explosive reactivity and is assigned EPA Hazardous Waste Number K044. Red/pink water from TNT operations is also considered a listed waste due to explosive reactivity and is assigned EPA Hazardous Waste Number K047. However, EPA's background listing document supporting these designations explicitly lists wastes derived from the manufacturing, loading, assembling, and packing of explosives, not removal from munitions. Therefore, neither the contamination on the building surfaces nor in the process equipment, nor the sludge or water in the washout water sump are specific listed wastes. Furthermore, the RCRA reactivity criteria, for which the K044 and K047 wastes and reactivity are not applicable

or appropriate in regard to the building surfaces, but may be classified as TBC guidance. At present, there are no chemical-specific federal or state regulations that specify action or cleanup levels for explosives-contaminated surfaces. It was for the above reasons that risk-based PRGs were developed for the Washout Plant building surfaces.

The sludge in the sump does exceed 10% total explosives and is considered detonable or reactive. However, these materials were generated prior to the effective date of RCRA. The RCRA regulations governing transportation, storage, treatment and disposal of these materials are relevant and appropriate for the material as it exists in the sump, and applicable if the material is removed from the sump and actively managed.

The RCRA reactivity criteria would be appropriate to disposal of possible residual explosives remaining within the process equipment and two of the waste materials generated during remediation. These are:

- spent solvent from process equipment washout
- solvent wet cloths used for solvent wiping of building or equipment surfaces.

These two wastes would also be considered F001-F005 listed wastes, as spent solvents or wipes containing spent solvents. The above three items would be treated/disposed of by burning and incineration to comply with the regulations for disposal of reactive or spent solvent wastes.

Location-specific ARARs would include the Endangered Species Act to protect rare and endangered species, the Clean Water Act for protection of wetlands, the National Historic Preservation Act, and the Archaeological Resources Protection Act. Although areas of the UMDA installation provide critical habitat for threatened or endangered species, no activities at the Explosives Washout Plant are expected to impact those habitats. No archaeological or historic resources are known to exist in vicinity of the Washout Plant or to be affected by the remedial action. The Washout Plant Operable Unit is not located within or near a wetland or floodplain.

Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy. The only activity expected to trigger a possible ARAR is the hot gas decontamination process which may require air monitoring.

DoD explosives decontamination regulations in Technical Bulletin 700-4 specify that explosives-contaminated equipment be thoroughly decontaminated of explosives, preferably by thermal means, prior to releasing such equipment from Government control. Whereas reactive or detonable quantities of explosives are known or suspected to exist in the washout water sump and Washout Plant process equipment, this requirement would apply to the washout water sump, the process equipment and surfaces receiving spills of explosive. The thorough decontamination of the equipment is usually assured by a heat treatment regimen of time at temperature and/or wipe testing with an indicator reagent (such as Webster's reagent) to verify there are no detectable residual explosives. Thermal decontamination of highly contaminated equipment (with reactive quantities of explosives) down to below detection level by indicator wipe testing (1-10 ug/sq cm) should also meet RCRA requirements for thermal destruction of explosives,

State of Oregon requirements for cleanup to lowest levels protective of human health and the environment, and the risk-based PRGs.

On-site CERCLA response actions must only comply with the substantive requirements of regulations and not the administrative requirements [CERCLA § 121(e)]. Therefore, in the event that the remedial alternatives for the Explosives Washout Plant are considered to take place within the confines of the CERCLA unit (i.e., on UMDA), the Army will not be required to obtain permits, but will have to comply with the substantive requirements of any statutes or regulations determined to be ARARs.

2.7 Description of Alternatives

After screening numerous potential remedial responses in the feasibility study (Arthur D. Little, 1993), five major remedial alternatives (including no action) were developed for the Explosives Washout Plant Operable Unit. Variations of two of these alternatives were also evaluated, resulting in a total of seven remedial alternatives which are described as follows:

- Alternative 1: No Action (Required by law to be considered)
- Alternative 2: Sump Clean-out/Controlled Access (Institutional Control)
- Alternative 3: Hydroblasting, Inspection, Demolition, and Disposal
- Alternative 4A: Hot Gas Decontamination, Total Demolition, and Disposal
- Alternative 4B: Hot Gas Decontamination, Partial Demolition, and Disposal
- Alternative 5A: Building Demolition, Inspection, and Disposal of Contaminated Materials
- Alternative 5B: Building Demolition, Inspection, Incineration of Concrete Rubble, and Disposal of Materials

All of the remedial alternatives that were developed and compared in the feasibility study (except Alternative 1) comply with both the NCP requirements and Army/DoD safety and hygiene regulations. For the alternatives that involve actually cleaning the building (those other than Alternatives 1 and 2), the possible detonable quantities of explosives in the process equipment and the asbestos and pigeon droppings would be cleaned up during a "pretreatment step" (discussed below) and would include building demolition and disposal steps.

The pretreatment operations would include:

- Removal of pigeon droppings and asbestos from the Washout Plant
- Removal of the sludge from the washout water sump and burning the sludge in the TNT burn trays at UMDA (as done in the past under a state permit)
- Removal of contaminated water from the washout water sump and adding it to the compost piles being used for treatment of the Washout Lagoon Soils
- Treatment of the washout water sump for residual explosive by flaming (Flaming is routinely used by the Army for decontamination of explosives and flaming is listed

as a decontamination method in EPA/600/2-85/028 March 1985 "Guide for Decontaminating Buildings, Structures & Equipment at Superfund Sites"

- Rinsing out the process equipment with a solvent (such as alcohol), as a safety precaution, to reduce the levels of explosives within the equipment to below detonable quantities
- Solvent wiping and removal of electrical wiring and controls from the Washout Plant
- Solvent-wipe cleaning of the interior galvanized steel buildings walls below 6 feet and wipe testing above 6 feet. in the washout building
- Solvent wipe cleaning of the pelletizer building (corrugated aluminum) interior walls and roof (in Alternatives 3, 5A, and 5B)

A brief description of each of the remedial alternatives follows.

Alternative 1: NO ACTION

Capital Cost: None

Operating and Maintenance Cost: None

Net Present Value: None

Months to Implement: None

Both CERCLA and Oregon DEQ regulations require that the "No Action" alternative be evaluated for every site to establish a baseline for comparison. Under this alternative, the Army would take no further action at the site to prevent exposure to the explosives in the Washout Plant or the associated washout water sump. The existing public access restrictions would continue only as long as the Army maintains control over UMDA.

Alternative 2: SUMP CLEAN-OUT/CONTROLLED ACCESS

Remedial Action Design and Planning: \$90,000

Initial Cost: \$55,000

Maintenance and Security Cost: \$7,800 per year for 30 years

Net Present Value: \$220,000 (total cost in today's dollars for current and future capital and operating costs for a period of 30 years)

**Months to Implement: Remedial Action Design and Planning = 6 months;
Construction = 2 months; Maintenance and Security = 360 months**

This alternative is the minimum action necessary to comply with the risk-based and Army safety-based cleanup requirements as long as the Army retains control of the Washout Plant. One of the other alternatives (Alternatives 3 through 5B) would be required in order to comply with Army safety requirements if the access restrictions *cannot* be maintained on the property. In Alternative 2, the water and sludge would be removed from the washout water sump and disposed of. The empty concrete sump would be flamed out to destroy any residual explosives and the concrete sump landfilled at UMDA. The soil beneath and around the sump would be analyzed for explosive contaminants and removed, as necessary, for treatment under the Washout Lagoons Soil operable unit and the hole created by removal of the sump filled with clean soil.

The building would be locked and maintained for an indefinite period of time, perhaps up to 30 years, with a review of the site health and environmental safety risks every 5 years.

Permanent access restrictions would prevent the imminent and substantial endangerment from explosives, but Army regulations would not permit release of the property without complete decontamination.

Alternative 3: HYDROBLASTING, INSPECTION, DEMOLITION, AND DISPOSAL

Remedial Action Design and Planning: \$170,000

Capital Cost: \$150,000

Treatment Operating Cost (Including pretreatment): \$570,000

Net Present Value: \$890,000

**Months to Implement: Remedial Action Design and Planning = 7 months;
Design/Construction = 2 months; Treatment Operations = 2 months**

In this cleanup alternative (hydroblasting), a high pressure water stream would be directed at the surfaces to be decontaminated. The high pressure water stream (containing abrasive grit in this application) would be used to remove (explosive) contamination and paint from the surfaces of equipment as well as about one-half inch depth of concrete from all the concrete surfaces of the building. The water from the hydroblasting operation would be treated and discharged to the ground at UMDA; the combination of wet grit, paint, concrete dust, and explosive contaminants from hydroblasting would be sent off site for disposal by incineration, blending with cement, and subsequent landfilling as a nonhazardous waste. The equipment from the building would be inspected for residual explosive and landfilled, as a nonhazardous waste, at UMDA or off site. The building would be demolished, the metal siding disposed of as scrap metal, and the concrete rubble landfilled, as a nonhazardous waste, at UMDA.

Alternative 4A: HOT GAS DECONTAMINATION, TOTAL DEMOLITION, AND DISPOSAL

Remedial Action Design and Planning: \$150,000

Capital Cost: \$410,000

Treatment Operating Cost (Including pretreatment): \$660,000

Net Present Value: \$1,220,000

**Months to Implement: Remedial Action Design and Planning = 8 months;
Design/Construction = 8 months; Treatment Operations = 4 months**

In the hot gas decontamination process, hot gas is used to vaporize and release the (explosive) contaminants from the non-porous surface of equipment and/ or from the surface or subsurface of porous materials, such as concrete. The hot gas from the building (or equipment enclosure) then passes through an afterburner (toxic fume combustor) where the contaminants removed from the building (or equipment) are destroyed. The hot gas supplied to the building (or equipment enclosure) would either be generated by a separate burner or by recycling hot gas from the afterburner.

The hot gas decontamination process has been demonstrated and shown to be effective in the removal of TNT from concrete (both surface and internal) to below detectable levels at the Cornhusker Army Ammunition Plant (AAP) in Nebraska (Arthur D. Little, 1987a) and in the removal of TNT, ammonium picrate, and smokeless powder from equipment to below detectable levels at the Hawthorne AAP in Nevada.

In this alternative, solvent wiping would be used during the pretreatment steps to decontaminate the galvanized steel siding in the washout building and the hot gas decontamination process would be used (after the general pretreatment steps) to decontaminate aluminum siding in the pelletizer building, the process equipment, and concrete floors and blast wall in both buildings. Following hot gas decontamination, the process equipment would be removed from the Washout Plant, transferred to another government facility or cut up, and disposed of as scrap metal. After complete building demolition, the concrete rubble would be disposed in a nonhazardous waste landfill on site and the sheet metal and structural steel disposed of as scrap metal.

Alternative 4B: HOT GAS DECONTAMINATION, PARTIAL DEMOLITION, AND DISPOSAL

Remedial Action Design and Planning: \$150,000

Capital Cost: \$410,000

Treatment Operating Cost (Including pretreatment): \$560,000

Net Present Value: \$1,120,000

**Months to Implement: Remedial Action Design and Planning = 8 months;
Design/Construction = 8 months; Treatment Operations = 4 months**

This alternative would be identical to Alternative 4A, except that the washout building of the Washout Plant would not be demolished, but instead would be retained for future use.

**Alternative 5A BUILDING DEMOLITION, INSPECTION, AND
DISPOSAL OF CONTAMINATED MATERIALS**

Remedial Action Design and Planning: \$240,000

Capital Cost: None

Treatment Operating Cost (Including pretreatment): \$570,000

Net Present Value: \$820,000

**Months to Implement: Remedial Action Design and Planning = 10 months;
Design/Construction = 1 month; Treatment Operations = 2 months**

In this alternative, the Washout Plant would be demolished after the pretreatment operations, so no remediation (cleanup) of the concrete would have taken place before (or after) the demolition. As part of the pretreatment operations, the interior of the process equipment would have been flushed (with a solvent such as alcohol) to remove any large quantity of explosives, but small quantities of explosive might still remain inside the equipment.

For reasons of safety, the Washout Plant concrete floor would be broken up by blasting (using blasting mats) rather than by jackhammer after demolition of the building. The contaminated process equipment and concrete rubble would be disposed of in an off-site hazardous waste landfill after the process tanks had been cut open to verify they contained no reactive quantity of residual explosives. Besides assuring that the residual explosives are non-reactive, LDRs also require that the residue pass the TCLP test for 2,4-DNT before being landfilled off site.

The structural steel and metal siding and roofing (which were cleaned up during pretreatment operations) would be disposed of as scrap metal.

**Alternative 5B: BUILDING DEMOLITION, CONCRETE TREATMENT,
INSPECTION AND DISPOSAL OF MATERIALS**

Remedial Action Design and Planning: \$180,000

Capital Cost: None

Treatment Operating Cost (including pretreatment): \$1,000,000

Net Present Value: \$1,180,000

Months to Implement: Remedial Action Design and Planning = 10 months; Design/Construction = 2 months; Treatment Operations = 6 to 9 months

Alternative 5B would be the same as Alternative 5A except that the concrete rubble from the demolition of the buildings would be burned in a rotary kiln incinerator brought on site at UMDA so the decontaminated concrete rubble could then be landfilled in a nonhazardous waste landfill on site at UMDA.

2.8 Summary of Comparative Analysis of Alternatives

This section summarizes the relative performance of each of the seven alternatives with respect to the nine CERCLA evaluation criteria.

2.8.1 Threshold Criteria

Overall protection of human health and the environment. The primary objective of this remedial action is to reduce the potential risk to human health by explosives in the washout water sump, possible residual explosive within the process equipment, and explosive contamination of the interior building surfaces.

There is, currently, no risk to the environment and minimal risk to human health due to the Washout Plant building because of the containment of the explosive contamination within the building (and process equipment) and limited access to the building. In contrast, the washout water sump poses both an environmental and human health hazard, making Alternative 1 unacceptable. All of the remaining alternatives (2, 3, 4A, 4B, 5A and 5B) would be protective of human health and the environment, both in regard to the Washout Plant and the associated washout water sump.

Compliance with ARARs. All of the alternatives (except No Action) are considered to comply with the ARARs. Disposal of the sump sludge by drying and burning the sludge in the burn pans of the ADA would comply with Army safety regulations and RCRA requirements for deactivation of reactive characteristic wastes prior to disposal. Decontamination of the empty sump by flaming prior to disposal would again comply with Army safety regulations and RCRA LDRs as well as with Oregon's requirement for cleanup to background (non-detection) where practical.

Cleanup of the interior walls of the Washout Plant by solvent wiping would meet Oregon's requirement for cleanup to background or, at least, to levels protective of human health (and the environment) and EPA's requirement for reducing human health risks to acceptable levels in the case of building reuse. Solvent washing of the process equipment interior should meet the RCRA requirement by removing and treating reactive characteristic materials (explosives) from the equipment, but it would not necessarily meet Army safety requirements or guarantee that no reactive material would remain. Of all the alternatives, however, only Alternatives 4A and 4B would assure that Army safety

regulations were met (i.e., no reactive material remained within the equipment) and non-detectable levels of explosives were achieved in regard to the process equipment.

2.8.2 Primary Balancing Criteria

Long-term effectiveness. Of all the alternatives, the greatest long-term effectiveness is offered by Alternatives 4A and 4B. All of the remaining alternatives except Alternative 1 (which has no long-term effectiveness) have adequate long-term effectiveness and permanence.

Reduction in toxicity, mobility, or volume of contaminants through treatment. Alternatives 4A and 4B would reduce toxicity, mobility, and volume of contaminants to the greatest extent through the hot gas treatment process. Alternatives 3, 5A and 5B, would somewhat reduce toxicity in regard to the equipment, and Alternatives 3 and 5B would reduce the toxicity of the concrete rubble from the building. Alternatives 3 and 5B would also reduce the volume of contaminated material. All the alternatives (except Alternative 1) would reduce mobility of the explosive contaminants through treatment of the sump and its contents. Alternative 1 provides no reduction in toxicity, mobility, or volume of contaminated materials.

Short-term effectiveness. All the remedial alternatives can be implemented in two years or less. Because the risks during implementation would be very low, there is no significant difference among these remedial alternatives in terms of short-term effectiveness. There is, however, slightly less short-term risk associated with Alternative 2 than with the other remedial alternatives because there would be no remediation activities associated with the building that could possibly result in any release.

Implementability. All of the alternatives are readily implementable from an administrative and technical standpoint. In terms of materials and services, however, Alternatives 4A and 4B would require additional time for construction and demonstration of the hot gas decontamination system.

Cost. The least costly (but effective) remedial alternative is Sump Cleanout/Controlled Access, with net present value (the value of money today spent over a period of time in the future), using a 5 percent annual interest rate, of approximately \$220,000. Alternatives 3 and 5A would have a net present value (cost) of about \$890,00 and \$820,000 respectively, while Alternatives 4A, 4B, and 5B would have a net present value cost of over \$1 million each.

2.8.3 Modifying Criteria

State acceptance. The State of Oregon concurs with the Army and EPA in the selection of Alternative 4B. In addition, the state is satisfied that the state's remedial action process was followed in evaluating remedial action alternatives for the Explosives Washout Plant Operable Unit.

Public acceptance. Based on the absence of any significant negative comments from the public, it is assumed the public supports the selection of Alternative 4B.

2.9 Selected Remedy

The selected remedy to clean up the Washout Plant and washout water sump is Alternative 4B, in which the washout water sump would be remediated by cleanout and disposal of the standing water and sludge followed by remote flaming of the sump. The Washout Plant process equipment would be decontaminated by the hot gas process before removal from the Washout Plant building. The Washout Plant buildings would be remediated by hot gas decontamination of the concrete and aluminum siding and solvent wiping of any contaminated galvanized metal siding surfaces.

All the pretreatment steps, as described in Section 2.7 (including remediation of the washout water sump), would be carried out prior to hot gas treatment, including a solvent wash of the interior of the process equipment for reasons of safety. The interior surfaces of the Washout Plant building will be treated thermally or by solvent wiping until no detectable explosives remain on the surfaces.

The hot gas process was selected for the Washout Plant operable unit because it offers the greatest reduction in toxicity, mobility, and volume of explosive contaminants, long-term effectiveness, compliance with ARARs, and protection of human health and the environment. It also utilizes permanent solutions and alternative (innovative) treatment technologies to the maximum extent possible. Finally, it makes maximum use of recovery/recycle of materials by allowing reuse of the main building for future operations and allows the cleaned up process equipment to be recycled as equipment or scrap metal.

The estimated present worth cost of Alternative 4B is about \$1,120,000. The pretreatment steps all involve proven technology. The hot gas decontamination process is a relatively new innovative technology that offers the greatest degree of equipment decontamination (to below the PRGs), and a potential for recycle of scrap metal. The estimated volume of process equipment to be treated by the hot gas process is about 3,400 cubic feet. The building surface area requiring solvent wiping during pretreatment is estimated at 5,000 to 6,000 square feet.

The major components of the selected remedy include the following:

- Pump out wet explosive sludge from the washout water sump and move it to the burn trays in the Ammunition Demolition Area (ADA) area to dry and be burned
- Pump out contaminated water from the washout water sump and add it to the compost piles being operated under the Explosives Washout Lagoon Soils Operable Unit
- Excavate and flame (by remote operation) the empty washout water sump
- Test the soil under the sump, remove any contaminated soil for treatment under the Washout Lagoon Soils Operable Unit
- Landfill the decontaminated concrete sump (after wipe testing) and refill the hole left by the sump with clean soil.

- Additional Pretreatment Steps
 - Remove and dispose of asbestos insulation from piping and process equipment in an approved off-site landfill
 - Scrape and vacuum pigeon droppings from the floors for disposal in the on-site landfill.
 - Remove electrical wiring and controls from Washout Plant (after solvent wiping) for disposal as scrap materials
 - Rinse out process equipment with solvent (such as alcohol), as a safety precaution, and send waste solvent off site to disposal (by incineration)
 - Solvent wipe any building surfaces (such as the galvanized steel siding and roof of the washout building) that indicate explosive contamination by coloration and/or reagent wipe test and dispose of the solvent wipes in an off-site hazardous waste incinerator.

Although all of the internal surfaces of the washout building of the Washout Plant that were wipe sampled met the PRGs for this ROD, it is assumed in all the alternatives in this ROD (except Alternatives 1 and 2) that the washout building walls will be solvent-wipe cleaned (and wipe tested) up to a height of 6 ft. above the floor. The washout building walls above 6 ft. will be spot tested by wipe sampling and, if any explosive is detected, also solvent-wipe cleaned. The walls in the pelletizer building will not be wipe-cleaned, but will be wipe tested after hot gas decontamination.

Following the pretreatment steps, the hot gas decontamination system would be set up with the hot gas temperature enclosure (oven) inside the Washout Plant washout building and the burners and controls outside the Washout Plant. The process equipment and piping in the washout building would be disassembled and treated, in a series of runs, in the hot gas temperature enclosure to ensure no reactive explosives remain and Army requirements for thermal treatment of explosives contaminated equipment are met. The hot gas from the hot gas treatment system will be passed through an afterburner to ensure destruction of any of the vaporized contaminants before the gas is discharged to the atmosphere. After the hot gas treatment of the process equipment in the washout building, the concrete floor and blast wall in the washout building would also be treated by the hot gas process. Finally, the hot gas process would be used to decontaminate the entire pelletizer building including the aluminum siding and process equipment (which was left in place). Following hot gas treatment, the process equipment could be transferred to another government facility, sold, or disposed of as scrap metal.

The corrugated galvanized steel siding in the washout building would be decontaminated by solvent wiping (during pretreatment) rather than by hot gas decontamination because the hot gas treatment of this siding would result in severe damage to the siding. (The zinc coating would melt at the hot gas temperatures and there could be zinc vapor emissions.)

Because this selected remedy will not result in hazardous substances remaining on-site above health-based levels, the five-year review will not apply to this action and the site will not require any long-term management or review due to the total removal/destruction of contaminants of concern and hazard.

2.10 Statutory Determinations

The selected remedy satisfies the requirements under Section 121 of CERCLA to:

- Protect human health and the environment
- Comply with ARARs
- Be cost effective
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
- Satisfy the preference for treatment as a principal element

2.10.1 Protection of Human Health and the Environment

The selected remedy, Alternative 4B, will reduce the safety and health risks to any future users of the Washout Plant.

- The safety risks of reactive materials (the explosives) from the sump and process equipment will be eliminated.
- The health and environmental risks from the washout water sump and its contents will be eliminated.
- The health risks associated with the Washout Plant interior surfaces will be reduced to acceptable limits by reducing the residual concentrations to below the PRGs.
- Environmental protection is achieved by eliminating the washout water sump as a potential source of environmental release of contaminants.

No unacceptable short-term risks or cross-media impacts will be caused by implementing Alternative 4B. During remediation, adequate protection will be provided to the community and the environment by controlling dust generated during materials handling operations and emission monitoring during the hot gas decontamination process. In addition, workers will be provided with personal protective equipment and air monitoring during all phases of remediation.

2.10.2 Compliance with ARARs

The discussion below addresses compliance of the selected remedy with chemical-specific, location-specific, and action-specific ARARs.

Chemical-specific ARARs. The major chemical-specific ARARs are to deactivate any reactive explosives in the washout plant and sump, and the State's requirement to reduce the explosives concentrations to background or non-detectable levels. The combination of sludge disposal, surface flaming of the sump, solvent wiping of the washout building siding and hot gas decontamination of the process equipment and pelletizer building will achieve these goals. These procedures will also achieve the DoD requirement to treat or clean explosives-contaminated equipment prior to unrestricted disposal. DoD explosives decontamination regulations in Technical Bulletin 700-4 specify that explosives-contaminated equipment be thoroughly decontaminated of explosives, preferably by thermal means, prior to releasing such equipment from Government control.

Thermal decontamination of highly contaminated equipment (with reactive quantities of explosives) by hot gas treatment or surface flaming down to below detection level by indicator wipe testing (1 to 10 ug/sq cm) should also meet RCRA requirements for

destruction of explosives, State of Oregon requirements for cleanup to the lowest levels protective of human health and the environment, and the risk-based PRGs.

The regulations regarding K044 and K047 wastes and reactivity are not applicable or appropriate in regard to Washout Plant building surfaces but may be classified as TBC guidance. At present, there are no chemical-specific federal or state regulations that specify action or cleanup levels for explosive-contaminated surfaces. It was for the above reasons that risk-based PRGs were developed for the Washout Plant building surfaces. The selected (multistep) remedy should actually exceed these PRGs sufficiently to meet DoD and Oregon State requirements of decontamination to non-detectable levels.

The RCRA reactivity and/or ignitability criteria would however, be either applicable or relevant and appropriate, however, to disposal of four of the waste materials that might be generated during remediation. These are:

- possible residual explosives remaining within process equipment
- the sludge in the washout water sump
- spent solvent from process equipment washout
- solvent wet cloths used for solvent wiping of the building or equipment surfaces

The above four items would be disposed of by burning or incineration to comply with the land disposal regulations for disposal of characteristic reactive or ignitable, or listed spent solvent wastes.

The sludge from the washout water sump and any solid explosive residue removed from the interior of the process equipment would be disposed of by burning in the burn trays of the ADA. The waste solvent and solvent wet rags would be sent to an off-site hazardous waste incinerator for disposal.

Since the selected remedy is expected to achieve cleanup to non-detectable (i.e., background) levels of explosives in the sump, washout plant buildings and process equipment, it should thereby meet DEQs requirement for cleanup to background levels.

Location-specific ARARs. No location-specific ARARs are triggered for this alternative. Although areas of the UMDA installation provide critical habitat for threatened or endangered species, no activities at the Explosives Washout Plant are expected to impact those habitats. No archaeological or historic resources are known to exist in vicinity of the washout plant or to be affected by the remedial action. The washout plant operable unit is not located within or near a wetland or floodplain.

Action-specific ARARs. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. Testing or monitoring of the off-gas from the hot gas system afterburner will be required by the state or EPA. Open burning in the ADA burn trays such as used for deactivation of the sump sludge would normally be a state permitted operation. Currently, a state air contaminant discharge permit allows open burning and open detonation of explosive materials in the ADA. Although the permit may not still be in force at the time of the

Washout Plant remediation, the conditions of the permit would still be met during remediation. These open burning/open detonation activities are listed in UMDA's RCRA part B permit application and are currently being carried out under interim status.

OSHA safety requirements will have to be observed during removal of the asbestos from the Washout Plant equipment and piping by a licensed contractor as well as during the handling of solvents used for rinsing out the process equipment and performing the solvent wiping of surfaces. All the hazardous waste operations requirements of 29 CFR 1910.120 will also have to be met during site remediation.

The asbestos waste, waste solvent and solvent wet rags must be handled on-site in compliance with RCRA regulations and disposed of off-site in RCRA permitted facilities.

Finally, Army safety approval will be required for the plans for decontaminating the washout water sump by remote flaming and Army safety requirements will have to be met during disassembly of the equipment and piping and during its decontamination by the hot gas process.

2.10.3 Cost-Effectiveness

Although it is more costly than several of the other alternatives, the Hot Gas Decontamination Alternative is the only alternative that assures compliance with Department of the Army explosives decontamination regulations and ARARs while also preserving the value of the washout building for future use under the BRAC Program. It also provides the greatest overall protection of human health and the environment, compliance with ARARs, long-term effectiveness, and the reduction of toxicity, mobility, and volume of all the alternatives.

2.10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy of hot gas treatment of the pelletizer building, process equipment and concrete portion of the washout building of the Washout Plant meets the statutory requirements to utilize permanent solutions (because of complete destruction of the explosive contaminants) and alternative (innovative; more efficient) treatment technologies to the maximum extent practical. An analogous treatment technology, flaming, will provide for permanent decontamination of the washout water sump.

This remedy also provides for the maximum use and recycle of materials through reuse of the washout building of the Washout Plant for other activities and reclaim of process equipment for reuse or recycle as scrap metal.

The support of the state and community in the evaluation process and the selection of Alternative 4B, Hot Gas Decontamination, further justify the selection of this alternative.

2.10.5 Preference for Treatment as a Principal Element

The statutory preference for treatment is satisfied by using the hot gas decontamination process as the primary means for addressing and destroying the explosives contaminants in the Washout Plant building and flaming for the decontamination of the washout water sump.

2.11 Documentation of Significant Changes

The selected remedy was the preferred alternative presented in the Proposed Plan. No changes have been made.

3.0 Responsiveness Summary

The final component of the ROD is the Responsiveness Summary, which serves two purposes. First, it provides the agency decision makers with information about community preferences regarding the remedial alternatives and general concerns about the site. Second, it demonstrates to members of the public how their comments were taken into account as part of the decision-making process.

Historically, community interest in the UMDA installation has centered on the impacts of installation operations on the local economy. Interest in the environmental impacts of UMDA activities has typically been low. Only the proposed chemical demilitarization program, which is separate from CERCLA remediation programs, has drawn substantial comment and concern.

As part of the installation's community relations program, UMDA assembled in 1988 a Technical Review Committee (TRC) composed of elected and appointed officials and interested citizens from the surrounding communities. Quarterly meetings provide an opportunity for UMDA to brief the TRC on installation environmental restoration projects and to solicit input from the TRC. Approximately 20 TRC meetings have been held since the TRC was created. A TRC meeting was held on January 27, 1993, during preparation of the feasibility study for the Explosives Washout Plant Operable Unit. In that meeting, the TRC was briefed on the scope and methodology of the remedial alternatives considered in the feasibility study. In December 1993, the TRC was changed to a Restoration Advisory Board (RAB) with similar functions. Two RAB meetings have been held since then.

The feasibility study and proposed plan for the Explosives Washout Plant Operable Unit were made available to the public on February 15, 1994, at the following information repositories: UMDA Building 32, Hermiston, Oregon; the Hermiston Public Library, Hermiston, Oregon; and the EPA office in Portland, Oregon. The documents constituting the administrative record for this site were made available at the office of the BRAC Environmental Coordinator, Umatilla Depot Activity, Building 32, Hermiston, Oregon 97838.

Notice of the public comment period, public meeting, and availability of the proposed plan for the Washout Plant was published in the legal announcement section of *Hermiston Herald*, the *Tri-City Herald*, and the *East Oregonian* on February 15, 1994.

A public meeting was held at the Armand Larive Junior High School, Hermiston, Oregon, on March 2, 1994, to inform the public of the preferred alternative and to seek public comments. At this meeting, representatives from UMDA, USAEC, EPA, ODEQ, and Arthur D. Little presented the proposed remedy and were available to answer questions regarding the preferred alternative. Six persons from the public and media attended the meeting. Questions asked during the informal question and answer period requested more detail regarding enclosing the Washout Plant during remediation (not required) and the effect of the hot gas decontamination process on the structural integrity of the buildings (only a minor effect). The public comment period ended on March 17, 1994.

Two written comments were received during the public comment period following the March 2, 1994, public meeting. These comments and the Army responses have been included as attachments to this Responsiveness Summary.

Comment No. 1

I am very concerned about the Army's plan to incinerate weapons at the Umatilla Army Depot. Incineration is not safe. What we burn is not filtered out 100% and more and more is being discovered every year about the health risks involved in incineration.

Army Response

Thank you for your interest in the cleanup plans for Umatilla Depot Activity. The cleanup plans that are currently under consideration and were discussed at the March 2, 1994, Public Meeting were directed to the cleanup of contaminated soil, ground water and buildings and do not involve chemical or conventional weapons. In addition, incineration usually refers to burning solid or liquid materials, neither of which is proposed for UMDA for any of the remediation (cleanup) sites that were discussed during the March 2, 1994, presentation at the Armand Larive Junior High School.

Afterburners and/or scrubbers are often used following an incinerator as an air pollution (or safety) control devices to make sure no unburnt materials, dust, or acid gases from the incinerator escape to the environment.

In the hot gas process proposed for the Washout Plant at UMDA, hot air (or combustion gases) would be passed through an insulated section of the building or insulated enclosure containing explosive contaminated equipment to break down and vaporize the residual explosives (any explosives left behind after other cleanup methods, such as solvent washing, were used). The hot gases would then be passed through an afterburner at 1,800°F to make sure any explosive breakdown products are thoroughly destroyed. This hot gas process has been tested at two Army ammunition plants. Test results showed no acid gas or dust emission that would require a scrubber. The only fully accepted method for destroying explosives in contaminated equipment where residual explosives may be caught in cracks or crevices, and where the explosives cannot be safely removed by any other means, thus posing potential for explosion is by heating.

At many existing explosive production plants, explosive contaminated equipment is heated in ovens, to destroy residual explosives, without air pollution control systems such as afterburners. However, it is likely that in the future, air pollution controls (such as afterburners) will be required by the EPA.

Comment No. 2

We agree that it is necessary to cleanup specific areas at the UMDA due to contamination problems. We can not support any project that uses incineration as a disposal method or cleanup method. Incineration changes one form of contamination into another by releasing emissions through the smokestack.

Why was there no public notice about membership on this commission? An announcement at the March 2, 1994, Public Meeting is not an acceptable method of notifying the public about commission membership applications.

Army Response

Thank you for your interest in the cleanup plans for Umatilla Depot Activity. Incineration usually refers to burning solid or liquid materials, neither of which is proposed for UMDA for any of the remediation (cleanup) sites that were discussed during the March 2, 1994, presentation at the Armand Larive Junior High School.

Afterburners and/or scrubbers are often used following an incinerator as an air pollution (or safety) control devices to make sure no unburnt materials, dust, or acid gases from the incinerator escape to the environment.

In the hot gas process proposed for the Washout Plant at UMDA, hot air (or combustion gases) would be passed through an insulated section of the building or insulated enclosure containing explosive contaminated equipment to break down and vaporize the residual explosives (any explosives left behind after other cleanup methods, such as solvent washing, were used). The hot gases would then be passed through an afterburner at 1,800°F to make sure any explosive breakdown products are thoroughly destroyed. This hot gas process has been tested at two Army ammunition plants. Test results showed no acid gas or dust emission that would require a scrubber. The only fully accepted method for destroying explosives in contaminated equipment where residual explosives may be caught in cracks or crevices, and where the explosives cannot be safely removed by any other means, thus posing potential for explosion is by heating.

At many existing explosive production plants, explosive contaminated equipment is heated in ovens, to destroy residual explosives, without air pollution control systems such as afterburners. However, it is likely that in the future, air pollution controls (such as afterburners) will be required by the EPA.

Guidance on forming Restoration Advisory Boards (RABs) is still being developed within the Army. Current draft guidance provides options for soliciting membership. One such option, issuing a news release, was used at the Umatilla Depot. A news release was issued on December 9, 1993 to the *Hermiston Herald*, *East Oregonian*, and *Tri-City Herald*, and various local radio and TV stations. The release indicated that the Umatilla Depot was forming a RAB from the existing Technical Review Committee (TRC), and that interested persons wishing to join the RAB should attend the TRC meeting on December 15, 1993. Only the *East Oregonian* printed the meeting notice, and did not note the open membership to the RAB.

In order to ensure that an invitation to the RAB is published, a paid advertisement will be placed in the *Hermiston Herald*, *East Oregonian*, and *Tri-City Herald* in April 1994. Anyone who responds will be given a fact sheet and RAB membership application. Membership applications will be accepted through May 31, 1994.

Appendix A
Oregon DEQ Letter of Concurrence

Oregon

**DEPARTMENT OF
ENVIRONMENTAL
QUALITY**

July 26, 1994

Mr. Chuck Clarke
Regional Administrator, Region 10
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Re: Umatilla Depot Activity
Explosives Washout Plant
Operable Unit
Record of Decision

Dear Mr. Clarke:

The Oregon Department of Environmental Quality (DEQ) has reviewed the final Record of Decision, for the Explosives Washout Plant Operable Unit at the U.S. Army's Umatilla Depot Activity (UMDA). I am pleased to advise you that DEQ concurs with the remedy recommended by EPA and the Army. The major components of that remedy include:

- Removal, treatment and disposal of explosives-contaminated wastewater and sludge from the concrete sump;
- Decontamination by flaming, demolition and landfill disposal of the concrete sump;
- Pretreatment of the Washout Plant process equipment (removal of asbestos, cleanup of pigeon droppings, and solvent flush);
- Treatment by solvent wiping of galvanized steel siding, and by hot gas decontamination of the aluminum siding, concrete and process equipment;
- Removal and recycling/disposal of the process equipment; and,
- Demolition of the pelletizer building.

I find that this remedy is protective, and to the maximum extent practicable is cost effective, uses permanent solutions and alternative technologies, is effective and implementable. Accordingly, it satisfies the requirements of ORS 465.315, and OAR 340-122-040 and 090.



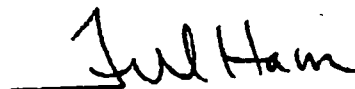
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993
DEQ-1

Chuck Clarke
Page 2

It is understood that placement of any demolition wastes from this operable unit into the Depot's Active Landfill is subject to the requirements of the permit for the landfill, previously issued by this Department.

If you have any questions concerning this matter, please contact Bill Dana of DEQ's Waste Management and Cleanup Division at (503) 229-6530.

Sincerely,



Fred Hansen
Director

BD:m

SITE\SM5939

cc: Lewis D. Walker, DOD
LTC. Moses Whitehurst, Jr., UMDA
Harry Craig, EPA-OOO
Jeff Rodin, EPA, Seattle
Bill Dana, DEQ/WMCD
Stephanie Hallock, DEQ/ERO

Appendix B

References

The following references are included with this ROD as a convenience to the reader and only constitute a partial list of the documents used in the preparation of the ROD. A complete listing of the documents used in the preparation of this ROD and other official reports and records pertaining to this operable unit are contained in the administrative record for this operable unit. The administrative record is available for review at the office of the BRAC Environmental Coordinator, Umatilla Depot Activity, Building 32, Hermiston Oregon, Monday through Thursday, 8 AM - 4 PM (503) 564-5294.

1. Arthur D. Little, Inc. 1993. *Final Feasibility Study for the Explosives Washout Plant - Building 489 (OU-6) at the Umatilla Depot Activity (UMDA)*. Prepared for U.S. Army Environmental Center, Contract DAAA15-91-D-0016, Delivery Order No. 2. December.
2. Arthur D. Little 1987a. *Pilot Plant Testing of Caustic Spray/Hot Gas Building Decontamination Process*. Prepared for U.S. Army Toxic and Hazardous Materials Agency, Contract No. DAAK11-85-D-0008, Task Order No. 5. August 1987.
3. Arthur D. Little, Inc. 1987b. *Testing to Determine Relationship Between Explosive Contaminated Sludge Components and Reactivity*. Prepared for the U.S. Army Toxic and Hazardous Materials Agency. Report No. AMXTH-TE-CR-86096, January 1987.
4. CH2M Hill and Morrison Knudsen Environmental Services. 1992. *Feasibility Study for the Explosives Washout Lagoons (Site 4) Soils Operable Unit, Umatilla Depot Activity, Hermiston OR*. Prepared for the U.S. Army Toxic and Hazardous Materials Agency, Contract DE-AC06-76RL 01830. April 1992.
5. Dames & Moore. 1990. *Final Enhanced Preliminary Assessment for Umatilla Depot Activity*. Volumes 1 and 2. Prepared for the U.S. Army Toxic and Hazardous Materials Agency, Contract No. DAAA15-88-D-0008, Delivery Order No. 3. April 1990.
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7. Dames & Moore. 1992b. *Final Remedial Investigation Report for the Umatilla Depot Activity Hermiston, Oregon*. Volumes 1 through 6. Prepared for the U.S. Army Toxic and Hazardous Materials Agency, Contract No. DAAA15-88-D-0008, Delivery Order No. 3. August 1992.
8. Dames & Moore. 1994. *Addendum to the Human Health Baseline Risk Assessment Explosives Washout Plant Umatilla Depot Activity, Hermiston OR*. Prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, MD, Contract No. DAAA 15-88-D-0008, Delivery Order 3. February 1994.
9. New Jersey Department of Environmental Protection. 1992. *Technical Basis and Background for Cleanup Standards for Contaminated Sites*, NJAC 7:26D.

10. Oak Ridge National Laboratory (ORNL). 1991. *Assessment of Applicable or Relevant and Appropriate Requirements (ARARs) for Umatilla Depot Activity, Explosive Washout Lagoons, Oregon*. Prepared by the Health and Safety Research Division of ORNL for the U.S. Army Toxic and Hazardous Materials Agency. May 1991.
11. U.S. Army Installation Restoration Program, 1992. *Record of Decision Umatilla Depot Activity Explosives Washout Lagoons Soils Operable Unit* (Sept. 1992)
12. U.S. Environmental Protection Agency. 1992. *Drinking Water Health Advisory for 2,4- and 2,6-Dinitrotoluene*, Health and Ecological Criteria Division, Office of Science and Technology, Office of Water, Washington, D.C., April 1992.
13. U.S. Environmental Protection Agency. 1991a. *Health Effects Assessment Summary Tables*, First Quarter FY 1991, OERR 9200.6-303-(91-1), Washington, D.C.
14. U.S. Environmental Protection Agency 1991c. *Integrated Risk Information System, Online, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office*, Cincinnati, Ohio. September, 1991.
15. U.S. Environmental Protection Agency 1989. *Interagency Agreement Between the U.S. Environmental Protection Agency, Region X, the Oregon Department of Environmental Quality, the U. S. Army, and the U.S. Army Depot Activity Umatilla*. October 31, 1989.