PLAN PART IV: ECOSYSTEM STATUS REPORT

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DRAFT:
ECOSYSTEM STATUS (Plan Part IV & TASK 4 element) REPORT
REGARDING U.S. ARMY TRANSFER OF
THE UMATILLA CHEMICAL DEPOT TO
THE LOCAL REUSE AUTHORITY,
HERMISTON, OREGON

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Pendleton, Oregon 97801
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ACRONYMS, ABBREVIATIONS, AND UNITS

AC	asbestos cement (pipe)
AQI	air quality index
ATSDR	Agency for Toxic Substances and Disease Registry
B.P.	before present
CERFA	Community Environmental Response Facilitation Act
CFR	Code of Federal Regulations
CTUIR	Confederated Tribes of the Umatilla Indian Reservation
DBP	disinfection by-products
FICWD	Federal Interagency Committee for Wetlands Delineation
ft	feet
gpm	gallons per minute
GWMA	Groundwater Management Area
hr	hour
INRMP	Integrated Natural Resources Management Plan
IWW	Institute for Water and Watersheds (at Oregon State University)
LUB	Lower Umatilla Basin
MCL	maximum contaminant level (in drinking water)
$\mu g/m^3$	micrograms per dry standard cubic meter
µg/L	micrograms per liter (= parts per billion)
mg/L	milligrams per liter (= parts per million)
mph	miles per hour
MPN	most probable number (of microbes)
NAAQS	National Ambient Air Quality Standard
ODEQ	Oregon Department of Environmental Quality
ODHS/DWP	Oregon Department of Human Services/Drinking Water Program
OHTAC	Oregon Historic Trails Advisory Council
ONHIC	Oregon Natural Heritage Information Center
OU	operable unit
$PM_{2.5}$	particulate matter 2.5 – microns (or less) in diameter
PM_{10}	particulate matter 10 – microns (or less) in diameter
ppb(m)	parts per billion (million)
pCi/l	pico-Curie/liter
PVC	polyvinyl chloride (pipe)
RDX	Royal Demolition Explosive (hexahydro–1,3,5–trinitro–1,3,5–triazine)
RTE	rare, threatened, endangered (plant-animal species)
SAIC	Science Applications International Corporation
ssp.	subspecies (of a particular species)
TNT	2,4,6 – trinitrotoluene
UMCD	Umatilla Chemical Depot
UMCDF	Umatilla Chemical Agent Disposal Facility
USACE	United States Army Corps of Engineers
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency
UFSG	Unhealthy for Sensitive Groups
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

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1. TOPOGRAPHY

The Umatilla Chemical Depot (UMCD) lies within the Umatilla Lowlands portion of the Columbia Plateau physiographic province. The UMCD lies within a level to gently sloping plain. In the north half of the Depot, the land generally slopes north to northwest towards the Columbia River; lands in the southern half tend to slope towards the southeast to south. The UMCD consists of two terraces separated along Coyote Coulee (Figure 1-1). Elevations across the Depot range from about 420 feet above mean sea level in the northwestern corner to about 670 feet on the eastern rim of the Coulee, within the northeast quadrant of the site.

Parallel, lacustrine-deposited dune lines are a predominant feature in the northernmost third of the Depot. The northeast trending aeolian deposits of loess-like materials were formed by strong winds blowing from the southwest.

The second prominent surface feature, Coyote Coulee, is a valley that cuts across the Depot along a northeast axis. The western edge has slopes of 5 to 10%. The eastern edge is an escarpment 60 to 90 feet deep, with 30 to 45% slopes. The coulee appears to be a relict of late-Pleistocene age, catastrophic flooding within the Columbia River drainage. The Depot has no well-developed surface drainage features, probably due to the area's low annual precipitation and rapid infiltration into the coarse-textured soils.

2. ATMOSPHERIC RESOURCES

2.1 CLIMATE

2.1.1 Current Conditions

The UMCD is located within Oregon's North Central Climatic Zone (No. 6) established by the National Climatic Data Center. The Depot lies within the rain shadow of the Cascade Mountains, resulting in a dry continental climate characterized by significant variations in both temperature and precipitation between winter and summer (Table 2-1). Inspection of this table indicates the UMCD has a moderate semi-arid climate with cool-moist winters and hot-dry summers.

Table 2-1. Historic and Projected Climate Data for the UMCD and Vicinity [a, b]

Tri-Monthly Intervals										
	Dec.-Feb.		**Mar.-May**		**Jun.-Aug.**		**Sep.-Nov.**		**Annual Average**	
Time Periods	**Temp.**	**Pptn.**	**Temp.**	**Pptn.**	**Temp.**	**Pptn.**	**Temp.**	**Pptn.**	**Temp.**	**Pptn.**
Current	35.7 (44.1)	3.3	53.3 (66.6)	2.1	71.0 (86.4)	1.0	52.5 (65.7)	2.2	53.1 (65.7)	8.6
Projected	37.6	3.2	55.4	2.0	74.7	0.9	55.2	2.5	56.3	8.6

[a] Monthly and annual average precipitation data (inches) are for Boardman, OR for the period 1971-2000. Monthly mean and monthly maximum average (in parentheses) temperature data are for Heppner, OR for the period of 1971-2000. Both data sets were prepared by Taylor et al. (no date).

[b] Projected data were generated by MSE from regional climate data modeling performed by Salathe, Jr. et al. (2009), for the period 2030-2059.

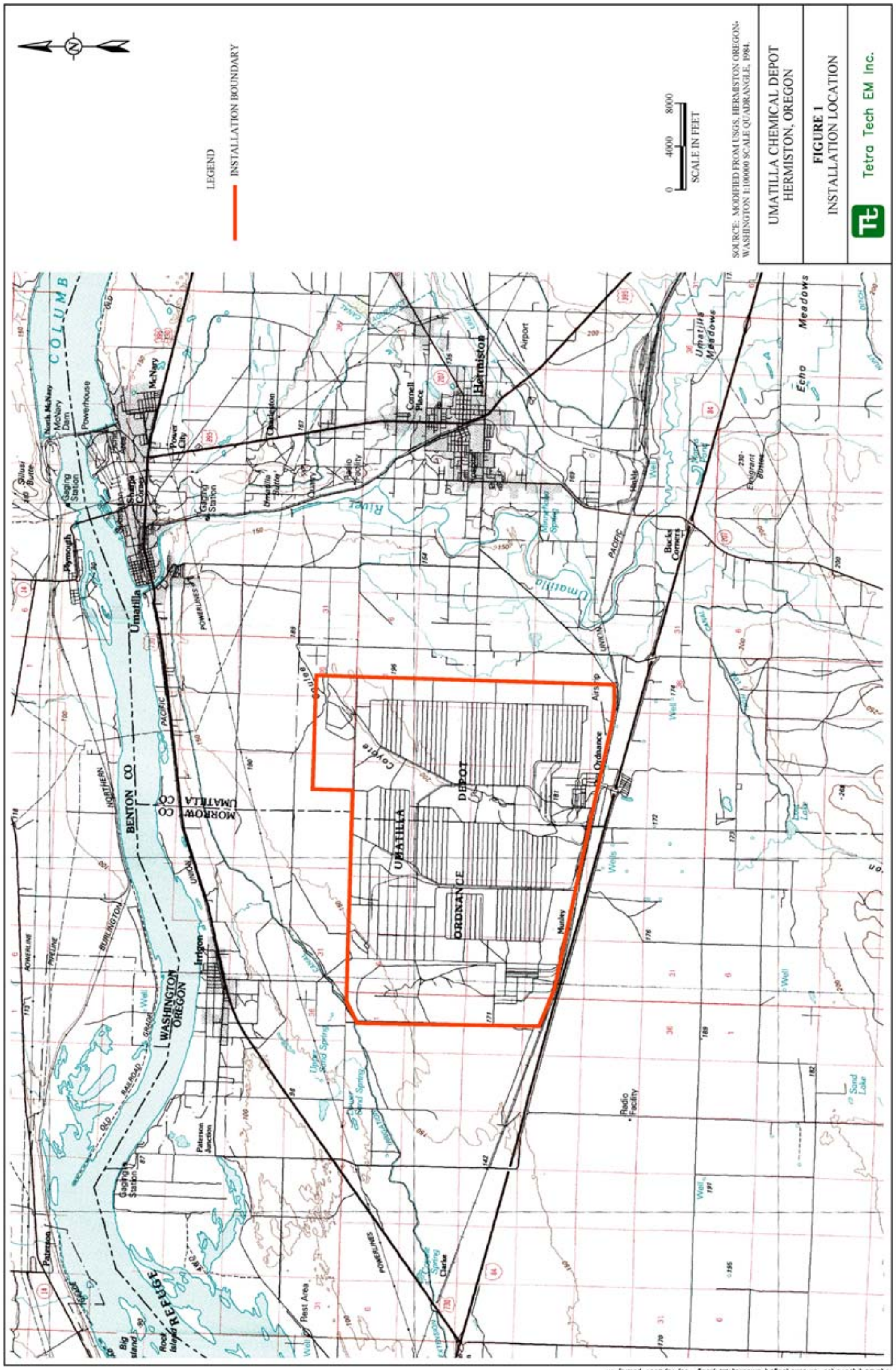

Figure 1-1. Umatilla Chemical Depot (UMCD) location map.
Source: Tetra Tech, 2002a.

The Columbia Gorge moderates air temperatures by allowing maritime air to reach the area from the west. Wind is also channeled by the Columbia River Valley. Such effect, in conjunction with a generally prevailing westerly wind, results in a west-southwest wind at the Depot (Figure 2-1). However, down valley winds during night and early morning hours plus morning winds from the Blue Mountains are also common. The mean annual wind velocity, calculated from the on-post 330-ft tall meteorological monitoring tower between 1995 and 2000, is 8.7 mph; annual and monthly average windroses for the UMCDF site are found in the Risk Assessment Work Plan (Ecology and Environment, 2004; Section 3). Wind velocity and direction are subject to rapid change.

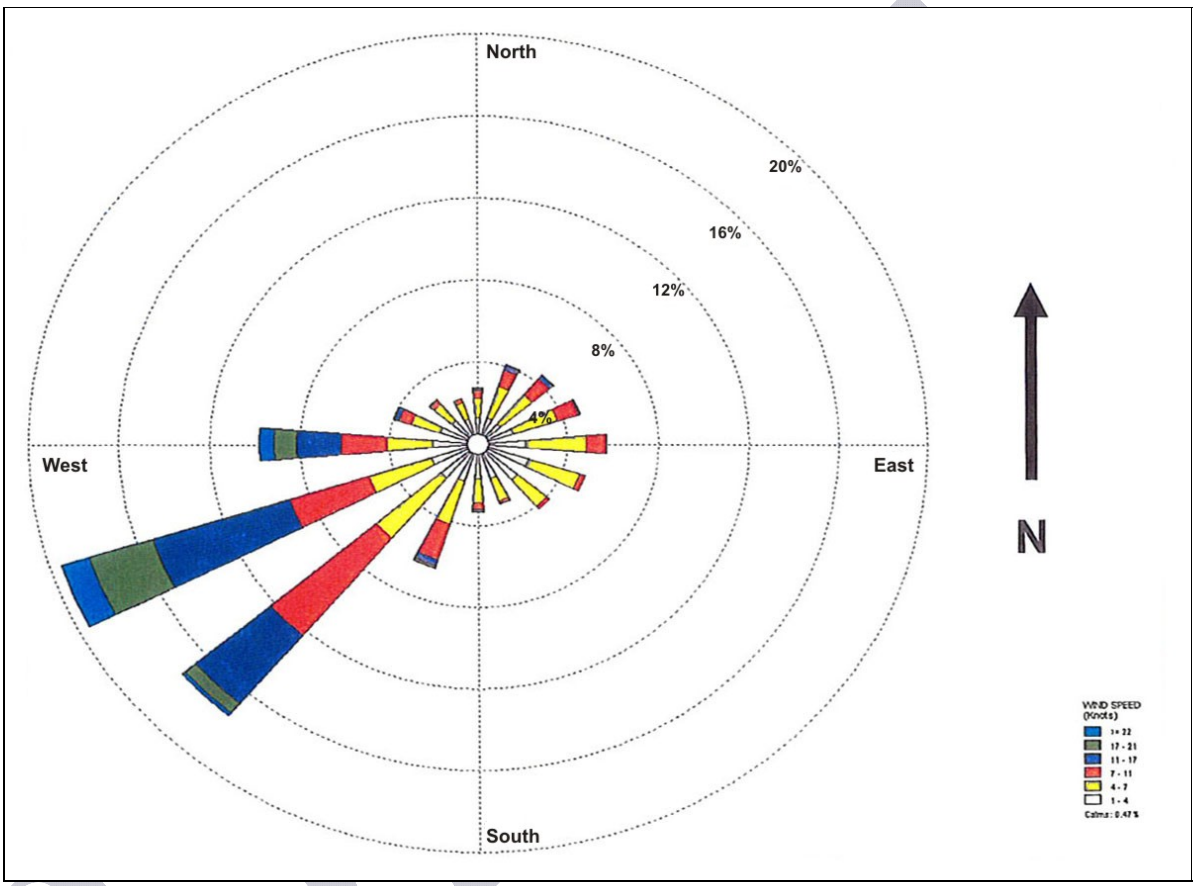

Figure 2-1. Annual windrose for the UMCDF site; wind is indicated in the "blowing-from" direction.
Source: CTUIR, 2009.

Predominating, stagnant high pressure systems in the north and east during summer and early fall can result in dry-hot southerly air at the Depot. Interactions between southerly air and cold fronts can produce thunderstorms with brief, but intense, rainfall and/or lightning strikes; the latter event increases the risk of rangeland wildfire. A tornado would be an extremely rare event at the UMCD; even the lowest storm category (of 42-72 mph sustained wind) has a recurrence rate of over 220,000 years (SAIC, 2002; p. 5-23).

2.1.2 Projected Conditions

Regional-scale modeling of climate change over the next 20 or more years has some uncertainties (Salathe, Jr. et al., 2009). Nevertheless, there is sufficient likelihood of a warmer (but not necessarily wetter) "future" to justify planning of adaptive responses to such changes at the Depot. The potential changes are shown in Table 2-1 above. Other anticipated outcomes include:

- More intense storms in the fall (i.e., 24-hr events with ≥ 0.5 inch precipitation) and more frequent heat wave events (i.e., daily heat index values > 89.6 °F) during the summer (Salathe, Jr. et al., 2009);
- 10 to 15% decreases (from present) in rooting zone soil moisture levels during the growing season (Elsner et al., 2009); and
- Increased germination and growth rates of such winter annuals as cheatgrass (*Bromus tectorum*), (Stockle et al., 2009).

It is not presently clear whether these "extreme" winter or summer precipitation events would exceed current design standards for stormwater runoff management (Rosenberg et al., 2009). However, changes in total and/or seasonal distribution of precipitation could adversely affect shrub-steppe plant communities (Bates et al., 2006) and soil fertility/stability conditions (Aguilar et al., 2009).

2.2 AIR QUALITY

Recent air quality monitoring data for the UMCD site vicinity are shown in Table 2-2, while Air Quality Index summaries for the Hermiston Airport monitoring site are shown in Table 2-3. Inspection of these data indicates that air quality conditions are fair-to-good in the vicinity of the UMCD. "Moderate" AQI periods generally occurred from mid-October through early December in 2007; similar conditions were observed intermittently from May through August in 2008. The "USFG" episode in 2008 occurred in late January. The most likely sources of $PM_{2.5}$ are combustion of fossil fuels/biomass and dust generation.

Table 2-2. Data summary for the Hermiston Air Quality Monitoring Stations [a]

Part A. Particulate Matter							
				24-hr Averages		**Primary NAAQS**	
Parameter (units)	**Stn. Code**	**Year**	**Mean Conc.**	**Max. (date)**	**95th Percentile (date)**	**Annual**	**24-hr**
$PM_{2.5}$ (µg/m^3)	HMA	2007	Not Calculated	28 (11/08)	23 (11/23)	15	35
PM_{10} (µg/m^3)	HPS	2001	23.0	55 (10/04)	52 (05/19)	None	150
Part B. Ozone							
						Primary NAAQS	
Parameter (units)	**Stn. Code**	**Year**	**Summer Average**	**1-hr Max. (date)**	**8-hr Max. (date)**	**1-hr**	**8-hr**
Ozone (ppm)	HMA	2007	0.031	0.082 (04/05)	0.069 (06/02)	0.12	0.075
	HMA	2008	0.028	0.081 (07/01)	0.074 (07/01)	0.12	0.075
Part C. Nitrogen Dioxide							
						Primary NAAQS	
Parameter (units)	**Stn. Code**	**Year**	**Annual Arith. Mean**	**Max. 1-hr Avg. (date)**		**Annual Arith. Mean**	
Nitrogen Dioxide (ppm)	HMA	2007	0.008 (summer data	0.047 (09/01)		0.053	

			only)				
Part D. Sulfur Dioxide							
						Primary NAAQS	
Parameter (units)	**Stn. Code**	**Year**	**24-hr Avg. Max.**	**Annual Average**		**24-hr**	**Annual Arith. Mean**
Sulfur Dioxide (ppm)	HMA	2007/2008 (364 days)	0.002	0.001		0.14	0.03

[a] HMA = Hermiston Municipal Airport (ODEQ No. 31000) and HPS = Hermiston Pump Station (ODEQ No. 24735) monitoring sites.

Source: Oregon Department of Environmental Quality, 2009.

Table 2-3. Hermiston air quality index data for 2007 and 2008

Part A. 2007 Data			
Health Category	**Total Days**	**$PM_{2.5}$**	**Ozone**
Good	274	278	301
Moderate	34	30	4
USFG[a]	0	0	0
Unhealthy	0	0	0
Missing	57	57	60
Total	365	365	365
Part B. 2008 Data			
Health Category	**Total Days**	**$PM_{2.5}$**	**Ozone**
Good	198	55	143
Moderate	14	8	6
USFG[a]	1	1	0
Unhealthy	0	0	0
Missing	4	5	4
Total	217	69	153

[a] USFG = Unhealthy for sensitive groups (i.e., persons with heart disease, respiratory disease, older adults, and children should reduce prolonged or heavy exertion).

Source: Oregon Department of Environmental Quality, 2009.

Air toxics of concern (e.g., polycyclic organic matter, elemental mercury) were not monitored at the Hermiston sites. The Comprehensive Monitoring Program associated with the UMCDF operations does analyze for a number of metals and organic compounds in soil and biota, but not in air samples (Washington Demil. Co., 2008; Table 3-1). However, continuous sampling and analysis for presence of chemical warfare agents (e.g., sulfur-mustard, HD) in air does occur throughout the UMCD and beyond.

3. GEOLOGY

The UMCD is situated in the Dalles-Umatilla structural basin, located within the Columbia Plateau physiographic province. The Depot is located on the southern side of this depression, in an area known as the Umatilla Plateau and Lowlands (Wozniak, 1995).

The near surface geological strata on the Plateau include Holocene- (< 12 thousand years before present, B.P.) to Pliocene-aged (< 10.5 million years B.P.) sediments. These surficial materials are underlain by Miocene-aged (> 10.5 million years B.P.) flood basalts of the Columbia River Basalt Group. A brief description of each major strata, from youngest to oldest, is presented below.

A thin (0-10 ft thick) veneer of wind-deposited silt (loess) and sand lies nearest to surface, and essentially provides the parent materials for the overlying soils (Section 4). The Pleistocene-aged (ca. 12-18 thousand years B.P.) alluvium was deposited during catastrophic releases of upstream glacial lake waters. The “Missoula” or “Spokane” flood deposits are 100-200 ft thick at the UMCD, and are know locally as the Ordnance Gravels. The basalt formations were formed by many individual flows of varying thickness. The flows are generally characterized by dense, vertically-jointed centers and relatively porous top and bottom surfaces. The individual flows are often separated by sedimentary layers composed of gravel, sand, silt, and clay. The UMCD is underlain by the youngest formation, the Saddle Mountains Basalt, which is at least 1,500 ft thick at the Depot (Wozniak, 1995).

The near-surface mineral resources are limited to the Ordnance Gravels that have been used for on-site road and other construction activities. There are no known mineral deposits, including oil and coal, on or in the vicinity of the Depot (Canestorp, 2007; p. 16).

Structural deformation in the UMCD vicinity apparently reached it maximum between 7 and 2 million years B.P., and has been tectonically inactive since that time (Benkendorf Associates et al., 1993; p. II-2). Large seismic events (≥ 6.1 on the Richter Scale) occur about once every 500 years in the UMCD region. Such events could result in collapse of elevated tanks and factory stacks, and cause frame house to move on foundations if not bolted down. More damaging earthquakes (6.7 on the Richter Scale) occur about every 3,000 years in the area. With the possible exception of the storage igloos, most of the components and structures at UMCD are likely to withstand most earthquakes expected to occur at, or in the vicinity of, the Depot (SAIC, 2002; Section 5.1).

4. SOIL RESOURCES

4.1 SOIL SERIES

The three soil series identified at the UMCD are Burbank loamy fine sand, Quincy fine sand, and Quincy loamy fine sand (Figure 4-1). All series are of aeolian origin (deposited by the wind), are unconsolidated, and therefore are susceptible to severe wind erosion when vegetative cover is removed. Burbank loamy fine sand is very deep, excessively drained soil formed in gravelly deposits and wind-worked material. Organic matter in the upper layer is low. Below this, a dense, very cobbley and gravelly layer restricts root penetration. Permeability is rapid throughout the column, and the water-holding capacity is low. Soil pH in the upper layer is near neutral (6.4 to 7.8), but beginning in the gravel layer, the pH increases to 8.4 (Ecology and Environment, 2004).

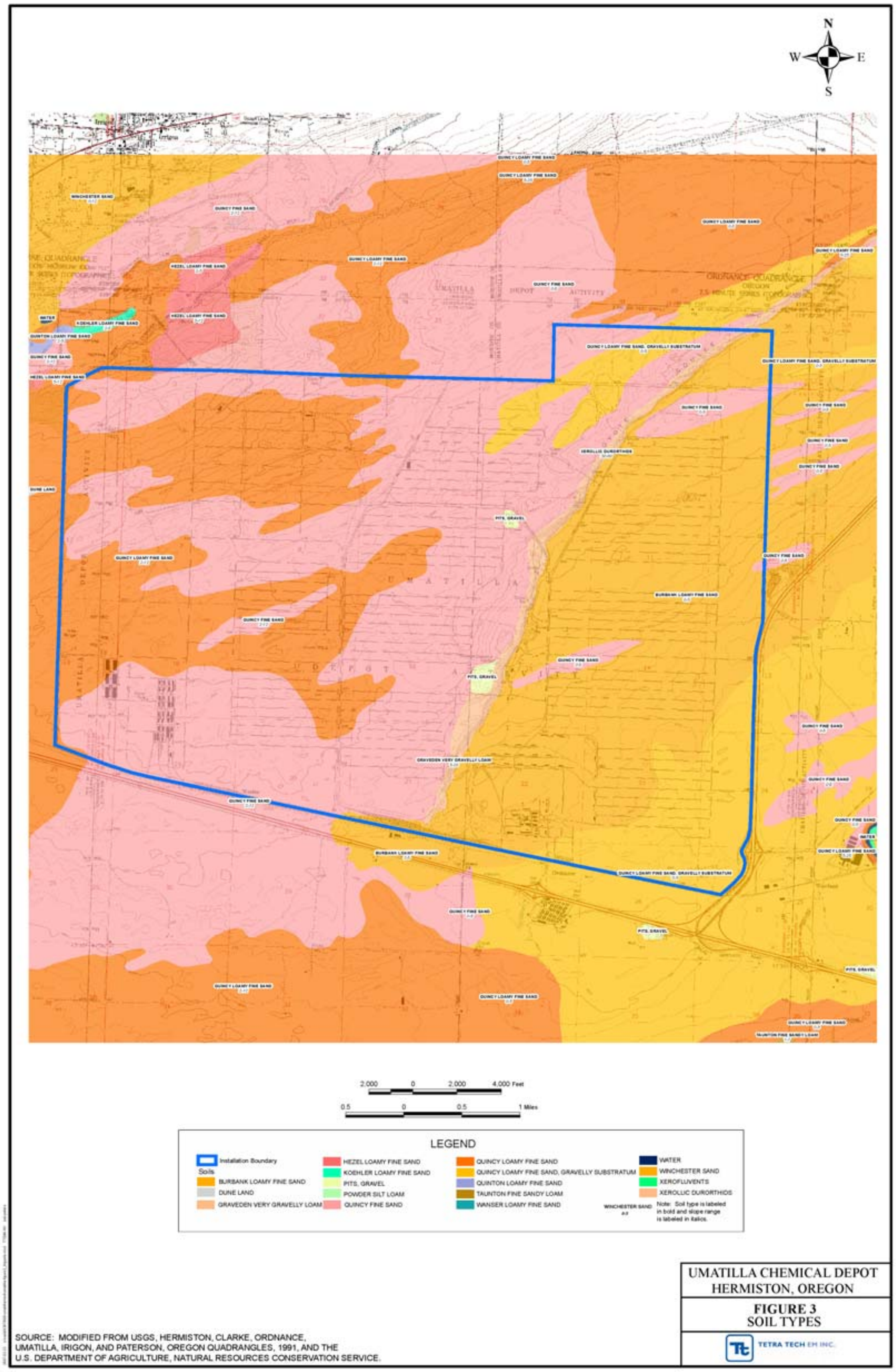

Figure 4-1. Soils map for the UMCD and vicinity
Source: Tetra Tech, 2002a.

Quincy fine sand is very deep, excessively drained soil formed in mixed sand. Permeability is rapid, and water-holding capacity is low. Effective rooting depth is greater than 5 ft. However, 80% of roots are found in the upper 12 inches. Soil pH gradually increases with depth from near neutral to 8.5 at 5 ft. Organic matter content is low (Ecology and Environment, 2004).

Quincy loamy fine sand is very similar to the quincy fine sand but occurs on slightly flatter slopes and has slightly more silt and clay in the upper layer, resulting in a higher water-holding capacity (Ecology and Environment, 2004).

4.2 SOIL EROSION

The Quincy and Burbank soils have rapid permeability and slow run-off, resulting in a low water erosion hazard. Both soils have high hazard for wind erosion due to the predominance of fine sands in the surface layers and the region's frequent, high winds. The Quincy fine sand phase has one of the highest hazard ratings for blowing soil and it is recommended that new land disturbance be limited to the period of Mary 15 to September 15. Table 4-1 provides the wind erosion factor (T factor) erodibility groups and land capability classifications for the Quincy and Burbank phases located on the Depot.

Table 4-1. Wind erosion hazard ratings for UMCD soils

Soil Series	Soil Taxonomy	Erosion Factor (T)[a]	Wind Erodibility Group[b]	Land Capability Classification[c]
Quincy fine sand	Mixed, mesic Xeric Torripsamments	5	1	VIIe
Quincy loamy fine sand, gravelly substratum	Mixed, mesic Xeric Torripsamments	3	2	VIIe
Burbank loamy fine sand	Sandy-skeletal, mixed, mesic Xeric Torriorthents	2	2	VIIe

[a] Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. Rate is in tons per acre per year.

[b] Wind Erodibility Group: This indicates the susceptibility of a soil to wind erosion and the amount of soil left. They are represented by federal classes and range from 1 to 8 with Group 1 soils being extremely erodible and Group 2 soils being very highly erodible.

[c] Land Capability Classification: This shows the suitability of a soil for field crops and is based on a soil's limitation for field crops, risk of damage if used for field crops, and the way they respond to management. Classes range from I to VIII with increasing severity of limitations as one approaches VIII. The subclass e shows the main limitation is risk of erosion.

Source: Horne Engineering Services, 1997 (Table 4-1).

Cryptogamic soils at the UMCD are particularly vulnerable to disturbance, such as from livestock grazing (Ponzetti and McCune, 2001). Light damage to the cryptobiotic crusts in arid and semi-arid regions may take several years to rehabilitate (Ford and Johnson, 2006), whereas extensive damage may require 50 to 250 years to fully restore (Muscha and Hild, 2006) depending upon effective precipitation/soil moisture conditions. Once fractured and displaced, it is unlikely the detached pieces of crust will be able to reattach themselves. Furthermore, when the protective crust is displaced, soils exposed by the damage may now be windblown onto adjacent healthy crust, preventing light from getting to the crust and in turn killing the microorganisms that form that crust as well (Canestorp, 2007).

5. VEGETATION RESOURCES

5.1 PLANT COMMUNITIES

The UMCD is situated within the *Artemisia-Agropyron* (A-A) steppe zone within the lower Umatilla Basin. The zone is named after the big sagebrush (*Artemisia tridentata* ssp. *tridentata*) – bluebunch wheatgrass (*Pseudoroegneria spicata*) plant association growing in loamy soils of the undulating uplands adjacent to the Columbia River. The antelope bitterbrush (*Purshia tridenta*) – needle-and-thread (*Hesperostipa comata*) association appears to be an "edaphic climax" growing in well-drained, sandy soils within the A-A zone (Poulton, 1955; p. 69). Cheatgrass (*Bromus tectorum*) is the predominant understory species in disturbed bitterbrush communities (ibid). Kagan et al. (2000) indicates that the UMCD and Boeing leaselands (5 miles west of UMCD) contain the largest remaining bitterbrush shrub-steppe habitats in the Columbia Basin. As such, the Depot provides valuable habitat for native plant and animal species; some of these "obligate" species are found only within the A-A steppe zone (e.g., Sage sparrow, *Amphispiza belli*).

Tetra Tech (2002a) conducted planning level vegetation surveys on the Depot in 1999-2000. The shrub, grass, and mixed plant communities identified are shown in Table 5-1. Distribution of the major vegetation types (e.g., shrublands) are shown in Figure 5-1; while shrubland community types are delineated in Figure 5-2. Most of the communities appear to be variations of the sagebrush-needlegrass, bitterbrush-needlegrass, and needlegrass-Sandberg's bluegrass associations. Overall, the vegetative communities support a relatively high degree of native species diversity.

Table 5-1. Plant community types observed within the UMCD fenceline

Major Mapping Unit[a]	Community Types	Areal Extent (Acres)	Comments
Shrublands	Sagebrush/Annual Grasslands [b]	173	Found primarily in the sand dunes in the eastern portion of the Depot.
	Sagebrush-Bitterbrush/Sandberg's Bluegrass (*Poa secunda*)-Cheatgrass [b]	397	Equal coverage by shrub species, while cheatgrass understory is dense and continuous.
	Bitterbrush/Sandberg's Bluegrass-Cheatgrass [b]	3,072	Some older stands have shrubs > 6 ft tall; species diversity is low, especially for native grasses.
	Bitterbrush/Indian Ricegrass (*Achnatherum hymenoides*) [b]	164	Most species rich of the shrub communities, with high percentage of native species. Extensive surface coverage by cryptogamic soil crusts.
	Gray (*Ericameria nauseosa*) and Green (*Chrysothamnus viscidiflorus*) Rabbitbrush/ Sandberg's Bluegrass-Cheatgrass [b]	110	Found along the northeastern boundary of the Depot.
Grasslands	Needle-and-Thread Grass – Sandberg's Bluegrass-Cheatgrass	313	Highest species diversity of the grassland communities, with high percentage of native species and occurrence of cryptogamic soil crusts. Present in the northeastern and southeastern portions of the Depot.
	Sandberg's Bluegrass-Cheatgrass	607	Found in the northeastern and north-central portions of the Depot.
	Sandberg's Bluegrass-Balsamroot	137	Found mainly in the east-central portion

Major Mapping Unit[a]	Community Types	Areal Extent (Acres)	Comments
	(*Balsamorhiza careyana* var. *careyana*)		of the Depot; has the highest percent cover of cryptogamic soil crust (22%).
	Cheatgrass-Bulbous Bluegrass (*Poa bulbosa*)	3,097	Largely associated with the storage igloo areas in the central and eastern portions of the Depot.
	Cheatgrass-Sandberg's Bluegrass	2,418	Has the highest percent cover of exotic species, and lowest percent cover of cryptogamic crust.
	Crested Wheatgrass (*Agropyron cristatum*)	Not given	Found primarily in the northeastern and northwestern portions of the Depot.
Mixed	An integrated combination of several of the above plant communities.	Not given	Found primarily in the northeastern and northwestern portions of the Depot.

[a] See Figure 5-1 for distribution of these mapping units.
[b] See Figure 5-2 for distribution of the shrub community types.

Source: Tetra Tech, 2002a.

The vegetation data contained in the Planning Level Survey (Tetra Tech, 2002a) may not adequately support a project-specific activity; thus, additional information gathering may be necessary for potential impact assessment and mitigation purposes. Level of effort would be determined by the anticipated areal extent/intensity (severity) plus seasonality/duration of the impact(s). Consideration would also be given to the likelihood of encountering a biologically significant resource (e.g., a species of regulatory concern).

5.2 PLANT SPECIES OF REGULATORY CONCERN

5.2.1 Rare, Threatened, and Endangered (RTE) Plus Other Sensitive Plants

Laurence's milk-vetch (*Astragalus collinus* var. *laurentii*) is a federal species of concern and is listed as threatened by the State of Oregon (ONHIC, 2007). The federal designation indicates that sufficient biological information exists to support inclusion as an RTE species. This vetch has been collected in Morrow and Umatilla Counties at elevations exceeding those of the UMCD (Kagan et al., 2000; Figure 3). Most of these sites occurred within the mesic *Agropyron-Poa* zone (topographically above the *Artemisia-Agropyron* zone) demarcated by Poulton (1955).

Douglas' spiny milk-vetch (*Astragalus kentrophyta* var. *douglasii*) is not federally listed; the INRMP (Canestorp, 2007; Table 8-1) includes this variety as a sensitive-critical species by the State of Oregon. The USDA's National Plant Data Center does not indicate specimens being collected in Morrow or Umatilla counties. As this species grows in rocky soil at varying elevations, its potential presence at UMCD cannot be eliminated.

5.2.2 Exotic Plant Species

This category includes invasive, non-native plant species, some of which are regulated as "noxious weeds". The most widespread or notable species identified during the planning level vegetation survey (Tetra Tech, 2002a; Section 4.6) are shown in Table 5-2. All of these species threaten future agricultural and/or shrub-steppe restoration activities at the Depot. Details regarding the weed control program currently implemented by UMCD's Public Works Department are found in Appendix H of the INRMP (Canestorp, 2007).

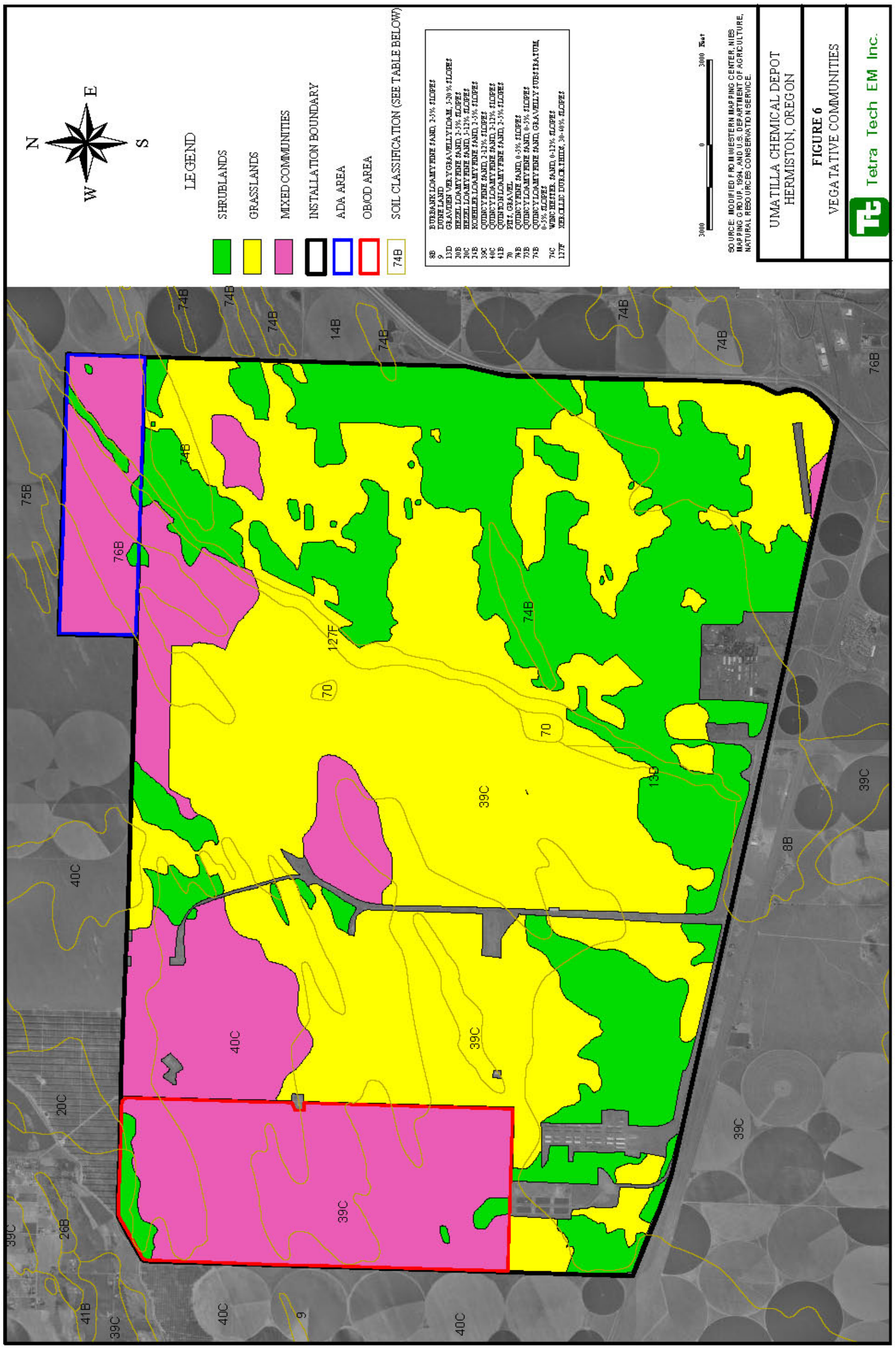

Figure 5-1. Major vegetation mapping units for the UMCD
Source: Tetra Tech, 2002a.

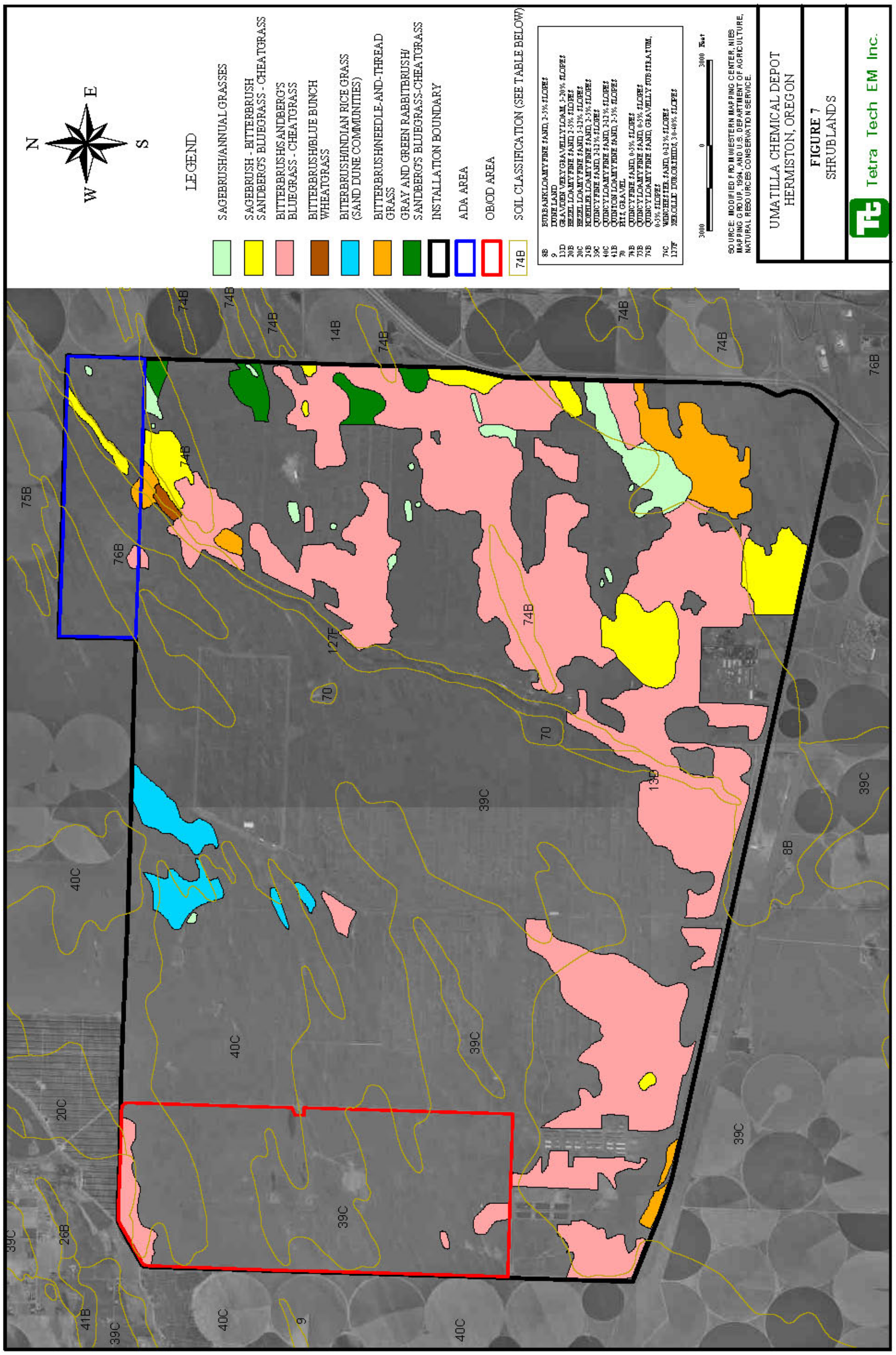

Figure 5-2. Shrub community types identified within the UMCD
Source: Tetra Tech, 2002a.

5.2.3 Ethnobotanical Species

TBD

5.2.4 Wetlands

A National Wetlands Inventory was conducted on the Depot in June 2000; no permanent, naturally occurring wetlands were found on the Depot (Canstorp, 2007; p.27). Small wet areas created by wildlife water devices plus the stormwater runoff impoundment at the UMCD exhibit wetlands vegetation (e.g., *Typha* species). These sites do not exhibit the combined characteristics of hydrophytic vegetation, hydric soils, and hydrological conditions required for designation as "jurisdictional" wetlands (Federal Interagency Commission for Wetlands Delineation, 1989). However, the presence of wetlands vegetation indicates their potential as "functional" wetlands (Crowe et al., 2004). Subsequently, the above sites should be protected for their wildlife habitat values.

Table 5-2. Invasive, non-native plant species observed at the UMCD

Part A. "B" List Species[a]		
Common Name	**Taxonomic Name**	**Comments**
Diffuse knapweed	*Centaurea diffusa*	Widely distributed across the Depot along roadsides and disturbed areas; a candidate for biological control by various insect (e.g., fly, moth, beetle, weevil) species.
Cereal rye	*Secale cereale*	Potentially problematic at two fenceline locations in the southeastern corner of the UMCD (Tetra Tech 2002a; Figure 11). Designated as a class B weed by the Umatilla County Weed Control Board (UCWCB).
Rush skeletonweed	*Chondrilla juncea*	Infestations limited to northcentral and southcentral fenceline locations at the Depot (Tetra Tech 2002; Figure 11). Designated as a class A weed by the UCWCB, and a candidate for biological control by various insect (e.g., moth, midge, mite) and fungal species. Also listed as a targeted ("T") species.
Part B. Non-Regulated Species		
Bulbous bluegrass	*Poa bulbosa*	Tends to grow during mild winter weather, and potentially out-competes native species (e.g., grasses, sagebrush) germination rates.
Cheatgrass	*Bromus tectorum*	Same as above. Inhibition of root elongation by exudates from strain D7 of *Rhizobacterium* may serve as a biological control approach.
Russian thistle	*Salsola kali*	Local infestations observed at central and northcentral sites within the UMCD (Tetra Tech, 2002a; Figure 11). Biological control by moth (*Coleophora*) species is feasible.

[a] "A" Designated Weeds are those subject to eradication or intensive control when and where found. "B" Designated Weeds are subject to intensive control on a site-specific, case-by-case basis; where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method (Oregon Department of Agriculture, 2009).

Source: Tetra Tech, 2002a.

6. WILDLIFE RESOURCES

6.1 OVERVIEW

The UMCD's faunal species are those generally observed in Columbia Basin native shrub-steppe and grassland habitat. Typical species include: coyote (*Canis latrans*), American badger (*Taxidea taxus*), Swainson's and Red-tailed hawks (*Buteo swainsoni* and *B. jamaicensis),* Burrowing owl (*Athene cunic-ularia* ssp. *hypugea*) and Long-billed curlew (*Numenius americanus*). The May 1991 on-site wildlife inventory is found in Appendix B2 of the INRMP (Canestorp, 2007). An updated, more regional, listing is presented in the draft Umatilla/Willow Subbasin Plan (DeBano and Wooster, 2004; Appendix A). The pronghorn antelope (*Antilocapra americana*) is not free-ranging, as the Depot's perimeter fence keeps it captive. The lack of permanent surface water on the Depot precludes occurrence of native fish species; however, mosquito fish (*Gambusia* sp.) are stocked in the stormwater retention pond at the UMCDF to consume mosquito larvae (Canestorp, 2007, p.27).

6.2 SPECIES OF REGULATORY CONCERN

Tetra Tech conducted Planning Level Surveys for threatened and endangered wildlife species on the Depot in 1999 and 2000; the efforts focused on the bald eagle (*Haliaeetus leucocephalus*), peregrine falcon (*Falco peregrinus*), and the Washington ground squirrel (*Spermophilus washingtoni*). Table 6-1 presents the results of their winter 1999 and spring-through-summer 2000 field surveys (Tetra Tech, 2000b). Key results include:

- occasional foraging onsite by bald eagles and peregrine falcons, given the UMCD's proximity to the Columbia River and Umatilla National Wildlife Refuge;
- identification of marginal ground squirrel habitat on the eastern third of the Depot, but no certain presence of *S. washingtoni*; and
- putative presence of Greater sage grouse (*Centrocercus urophasianus*) in the northeastern corner of the Depot.

Given the obligate relationship between this grouse species and sagebrush habitat, its presence (along with that of the Loggerhead Shrike and sage sparrow) indicates high quality wildlife habitat worthy of protection. Finally, a number of birds (e.g., Burrowing owl) protected under the Migratory Bird Treaty Act of 1919 (U.S.C. 703-712), as amended, were also observed on-site; a regional listing of these species is found in DeBano and Wooster (2004; Table 26).

The wildlife data contained in the Planning Level Survey (Tetra Tech, 2002b) may not adequately support a project-specific activity; thus, additional information gathering may be necessary for potential impact assessment and mitigation purposes. Level of effort would be determined by the anticipated areal extent/intensity (severity) plus seasonality/duration of the impact(s). Consideration would also be given to the likelihood of encountering a biologically significant resource (e.g., a species of regulatory concern).

Table 6-1. Federal and Oregon State faunal and floral species of special concern potentially found on the Umatilla Chemical Depot

Common Name	Taxonomic Name	Federal Status	State Status	Occurrence
Reptiles and Amphibians				
Northern Sagebrush Lizard	*Sceloporus graciosus ssp. graciosus*	SoC	SV	Present
Birds				
Long-billed Curlew	*Numenius americanus*	None	SV	Present
Bald Eagle	*Haliaeetus leucocephalus*	Delisted	Delisted	Transient
Swainson's Hawk	*Buteo swainsoni*	None	SV	Present
Ferruginous Hawk	*Buteo regalis*	SoC	SC	Present
Peregrine Falcon	*Falco peregrinus*	None	SV	Transient
Sage Grouse	*Centrocercus urophasianus*	C	SV	Potential
Western Burrowing Owl	*Athene cunicularia hypugea*	SoC	SC	Present
Lewis' Woodpecker	*Melanerperes lewis*	None	SC	Present
Bank Swallow	*Riparia riparia*	None	SU	Present
Loggerhead Shrike	*Lanius ludovincianus*	None	SV	Present
Grasshopper Sparrow	*Ammodramus savannarum*	None	SV	Present
Black throated Sparrow	*Amphispiza bilineata*	None	Removed	Present
Sage Sparrow	*Amphispiza belli*	None	SC	Present
Bobolink	*Dolichonyx orvzivorus*	None	SV	Present
Tricolored Blackbird	*Agelaius tricolor*	SoC	Removed	Potential
Mammals				
Western Srnal1-footed Myotis	*Myotis ciliolabrum*	SoC	Removed	Potential
Long-eared Myotis	*Myotis evotis*	SoC	Removed	Potential
Long-legged Myotis	*Myotis volans*	SoC	SV	Potential
Townsend's Big-eared Bat	*Corynorhinus townsendii*	SoC	SC	Potential
Pallid Bat	*Antrozous pallidus*	None	SV	Potential
White-tailed Jackrabbit	*Lepus townsendii*	None	SV	Potential
Washington ground squirrel	*Spermophilus washingtoni*	SoC	LE	Potential

Federal:
LT: Listed Threatened. This category includes taxa listed as threatened by the USFWS under the Endangered Species Act (16U.S.C.1531-1544).
C: Candidate species. This category includes taxa for which the USFWS has sufficient biological information to support a proposal to list as endangered or threatened.
SoC: Species of Concern. This category includes taxa for which existing information may warrant listing, but for which substantial biological information is lacking.
State Protected: (State Protected List also includes the categories listed as State Sensitive.)
LE Listed as an Endangered Species.
LT Listed as a Threatened Species.
PE Proposed as an Endangered Species.
PT Proposed as a Threatened Species.
SC Sensitive – Critical. Those species for which state listing as threatened or endangered is pending, or for which state listing as threatened or endangered may be appropriate if immediate conservation efforts are not taken.
SV Sensitive – Vulnerable. Those species for which state listing is not believed to be imminent and could be avoided through continued or expanded conservation measures or monitoring.
SP Sensitive – Peripheral or Naturally Rare. Those species that occur in the state at the edge of their distribution.
SU Sensitive - Undetermined Status, Those species whose status is unclear.

7. GROUNDWATER RESOURCES

7.1 REGIONAL OVERVIEW

The Depot's groundwater exists in unconfined alluvial aquifers within surface sediments, as well as in a confined basalt aquifer system. Localized hydraulic interconnection exists between the unconfined aquifer and the uppermost portion of the basalt aquifer system in the Saddle Mountain Basalt. Groundwater in the alluvial aquifer and the interflow zones between basalt flows or layers primarily travels in a horizontal direction. Groundwater flow in areas where vertical jointing of the basalt is prevalent has higher vertical flow rates. All interflow zones in the Columbia River Basalt Group are hydrologically interconnected, creating a large aquifer system (Wozniak, 1995).

The overall flow direction of unconfined and confined aquifers near the Depot is northwest toward the Columbia River, from recharge areas in the Blue Mountains. This overall flow is diverted northward on the southeastern corner of the Depot. Such diversion is probably attributed to year-round pumping of groundwater at the Lamb-Weston well located near the Depot. Unconfined alluvial aquifers, and possible the Saddle Mountain Basalt portion of the confined basalt aquifers, discharge into local streams and rivers via seeps and springs, with an ultimate discharge point at the Columbia River. The deeper portions of the confined basalt aquifers in the Wanapum Basalt and particularly in the Grand Ronde Basalt, provide minimal input to these base flows (Wozniak, 1995).

7.2 GROUNDWATER QUANTITY AND QUALITY

7.2.1 Groundwater Quantity

7.2.1.1 Alluvial Aquifer

The saturated, near-surface Ordnance Gravels (Section 3) are generally unconfined; less permeable silty-clay layers can alter local flow patterns. Natural recharge (e.g., from precipitation) is much less than that from anthropogenic sources (e.g., pivot irrigation and leakage from irrigation canals). Another source of recharge is from artificial groundwater recharge (AR) projects; such projects are designed specifically to add water for consumptive and/or environmental benefit. The County Line Water Improvement District has implemented an AR project (the first in Oregon) for the Ordnance gravel aquifer west of the Umatilla River (Umatilla County Critical Groundwater Task Force, 2008).

As groundwater use greatly exceeds recharge, the shallow water table has been dropping for many years throughout the Lower Umatilla Basin. Subsequently, the Oregon Water Resources Department (OWRD) designated the Ordnance Gravels as a Critical Groundwater Area (CGWA) in 1976; the UMCD is situated within this CGWA. The OWRD determines the allocation that each water right holder can use, based on "sustainable annual yield" of the aquifer; within the CGWA, no new permits to appropriate groundwater are issued. Such regulatory activity has slowed the decline in groundwater levels within the Ordnance Gravels (ibid). The UMCD's water supply wells do not utilize the Ordnance aquifer.

7.2.1.2 Columbia River Basalt Group Aquifer

Groundwater stored in the basalt aquifers is generally limited to the more porous interflow layers between basalt flows (Section 3). Such waters are generally confined under pressure; thus, water levels tend to rise upon penetration of the aquifer by wells. Recharge to the basalt aquifers is primarily from infiltration of precipitation and snowmelt into higher elevation faults and fracture zones in the Blue Mountains, located southeast of the UMCD (Critical Groundwater Task Force, 2008).

Because of the limited thickness of most of the interflow zones, transmissivity tends to be low. Consequently, water wells are commonly drilled through more than one interflow zone to attain the desired yield. Due to high permeability of the zones, some wells produce more than 2,500 gallons per minute (gpm) with high specific capacity (i.e., gpm/ft of drawdown over a 24-hr period). Nevertheless, the slow movement of groundwater from higher-to-lower elevations, plus high usage rates, has resulted in declines of 10s to 100s of ft in groundwater levels at the UMCD over the past 50 years (Davies-Smith et al., 1988; IWW, 2006). Subsequently, the OWRD designated the CRBG aquifer as a CGWA in 1976 and has issued a plan for recovery of and sustaining this resource over the next 50 years (Critical Groundwater Task Force, 2008). The UMCD is located within this area; thus, new wells cannot be developed and capacity of existing wells cannot be increased at the Depot.

Seven water supply wells have been completed in the basalt aquifers on the Depot. Well depths range from 327 to 710 ft bgs; driller's logs for these wells are found in Hogenson (1964). Physical conditions (e.g., casing integrity) of the 50- to 60-year old wells varies from poor to good. Perfected water rights total about 4,500 gpm (10.05 cfs); however, tested capacity is 3,525 gpm. Currently designated usages include fire protection, industrial and domestic; however, allocations can be transferred to uses other than those initially specified (Benkendorf Associates et al., 1993).

The Depot's north system includes three wells providing 2,030 gpm and 120,000 gallons of elevated (tank) storage. Chlorinated water is delivered via 3- to 12-inch diameter asbestos concrete or 1- to 6-inch PVC lines to various points of use in the northwest and northcentral portions of the Depot, including the UMCDF operations. Except for the 12-inch and 10-inch AC transmission lines and perhaps the 6-inch booster pump system, the north system would not meet present-day standards. The 3-inch lines may be adequate to provide a sufficient flow of drinking water or process water, but they are inadequate for fire flows (Benkendorf Associates et al., 1993; p. II-53).

The south system serves the administrative and warehouse areas via three wells producing 2,120 gpm and 250,000 gallons of elevated storage capacity. A fourth well has been closed due to elevated nitrate levels, while a one-million-gallon ground reservoir is not in use due to lack of demand. Most of the distribution piping is cast iron with lead joints; there are some lengths of AC and PVC piping. Although the south system is generally in satisfactory condition, well no. 7 (from the north system) currently supplies the Administrative Area. Well no. 2 (from the south system) produces only 30 gpm due to cavitation problems (Gillis, 2009a).

Both north and south systems are classified by the Oregon Department of Human Services' Drinking Water Program (ODHS/DWP) as "non-transient, non-community water supplies". The Public Water System (PWS) identification number of the north system is OR4191664; it serves 10 residential connections and a population of 662 people (ODHS/DWP, 2009). The south system's PWS ID number is OR4101136; this system serves 25 residential connections and a population of 170 people (ibid.).

7.2.2 Groundwater Quality

7.2.2.1 Alluvial Aquifer

Numerous non-point sources have contributed nitrate-nitrite and perchlorate ions to shallow groundwater within the Lower Umatilla Basin (LUB): food processing plants, normal agricultural practices, and possibly from historic UMCD operations. As nitrate levels have generally exceeded 7 mg/L for many years throughout the LUB, the ODEQ declared the basin to be a Groundwater Management Area (GWMA) in 1990. The Department published an Action Plan in 1997 wherein voluntary actions would achieve a downward trend in nitrate levels by December 2009. Statistical analysis of the 1998-2008 data set indicates a very slight (0.006 ppm/yr), but statistically significant (88% confidence level using the Regional Kendall test) increase in nitrate levels over time (ODEQ, 2009; p. 21). The plan also requires the UMCD to provide evidence by December 2009 that:

- Groundwater treatment at the washout lagoons (OU No. 3) is working as expected; and
- Reinjection water (following treatment) is not migrating beyond the captive zone of the RDX/TNT pump-and-treat system (ibid., p. 25).

Laboratory analysis of the September 2003 groundwater samples also indicated low levels of perchlorate ion in over half of the 133 wells sampled in the LUB. Nitrate and perchlorate data from the UMCD wells are presented and discussed below.

Downward percolation of wastewater from the former washout lagoons may be contributing nitrate ion to shallow groundwater (Benkendorf Associates et al., 1993; p. A-10). Incomplete combustion of ordnance at the ADA may have contributed perchlorate ion to the alluvial aquifer (ODEQ, 2006, p. 5-7). Relevant data from the September 2003 sampling event is shown in Table 7-1. Inspection of these results indicates that:

- 8 of 14 samples exceed the 7 mg/L GWMA threshold, while only 3 exceed the federal primary drinking water standard of 10 mg/L (as nitrate-N; 40 CFR 141.23); and
- no perchlorate concentrations exceed the USEPA's Interim Health Advisory level of 15 μg/L (USEPA, 2009), although 3 of 14 exceed the Region 10 action level of 4 μg/L.

Table 7-1. Nitrate + nitrite and perchlorate data (September 2003) for alluvial groundwater at the UMCD

			Parameters	
ODEQ Well ID	**UMCD Well ID**	**Sample Date**	**Nitrate + Nitrite -N (mg/L)**	**Perchlorate (μg/L)**
UMA202	18-2	9/17	0.0936	< 1
UMA203	39-2	9/18	28.7	6.53
UMA204	46	9/23	16.5	1.67
UMA205	57-5	9/23	< 0.02	< 1
UMA206	57-4	9/17	6.2	< 1
UMA213	19-2	9/17	3.61	5.06
UMA214	38-3	9/17	7.39	< 1
UMA215	38-4	9/23	17.2	5.02
UMA217	16-2	9/23	6.91	1.54
UMA218	MW4	9/18	7.4	2.82
UMA224	Well 4	9/23	7.35, 7.31 (duplicates)	2.17, 2.4 (duplicates)
UMA225	4-18	9/23	8.59	1.4
UMA228	4-18	9/22	7.66	2.56
UMA276	57-3	9/23	6.02	1.34

Source: ODEQ, 2006 (Appendix 1).

Overall, investigations have concluded that perchlorate exposure will not result in adverse health effects in the North Morrow Perchlorate Area (ATSDR, 2006 and 2007).

Analytical data from July 1990-March 1993 sampling events indicates occasional exceedance of the MCL for arsenic (10 μg/L; 40 CFR 141.23) in wells located within the north half of the UMCD (Grondin and Nelson, 1995; Plate 4.12). Such data probably represents geochemical background conditions in the shallow aquifer (USEPA, 1993). Qualitative discussions regarding site-specific contaminants observed in the Depot's shallow groundwater are found in the CERFA Report (Young et al., 1994). Numerical data plus interpretations for select cleanup sites are found in several of the records of decision for the UMCD (e.g., USEPA, 1994).

7.2.2.2 Basalt Aquifer(s)

The Depot's groundwater is slightly alkaline and of the calcium, sodium-calcium, or sodium bicarbonate type. Dissolved solid concentrations in the basalt aquifer system range from 200 to 400 mg/L with an average of 230 mg/L. Higher concentrations of dissolved solids exist in the alluvial aquifer at the surface. While groundwater is suitable for most purposes, its hardness in the alluvial aquifer is greater than what is desired for domestic use. Groundwater in the deeper portions of the basalt aquifer system has decreased hardness and concentrations of sulfate and bicarbonate, with greater concentrations of sodium and fluoride (Grondin and Nelson, 1995.)

As discussed in Section 7.2.1.2, the Depot's water supply is provided by south and north systems, and that the Administrative Area currently receives most of its potable water from the north system. Water quality data for the south and north systems are shown in Table 7-2 (Parts A and B, respectively). These data indicate that the Depot's basalt aquifer(s) can supply good quality drinking water. However, the historic closure of one of the south wells due to elevated nitrate levels suggests the potential for:

- "natural" hydrogeological connections between the alluvial and basalt aquifers; or
- "anthropogenic" connections via downward leakage (of shallow groundwater) along the aging well bores.

Such mechanisms could result in local contamination of the basalt aquifer(s).

Table 7-2. Water quality data for the basalt aquifer(s) at UMCD

Parameter (units)	Mean (n)	Max.	MCL[a]	Sampling Interval[b]
Part A. Well field "A" (wells 4 and 5)				
Arsenic (μg/L)	2.2 (6)	5.0	10	9/04 – 12/07
Barium (mg/L)	0.044 (4)	0.065	2.0	4/94 – 8/00
DPBs (μg/L)				
• Haloacetic acids	1.1(4)	1.8	60	9/04 – 8/06
• Trihalomethanes	3.9 (3)	5.0	80	9/04 – 8/06
Coloiforms (MPN)				
• Fecal	0	–	0 detects	1/99 – 9/09
• Total	0	–-	< 1 detect/month	1/99 – 9/09
Fluoride (mg/L)	0.97 (7)	1.3	4.0	4/94 – 8/00
Gross Alpha (pCi/L)	2.83 (1)	2.83	15	8/03
Nitrate (mg/L)	0.99 (11)	2.1	10	3/91 – 10/08
Nitrite (mg/L)	Not detected (15)	–	1.0	6/97 – 8/09

Parameter (units)	Mean (n)	Max.	MCL[a]	Sampling Interval[b]
Thallium (µg/L)	0.4 (1)	0.4	2.0	6/97
Total U (µg/L)	0.002 (2)	0.002	30	8/03
Total Dissolved Solids (mg/L)	335 (3)	417	500 (secondary standard)	6/82 – 4/91
Part B. Well field "B" (wells 6 and 7)				
Arsenic (µg/L)	1.3 (6)	2.1	10	12/99 – 9/05
Barium (mg/L)	0.017 (8)	0.044	2.0	4/94 – 10/02
DPBs (µg/L)				
• Haloacetic acids	1.8 (3)	2.8	60	9/04 – 8/06
• Trihalomethanes	9.8 (3)	21.2	80	9/04 – 8/06
Coloiforms (MPN)				
• Fecal	0	–	0 detects	1/99 – 9/09
• Total	0	–	< 1 detect/month	1/99 – 9/09
Fluoride (mg/L)	1.5 (10)	1.9	4.0	1/91 – 10/02
Gross Alpha (pCi/L)	Not detected (5)	–	15	2/91 – 12/98
Nitrate (mg/L)	0.025 (2)	0.030	10	4/94 – 10/08
Nitrite (mg/L)	Not detected (18)	–	1.0	4/94 – 8/05
Thallium (µg/L)	Not detected	–	2.0	4/94 – 10/02
Total U (µg/L)	Not analyzed (?)	–	30	–
Total Dissolved Solids (mg/L)	412 (2)	450	500 (secondary standard)	1/91

[a] Drinking water standards (MCLs/secondary standards) are found at website http://www.epa.gov./safe-water/contaminants/index.html.
[b] Month/Year (e.g., 9/04 = September 2004).

Source: Oregon Department of Human Services, Drinking Water Program (2009).

8. CULTURAL-HISTORICAL RESOURCES

The UMCD's paleontological and prehistoric/historic contexts are found in Sections 3.5 and 3.2, respectively, of the Integrated Cultural Resources Management Plan (Pumphrey, 2002). The key findings of these surveys include:

- discovery of a "large bone" during Depot construction that was "turned over to an unknown natural history society" (ibid., p.3-20);
- presence of "minor lithic scatter" and "isolated finds (a mussel shell fragment and a basalt flake)" at sites along the west rim of Coyote Coulee that did not meet the definition of prehistoric sites (ibid., p. 4-1);
- remnants of the historic Oregon Trail (i.e., wagon wheel ruts) in southeastern and northeastern parts of the Depot (ibid., p. 4-1) plus West Extension Injection Canal (and

potential lateral canals) located in the northwestern corner of the Depot (ibid., pp. 3-41, 42); and
- eligibility of the Administration and Firehouse buildings for inclusion on the National Register of Historic Places (ibid., p 4-3), while the Depot as a whole exhibits potential designation as an Historic District (ibid., p. 3-44).

Current status and path forward regarding protection of on-site cultural-historical resources are discussed below.

The U.S. Army's compliance with Section 106 of the National Historic Preservation Act (16 U.S.C.'470) plus implementing regulations (36 CFR 800) and appropriate National Register Bulletins (e.g., Parker and King, 1998) will occur during the final stages of UMCD decommissioning (Stein, 2009). The USACE/Mobil District is contracting for a site-wide tribal cultural properties/sacred sites survey. No further action has occurred regarding formal listing of the Administration and Firehouse buildings, or Depot as a whole, on the National Register (Gillis, 2009b). However, protection of all properties, "found to be potentially eligible, or eligible to the National Register of Historic Places will be addressed in a future programmatic agreement", with the State of Oregon (Stein, 2009). Such evaluations will include the Oregon Trail, which has been nominated to the Register by the USFS (OHTAC, 2009; p. 2).

Finally, historical/archaeological clearance by Oregon's State Historic Preservation Office will probably be needed during planning of any site-specific reuse activity on the Depot. Each survey's level of effort will be determined by:

- current and project-specific degrees of site disturbance (as judged by a certified archaeologist and/or historian); and
- surface/subsurface cultural resource values potentially affected by project implementation (Pumphrey, 2002; Section 5.9).

Thus, impacts to cultural resources will be anticipated and mitigated to the extent possible during the project planning phase. Unexpected discoveries-disturbances during project implementation (e.g., site excavation) will be documented and mitigated to the extent practicable by the cultural resource professional.

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