

# Environmental Radiological Survey Summary

Calendar Year 2012, Fourth Quarter

Hanford Site 100, 200, 300, and 600 Areas



Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management  
Contractor for the U.S. Department of Energy  
under Contract DE-AC06-09RL14728



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## Calendar Year 2012, Fourth Quarter Hanford Site 100, 200, 300, and 600 Areas

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**APPROVED**

*By Janis D. Aardal at 7:32 am, Jan 23, 2013*

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Release Approval

Date

## Executive Summary

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This report provides a summary of the radiological surveys performed in support of near-facility environmental monitoring at the Hanford Site during the fourth quarter of calendar year (CY) 2012. For continuity between the quarterly reports, the use of the term *Contamination Areas* in this report includes High Contamination, Contamination, and Soil Contamination Area categories/designations. Underground Radioactive Material, Radiological Buffer, Radiologically Controlled Areas, and Radiation/High Radiation Areas are referred to when required. The quarterly survey results and the status of actions required are summarized below:

- One hundred and five routine environmental radiological surveys were performed.
- Two routine surveys were conducted by Mission Support Alliance, LLC (MSA), 63 by CH2M HILL Plateau Remediation Company (CHPRC), 32 by Washington River Protection Solutions, LLC (WRPS), and eight by Washington Closure Hanford, LLC (WCH).
- Contamination above background levels were found at four of the routine survey sites and one incident of contamination outside posted Contamination Areas at non-routine survey sites. Contamination levels ranging from a low of 24,000 dpm/100 cm<sup>2</sup> beta/gamma to > 1,000,000 dpm/100 cm<sup>2</sup> beta/gamma were reported. Of the five contaminated sites, four were CHPRC sites and one was a WRPS site. Of the five contaminated sites, four were in unposted areas and one was inside a Radiological Buffer Area (RBA). All of the contamination was removed for proper disposal. All cleanup activities were conducted to meet the requirements of *MSC Radiological Control Manual* ([MSC-5173](#)), *CH2M HILL Plateau Remediation Company Radiological Control Manual* ([CHPRC-00073](#)), and/or *Tank Farms Radiological Control Manual* ([HNF-5183](#)).
- All five contamination incidents were caused by vegetation uptake.
- Twenty three waste sites were interim closed (Section 3.1).

Hanford Site Integrated Biological Control Program activity for this quarter included:

- One hundred forty-five hectares (358 acres) were treated with herbicides, with no noxious weeds being treated.
- Seven hundred thirty-two pest control responses were conducted.
- Three thousand four hundred six animal control devices and bait stations were placed in operational areas and facilities.
- Twelve non-regulated compactor truckloads of tumbleweeds were taken to the 200 West Area Burn Pit for disposal (one compactor truckload  $\cong$  11,000 ft<sup>3</sup> of uncompacted tumbleweeds).
- There were no regulated compactor truckloads of tumbleweeds taken to the Environmental Restoration Disposal Facility (ERDF) for disposal during the reporting period.

A numerical ranking system is used for categorizing contaminated waste sites relative to environmental radiological concerns. The waste sites in Table ES.1 have values that are among the highest in each category. The rankings are based on levels and types of contamination, proximity to human occupied or utilized areas, and have a historical or potential to spread contamination. The prioritization system and rankings are described in Section 2.2.

**Table ES.1 Top Ten Priority Ranking for Contaminated Waste Sites**

<b>Waste Site</b>	<b>Custodian</b>	<b>Levels</b>	<b>Location</b>	<b>Mobility</b>
200-E-109 200-E Fence Line	CHPRC	3	4	5
218-E-12B Burial Ground	CHPRC	4	3	5
218-E-12A Burial Ground	CHPRC	4	3	5
216-BC Cribs/Control Area	CHPRC	4	3	5
216-U-10 Pond	CHPRC	4	4	4
241-B Tank Farm	WRPS	5	1	5
241-SX/SY Tank Farm	WRPS	3	4	4
241-BX/BY Tank Farm	WRPS	5	1	5
241-C Tank Farm	WRPS	5	1	5
241-S Tank Farm	WRPS	5	1	5

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## Acronyms

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ALARA	as low as reasonably achievable
BCP	Biological Control Program
c	centimeter
CA	Contamination Area
CFR	Code of Federal Regulations
CHPRC	CH2M Hill Plateau Remediation Company
cm <sup>2</sup>	square centimeter
cpm	counts per minute
CY	calendar year
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
dpm	disintegrations per minute
ERDF	Environmental Restoration Disposal Facility
ETF	200 Area Effluent Treatment Facility
LERF	Liquid Effluent Treatment Facility
mrad/hr	millirad (radiation-absorbed dose) per hour
MSA	Mission Support Alliance, LLC
N/A	not applicable
PA	probe area
RBA	Radiological Buffer Area
RCW	Revised Code of Washington
URMA	Underground Radioactive Material Area
WAC	Washington Administrative Code
WCH	Washington Closure Hanford, LLC
WIDS	Waste Information Data System
WRPS	Washington River Protection Solutions, LLC
WSCF	Waste Sampling and Characterization Facility

## 1.0 Introduction

This quarterly report summarizes the radiological surveys performed on the Hanford Site in support of near-facility environmental monitoring. The survey results and the status of corrective actions required are also discussed in this report.

Routine radiological surveys are an integral part of the Hanford Site near-facility environmental monitoring for tracking facility and waste site status, and to aid in the reduction of the radiological areas at the Hanford Site. Radiological Control Groups of Mission Support Alliance, LLC (MSA), CH2M HILL Plateau Remediation Company (CHPRC), Washington River Protection Solutions, LLC (WRPS), and Washington Closure Hanford, LLC (WCH) perform routine radiological surveys on the Hanford Site. Radiological surveys are performed at inactive waste sites, outdoor radiological control areas, tank farm perimeters (including diversion boxes, lift stations, and vent stations), perimeters of active or uncovered waste sites (such as burial grounds, retention basins, ponds, process trenches, and ditches), underground pipelines, and road surfaces (see Figures 1 through 10 which include Interim Closed Out/Closed Out Waste Sites).

In the beginning of the year, MSA Environmental Surveillance staff and the site contractor's radiological control groups developed a waste site survey schedule, [HNF-51300](#), *Environmental Surveillance Near-Field Monitoring Schedule, Calendar Year 2012*. However, some waste sites were not accessible during the calendar year due to ongoing remediation activities. MSA Environmental Surveillance staff reviews and summarizes the radiological survey reports in the [Hanford Site Annual Environmental Report](#). Radiological conditions are tracked and trends are noted for use by the facility managers and the landlords.

Newly discovered radioactive waste and unplanned release sites are added to the schedule as necessary. The survey frequencies are based on site history, radiological conditions, and general maintenance. Non-routine surveys may be conducted if conditions warrant (e.g., growth of deep-rooted vegetation is noted at a waste site). Radiological surveys are conducted to detect surface contamination and document changes in vegetation growth, biological intrusion, erosion, and site maintenance conditions. Survey data are compared with standards identified in *MSC Radiological Control Manual* ([MSC-5173](#)), *CH2M HILL Plateau Remediation Company Radiological Control Manual* ([CHPRC-00073](#)), and/or *Tank Farms Radiological Control Manual* ([HNF-5183](#)), as well as previous surveys to determine trends, assess environmental impact, and allow determination of where corrective actions are needed.

The Occurrence Reporting System is used to track legacy radioactive contamination greater than ten times the total contamination values in Title 10 Code of Federal Regulations (CFR) [Part 835](#), *Occupational Radiation Protection*, Appendix D, and is found outside a posted Contamination Area (CA), High CA, Airborne Radioactivity Areas, Radiological Buffer Areas, and areas controlled in accordance with [10 CFR 835.1102\(c\)](#).

These radiological surveys are conducted to determine surface radiological conditions and do not constitute a release survey. Therefore, surveys that detect no contamination in radiological areas do not release the site from control, but may result in changing the posting status. Surveillance of the active nuclear facilities and the areas inside the tank farm fences are the responsibility of the contractor those sites are assigned to.

Figure 1. 100-B/C Area

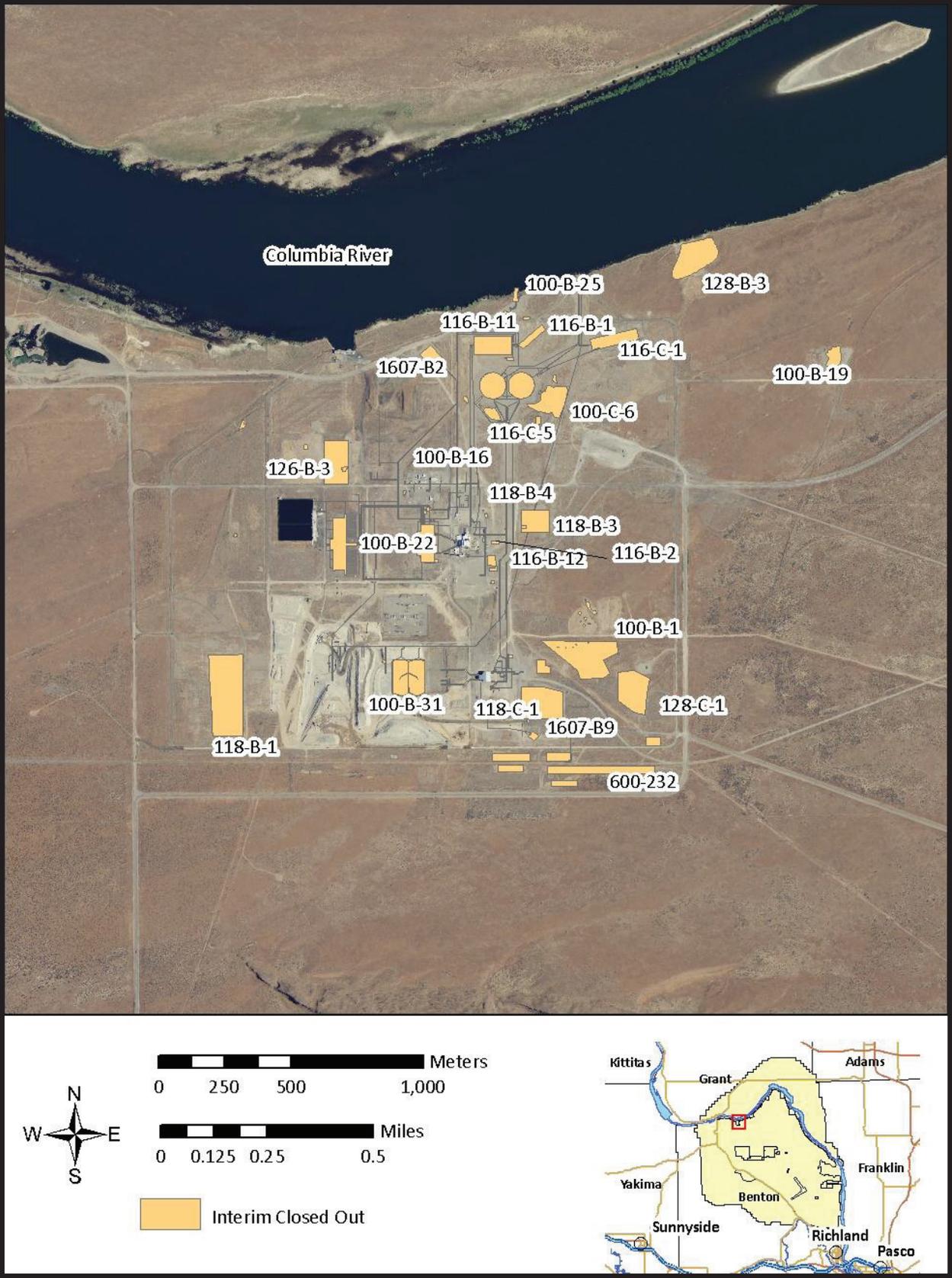


Figure 2. 100-D/DR Area

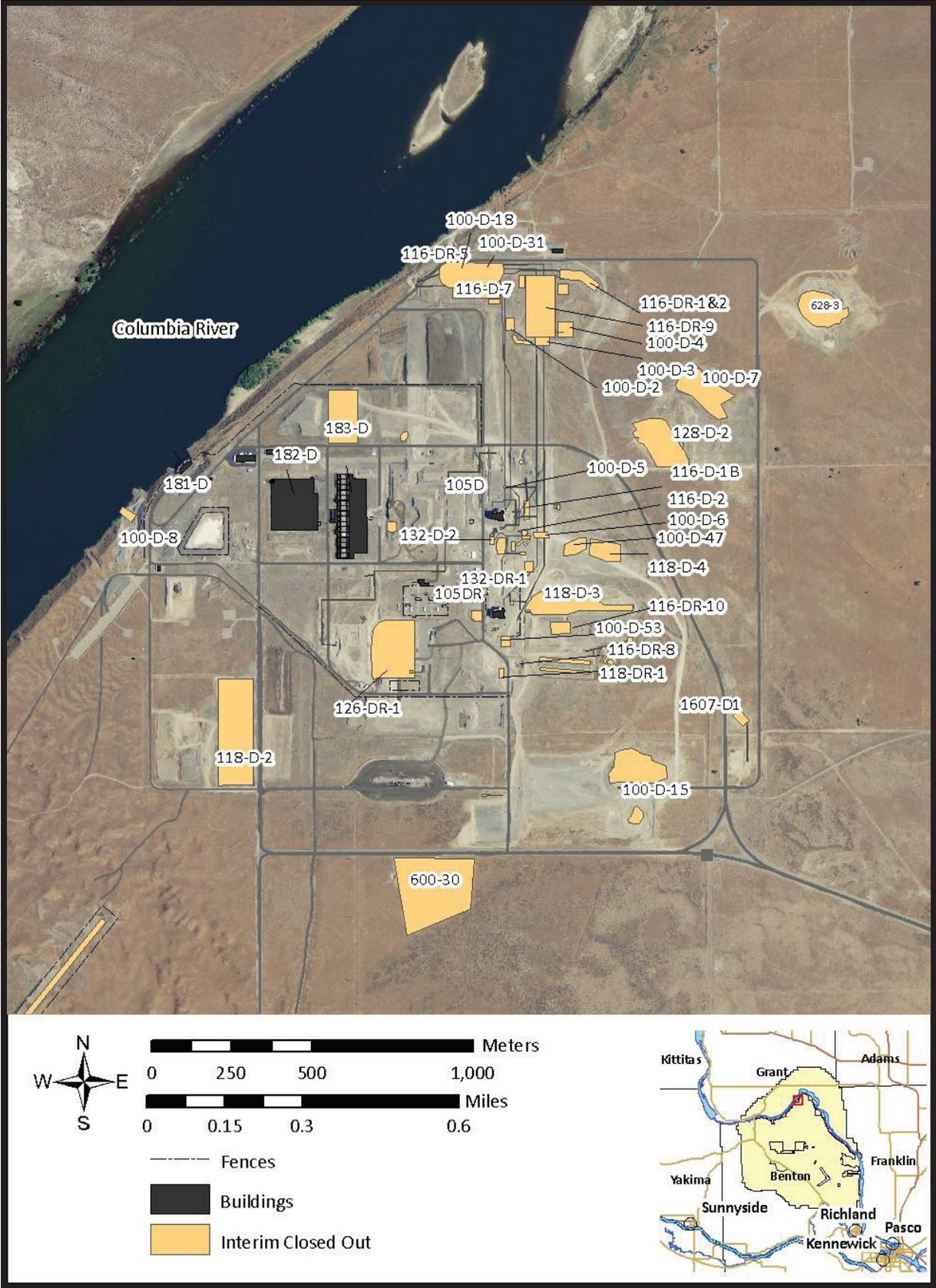


Figure 3. 100-F Area

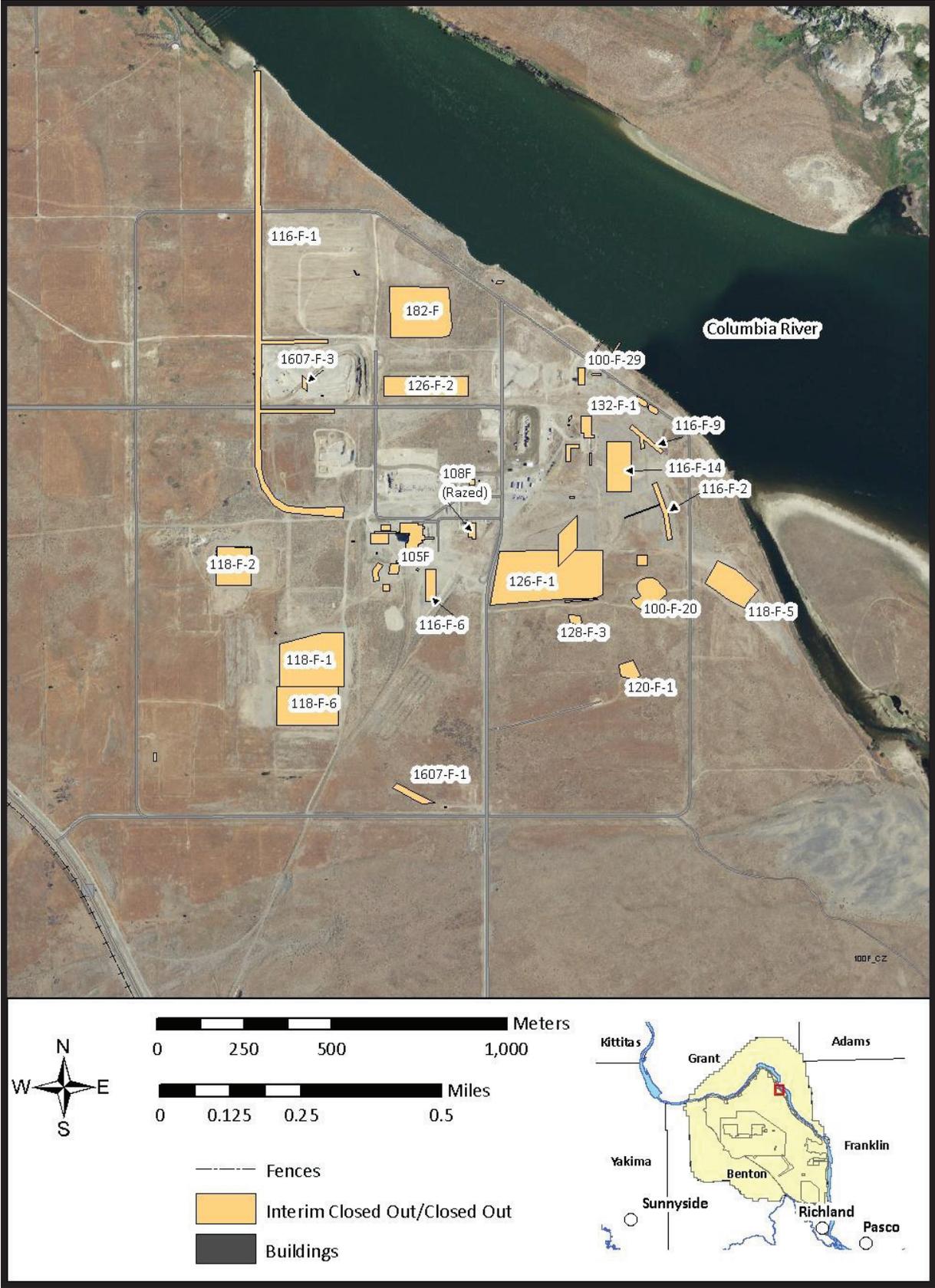


Figure 4. 100-H Area

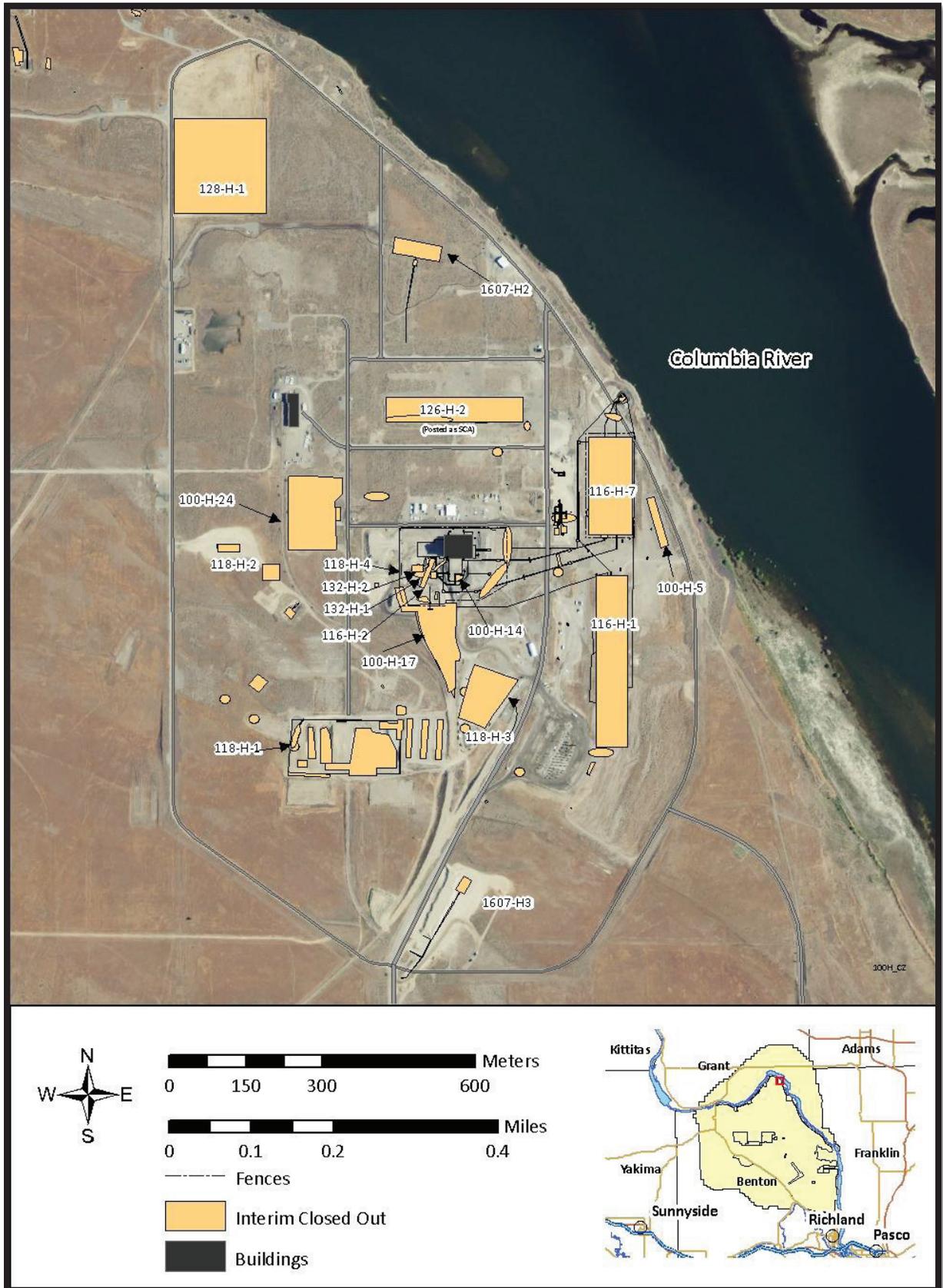


Figure 5. 100-K Area

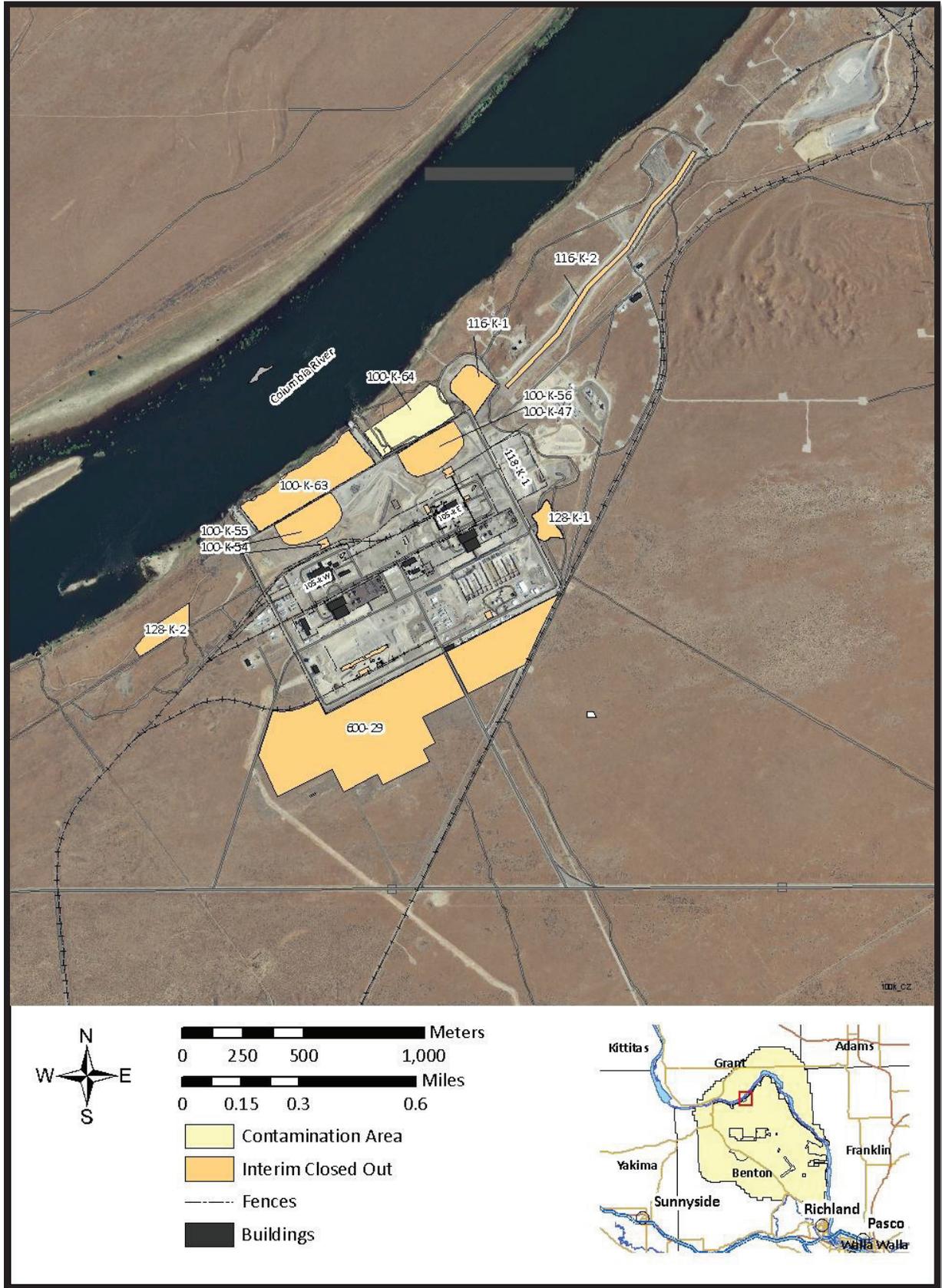


Figure 6. 100-N Area

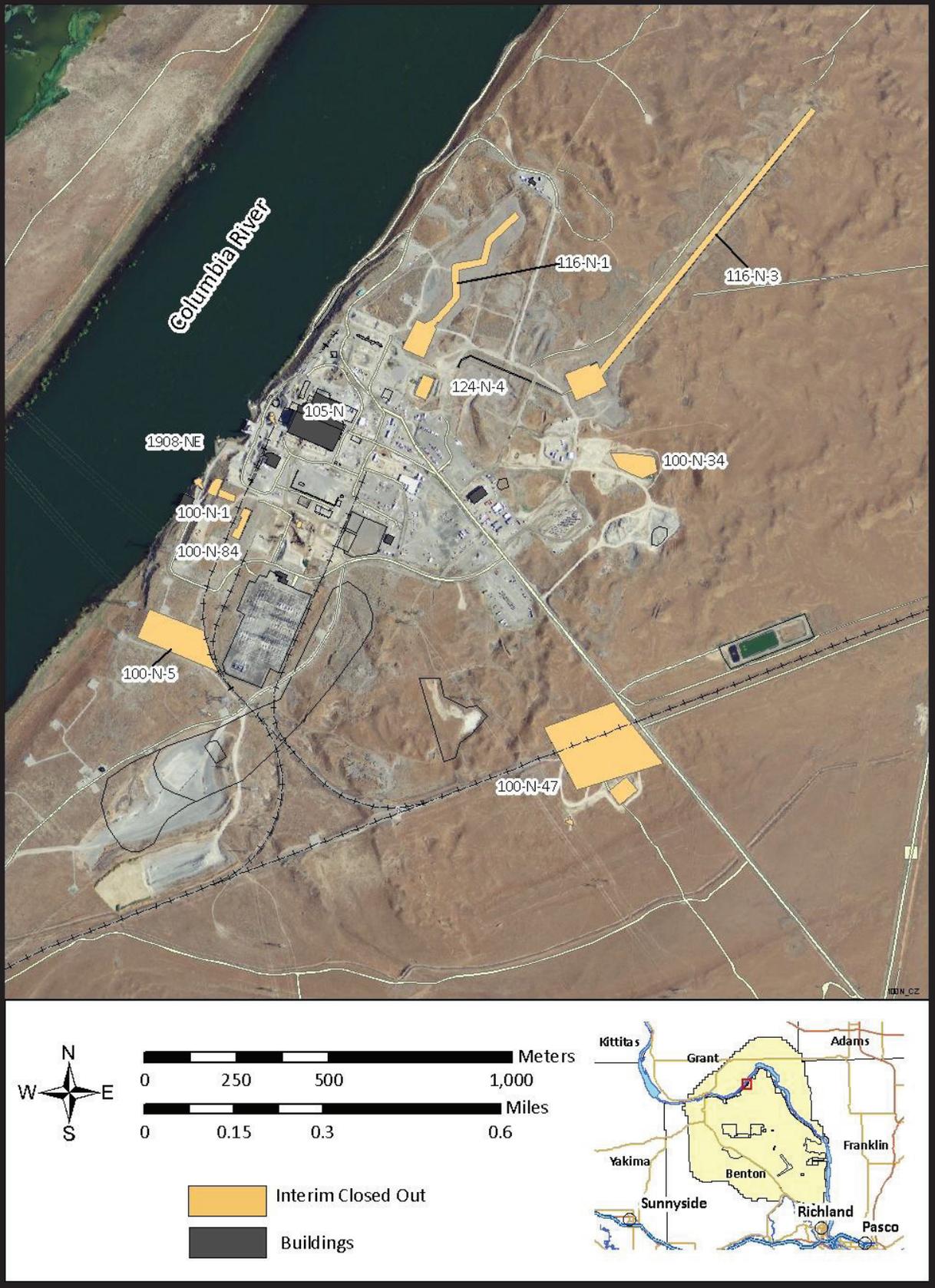


Figure 7. 200 East Area

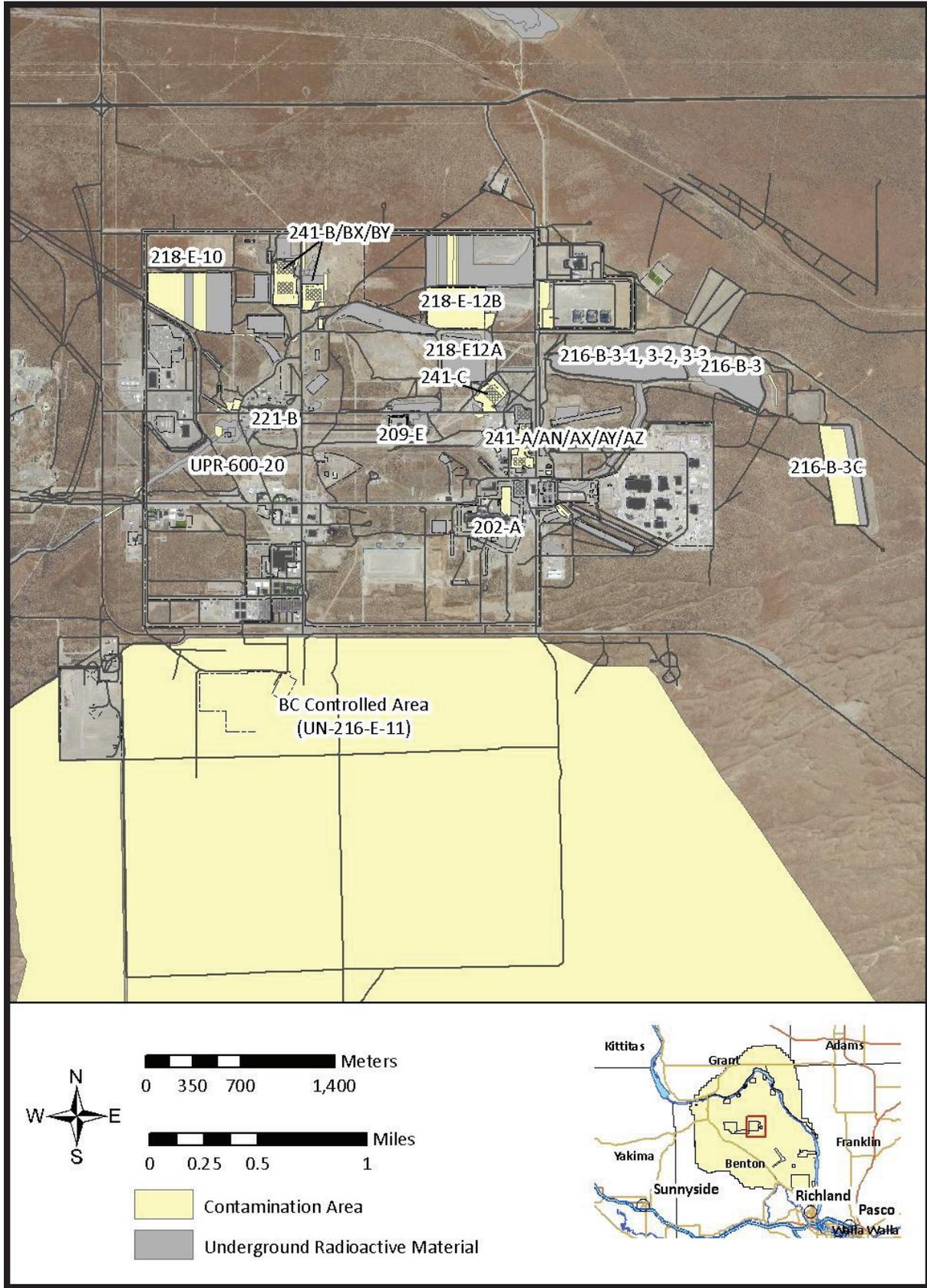


Figure 8. 200 West Area

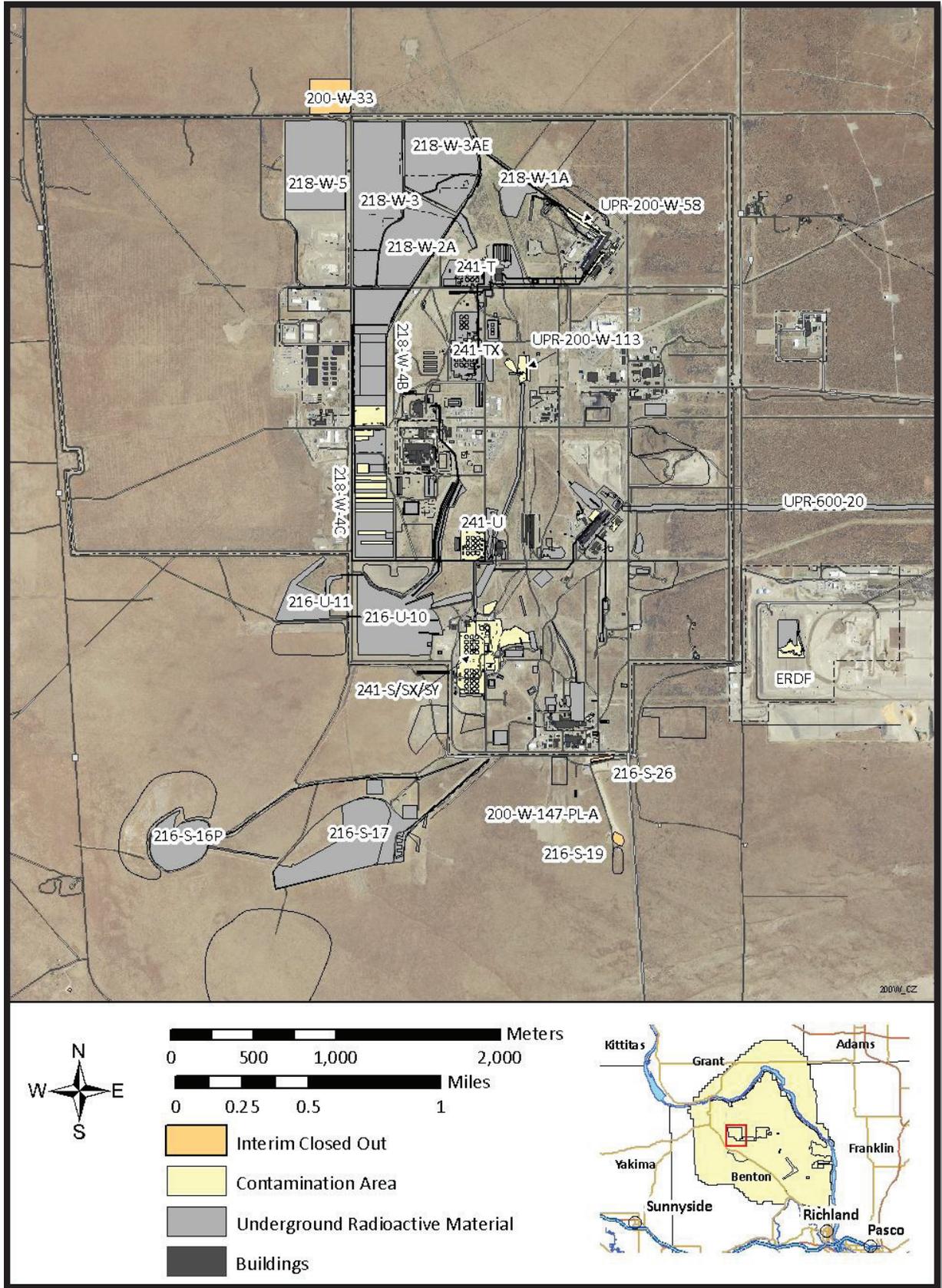


Figure 9. 300 Area

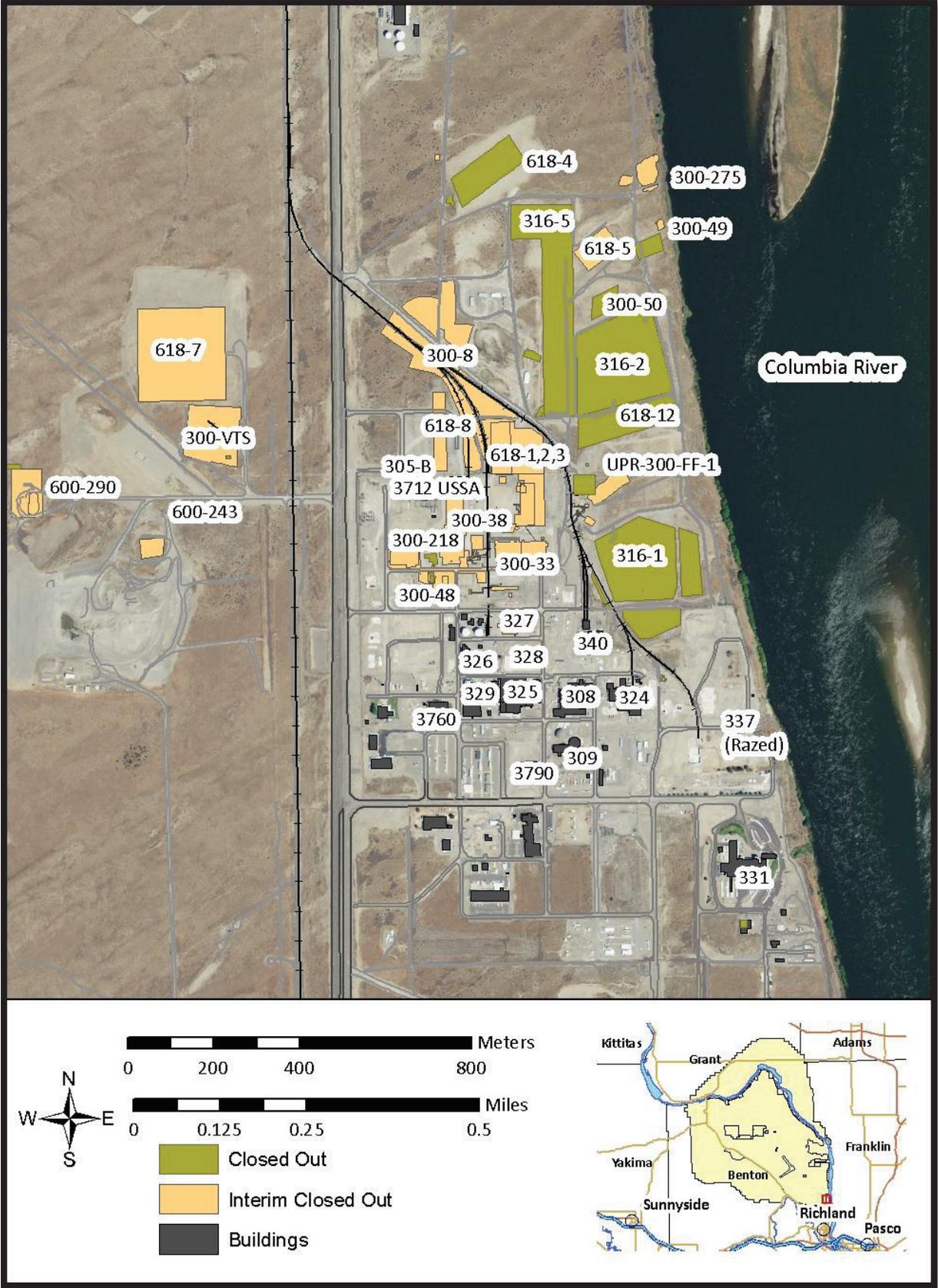
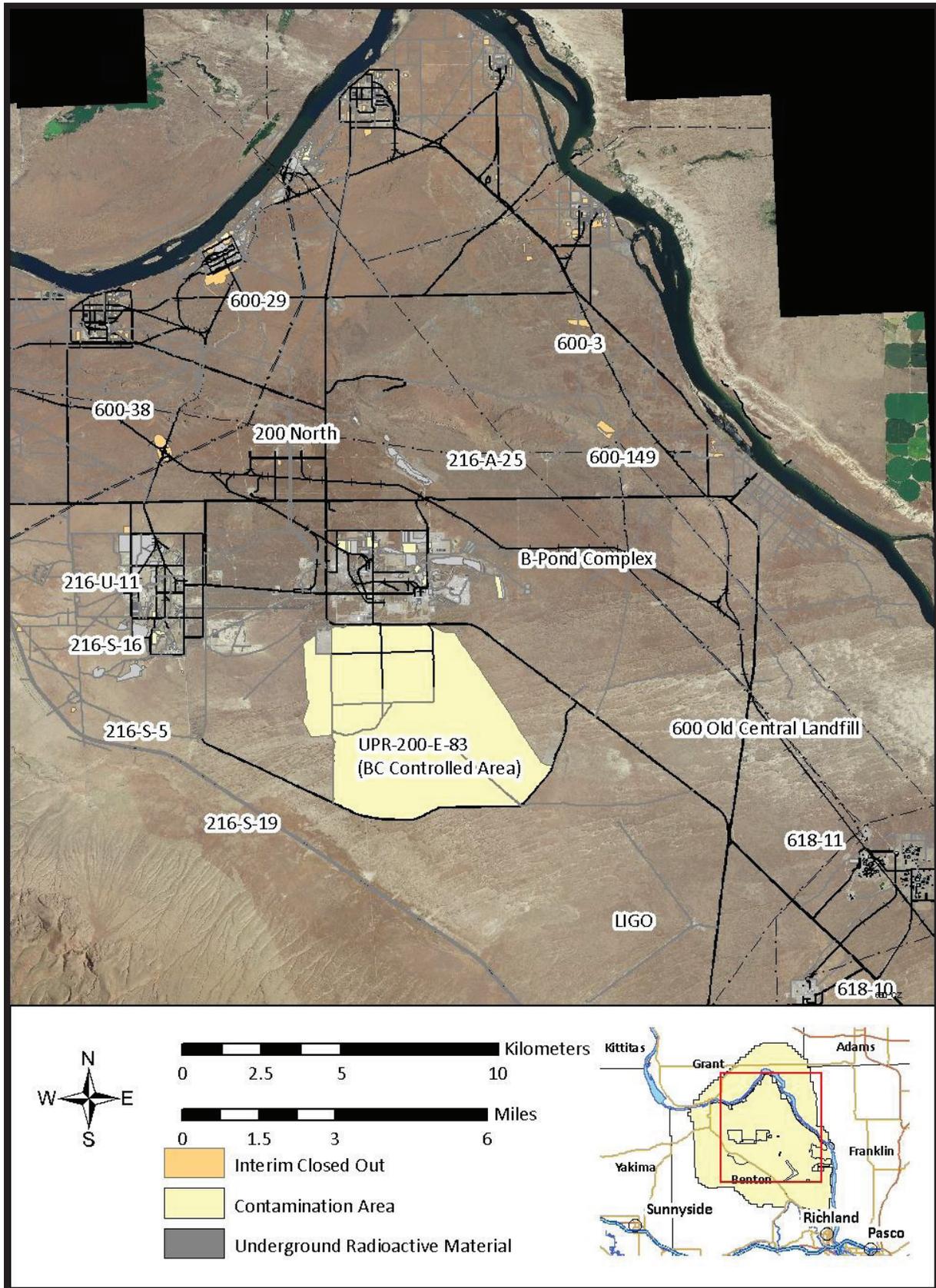


Figure 10. 600 Area



## 2.0 Program Description

### 2.1 Environmental Radiological Survey Objectives

The objective of the radiological surveys is to determine whether there have been changes in the radiological status of the 100, 200, 300, and 600 Areas outdoor radioactive waste sites. These sites include surface water disposal units, cribs, trenches, burial grounds, tank farm diversion box perimeters, and reverse wells (refer to [HNF-51300](#), for the listing of waste sites and the survey frequency). Determining trends in radiation levels or radiological contamination may aid in assessing the adequacy of waste containment by detecting the movement of radioactive material away from radiological control areas, or by detecting releases that might otherwise go unrecognized. When activity is detected, a thorough survey is performed using a portable count rate meter equipped with a thin-window, pancake-type probe. The appropriate facility manager or landlord is notified if contamination is identified and the responsible manager initiates corrective actions.

### 2.2 Priority Ranking System

A numerical ranking system is used for categorizing contaminated waste sites relative to environmental radiological concerns. This system provides guidance to responsible landlords for clean up or interim stabilization of waste sites.

The waste site level and type of contamination, site accessibility and size, and contamination mobility are all used as a basis for review. A numerical value is assigned to each site based on this review.

Contamination levels ranging from 1,000 disintegrations per minute (dpm) to greater than 10 millirads per hour (mrad/hr) (as measured on field survey instruments) are considered and assigned a numerical value of one (lowest value) to five (greatest value). Any removable alpha contamination is considered a high priority and automatically receives a numerical rank value of five.

The location is evaluated for accessibility. A restricted site in a remote area would receive the lowest point value of one. They would progress up to a value of five where the public may have access.

Mobility scoring is based on contamination that can be, or has a history of being, transported from where it was originally identified to places outside of the posted radiological area. Fixed contamination would receive a value of one progressing to contamination that can potentially be blown by the wind or through biological uptake and transport receiving a value of five. There is a maximum of 15 points possible with this ranking system.

It should be noted that this system is not intended to be a total qualitative or quantitative risk assessment, but rather a way of communicating environmental significance to the landlord and respective program office. Before a site is designated for remediation, other elements of the site clean-up process are also considered such as costs, location, public/regulatory interest, risk assessments, and engineering strategies.

### 2.3 Environmental Standards

Radiological survey data are used to determine compliance of radioactive waste sites with *Effluent and Environmental Monitoring* ([MSC-PRO-15334](#)), and *Environmental Protection Requirements* ([MSC-RD-15332](#)) for MSA monitored sites; *Required Radiological Surveillances* (TFC-ESHQ-RP-MON-P-10) for Washington River Protection Solutions, LLC (WRPS) managed sites; and *Environmental Protection Requirements* ([PRC-RD-EP-15332](#)), and *Effluent and Environmental Monitoring for Radionuclide Airborne Emissions* ([PRC-PRO-EP-15334](#)) for CH2M HILL Plateau Remediation Company (CHPRC) managed sites. *Environmental Monitoring and Management* ([ENV-1](#)), [Chapter 1.9](#), for Washington Closure Hanford, LLC (WCH) managed sites.

In order to compare field instrument values with the standards listed in the contractor's radiological control manuals, a conversion factor is necessary. This conversion factor has been established using a Geiger-Mueller detector with a pancake type probe where 20,000 dpm (2,000 counts per minute [cpm]) are approximately equivalent to one millirem per hour for beta-emitting radionuclides as indicated in UCRL-88275, *Evaluation of Beta Energy (E max) and Spectral Type Using Survey Instruments*. It should be understood that converting field instrument values, which include both beta and gamma energies, is approximate for field reporting purposes and does not allow for absolute precision.

### 2.4 Survey Methods and Procedures

Surveys documented in this report include road surfaces, cribs, underground pipelines, stabilized burial grounds, covered ponds and ditches, tank farm perimeters, active burial ground perimeters, unplanned release sites, and other radiological areas. Methods and procedures for these surveys can be found in *Near-Facility Environmental Monitoring* ([MSC-PRO-EI-0611](#)), *MSC Radiological Control Manual* ([MSC-5173](#)), *CH2M HILL Plateau Remediation Company Radiological Control Manual* ([CHPRC-00073](#)), *Tank Farms Radiological Control Manual* ([HNF-5183](#)), and WCH procedure *Environmental Monitoring and Management* ([ENV-1](#)), [Chapter 1.9](#) -1-2.35).

Waste sites and other radiological areas are surveyed with portable site approved field instruments. The portable field instrument survey results are reported in dpm per 100 centimeters<sup>2</sup> (dpm/100 cm<sup>2</sup>). Efficiency correction factors, as documented in the various Contractor radiological control manual/procedures, are applied. These can vary between contractors, but are approved as part of each Contractor's radiological control program. Surveys include the perimeter and portions of the ground surface of radiological areas. Wherever possible, smear surveys are made on the surface of exposed equipment and other hard surfaces within a radiological area.

Vegetation, animal burrows, and animal feces are also monitored to detect biological transport when they are within the survey area.

## 3.0 Radiological Survey Summary

Contamination above background levels was found at four of the schedule routine survey sites, and one incident of contamination outside posted CAs at non-routine survey sites. Contamination levels ranging from a low of 24,000 dpm/100 cm<sup>2</sup> beta/gamma to > 1,000,000 dpm/100 cm<sup>2</sup> beta/gamma were reported. Of the five contaminated sites, four were CHPRC sites and one was a WRPS site. Of the five contaminated sites, four were in unposted areas and one was inside an RBA.

All of the contamination was removed for proper disposal. The radiologically contaminated areas are posted to meet the requirements as outlined in the respective contractor’s radiological control manual. The posting includes the following categories: High Contamination (activity >100,000 dpm/100 cm<sup>2</sup> beta/gamma and/or >2,000 dpm/100 cm<sup>2</sup> alpha), Contamination, Soil Contamination, Underground Radioactive Material, Radiological Buffer, and Radiation and High Radiation areas.

While conducting radiological surveys, contaminated media were encountered and collected for analysis and/or disposal. Media found above actions levels defined in the respective Contractor’s radiological control manual are documented via the various contractor-reporting mechanisms such as Radiological Problem Reports, Problem Evaluation Requests, and/or Occurrence Reports. Table 1 summarizes the contamination found, location, survey document, and the corresponding field readings.

**3.1 Waste Information Data System (WIDS) Summary**

The 23 waste sites below were interim closed during the fourth quarter of CY 2012.

600-317	600-309	600-308	600-310	100-D-14	600-313
600-312	600-311	600-305	600-314	600-319	600-324
126-H-2	128-K-2	100-K-36	100-K-68	100-K-3	100-K-69
100-K-70	100-K-71	100-N-22	100-N-55	1908-NE	

The *Administrative Interface Agreement between CH2M HILL Plateau Remediation Company (CHPRC) and Washington Closure Hanford (WCH), Washington River Protection Solutions (WRPS), Mission Support Alliance (MSA), and Pacific Northwest National Laboratory (PNNL) for Hanford Environmental Data Integration (HNF-48562)*, states that an area that is posted Soil Contamination Area or CA (and not located on an existing WIDS site) should be added to the WIDS database as a new waste site if it cannot be cleaned up and down posted within 90 days.

The Environmental Restoration Disposal Facility (ERDF) continued to receive waste from the remediation activities in the 100, 200, 300, and 600 Areas.

Table 2 summarizes the contamination incidents by area and media type for calendar year 2012. The column "Other" in this table is for miscellaneous items (e.g., clothing, equipment, etc.).

**Table 1. Reports of Environmental Contamination (CY 2012)**

DATE	DESCRIPTION	LOCATION	DOCUMENT	FIELD READING (Beta/Gamma)
01/04/12	Tumbleweeds	Inside perimeter fence of ETF	ARJ 01/04/2012	1,200,000 dpm/100cm <sup>2</sup>
01/05/12	Tumbleweeds	Inside perimeter fence of ETF	DAR 01/05/2012	420,000 dpm/100cm <sup>2</sup>
01/09/12	Tumbleweeds	Inside perimeter fence of ETF	ARJ 01/09/2012	2,100,000 dpm/100cm <sup>2</sup>
01/10/12	Tumbleweeds	Outside perimeter fence of ETF	ARJ 01/10/2012	240,000 dpm/100cm <sup>2</sup>
01/12/12	Tumbleweed	Canton Avenue Barrow Pit	ARJ 01/12/2012	30,000 dpm/100cm <sup>2</sup>
02/02/12	Coyote Urine	B/C/ Controlled Area	RCR 02/02/2012	>1,000,000 dpm/100cm <sup>2</sup>
02/16/12	Mud Dauber Nest	Conex box at 100-N	RCR 02/28/2012	200,000 dpm/100cm <sup>2</sup>
02/23/12	Speck	Outside NE perimeter fence of 241-C Tank Farm	RCR 02/23/2012	400,000 dpm/100cm <sup>2</sup>
02/23/12	Speck	Outside NE perimeter fence of 241-C Tank Farm	RCR 02/23/2012	30,000 dpm/100cm <sup>2</sup>
03/05/12	Tumbleweeds	Outside perimeter fence of 221-T Plant	RCR 03/05/2012	90,000 dpm/100cm <sup>2</sup>
03/09/12	Coyote Urine	Inside 218-E-12B Burial Ground	NPD 03/09/2012	750,000 dpm/100cm <sup>2</sup>
04/11/12	Stone	On WIDS site 218-E-5	DAR 04/11/2012	300,000 dpm/100cm <sup>2</sup>
04/12/12	Tumbleweeds	Around outer perimeter fence of 241-TX/TY Tank Farm	DAR 04/12/2012	1,800,000 dpm/100cm <sup>2</sup>
04/13/12	Swab Riser Pipe Cap	Next to swab riser on UPR-600-20	DAR 04/13/2012	200,000 dpm/100cm <sup>2</sup>
04/18/12	Animal Urine	WIDS pipelines south of 272-S	RCR 04/18/2012	800,000 dpm/100cm <sup>2</sup>
04/25/12	Foam Material	Northeast of 241-C Tank Farm	RCR 04/25/2012	90,000 dpm/100cm <sup>2</sup>
05/03/12	Tumbleweed and Fragments	West fence line of 241-TY Tank Farm	DAR 05/03/2012	2,400,000 dpm/100cm <sup>2</sup>
05/04/12	Grass Roots	Inside RMA south-east of 241-C Tank Farm	DAR 05/04/2012	750,000 dpm/100cm <sup>2</sup>
05/07/12	Tumbleweed and Fragments	West fence line of 241-TX/TY Tank Farm	RCR 05/07/2012	900,000 dpm/100cm <sup>2</sup>
05/21/12	Robin Nest	Inside LERF #42 Catch Basin	IBC 05/30/2012	65,000 dpm/100cm <sup>2</sup>
05/23/12	Swallow Nest	Submarine reactor compartments at 218-E-12B Trench 94	IBC 05/30/2012	18,000 dpm/100cm <sup>2</sup>
05/24/12	Rocks	Inside fence line of 202-A PUREX	RCR 05/24/2012	300,000 dpm/100cm <sup>2</sup>
06/11/12	Rock	Inside fence line of 221-B	RCR 06/11/2012	>1,000,000 dpm/100cm <sup>2</sup>
06/13/12	Tumbleweed	Inside perimeter of LERF Basin #44	RCR 06/14/2012	30,000 dpm/100cm <sup>2</sup>
06/13/12	Bird Feces	Inside perimeter of LERF Basin #44	RCR 06/14/2012	420,000 dpm/100cm <sup>2</sup>
06/29/12	Specks	South-west of 241-C Tank Farm perimeter fence	RCR 06/29/2012	800,000 dpm/100cm <sup>2</sup>
06/30/12	Bird Droppings and Egg Shell	Inside ETF Surge Berm	RCR 07/02/2012	25,000 dpm/100cm <sup>2</sup>
08/01/12	Speck	Between 241-C and 241-AN Tank Farms	RCR 08/08/2012	40,000 dpm/100cm <sup>2</sup>
08/16/12	Speck	Outside SW corner of 241-B Tank Farm perimeter fence	RCR 08/16/2012	74,000 dpm/100cm <sup>2</sup>
08/28/12	Owl Pellets	Submarine reactor compartments at 218-E-12B Trench 94	DAR 08/29/2012	59,850 dpm/100cm <sup>2</sup>
08/29/12	Mud Dauber Nest	100-N Area at 1904NC Lift Station	RCR 08/29/2012	96,000 dpm/100cm <sup>2</sup>
09/05/12	Rabbit Pellet	At WIDS Site 216-U-14	DAR 09/05/2012	300,000 dpm/100cm <sup>2</sup>
09/06/12	Tumbleweed	Submarine reactor compartments at 218-E-12B Trench 94	RCR 09/10/2012	30,000 dpm/100cm <sup>2</sup>
09/10/12	Speck	Outside perimeter fence of 241-T Tank Farm	DAR 09/10/2012	210,000 dpm/100cm <sup>2</sup>
09/12/12	Tumbleweed Fragment	Perimeter of 218-W-4B Burial Ground	RCR 09/12/2012	4,000 dpm/100cm <sup>2</sup>
09/18/12	Coyote Feces	Perimeter of 218-E-10 Burial Ground	RCR 09/18/2012	20,000 dpm/100cm <sup>2</sup>
09/18/12	Soil	Perimeter of 218-E-10 Burial Ground	RCR 09/18/2012	40,000 dpm/100cm <sup>2</sup>
09/22/12	Bird Droppings	Inside ETF Surge Berm	RCR 09/24/2012	7,000 dpm/100cm <sup>2</sup>
10/25/12	Tumbleweed	Inside fence line NE corner of 200 West Area	RPR-N-12-005	45,000 dpm/100cm <sup>2</sup>
10/30/12	Tumbleweed	West fence of 221-T Plant	RPR-N-12-006	24,000 dpm/100cm <sup>2</sup>
12/05/12	Tumbleweed	Inside 200 East perimeter fence	DAR 12/05/2012	>1,000,000 dpm/100cm <sup>2</sup>
12/19/12	Tumbleweed	South fence of 241-T Tank Farm	RCR 12/19/2012	60,000 dpm/100cm <sup>2</sup>
12/31/12	Cattail Reed	North side of LERF Basin 44	RCR 01/03/2012	98,500 dpm/100cm <sup>2</sup>
<b>Referenced Documents:</b>			<b>Abbreviations:</b>	
NRS Environmental/WSCF Radiological Survey Reports: N-XXXXX			dpm = Disintegrations per minute.	
Occurrence Reports: (MSC-GEN-2012-XXX, CPRC-SNF-2012-XXX, WCH-REMACT-2012-XXX)			cm <sup>2</sup> = Square Centimeter	
Daily Activity Reports: DAR xx/xx/2012, ARJ xx/xx/2012, RCRxx/xx/2012, NPD xx/xx/2012			N/A = Not applicable	
CHPRC Groundwater Radiological Survey Reports: GW-XXXXX			PA = Probe Area.	
CHPRC Radiological Survey Reports: RC-XXXXX			ETF = Effluent Treatment Facility	
Radiological Problem Reports: RPR-N-12-XXX			LERF = Liquid Effluent Retention Facility	
WRPS Problem Evaluation Reports: WRPS-PER-2012-XXX			WSCF = Waste Sampling and Characterization Facility	
Activity levels reported: Maximum observed in the field.				

**Table 2. Contamination Incidents by Area and Type (CY 2012)**

<b>Area/Waste Site Type</b>	<b>Vegetation</b>	<b>Animals</b>	<b>Soil/Specks</b>	<b>Other</b>	<b>Total</b>
200 East Tank Farms	1	0	5	1	7
200 West Tank Farms	4	0	1	0	5
200 East Burial Grounds	1	4	2	0	7
200 West Burial Grounds	1	0	0	0	1
200 East Cribs, Ponds, & Ditches	0	0	0	0	0
200 West Cribs, Ponds, & Ditches	0	0	0	0	0
200 East Fence Lines	1	0	0	0	1
200 West Fence Lines	1	0	0	0	1
200 East Roads & Rail Roads	0	0	0	0	0
200 West Roads & Rail Roads	0	0	0	0	0
200 East Unplanned Release Sites	0	0	0	0	0
200 West Unplanned Release Sites	0	0	0	0	0
200 East Underground Pipelines	0	0	0	0	0
200 West Underground Pipelines	0	1	0	0	1
Cross-Site Transfer Line	0	0	0	1	1
200-BC Cribs and Trenches	0	1	0	0	1
200 East Miscellaneous	7	4	2	0	13
200 West Miscellaneous	2	1	0	0	3
200 North Area	0	0	0	0	0
100 Areas	0	2	0	0	2
300 Areas	0	0	0	0	0
400 Areas	0	0	0	0	0
600 Areas	0	0	0	0	0
1100 Areas	0	0	0	0	0
<b>TOTALS</b>	<b>18</b>	<b>13</b>	<b>10</b>	<b>2</b>	<b>43</b>

## 4.0 BIOTIC TRANSPORT

Waste management, environmental protection, safety, and as low as reasonably achievable (ALARA) practices on the Hanford Site require that whenever possible, radiological contamination exposed to the environment be cleaned up or stabilized so that it is not easily transported from posted radiological control areas. 10 CFR 835 requires that appropriate controls be maintained and verified which prevent the inadvertent transfer of removable contamination to locations outside of radiological areas under normal operating conditions.

In response to a U.S. Department of Energy, Richland Operations Office concern, a centralized Integrated Biological Control Program (IBC) to control the spread of contamination caused by biotic vectors was established. The IBC provides vegetation control through herbicide application, grubbing, and vegetation removal in areas of accumulation. Trapping, baiting, fumigation, and the application of pesticides are used to control the spread of contamination by animals and insects.

### 4.1 Deep-Rooted Vegetation Vectors

Deep-rooted vegetation (e.g., tumbleweeds, sagebrush) growing over underground sources of radionuclides may selectively uptake contaminants into their tissues. When radionuclides are transported from roots to aerial portions of the plant, as often happens with tumbleweeds, surface contamination may result. This surface contamination poses a potential risk of environmental transport or human contact and can be very costly to clean up and/or stabilize. The MSA procedures/requirements, [MSC-RD-15332](#), requires that the tumbleweeds and other deep-rooted vegetation be removed from waste sites where radionuclide uptake is detected or probable.

A review of radiological reports (Radiological Problem Reports, Problem Evaluation Reports, Daily Activity Reports, Occurrence Reports, and Radiological Survey Records) identified five incidents of contaminated vegetation. These incidents included four tumbleweeds and one cattail reed.

Table 3 summarizes the number of incidents of contaminated vegetation found and the range of activity encountered between 1995 and December 31, 2012. It has been determined through field readings that the dose rate for meter readings on tumbleweeds having greater than 6,000,000 dpm/100 cm<sup>2</sup> ranges from approximately 2.0 to 50 mrad/hr.

Figure 11 depicts graphically, the average number of contaminated vegetation incidents encountered quarterly between 1995 and 2011 and the number of incidents occurring quarterly during CY 2012. Figure 12 displays the average number of contaminated vegetation incidents encountered monthly between 1995 and 2011 and the number of incidents occurring monthly during CY 2012.

### 4.2 Animal Vectors

Biotic transport of radiological contamination through animal (insects, mice, etc.) vectors has been a major cause of contamination spread throughout the Hanford Site for a number of years.

A review of radiological reports (Radiological Problem Reports, Problem Evaluation Reports, Daily Activity Reports, Occurrence Reports, and Radiological Survey Records) during this reporting period identified no incidents of contaminated animals and animal related material (bird-related material and mammal droppings). Table 4 shows the number of contaminated animal related incidences found and the range of activity encountered for the years 1995 through December 31, 2012. It

should be noted that the dose rates for meter readings greater than 6,000,000 dpm/100 cm<sup>2</sup> or 1,000,000 dpm/PA detected in the animals/insects could range as much as approximately 1.5 to 15 mrad/hr.

Figure 13 summarizes the average number of contaminated animal incidents encountered quarterly from 1995 through 2011 and the number of incidents occurring quarterly during CY 2012.. This graphic also demonstrates the decreased activity of animals during the winter.

Figure 14 displays the average number of contaminated animal incidents encountered monthly between 1995 and 2011 and the number of incidents occurring monthly during CY 2012.

### **4.3 Integrated Biological Control Program**

The Integrated Biological Control Program (IBC) continues to work towards controlling the spread of radioactive contamination by biological vectors. The IBC scope includes: (1) integrated surveillance, (2) cleanup, (3) control, and (4) site restoration.

**Table 3. Yearly Summary of Contaminated Vegetation Incidents**

Year	Number of Incidents	Maximum Activity (dpm)B/G <sup>a</sup>	Minimum Activity (dpm)B/G
2012	18	2,400,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
2011	29	>1,000,000/100cm <sup>2</sup>	5,000/100cm <sup>2</sup>
2010	31	>1,000,000/100cm <sup>2</sup>	7,000/100cm <sup>2</sup>
2009	88	>6,000,000/100cm <sup>2</sup>	2,500/100cm <sup>2</sup>
2008	127	>6,000,000/100cm <sup>2</sup>	6,000/100cm <sup>2</sup>
2007	62	2,400,000/100cm <sup>2</sup>	3,000/100cm <sup>2</sup>
2006	75	5,397,000/100cm <sup>2</sup>	10,000/100cm <sup>2</sup>
2005	66	1,800,000/100cm <sup>2</sup>	6,000/100cm <sup>2</sup>
2004	60	540,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
2003	32	3,600,000/100cm <sup>2</sup>	6,000/100cm <sup>2</sup>
2002	16	1,800,000/100cm <sup>2</sup>	3,000/100cm <sup>2</sup>
2001	31	>6,000,000/100cm <sup>2</sup> <sup>b</sup>	6,000/100cm <sup>2</sup>
2000	65	>1,000,000/100cm <sup>2</sup>	5,000/100cm <sup>2</sup>
1999	84	>1,000,000/100cm <sup>2</sup>	8,000/100cm <sup>2</sup>
1998	51	>1,000,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
1997	42	>1,000,000/PA	2,500/PA
1996	21	800,000/PA	6,000/PA
1995	12	250,000/PA	2,000/PA

<sup>a</sup> The reporting of the activity changed in 1998 to meet the requirements identified in each contractors radiological control manuals. The activity is reported in dpm per probe area prior to 1998 and in dpm per 100 cm<sup>2</sup> since 1998 (unless otherwise noted e.g., for a speck or insect).

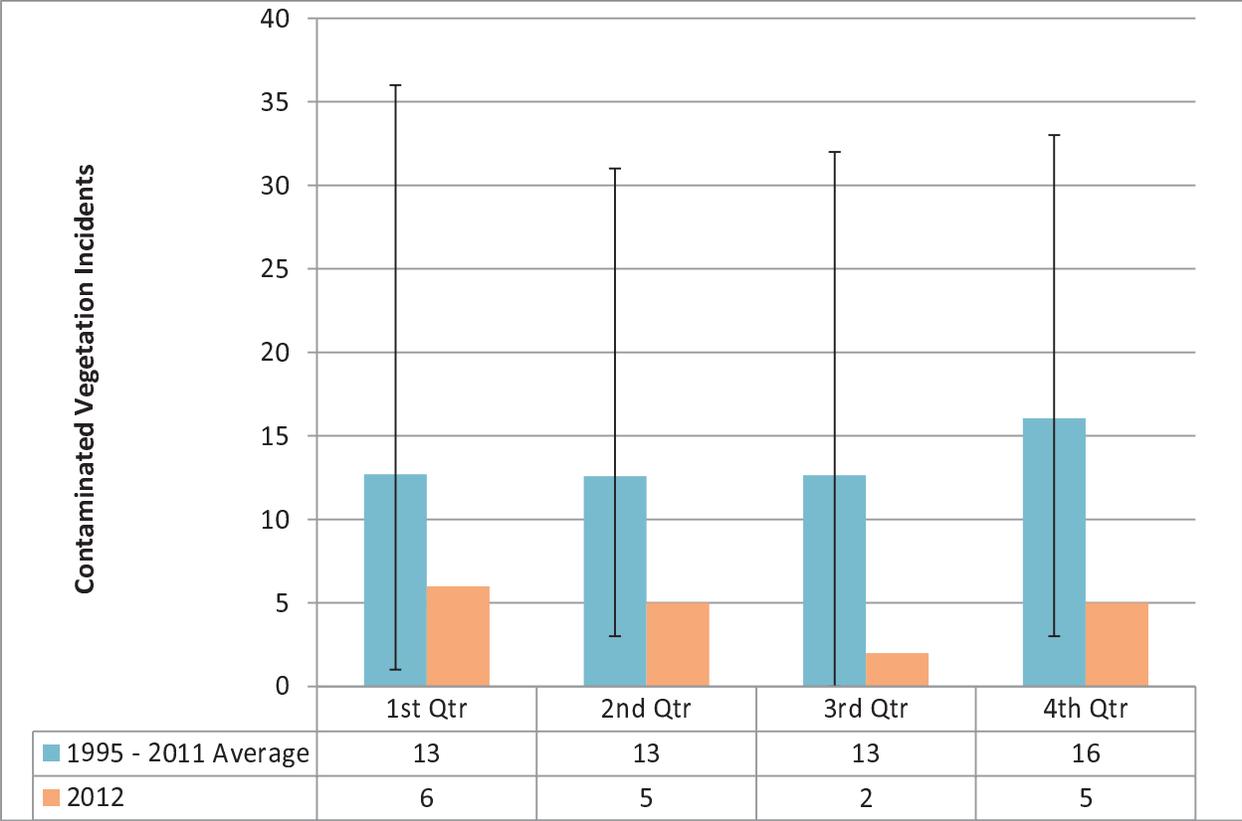
<sup>b</sup> >6,000,000/100 cm<sup>2</sup> being used in 2001 and subsequent years includes a correction factor of 6 to correct from probe area to 100 cm<sup>2</sup> which was not used in previous years.

B/G = Beta/Gamma

dpm = Disintegrations per minute

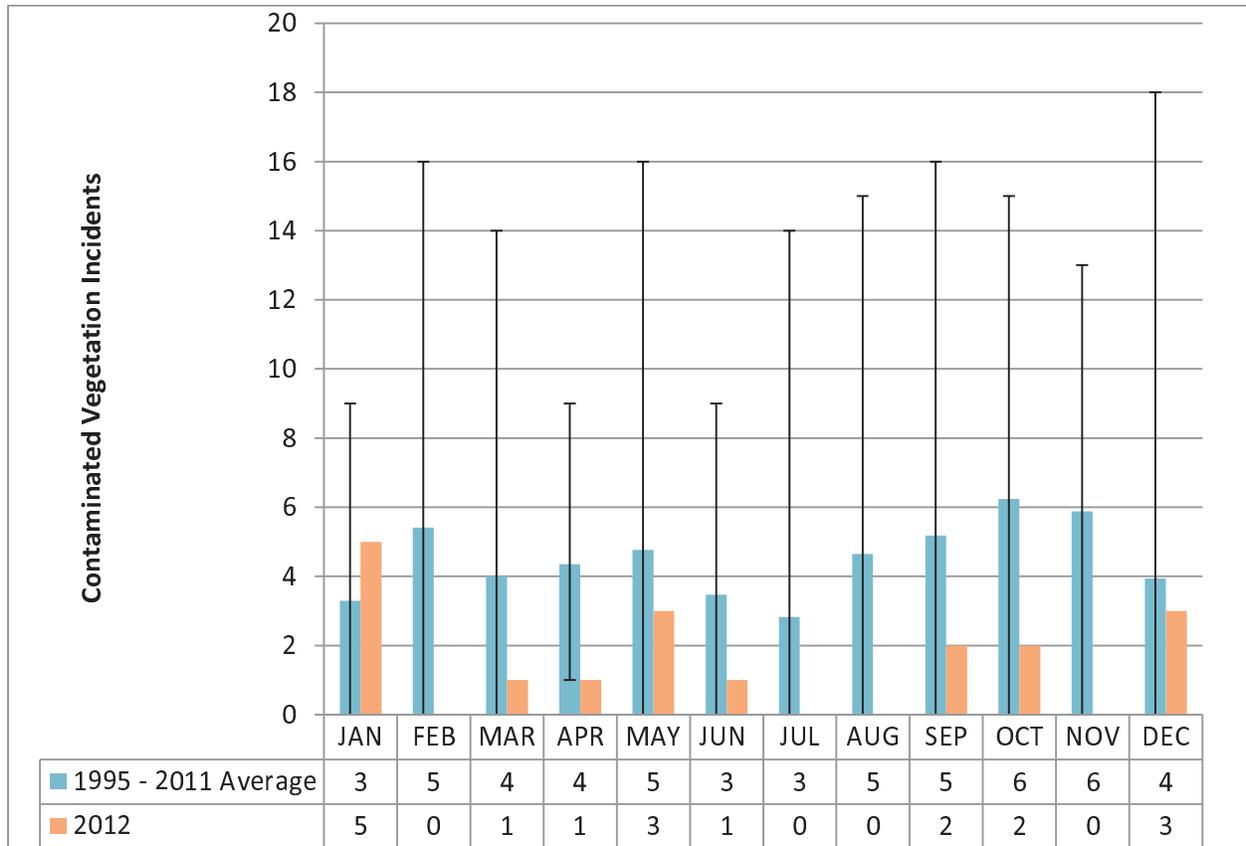
PA = Probe Area

**Figure 11. Contaminated Vegetation Incidents by Quarter**



Note: Historical data also shows range of the number of contaminated vegetation incidents reported.

**Figure 12. Contaminated Vegetation Incidents by Month**



Note: Historical data also shows range of the number of contaminated vegetation incidents reported.

**Table 4. Yearly Summary of Contaminated Animal Incidents**

Year	Number of Incidents	Maximum Activity (dpm)B/G <sup>a</sup>	Minimum Activity (dpm)B/G
2012	13	>1,000,000/100cm <sup>2</sup>	7,000/100cm <sup>2</sup>
2011	19	>1,000,000/100cm <sup>2</sup>	18,000/100cm <sup>2</sup>
2010	21	1,950,000/100cm <sup>2</sup>	3,000/100cm <sup>2</sup>
2009	26	>1,000,000/100cm <sup>2</sup>	20,000/100cm <sup>2</sup>
2008	30	3,600,000/100cm <sup>2</sup>	1,500/100cm <sup>2</sup>
2007	6	600,000/100cm <sup>2</sup>	20,000/100cm <sup>2</sup>
2006	17	>1,000,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
2005	13	>1,000,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
2004	20	649,000/100cm <sup>2</sup>	1,500/100cm <sup>2</sup>
2003	26	1,200,000/100cm <sup>2</sup>	900cpm
2002	10	42,000/100cm <sup>2</sup> Alpha <sup>b</sup>	2,500/100cm <sup>2</sup>
2001	10	>6,000,000/100cm <sup>2</sup> <sup>c</sup>	1,000/PA
2000	13	300,000/100cm <sup>2</sup>	3,000/100cm <sup>2</sup>
1999	17	500,000/100cm <sup>2</sup>	2,000/PA
1998	46	>1,000,000/100cm <sup>2</sup>	4,000/100cm <sup>2</sup>
1997	27	>1,000,000/PA	NR
1996	44	>1,000,000/PA	500/PA
1995	28	>1,000,000/PA	2,000/PA

<sup>a</sup> The reporting of the activity changed in 1998 to meet the requirements identified in each contractor's radiological control manuals. The activity is reported in dpm per probe area prior to 1998 and in dpm per 100 cm<sup>2</sup> since 1998 (unless otherwise noted e.g., for a spec or insect). Activity reported as beta/gamma unless otherwise noted.

<sup>b</sup> No Beta/Gamma reported on this incident.

<sup>c</sup> >6,000,000/100 cm<sup>2</sup> being used in 2001 and subsequent years includes a correction factor of 6 to correct from probe area to 100 cm<sup>2</sup> which was not used in previous years.

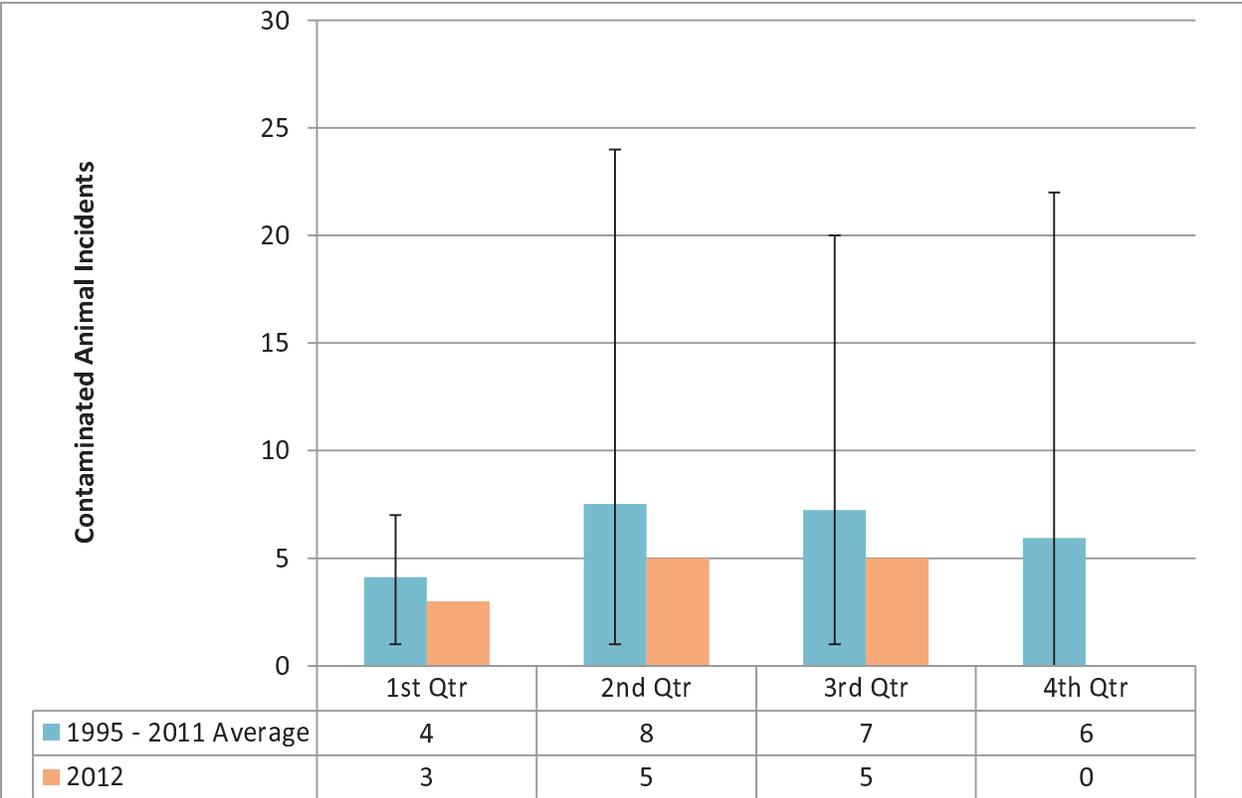
B/G = Beta/Gamma

dpm = Disintegrations per minute

NR = No activity above background recorded in the field

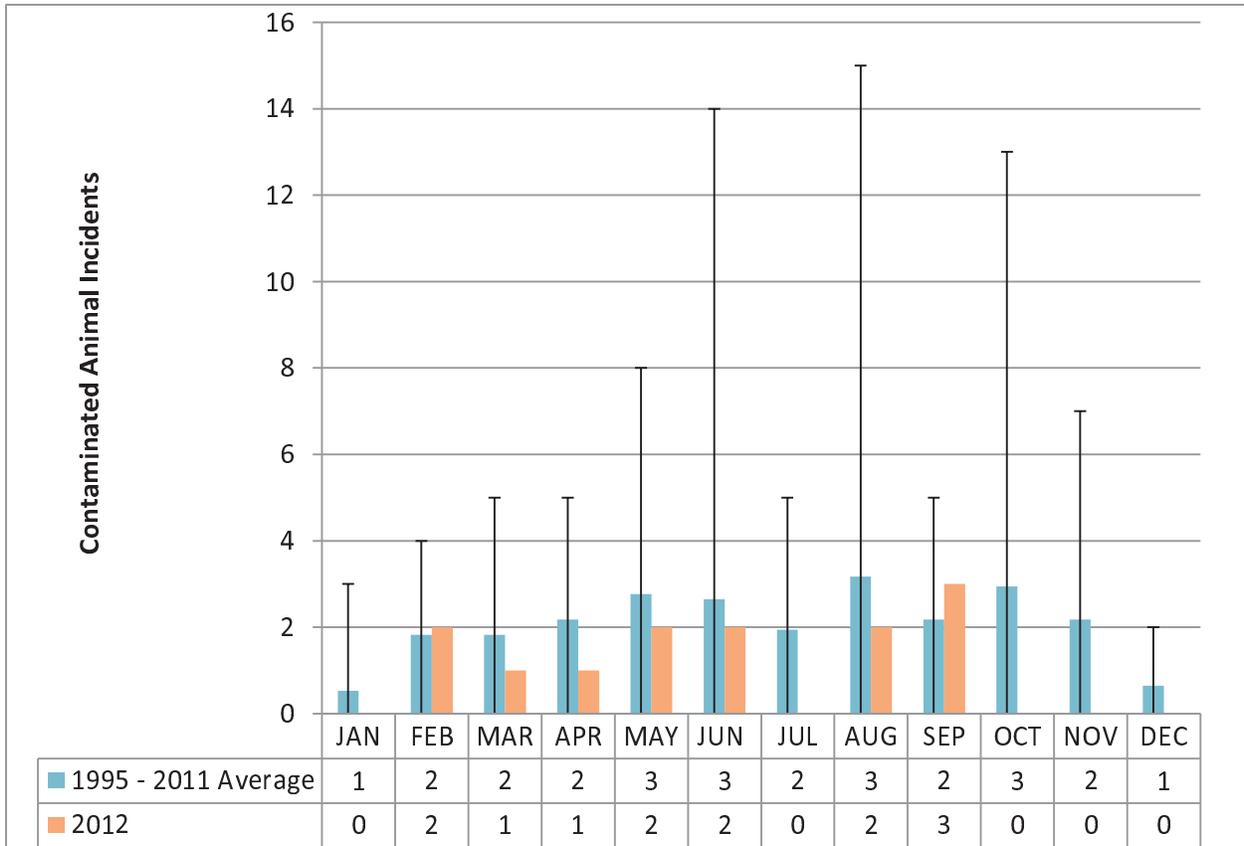
PA = Probe Area

Figure 13. Contaminated Animal/Insect Incidents by Quarter



Note: Historical data also shows range of the number of contaminated animal incidents reported.

Figure 14. Contaminated Animal Incidents by Month



Note: Historical data also shows range of the number of contaminated animal incidents reported.

#### 4.3.1 Surveillance

There were no animal related incidents reported during the fourth quarter, the quarterly average number of incidents is six. In addition, there were five vegetation related incidents, which was lower than quarterly average of 16. The radioactivity monitoring and surveillance activities for this quarter indicate that the control of contaminated vegetation and animal related material was maintained and was consistent with incidents reported in the same period in previous years.

#### 4.3.2 Clean-up

The IBC continued removal and cleanup of tumbleweeds in the operations areas in CY 2012. Cleanup and stabilization activities during the fourth quarter of CY 2012 included the following:

- Twelve non-regulated compactor truckloads of tumbleweeds were taken to the 200-W burn pit for disposal (one compactor truckload is approximately equal to 11,000 ft<sup>3</sup>).
- No regulated compactor truckloads of tumbleweeds were taken to the ERDF for disposal.

#### 4.3.3 Control

In CY2009, the IBC Program was revised and implemented to rotate herbicides used to control deep-rooted vegetation to prevent vegetation from developing a chemical resistance from the usage of the same herbicide chemistry over a period of years. Test plots were set up outside the 200 East and 200 West Areas to test several herbicides and their application rates. The herbicides that showed the greatest effect were used for 2012. Some improvements have been noticed as to the effectiveness of the herbicides being used and new products are being tested so the most effective herbicide is used on the Hanford Site.

Highlights for this quarter include:

- Approximately 145 hectares (358 acres) of Hanford Site land were treated with herbicides.
- 732 pest control responses for Hanford Site facilities were conducted.
- 3,406 bait stations and animal control devices were in place.
- 428 animals were captured, none of which were contaminated.

#### 4.3.4 Noxious Weed Control

The U.S. Department of Energy (DOE) is obligated by the *Agriculture Risk Protection Act of 2000* to control noxious weeds. Washington Administrative Code ([WAC 16-750](#), *State Noxious Weed List and Schedule of Monetary Penalties*), and Revised Code of Washington ([RCW 17.10](#), *Noxious Weeds – Control Boards*), require all landowners to control noxious weeds on their property and impose specific penalties for failure to do so. The Washington State Noxious Weed laws are enforced by the county Noxious Weed Control Boards. In compliance with federal, state, and local laws, each DOE facility is required to have a noxious weed management program.

Noxious weeds are treated with herbicide applications when found on industrial areas such as waste sites, parking lots, and road shoulders. However, noxious weeds have not been treated outside of active industrial areas. Recent decisions regarding application of the [National Environmental Policy Act of 1969](#) (NEPA) to noxious weed control have affected our ability to control weeds. Resolution to the issues is currently being sought.

In 1996, when the active noxious weed program began on the Hanford Site, NEPA requirements were investigated and it was determined that legally required noxious weed control was part of routine maintenance and covered under the Site-Wide Categorical Exclusion and did not require ecological and cultural clearances.

In CY2010, the NEPA determination in regards to noxious weed control (spraying) was re-evaluated. It was determined that site specific and activity specific NEPA evaluations were required, with the exclusion of the active industrial areas. These areas were covered under the existing Site-Wide Categorical Exclusion. The MSA is in the process of completing the compliance review consultations.

For a detailed description of the noxious weeds found on the Hanford Site, refer to the [Hanford Site Environmental Report](#).

#### **4.3.5 Site Restoration**

Opportunities for site restoration as part of the BCP during the fourth quarter of CY 2012 included 72 hectares (179 acres) of grass seeding.

## **5.0 Summary**

There were 105 routine outdoor radiological surveys completed during the quarter in the 100, 200, 300, and 600 Areas.

### **5.1 Biotic Transport Activity**

During the fourth quarter of CY 2012, there were five incidents of contaminated vegetation (tumbleweeds, cattail reed) and no incidents of contaminated animals or animal-related material. These numbers correspond to the four incidents of contaminated vegetation and one incident of contaminated animal related material during the same reporting period in CY 2011. Levels of activity ranged from 24,000 dpm/100 cm<sup>2</sup> to >1,000,000 dpm/100 cm<sup>2</sup> beta/gamma, with no alpha reported in the biota.

## 6.0 References

- 10 CFR 835. Occupational Radiation Protection, Title 10, *Code of Federal Regulations*, Part 835, as amended. Online at <http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&rgn=div5&view=text&node=10:4.0.2.5.27&idno=10>.
- CHPRC-00073. *CH2M HILL Plateau Remediation Company Radiological Control Manual*, CH2M HILL Plateau Remediation Company, Richland, Washington. Online at <http://idmsweb.rl.gov/idms/livelink.exe/fetch/2000/18814/1081672/60626/145203477/145207109/145562868/145570421/CHPRC-00073 - Rev 07.PDF?nodeid=172684471&vernum=1>.
- ENV-1. *Environmental Monitoring and Management*, Washington Closure Hanford, LLC, Richland, Washington.
- HNF-48562. *Administrative Interface Agreement between CH2M HILL Plateau Remediation Company (CHPRC) and Washington Closure Hanford (WCH), Washington River Protection Solutions (WRPS), Mission Support Alliance (MSA), and Pacific Northwest National Laboratory (PNNL) for Hanford Environmental Data Integration*, CH2M HILL Plateau Remediation Company, Richland, Washington. Online at <http://idmsweb.rl.gov/idms/livelink.exe/properties/156545231>.
- HNF-5183. *Tank Farms Radiological Control Manual*, Washington River Protection Solutions, LLC, Richland, Washington. Online at <http://idmsweb/idms/livelink.exe/open/168104879>.
- HNF-51300. *Environmental Surveillance Near-Field Monitoring Schedule*, Mission Support Alliance, LLC, Richland, Washington. Online at <http://idmsweb.rl.gov/idms/livelink.exe/open/171891287>
- MSC-5173. *MSC Radiological Control Manual*, Mission Support Alliance, LLC, Richland, Washington. Online at <http://msc.rl.gov/rapidweb/MSCDOL/dol/displayDoc.cfm?docno=MSC-5173>.
- MSC-PRO-15333. *Environmental Protection Processes*, Mission Support Alliance, LLC, Richland, Washington. Online at <http://msc.rl.gov/rapidweb/MSCDOL/dol/displayDoc.cfm?docno=MSC-PRO-15333>.
- MSC-PRO-15334. *Effluent and Environmental Monitoring*, Mission Support Alliance, LLC, Richland, Washington. Online at [http://msc.rl.gov/rapidweb/MSCDOL/dol/display.cfm?doc\\_number=MSC-PRO-15334](http://msc.rl.gov/rapidweb/MSCDOL/dol/display.cfm?doc_number=MSC-PRO-15334).
- MSC-PRO-EI-0611. *Near-Facility Environmental Monitoring*, Mission Support Alliance, LLC, Richland, Washington. Online at <http://msc.rl.gov/ims/files.cfm/MSC-PRO-EI-0611.pdf>.
- MSC-RD-15332. *Environmental Protection Requirements*, Mission Support Alliance, LLC, Richland, Washington. Online at <http://msc.rl.gov/rapidweb/MSCDOL/dol/displayDoc.cfm?docno=MSC-RD-15332>.
- National Environmental Policy Act of 1969*, 42 USC 4321, et seq. Online at [http://www.faa.gov/about/office\\_org/headquarters\\_offices/ast/licenses\\_permits/htm/nepa/](http://www.faa.gov/about/office_org/headquarters_offices/ast/licenses_permits/htm/nepa/).
- Hanford Site Environmental Reports, Mission Support Alliance, Richland, Washington. Online at <http://msa.hanford.gov/msa/index.cfm/Env. Reports 2001 - Latest>.

PRC-PRO-EP-15334. *Effluent and Environmental Monitoring for Radionuclide Airborne Emissions*, CH2M HILL Plateau Remediation Company, Richland, Washington. Online at <http://prc.rl.gov/rapidweb/PRCDOL/prc/displayDoc.cfm?docno=PRC-PRO-EP-15334>.

PRC-RD-EP-15332. *Environmental Protection Requirements*, CH2M HILL Plateau Remediation Company, Richland, Washington. Online at <http://prc.rl.gov/rapidweb/PRCDOL/prc/displayDoc.cfm?docno=PRC-RD-EP-15332>.

RCW 17.10. *Noxious Weeds – Control Boards, Revised Code of Washington*, as amended. Online at <http://apps.leg.wa.gov/RCW/default.aspx?cite=17.10>.

TFC-ESHQ-RP-MON-P-10. *Required Radiological Surveillances*, Washington River Protection Solutions, LLC, Richland, Washington.

UCRL-88275. *Evaluation of Beta Energy (E max) and Spectral Type Using Survey Instruments*, Hankins, D. E., October 1982.

WAC 16-750. *State Noxious Weed List and Schedule of Monetary Penalties*. Washington Administrative Code, Olympia, Washington. Online at <http://apps.leg.wa.gov/WAC/default.aspx?cite=16-750>.

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